Osi

0.105

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Here are the classes, structs, unions and interfaces with brief descriptions:

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4.1 File List

Here is a list of all documented files with brief descriptions:

5 Class Documentation

5.1 OsiSolverInterface::ApplyCutsReturnCode Class Reference

Internal class for obtaining status from the applyCuts method.

`#include <OsiSolverInterface.hpp>`

Public Member Functions

Constructors and desctructors

- ApplyCutsReturnCode ()
  Default constructor.
- ApplyCutsReturnCode (const ApplyCutsReturnCode &rhs)
  Copy constructor.
- ApplyCutsReturnCode & operator= (const ApplyCutsReturnCode &rhs)

Assignment operator.

- ~ApplyCutsReturnCode ()

  Destructor.

Accessing return code attributes

- int getNumInconsistent ()

  Number of logically inconsistent cuts.
- int getNumInconsistentWrtIntegerModel ()

  Number of cuts inconsistent with the current model.
- int getNumInfeasible ()

  Number of cuts that cause obvious infeasibility.
- int getNumIneffective ()

  Number of redundant or ineffective cuts.
- int getNumApplied ()

  Number of cuts applied.

Friends

- class OsiSolverInterface

5.1.1 Detailed Description

Internal class for obtaining status from the applyCuts method.

Definition at line 72 of file OsiSolverInterface.hpp.

The documentation for this class was generated from the following file:

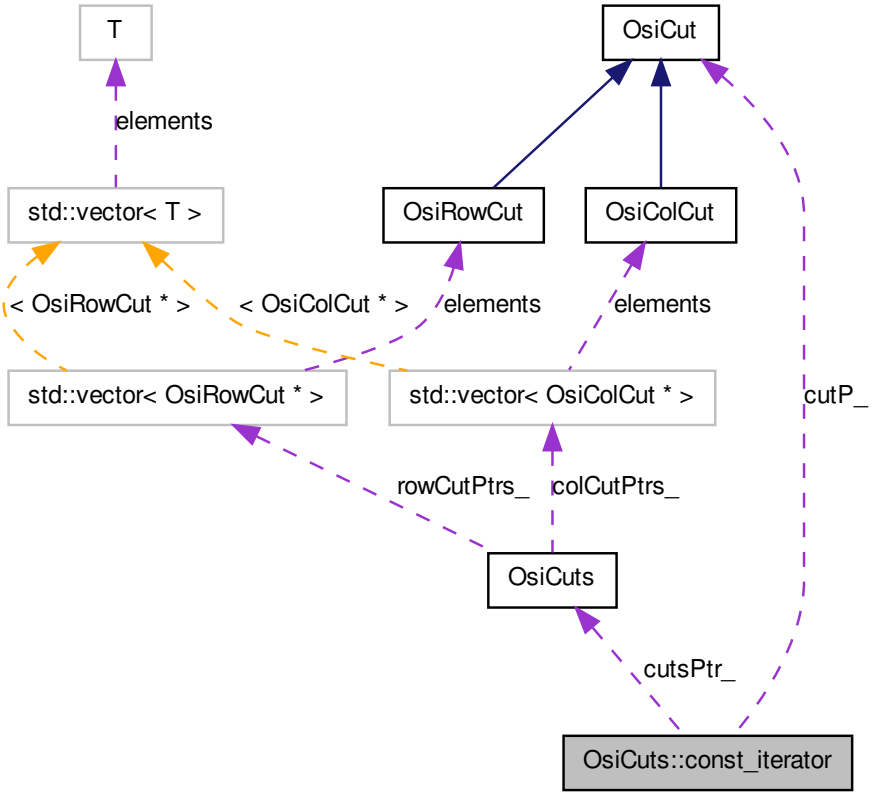
- OsiSolverInterface.hpp

5.2 OsiCuts::const_iterator Class Reference

Const Iterator.

```
#include <OsiCuts.hpp>
```

Collaboration diagram for OsiCuts::const_iterator:



Friends

- class OsiCuts

5.2.1 Detailed Description

Const Iterator.

This is a class for iterating over the collection of cuts.

Definition at line 74 of file OsiCuts.hpp.

The documentation for this class was generated from the following file:

- OsiCuts.hpp

5.3 glp_prob Struct Reference

5.3.1 Detailed Description

Definition at line 29 of file OsiGlpkSolverInterface.hpp.

The documentation for this struct was generated from the following file:

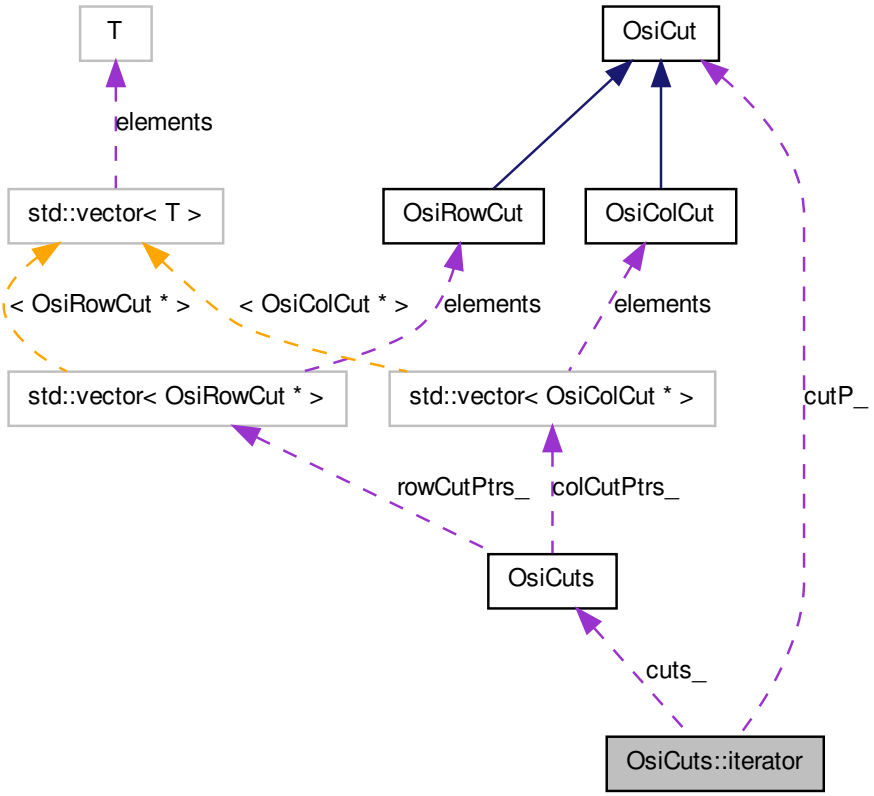
- OsiGlpkSolverInterface.hpp

5.4 OsiCuts::iterator Class Reference

Iterator.

`#include <OsiCuts.hpp>`

Collaboration diagram for OsiCuts::iterator:



Friends

- class OsiCuts

5.4.1 Detailed Description

Iterator.

This is a class for iterating over the collection of cuts.

Definition at line 30 of file OsiCuts.hpp.

The documentation for this class was generated from the following file:

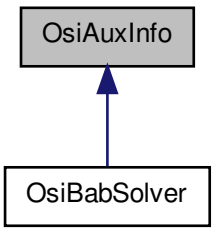
- OsiCuts.hpp

5.5 OsiAuxInfo Class Reference

This class allows for a more structured use of algorithmic tweaking to an OsiSolverInterface.

`#include <OsiAuxInfo.hpp>`

Inheritance diagram for OsiAuxInfo:



Public Member Functions

- virtual OsiAuxInfo * clone () const

  Clone.
- OsiAuxInfo & operator= (const OsiAuxInfo &rhs)

  Assignment operator.
- void * getApplicationData () const

  Get application data.

Protected Attributes

- void * appData_

  Pointer to user-defined data structure.

5.5.1 Detailed Description

This class allows for a more structured use of algorithmic tweaking to an OsiSolverInterface.

It is designed to replace the simple use of appData_ pointer.

This has been done to make it easier to use NonLinear solvers and other exotic beasts in a branch and bound mode. After this class definition there is one for a derived class for just such a purpose.

Definition at line 21 of file OsiAuxInfo.hpp.

The documentation for this class was generated from the following file:

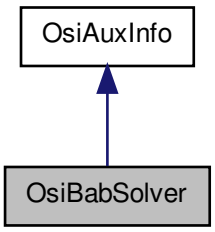
- OsiAuxInfo.hpp

5.6 OsiBabSolver Class Reference

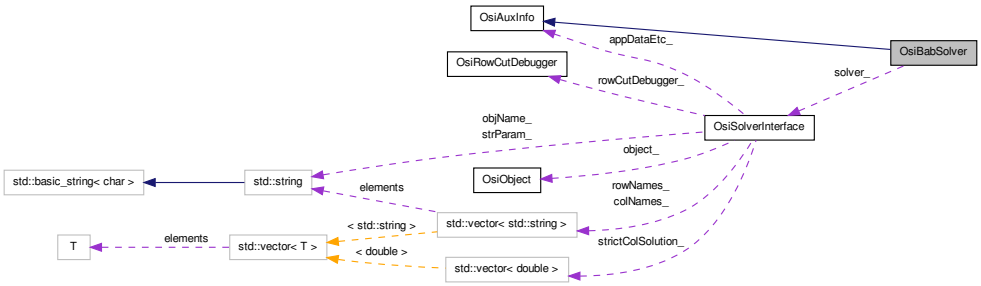
This class allows for the use of more exotic solvers e.g.

`#include <OsiAuxInfo.hpp>`

Inheritance diagram for OsiBabSolver:



Collaboration diagram for OsiBabSolver:



Public Member Functions

- virtual OsiAuxInfo ∗ clone () const

  Clone.
- OsiBabSolver & operator= (const OsiBabSolver &rhs)

  Assignment operator.
- void setSolver (const OsiSolverInterface ∗solver)

  Update solver.
- void setSolver (const OsiSolverInterface &solver)

  Update solver.
- int solution (double &objectiveValue, double ∗newSolution, int numberColumns)

  returns 0 if no heuristic solution, 1 if valid solution with better objective value than one passed in Sets solution values if good, sets objective value numberColumns is size of newSolution
- void setSolution (const double ∗solution, int numberColumns, double objectiveValue)

  Set solution and objective value.
- bool hasSolution (double &solutionValue, double ∗solution)

  returns true if the object stores a solution, false otherwise.
- void setSolverType (int value)

  Sets solver type 0 - normal LP solver 1 - DW - may also return heuristic solutions 2 - NLP solver or similar - can't compute objective value just from solution check solver to see if feasible and what objective value is.
- int solverType () const

  gets solver type 0 - normal LP solver 1 - DW - may also return heuristic solutions 2 - NLP solver or similar - can't compute objective value just from solution check this (rather than solver) to see if feasible and what objective value is
- bool solutionAddsCuts () const

  Return true if getting solution may add cuts so hot start etc will be obsolete.
- bool alwaysTryCutsAtRootNode () const

  Return true if we should try cuts at root even if looks satisfied.

- bool solverAccurate () const

  Returns true if can use solver objective or feasible values, otherwise use mipBound etc.
- bool reducedCostsAccurate () const

  Returns true if can use reduced costs for fixing.
- double mipBound () const

  Get objective (well mip bound)
- bool mipFeasible () const

  Returns true if node feasible.
- void setMipBound (double value)

  Set mip bound (only used for some solvers)
- double bestObjectiveValue () const

  Get objective value of saved solution.
- bool tryCuts () const

  Says whether we want to try cuts at all.
- bool warmStart () const

  Says whether we have a warm start (so can do strong branching)
- int extraCharacteristics () const

  Get bit mask for odd actions of solvers 1 - solution or bound arrays may move in mysterious ways e.g.
- void setExtraCharacteristics (int value)

  Set bit mask for odd actions of solvers 1 - solution or bound arrays may move in mysterious ways e.g.
- const double * beforeLower () const

  Pointer to lower bounds before branch (only if extraCharacteristics set)
- void setBeforeLower (const double *array)

  Set pointer to lower bounds before branch (only if extraCharacteristics set)
- const double * beforeUpper () const

  Pointer to upper bounds before branch (only if extraCharacteristics set)
- void setBeforeUpper (const double *array)

  Set pointer to upper bounds before branch (only if extraCharacteristics set)

Protected Attributes

- double bestObjectiveValue_

  Objective value of best solution (if there is one) (minimization)
- double mipBound_

  Current lower bound on solution (if > 1.0e50 infeasible)
- const OsiSolverInterface * solver_

  Solver to use for getting/setting solutions etc.
- double * bestSolution_

  Best integer feasible solution.
- const double * beforeLower_

Pointer to lower bounds before branch (only if extraCharacteristics set)

- const double * beforeUpper_

  Pointer to upper bounds before branch (only if extraCharacteristics set)

- int solverType_

  Solver type 0 - normal LP solver 1 - DW - may also return heuristic solutions 2 - NLP solver or similar - can't compute objective value just from solution check this (rather than solver) to see if feasible and what objective value is.

- int sizeSolution_

  Size of solution.

- int extraCharacteristics_

  Bit mask for odd actions of solvers 1 - solution or bound arrays may move in mysterious ways e.g.

5.6.1 Detailed Description

This class allows for the use of more exotic solvers e.g.

Non-Linear or Volume.

You can derive from this although at present I can't see the need.

Definition at line 49 of file OsiAuxInfo.hpp.

5.6.2 Member Function Documentation

5.6.2.1 void OsiBabSolver::setSolution (const double * *solution*, int *numberColumns*, double *objectiveValue*)

Set solution and objective value.

Number of columns and optimization direction taken from current solver. Size of solution is numberColumns (may be padded or truncated in function)

5.6.2.2 bool OsiBabSolver::hasSolution (double & *solutionValue*, double * *solution*)

returns true if the object stores a solution, false otherwise.

If there is a solution then solutionValue and solution will be filled out as well. In that case the user needs to allocate solution to be a big enough array.

5.6.2.3 void OsiBabSolver::setSolverType (int *value*) [inline]

Sets solver type 0 - normal LP solver 1 - DW - may also return heuristic solutions 2 - NLP solver or similar - can't compute objective value just from solution check solver to see if feasible and what objective value is.

- may also return heuristic solution 3 - NLP solver or similar - can't compute objective value just from solution check this (rather than solver) to see if feasible and what objective value is. Using Outer Approximation so called lp based

- may also return heuristic solution 4 - normal solver but cuts are needed for integral solution

Definition at line 102 of file OsiAuxInfo.hpp.

5.6.2.4 int OsiBabSolver::solverType ( ) const [inline]

gets solver type 0 - normal LP solver 1 - DW - may also return heuristic solutions 2 - NLP solver or similar - can't compute objective value just from solution check this (rather than solver) to see if feasible and what objective value is

- may also return heuristic solution 3 - NLP solver or similar - can't compute objective value just from solution check this (rather than solver) to see if feasible and what objective value is. Using Outer Approximation so called lp based
- may also return heuristic solution 4 - normal solver but cuts are needed for integral solution

Definition at line 116 of file OsiAuxInfo.hpp.

5.6.2.5 int OsiBabSolver::extraCharacteristics ( ) const [inline]

Get bit mask for odd actions of solvers 1 - solution or bound arrays may move in mysterious ways e.g.

cplex 2 - solver may want bounds before branch

Definition at line 152 of file OsiAuxInfo.hpp.

5.6.2.6 void OsiBabSolver::setExtraCharacteristics (int *value*) [inline]

Set bit mask for odd actions of solvers 1 - solution or bound arrays may move in mysterious ways e.g.

cplex 2 - solver may want bounds before branch

Definition at line 158 of file OsiAuxInfo.hpp.

5.6.3 Member Data Documentation

5.6.3.1 int OsiBabSolver::solverType_ [protected]

Solver type 0 - normal LP solver 1 - DW - may also return heuristic solutions 2 - NLP solver or similar - can't compute objective value just from solution check this (rather than solver) to see if feasible and what objective value is.

- may also return heuristic solution 3 - NLP solver or similar - can't compute objective value just from solution check this (rather than solver) to see if feasible and what objective value is. Using Outer Approximation so called lp based
- may also return heuristic solution

Definition at line 196 of file OsiAuxInfo.hpp.

5.6.3.2 int OsiBabSolver::extraCharacteristics_ [protected]

Bit mask for odd actions of solvers 1 - solution or bound arrays may move in mysterious ways e.g.

cplex 2 - solver may want bounds before branch

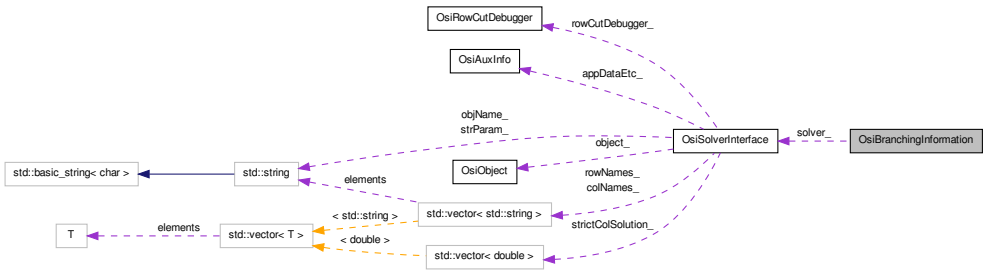
Definition at line 203 of file OsiAuxInfo.hpp.

The documentation for this class was generated from the following file:

- OsiAuxInfo.hpp

5.7 OsiBranchingInformation Class Reference

Collaboration diagram for OsiBranchingInformation:



Public Member Functions

- OsiBranchingInformation ()

  Default Constructor.
- OsiBranchingInformation (const OsiSolverInterface *solver, bool normalSolver, bool copySolution=false)

  Useful Constructor (normalSolver true if has matrix etc etc) copySolution true if constructot should make a copy.
- OsiBranchingInformation (const OsiBranchingInformation &)

  Copy constructor.
- OsiBranchingInformation & operator= (const OsiBranchingInformation &rhs)

  Assignment operator.
- virtual OsiBranchingInformation * clone () const

  Clone.
- virtual ~OsiBranchingInformation ()

  Destructor.

Public Attributes

- int stateOfSearch_

  data
- double objectiveValue_

  Value of objective function (in minimization sense)
- double cutoff_

  Value of objective cutoff (in minimization sense)
- double direction_

  Direction 1.0 for minimization, -1.0 for maximization.
- double integerTolerance_

  Integer tolerance.
- double primalTolerance_

  Primal tolerance.
- double timeRemaining_

  Maximum time remaining before stopping on time.
- double defaultDual_

  Dual to use if row bound violated (if negative then pseudoShadowPrices off)
- const OsiSolverInterface * solver_

  Pointer to solver.
- int numberColumns_

  The number of columns.
- const double * lower_

  Pointer to current lower bounds on columns.
- const double * solution_

  Pointer to current solution.
- const double * upper_

  Pointer to current upper bounds on columns.
- const double * hotstartSolution_

  Highly optional target (hot start) solution.
- const double * pi_

  Pointer to duals.
- const double * rowActivity_

  Pointer to row activity.
- const double * objective_

  Objective.
- const double * rowLower_

  Pointer to current lower bounds on rows.
- const double * rowUpper_

  Pointer to current upper bounds on rows.
- const double * elementByColumn_

  Elements in column copy of matrix.
- const CoinBigIndex * columnStart_

Column starts.

- const int * columnLength_

  Column lengths.

- const int * row_

  Row indices.

- double * usefulRegion_

  *Useful region of length CoinMax(numberColumns,2*numberRows) This is allocated and deleted before OsiObject::infeasibility It is zeroed on entry and should be so on exit It only exists if defaultDual_>=0.0.*

- int * indexRegion_

  Useful index region to go with usefulRegion_.

- int numberSolutions_

  Number of solutions found.

- int numberBranchingSolutions_

  Number of branching solutions found (i.e. exclude heuristics)

- int depth_

  Depth in tree.

- bool owningSolution_

  TEMP.

5.7.1 Detailed Description

Definition at line 367 of file OsiBranchingObject.hpp.

5.7.2 Member Data Documentation

5.7.2.1 int OsiBranchingInformation::stateOfSearch_

data

State of search 0 - no solution 1 - only heuristic solutions 2 - branched to a solution 3 - no solution but many nodes

Definition at line 402 of file OsiBranchingObject.hpp.

The documentation for this class was generated from the following file:

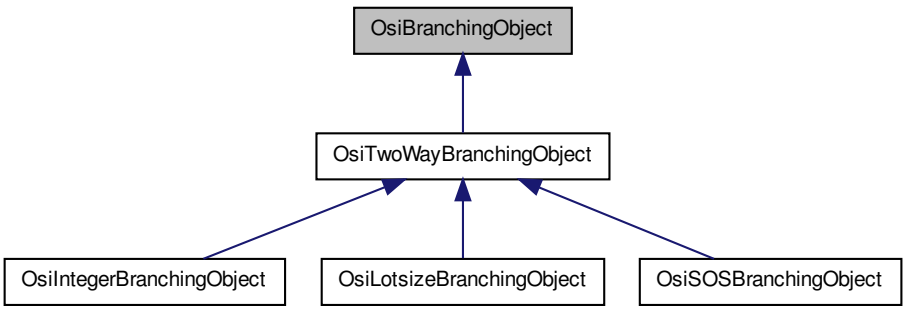
- OsiBranchingObject.hpp

5.8 OsiBranchingObject Class Reference

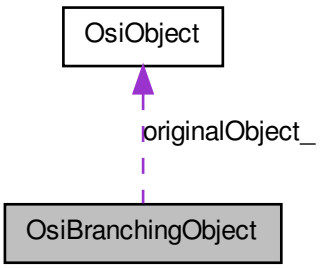
Abstract branching object base class.

`#include <OsiBranchingObject.hpp>`

Inheritance diagram for OsiBranchingObject:



Collaboration diagram for OsiBranchingObject:



Public Member Functions

- OsiBranchingObject ()
  Default Constructor.
- OsiBranchingObject (OsiSolverInterface ∗solver, double value)
  Constructor.
- OsiBranchingObject (const OsiBranchingObject &)
  Copy constructor.
- OsiBranchingObject & operator= (const OsiBranchingObject &rhs)
  Assignment operator.

- virtual OsiBranchingObject * clone () const =0

  Clone.
- virtual ~OsiBranchingObject ()

  Destructor.
- int numberBranches () const

  The number of branch arms created for this branching object.
- int numberBranchesLeft () const

  The number of branch arms left for this branching object.
- void incrementNumberBranchesLeft ()

  Increment the number of branch arms left for this branching object.
- void setNumberBranchesLeft (int)

  Set the number of branch arms left for this branching object Just for forcing.
- void decrementNumberBranchesLeft ()

  Decrement the number of branch arms left for this branching object.
- virtual double branch (OsiSolverInterface *solver)=0

  Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.
- virtual double branch ()

  Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.
- virtual bool boundBranch () const

  Return true if branch should fix variables.
- int branchIndex () const

  Get the state of the branching object This is just the branch index.
- void setBranchingIndex (int branchIndex)

  Set the state of the branching object.
- double value () const

  Current value.
- const OsiObject * originalObject () const

  Return pointer back to object which created.
- void setOriginalObject (const OsiObject *object)

  Set pointer back to object which created.
- virtual void checkIsCutoff (double)

  Double checks in case node can change its mind! Returns objective value Can change objective etc.
- int columnNumber () const

  For debug.
- virtual void print (const OsiSolverInterface *=NULL) const

  Print something about branch - only if log level high.

Protected Attributes

- double value_

  Current value - has some meaning about branch.
- const OsiObject * originalObject_

  Pointer back to object which created.
- int numberBranches_

  Number of branches.
- short branchIndex_

  The state of the branching object.

5.8.1 Detailed Description

Abstract branching object base class.

In the abstract, an OsiBranchingObject contains instructions for how to branch. We want an abstract class so that we can describe how to branch on simple objects (*e.g.*, integers) and more exotic objects (*e.g.*, cliques or hyperplanes).

The branch() method is the crucial routine: it is expected to be able to step through a set of branch arms, executing the actions required to create each subproblem in turn. The base class is primarily virtual to allow for a wide range of problem modifications.

See OsiObject for an overview of the two classes (OsiObject and OsiBranchingObject) which make up Osi's branching model.

Definition at line 254 of file OsiBranchingObject.hpp.

5.8.2 Member Function Documentation

5.8.2.1 virtual double OsiBranchingObject::branch (OsiSolverInterface * *solver*) [pure virtual]

Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Returns change in guessed objective on next branch

Implemented in OsiTwoWayBranchingObject, OsiIntegerBranchingObject, OsiSOSBranchingObject, and OsiLotsizeBranchingObject.

5.8.2.2 virtual double OsiBranchingObject::branch ( ) [inline, virtual]

Execute the actions required to branch, as specified by the current state of the branching object, and advance the object's state.

Returns change in guessed objective on next branch

Definition at line 309 of file OsiBranchingObject.hpp.

5.8.3 Member Data Documentation

5.8.3.1 short OsiBranchingObject::branchIndex_ [protected]

The state of the branching object.

i.e. branch index This starts at 0 when created

Definition at line 360 of file OsiBranchingObject.hpp.

The documentation for this class was generated from the following file:

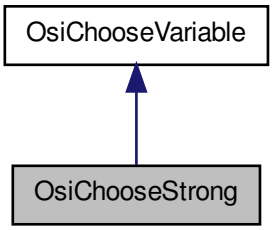
- OsiBranchingObject.hpp

5.9 OsiChooseStrong Class Reference

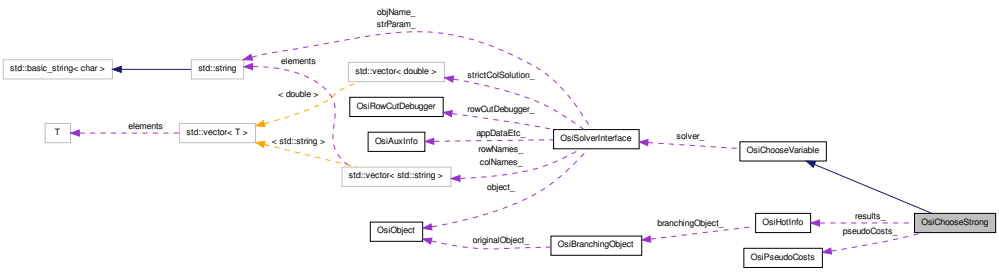
This class chooses a variable to branch on.

`#include <OsiChooseVariable.hpp>`

Inheritance diagram for OsiChooseStrong:



Collaboration diagram for OsiChooseStrong:



Public Member Functions

- OsiChooseStrong ()

  Default Constructor.
- OsiChooseStrong (const OsiSolverInterface *solver)

  Constructor from solver (so we can set up arrays etc)
- OsiChooseStrong (const OsiChooseStrong &)

  Copy constructor.
- OsiChooseStrong & operator= (const OsiChooseStrong &rhs)

  Assignment operator.
- virtual OsiChooseVariable * clone () const

  Clone.
- virtual ~OsiChooseStrong ()

  Destructor.
- virtual int setupList (OsiBranchingInformation *info, bool initialize)

  Sets up strong list and clears all if initialize is true.
- virtual int chooseVariable (OsiSolverInterface *solver, OsiBranchingInformation *info, bool fixVariables)

  Choose a variable Returns -.
- int shadowPriceMode () const

  Pseudo Shadow Price mode 0 - off 1 - use if no strong info 2 - use if strong not trusted 3 - use even if trusted.
- void setShadowPriceMode (int value)

  Set Shadow price mode.
- const OsiPseudoCosts & pseudoCosts () const

  Accessor method to pseudo cost object.
- OsiPseudoCosts & pseudoCosts ()

  Accessor method to pseudo cost object.
- int numberBeforeTrusted () const

  A feww pass-through methods to access members of pseudoCosts_ as if they were members of OsiChooseStrong object.

Protected Member Functions

- int doStrongBranching (OsiSolverInterface *solver, OsiBranchingInformation *info, int numberToDo, int returnCriterion)

  This is a utility function which does strong branching on a list of objects and stores the results in OsiHotInfo.objects.
- void resetResults (int num)

  Clear out the results array.

Protected Attributes

- int shadowPriceMode_

  Pseudo Shadow Price mode 0 - off 1 - use and multiply by strong info 2 - use.
- OsiPseudoCosts pseudoCosts_

  The pseudo costs for the chooser.
- OsiHotInfo * results_

  The results of the strong branching done on the candidates where the pseudocosts were not sufficient.
- int numResults_

  The number of OsiHotInfo objetcs that contain information.

5.9.1 Detailed Description

This class chooses a variable to branch on.

This chooses the variable and direction with reliability strong branching.

The flow is : a) initialize the process. This decides on strong branching list and stores indices of all infeasible objects b) do strong branching on list. If list is empty then just choose one candidate and return without strong branching. If not empty then go through list and return best. However we may find that the node is infeasible or that we can fix a variable. If so we return and it is up to user to call again (after fixing a variable).

Definition at line 318 of file OsiChooseVariable.hpp.

5.9.2 Member Function Documentation

5.9.2.1 virtual int OsiChooseStrong::setupList (OsiBranchingInformation * *info*, bool *initialize*) [virtual]

Sets up strong list and clears all if initialize is true.

Returns number of infeasibilities. If returns -1 then has worked out node is infeasible!

Reimplemented from OsiChooseVariable.

5.9.2.2 virtual int OsiChooseStrong::chooseVariable (OsiSolverInterface * *solver*, OsiBranchingInformation * *info*, bool *fixVariables*) [virtual]

Choose a variable Returns -.

-1 Node is infeasible 0 Normal termination - we have a candidate 1 All looks satisfied - no candidate 2 We can change the bound on a variable - but we also have a strong branching candidate 3 We can change the bound on a variable - but we have a non-strong branching candidate 4 We can change the bound on a variable - no other candidates We can pick up branch from bestObjectIndex() and bestWhichWay() We can pick up a forced branch (can change bound) from firstForcedObjectIndex() and firstForcedWhichWay() If we have a solution then we can pick up from goodObjectiveValue() and goodSolution() If fixVariables is true then 2,3,4 are all really same as problem changed

Reimplemented from OsiChooseVariable.

5.9.2.3 int OsiChooseStrong::doStrongBranching (OsiSolverInterface * *solver*, OsiBranchingInformation * *info*, int *numberToDo*, int *returnCriterion*) [protected]

This is a utility function which does strong branching on a list of objects and stores the results in OsiHotInfo.objects.

On entry the object sequence is stored in the OsiHotInfo object and maybe more. It returns - -1 - one branch was infeasible both ways 0 - all inspected - nothing can be fixed 1 - all inspected - some can be fixed (returnCriterion==0) 2 - may be returning early - one can be fixed (last one done) (returnCriterion==1) 3 - returning because max time

The documentation for this class was generated from the following file:

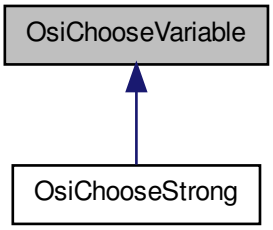
- OsiChooseVariable.hpp

5.10 OsiChooseVariable Class Reference

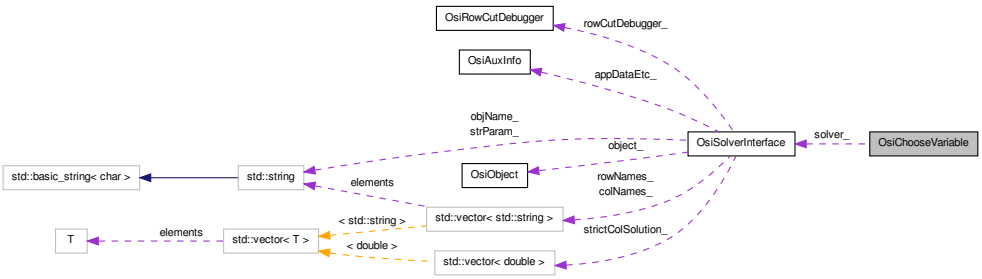
This class chooses a variable to branch on.

`#include <OsiChooseVariable.hpp>`

Inheritance diagram for OsiChooseVariable:



Collaboration diagram for OsiChooseVariable:



Public Member Functions

- OsiChooseVariable ()

  Default Constructor.
- OsiChooseVariable (const OsiSolverInterface ∗solver)

  Constructor from solver (so we can set up arrays etc)
- OsiChooseVariable (const OsiChooseVariable &)

  Copy constructor.
- OsiChooseVariable & operator= (const OsiChooseVariable &rhs)

  Assignment operator.
- virtual OsiChooseVariable ∗ clone () const

  Clone.
- virtual ∼OsiChooseVariable ()

  Destructor.
- virtual int setupList (OsiBranchingInformation ∗info, bool initialize)

  Sets up strong list and clears all if initialize is true.
- virtual int chooseVariable (OsiSolverInterface ∗solver, OsiBranchingInformation ∗info, bool fixVariables)

  Choose a variable Returns -.
- virtual bool feasibleSolution (const OsiBranchingInformation ∗info, const double ∗solution, int numberObjects, const OsiObject ∗∗objects)

  Returns true if solution looks feasible against given objects.
- void saveSolution (const OsiSolverInterface ∗solver)

  Saves a good solution.
- void clearGoodSolution ()

  Clears out good solution after use.
- virtual void updateInformation (const OsiBranchingInformation ∗info, int branch, OsiHotInfo ∗hotInfo)

  Given a candidate fill in useful information e.g. estimates.

- virtual void updateInformation (int whichObject, int branch, double changeInObjective, double changeInValue, int status)

  Given a branch fill in useful information e.g. estimates.
- double goodObjectiveValue () const

  Objective value for feasible solution.
- double upChange () const

  Estimate of up change or change on chosen if n-way.
- double downChange () const

  Estimate of down change or max change on other possibilities if n-way.
- const double * goodSolution () const

  Good solution - deleted by finalize.
- int bestObjectIndex () const

  Index of chosen object.
- void setBestObjectIndex (int value)

  Set index of chosen object.
- int bestWhichWay () const

  Preferred way of chosen object.
- void setBestWhichWay (int value)

  Set preferred way of chosen object.
- int firstForcedObjectIndex () const

  Index of forced object.
- void setFirstForcedObjectIndex (int value)

  Set index of forced object.
- int firstForcedWhichWay () const

  Preferred way of forced object.
- void setFirstForcedWhichWay (int value)

  Set preferred way of forced object.
- int numberUnsatisfied () const

  Get the number of objects unsatisfied at this node - accurate on first pass.
- int numberStrong () const

  Number of objects to choose for strong branching.
- void setNumberStrong (int value)

  Set number of objects to choose for strong branching.
- int numberOnList () const

  Number left on strong list.
- int numberStrongDone () const

  Number of strong branches actually done.
- int numberStrongIterations () const

  Number of strong iterations actually done.
- int numberStrongFixed () const

  Number of strong branches which changed bounds.
- const int * candidates () const

  List of candidates.

- bool trustStrongForBound () const

  Trust results from strong branching for changing bounds.
- void setTrustStrongForBound (bool yesNo)

  Set trust results from strong branching for changing bounds.
- bool trustStrongForSolution () const

  Trust results from strong branching for valid solution.
- void setTrustStrongForSolution (bool yesNo)

  Set trust results from strong branching for valid solution.
- void setSolver (const OsiSolverInterface *solver)

  Set solver and redo arrays.
- int status () const

  Return status -.

Protected Attributes

- double goodObjectiveValue_

  Objective value for feasible solution.
- double upChange_

  Estimate of up change or change on chosen if n-way.
- double downChange_

  Estimate of down change or max change on other possibilities if n-way.
- double * goodSolution_

  Good solution - deleted by finalize.
- int * list_

  List of candidates.
- double * useful_

  Useful array (for sorting etc)
- const OsiSolverInterface * solver_

  Pointer to solver.
- int bestObjectIndex_

  Index of chosen object.
- int bestWhichWay_

  Preferred way of chosen object.
- int firstForcedObjectIndex_

  Index of forced object.
- int firstForcedWhichWay_

  Preferred way of forced object.
- int numberUnsatisfied_

  The number of objects unsatisfied at this node.
- int numberStrong_

  Number of objects to choose for strong branching.
- int numberOnList_

  Number left on strong list.

- int numberStrongDone_

  Number of strong branches actually done.
- int numberStrongIterations_

  Number of strong iterations actually done.
- int numberStrongFixed_

  Number of bound changes due to strong branching.
- bool trustStrongForBound_

  List of unsatisfied objects - first numberOnList_ for strong branching Trust results from strong branching for changing bounds.
- bool trustStrongForSolution_

  Trust results from strong branching for valid solution.

5.10.1 Detailed Description

This class chooses a variable to branch on.

The base class just chooses the variable and direction without strong branching but it has information which would normally be used by strong branching e.g. to re-enter having fixed a variable but using same candidates for strong branching.

The flow is : a) initialize the process. This decides on strong branching list and stores indices of all infeasible objects b) do strong branching on list. If list is empty then just choose one candidate and return without strong branching. If not empty then go through list and return best. However we may find that the node is infeasible or that we can fix a variable. If so we return and it is up to user to call again (after fixing a variable).

Definition at line 33 of file OsiChooseVariable.hpp.

5.10.2 Member Function Documentation

5.10.2.1 virtual int OsiChooseVariable::setupList (OsiBranchingInformation * *info*, bool *initialize*) [virtual]

Sets up strong list and clears all if initialize is true.

Returns number of infeasibilities. If returns -1 then has worked out node is infeasible!

Reimplemented in OsiChooseStrong.

5.10.2.2 virtual int OsiChooseVariable::chooseVariable (OsiSolverInterface * *solver*, OsiBranchingInformation * *info*, bool *fixVariables*) [virtual]

Choose a variable Returns -.

-1 Node is infeasible 0 Normal termination - we have a candidate 1 All looks satisfied - no candidate 2 We can change the bound on a variable - but we also have a strong branching candidate 3 We can change the bound on a variable - but we have a non-strong branching candidate 4 We can change the bound on a variable - no other candidates We can pick up branch from bestObjectIndex() and bestWhichWay() We can pick

up a forced branch (can change bound) from firstForcedObjectIndex() and firstForcedWhichWay() If we have a solution then we can pick up from goodObjectiveValue() and goodSolution() If fixVariables is true then 2,3,4 are all really same as problem changed

Reimplemented in OsiChooseStrong.

5.10.2.3 int OsiChooseVariable::status ( ) const [inline]

Return status -.

-1 Node is infeasible 0 Normal termination - we have a candidate 1 All looks satisfied - no candidate 2 We can change the bound on a variable - but we also have a strong branching candidate 3 We can change the bound on a variable - but we have a non-strong branching candidate 4 We can change the bound on a variable - no other candidates We can pick up branch from bestObjectIndex() and bestWhichWay() We can pick up a forced branch (can change bound) from firstForcedObjectIndex() and firstForcedWhichWay() If we have a solution then we can pick up from goodObjectiveValue() and goodSolution()

Definition at line 177 of file OsiChooseVariable.hpp.

The documentation for this class was generated from the following file:

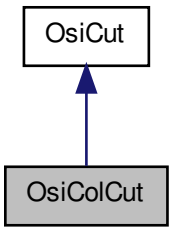
- OsiChooseVariable.hpp

5.11 OsiColCut Class Reference

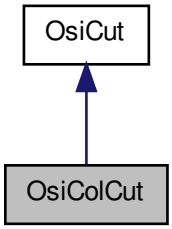
Column Cut Class.

`#include <OsiColCut.hpp>`

Inheritance diagram for OsiColCut:



Collaboration diagram for OsiColCut:



Public Member Functions

Setting column bounds

- void setLbs (int nElements, const int *colIndices, const double *lbElements)
  Set column lower bounds.
- void setLbs (const CoinPackedVector &lbs)
  Set column lower bounds from a packed vector.
- void setUbs (int nElements, const int *colIndices, const double *ubElements)
  Set column upper bounds.
- void setUbs (const CoinPackedVector &ubs)
  Set column upper bounds from a packed vector.

Getting column bounds

- const CoinPackedVector & lbs () const
  Get column lower bounds.
- const CoinPackedVector & ubs () const
  Get column upper bounds.

Comparison operators

- virtual bool operator== (const OsiColCut &rhs) const
  equal - true if lower bounds, upper bounds, and OsiCut are equal.
- virtual bool operator!= (const OsiColCut &rhs) const
  not equal

Sanity checks on cut

- virtual bool consistent () const
  Returns true if the cut is consistent with respect to itself.

- virtual bool consistent (const OsiSolverInterface &im) const
  Returns true if cut is consistent with respect to the solver interface's model.
- virtual bool infeasible (const OsiSolverInterface &im) const
  Returns true if the cut is infeasible with respect to its bounds and the column bounds in the solver interface's models.
- virtual double violated (const double ∗solution) const
  Returns infeasibility of the cut with respect to solution passed in i.e.

Constructors and destructors

- OsiColCut & operator= (const OsiColCut &rhs)
  Assignment operator.
- OsiColCut (const OsiColCut &)
  Copy constructor.
- OsiColCut ()
  Default Constructor.
- virtual OsiColCut ∗ clone () const
  Clone.
- virtual ∼OsiColCut ()
  Destructor.

Debug stuff

- virtual void print () const
  Print cuts in collection.

Friends

- void OsiColCutUnitTest (const OsiSolverInterface ∗baseSiP, const std::string &mpsDir)
  A function that tests the methods in the OsiColCut class.

5.11.1 Detailed Description

Column Cut Class.

Column Cut Class has:

- a sparse vector of column lower bounds
- a sparse vector of column upper bounds

Definition at line 23 of file OsiColCut.hpp.

5.11.2 Member Function Documentation

5.11.2.1 bool OsiColCut::consistent ( ) const [inline, virtual]

Returns true if the cut is consistent with respect to itself.

This checks to ensure that:

- The bound vectors do not have duplicate indices,
- The bound vectors indices are >=0

Implements OsiCut.

Definition at line 226 of file OsiColCut.hpp.

5.11.2.2 bool OsiColCut::consistent (const OsiSolverInterface & *im*) const [inline, virtual]

Returns true if cut is consistent with respect to the solver interface's model.

This checks to ensure that the lower & upperbound packed vectors:

- do not have an index >= the number of column is the model.

Implements OsiCut.

Definition at line 239 of file OsiColCut.hpp.

5.11.2.3 bool OsiColCut::infeasible (const OsiSolverInterface & *im*) const [inline, virtual]

Returns true if the cut is infeasible with respect to its bounds and the column bounds in the solver interface's models.

This checks whether:

- the maximum of the new and existing lower bounds is strictly greater than the minimum of the new and existing upper bounds.

Implements OsiCut.

Definition at line 290 of file OsiColCut.hpp.

5.11.2.4 virtual double OsiColCut::violated (const double * *solution*) const [virtual]

Returns infeasibility of the cut with respect to solution passed in i.e.

is positive if cuts off that solution. solution is getNumCols() long..

Implements OsiCut.

5.11.3 Friends And Related Function Documentation

5.11.3.1 void OsiColCutUnitTest (const OsiSolverInterface * *baseSiP*, const std::string & *mpsDir*) [friend]

A function that tests the methods in the OsiColCut class.

The documentation for this class was generated from the following file:

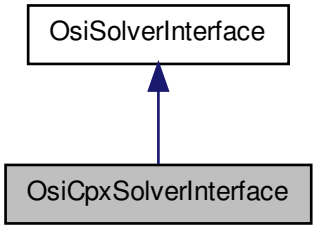
- OsiColCut.hpp

5.12 OsiCpxSolverInterface Class Reference

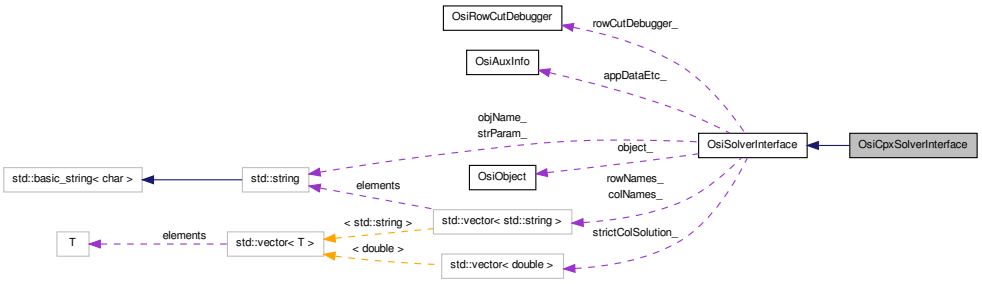
CPLEX Solver Interface.

`#include <OsiCpxSolverInterface.hpp>`

Inheritance diagram for OsiCpxSolverInterface:



Collaboration diagram for OsiCpxSolverInterface:



Public Member Functions

- virtual void setObjSense (double s)

  Set objective function sense (1 for min (default), -1 for max,)
- virtual void setColSolution (const double ∗colsol)

  Set the primal solution column values.
- virtual void setRowPrice (const double ∗rowprice)

  Set dual solution vector.
- const char ∗ getCtype () const

  return a vector of variable types (continous, binary, integer)

Solve methods

- virtual void initialSolve ()
  Solve initial LP relaxation.
- virtual void resolve ()
  Resolve an LP relaxation after problem modification.
- virtual void branchAndBound ()
  Invoke solver's built-in enumeration algorithm.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the volume algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

- bool setIntParam (OsiIntParam key, int value)
  Set an integer parameter.
- bool setDblParam (OsiDblParam key, double value)
  Set a double parameter.
- bool setStrParam (OsiStrParam key, const std::string &value)
  Set a string parameter.
- bool getIntParam (OsiIntParam key, int &value) const
  Get an integer parameter.
- bool getDblParam (OsiDblParam key, double &value) const
  Get a double parameter.
- bool getStrParam (OsiStrParam key, std::string &value) const
  Get a string parameter.
- void **setMipStart** (bool value)
- bool **getMipStart** () const

Methods returning info on how the solution process terminated

- virtual bool isAbandoned () const
  Are there a numerical difficulties?
- virtual bool isProvenOptimal () const
  Is optimality proven?
- virtual bool isProvenPrimalInfeasible () const
  Is primal infeasiblity proven?
- virtual bool isProvenDualInfeasible () const
  Is dual infeasiblity proven?
- virtual bool isPrimalObjectiveLimitReached () const
  Is the given primal objective limit reached?
- virtual bool isDualObjectiveLimitReached () const
  Is the given dual objective limit reached?
- virtual bool isIterationLimitReached () const
  Iteration limit reached?

WarmStart related methods

- CoinWarmStart * getEmptyWarmStart () const
  Get an empty warm start object.
- virtual CoinWarmStart * getWarmStart () const
  Get warmstarting information.
- virtual bool setWarmStart (const CoinWarmStart *warmstart)
  Set warmstarting information.

Hotstart related methods (primarily used in strong branching).

The user can create a hotstart (a snapshot) of the optimization process then reoptimize over and over again always starting from there.

***NOTE**: between hotstarted optimizations only bound changes are allowed.*

- virtual void markHotStart ()
  Create a hotstart point of the optimization process.
- virtual void solveFromHotStart ()
  Optimize starting from the hotstart.
- virtual void unmarkHotStart ()
  Delete the snapshot.

Methods related to querying the input data

- virtual int getNumCols () const
  Get number of columns.
- virtual int getNumRows () const
  Get number of rows.
- virtual int getNumElements () const
  Get number of nonzero elements.
- virtual const double * getColLower () const
  Get pointer to array[getNumCols()] of column lower bounds.
- virtual const double * getColUpper () const
  Get pointer to array[getNumCols()] of column upper bounds.
- virtual const char * getRowSense () const
  Get pointer to array[getNumRows()] of row constraint senses.
- virtual const double * getRightHandSide () const
  Get pointer to array[getNumRows()] of rows right-hand sides.
- virtual const double * getRowRange () const
  Get pointer to array[getNumRows()] of row ranges.
- virtual const double * getRowLower () const
  Get pointer to array[getNumRows()] of row lower bounds.
- virtual const double * getRowUpper () const
  Get pointer to array[getNumRows()] of row upper bounds.
- virtual const double * getObjCoefficients () const
  Get pointer to array[getNumCols()] of objective function coefficients.
- virtual double getObjSense () const
  Get objective function sense (1 for min (default), -1 for max)
- virtual bool isContinuous (int colNumber) const

Return true if column is continuous.

- virtual const CoinPackedMatrix * getMatrixByRow () const

  Get pointer to row-wise copy of matrix.
- virtual const CoinPackedMatrix * getMatrixByCol () const

  Get pointer to column-wise copy of matrix.
- virtual double getInfinity () const

  Get solver's value for infinity.

Methods related to querying the solution

- virtual const double * getColSolution () const

  Get pointer to array[getNumCols()] of primal solution vector.
- virtual const double * getRowPrice () const

  Get pointer to array[getNumRows()] of dual prices.
- virtual const double * getReducedCost () const

  Get a pointer to array[getNumCols()] of reduced costs.
- virtual const double * getRowActivity () const

  Get pointer to array[getNumRows()] of row activity levels (constraint matrix times the solution vector.
- virtual double getObjValue () const

  Get objective function value.
- virtual int getIterationCount () const

  Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.
- virtual std::vector< double * > getDualRays (int maxNumRays, bool fullRay=false) const

  Get as many dual rays as the solver can provide.
- virtual std::vector< double * > getPrimalRays (int maxNumRays) const

  Get as many primal rays as the solver can provide.

Changing bounds on variables and constraints

- virtual void setObjCoeff (int elementIndex, double elementValue)

  Set an objective function coefficient.
- virtual void setObjCoeffSet (const int *indexFirst, const int *indexLast, const double *coeffList)

  Set a a set of objective function coefficients.
- virtual void setColLower (int elementIndex, double elementValue)

  Set a single column lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setColUpper (int elementIndex, double elementValue)

  Set a single column upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setColBounds (int elementIndex, double lower, double upper)

  Set a single column lower and upper bound
  The default implementation just invokes `setColLower()` and `setColUpper()`
- virtual void setColSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

Set the bounds on a number of columns simultaneously
The default implementation just invokes `setCollower()` *and* `setColupper()` *over and over again.*

- virtual void setRowLower (int elementIndex, double elementValue)
  Set a single row lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setRowUpper (int elementIndex, double elementValue)
  Set a single row upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setRowBounds (int elementIndex, double lower, double upper)
  Set a single row lower and upper bound
  The default implementation just invokes `setRowLower()` *and* `setRowUpper()`
- virtual void setRowType (int index, char sense, double rightHandSide, double range)
  Set the type of a single row
- virtual void setRowSetBounds (const int ∗indexFirst, const int ∗indexLast, const double ∗boundList)
  Set the bounds on a number of rows simultaneously
  The default implementation just invokes `setRowLower()` *and* `setRowUpper()` *over and over again.*
- virtual void setRowSetTypes (const int ∗indexFirst, const int ∗indexLast, const char ∗senseList, const double ∗rhsList, const double ∗rangeList)
  Set the type of a number of rows simultaneously
  The default implementation just invokes `setRowType()` *and over and over again.*

Integrality related changing methods

- virtual void setContinuous (int index)
  Set the index-th variable to be a continuous variable.
- virtual void setInteger (int index)
  Set the index-th variable to be an integer variable.
- virtual void setContinuous (const int ∗indices, int len)
  Set the variables listed in indices (which is of length len) to be continuous variables.
- virtual void setInteger (const int ∗indices, int len)
  Set the variables listed in indices (which is of length len) to be integer variables.

Methods to expand a problem.

Note that if a column is added then by default it will correspond to a continuous variable.

- virtual void addCol (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)
  Add a column (primal variable) to the problem.
- virtual void addCols (const int numcols, const CoinPackedVectorBase ∗const ∗cols, const double ∗collb, const double ∗colub, const double ∗obj)
  Add a set of columns (primal variables) to the problem.
- virtual void deleteCols (const int num, const int ∗colIndices)
  Remove a set of columns (primal variables) from the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)

Add a row (constraint) to the problem.

- virtual void addRow (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)

  Add a row (constraint) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase *const *rows, const double *rowlb, const double *rowub)

  Add a set of rows (constraints) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase *const *rows, const char *rowsen, const double *rowrhs, const double *rowrng)

  Add a set of rows (constraints) to the problem.
- virtual void deleteRows (const int num, const int *rowIndices)

  Delete a set of rows (constraints) from the problem.

Methods to input a problem

- virtual void loadProblem (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

  Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void assignProblem (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, double *&rowlb, double *&rowub)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void loadProblem (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)

  Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void assignProblem (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, char *&rowsen, double *&rowrhs, double *&rowrng)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void loadProblem (const int numcols, const int numrows, const int *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual void loadProblem (const int numcols, const int numrows, const int *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual int readMps (const char *filename, const char *extension="mps")

  Read an mps file from the given filename.
- virtual void writeMps (const char *filename, const char *extension="mps", double objSense=0.0) const

  Write the problem into an mps file of the given filename.

Message handling

- void passInMessageHandler (CoinMessageHandler *handler)

  Pass in a message handler It is the client's responsibility to destroy a message handler installed by this routine; it will not be destroyed when the solver interface is destroyed.

Constructors and destructor

- OsiCpxSolverInterface ()

  Default Constructor.
- virtual OsiSolverInterface * clone (bool copyData=true) const

  Clone.
- OsiCpxSolverInterface (const OsiCpxSolverInterface &)

  Copy constructor.
- OsiCpxSolverInterface & operator= (const OsiCpxSolverInterface &rhs)

  Assignment operator.
- virtual ~OsiCpxSolverInterface ()

  Destructor.
- virtual void reset ()

  Resets as if default constructor.

OsiSimplexInterface methods

Cplex adds a slack with coeff +1 in "<=" and "=" constraints, with coeff -1 in ">=", slack being non negative.

We switch in order to get a "Clp tableau" where all the slacks have coefficient +1 in the original tableau.

If a slack for ">=" is non basic, invB is not changed; column of the slack in the optimal tableau is flipped.

If a slack for ">=" is basic, corresp. row of invB is flipped; whole row of the optimal tableau is flipped; then whole column for the slack in opt tableau is flipped.

Ranged rows are not supported. It might work, but no garantee is given.

Code implemented only for Cplex9.0 and higher, lower version number of Cplex will abort the code.

- virtual int canDoSimplexInterface () const

  Returns 1 if can just do getBInv etc 2 if has all OsiSimplex methods and 0 if it has none.
- virtual void enableSimplexInterface (int doingPrimal)

  Useless function, defined only for compatibility with OsiSimplexInterface.
- virtual void disableSimplexInterface ()

  Useless function, defined only for compatibility with OsiSimplexInterface.
- virtual void enableFactorization () const

  Useless function, defined only for compatibility with OsiSimplexInterface.
- virtual void disableFactorization () const

  Useless function, defined only for compatibility with OsiSimplexInterface.
- virtual bool basisIsAvailable () const

Returns true if a basis is available.

- virtual void getBasisStatus (int ∗cstat, int ∗rstat) const

  Returns a basis status of the structural/artificial variables At present as warm start i.e 0: free, 1: basic, 2: upper, 3: lower.
- virtual void getBInvARow (int row, double ∗z, double ∗slack=NULL) const

  Get a row of the tableau (slack part in slack if not NULL)
- virtual void getBInvRow (int row, double ∗z) const

  Get a row of the basis inverse.
- virtual void getBInvACol (int col, double ∗vec) const

  Get a column of the tableau.
- virtual void getBInvCol (int col, double ∗vec) const

  Get a column of the basis inverse.
- virtual void getBasics (int ∗index) const

  Get indices of the pivot variable in each row (order of indices corresponds to the order of elements in a vector retured by getBInvACol() and getBInvCol()).
- void switchToLP ()

  switches CPLEX to prob type LP
- void switchToMIP ()

  switches CPLEX to prob type MIP

Protected Member Functions

Protected methods

- virtual void applyRowCut (const OsiRowCut &rc)

  Apply a row cut. Return true if cut was applied.
- virtual void applyColCut (const OsiColCut &cc)

  Apply a column cut (bound adjustment).

Friends

- void OsiCpxSolverInterfaceUnitTest (const std::string &mpsDir, const std::string &netlibDir)

  A function that tests the methods in the OsiCpxSolverInterface class.

CPLEX specific public interfaces

- enum keepCachedFlag {

  KEEPCACHED_NONE = 0, KEEPCACHED_COLUMN = 1, KEEPCACHED_ROW = 2, KEEPCACHED_MATRIX = 4,

  KEEPCACHED_RESULTS = 8, KEEPCACHED_PROBLEM = KEEPCACHED_COLUMN | KEEPCACHED_ROW | KEEPCACHED_MATRIX, KEEPCACHED_ALL = KEEPCACHED_PROBLEM | KEEPCACHED_RESULTS, FREECACHED_COLUMN = KEEPCACHED_PROBLEM & ∼KEEPCACHED_COLUMN,

  FREECACHED_ROW = KEEPCACHED_PROBLEM & ∼KEEPCACHED_ROW, FREECACHED_MATRIX = KEEPCACHED_PROBLEM & ∼KEEPCACHED_MATRIX, FREECACHED_RESULTS = KEEPCACHED_ALL & ∼KEEPCACHED_RESULTS
  }

Get pointer to CPLEX model and free all specified cached data entries (combined with logical or-operator '|'):

- CPXLPptr **getLpPtr** (int keepCached=KEEPCACHED_NONE)
- CPXENVptr getEnvironmentPtr ()

  Method to access CPLEX environment pointer.

5.12.1 Detailed Description

CPLEX Solver Interface.

Instantiation of OsiCpxSolverInterface for CPLEX

Definition at line 26 of file OsiCpxSolverInterface.hpp.

5.12.2 Member Enumeration Documentation

5.12.2.1 enum OsiCpxSolverInterface::keepCachedFlag

Get pointer to CPLEX model and free all specified cached data entries (combined with logical or-operator '|'):

Enumerator:

KEEPCACHED_NONE discard all cached data (default)

KEEPCACHED_COLUMN column information: objective values, lower and upper bounds, variable types

KEEPCACHED_ROW row information: right hand sides, ranges and senses, lower and upper bounds for row

KEEPCACHED_MATRIX problem matrix: matrix ordered by column and by row

KEEPCACHED_RESULTS LP solution: primal and dual solution, reduced costs, row activities.

KEEPCACHED_PROBLEM only discard cached LP solution

KEEPCACHED_ALL keep all cached data (similar to getMutableLpPtr())

FREECACHED_COLUMN free only cached column and LP solution information

FREECACHED_ROW free only cached row and LP solution information

FREECACHED_MATRIX free only cached matrix and LP solution information

FREECACHED_RESULTS free only cached LP solution information

Definition at line 611 of file OsiCpxSolverInterface.hpp.

5.12.3 Member Function Documentation

5.12.3.1 CoinWarmStart* OsiCpxSolverInterface::getEmptyWarmStart ( ) const [virtual]

Get an empty warm start object.

This routine returns an empty CoinWarmStartBasis object. Its purpose is to provide a way to give a client a warm start basis object of the appropriate type, which can resized and modified as desired.

Implements OsiSolverInterface.

5.12.3.2 virtual bool OsiCpxSolverInterface::setWarmStart (const CoinWarmStart * *warmstart*) [virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

Implements OsiSolverInterface.

5.12.3.3 virtual const char* OsiCpxSolverInterface::getRowSense ( ) const [virtual]

Get pointer to array[getNumRows()] of row constraint senses.

- 'L': <= constraint
- 'E': = constraint
- 'G': >= constraint
- 'R': ranged constraint
- 'N': free constraint

Implements OsiSolverInterface.

5.12.3.4 virtual const double* OsiCpxSolverInterface::getRightHandSide ( ) const [virtual]

Get pointer to array[getNumRows()] of rows right-hand sides.

- if rowsense()[i] == 'L' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'G' then rhs()[i] == rowlower()[i]
- if rowsense()[i] == 'R' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'N' then rhs()[i] == 0.0

Implements OsiSolverInterface.

5.12.3.5 virtual const double* OsiCpxSolverInterface::getRowRange ( ) const [virtual]

Get pointer to array[getNumRows()] of row ranges.

- if rowsense()[i] == 'R' then rowrange()[i] == rowupper()[i] - rowlower()[i]
- if rowsense()[i] != 'R' then rowrange()[i] is 0.0

Implements OsiSolverInterface.

5.12.3.6 virtual int OsiCpxSolverInterface::getIterationCount ( ) const [virtual]

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.

Implements OsiSolverInterface.

5.12.3.7 virtual std::vector<double*> OsiCpxSolverInterface::getDualRays (int *maxNumRays*, bool *fullRay* = false) const [virtual]

Get as many dual rays as the solver can provide.

(In case of proven primal infeasibility there should be at least one.)

The first getNumRows() ray components will always be associated with the row duals (as returned by getRowPrice()). If fullRay is true, the final getNumCols() entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumRows() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.12.3.8 virtual std::vector<double*> OsiCpxSolverInterface::getPrimalRays (int *maxNumRays*) const [virtual]

Get as many primal rays as the solver can provide.

(In case of proven dual infeasibility there should be at least one.)

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumCols() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.12.3.9 virtual void OsiCpxSolverInterface::setColLower (int *elementIndex*, double *elementValue*) [virtual]

Set a single column lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.12.3.10 virtual void OsiCpxSolverInterface::setColUpper (int *elementIndex,* double *elementValue*) [virtual]

Set a single column upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.12.3.11 virtual void OsiCpxSolverInterface::setColSetBounds (const int * *indexFirst,* const int * *indexLast,* const double * *boundList*) [virtual]

Set the bounds on a number of columns simultaneously

The default implementation just invokes `setCollower()` and `setColupper()` over and over again.

Parameters

<*code*>[inde	contains the indices of the constraints whose either bound changes
boundList	the new lower/upper bound pairs for the variables

Reimplemented from OsiSolverInterface.

5.12.3.12 virtual void OsiCpxSolverInterface::setRowLower (int *elementIndex,* double *elementValue*) [virtual]

Set a single row lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.12.3.13 virtual void OsiCpxSolverInterface::setRowUpper (int *elementIndex,* double *elementValue*) [virtual]

Set a single row upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.12.3.14 virtual void OsiCpxSolverInterface::setRowSetBounds (const int * *indexFirst,* const int * *indexLast,* const double * *boundList*) [virtual]

Set the bounds on a number of rows simultaneously

The default implementation just invokes `setRowLower()` and `setRowUpper()` over and over again.

Parameters

<*code*>[inde	contains the indices of the constraints whose either bound changes
boundList	the new lower/upper bound pairs for the constraints

Reimplemented from OsiSolverInterface.

5.12.3.15 virtual void OsiCpxSolverInterface::setRowSetTypes (const int * *indexFirst*, const int * *indexLast*, const char * *senseList*, const double * *rhsList*, const double * *rangeList*) [virtual]

Set the type of a number of rows simultaneously

The default implementation just invokes `setRowType()` and over and over again.

Parameters

<*code*>[inde	contains the indices of the constraints whose type changes
senseList	the new senses
rhsList	the new right hand sides
rangeList	the new ranges

Reimplemented from OsiSolverInterface.

5.12.3.16 virtual void OsiCpxSolverInterface::setColSolution (const double * *colsol*) [virtual]

Set the primal solution column values.

colsol[numcols()] is an array of values of the problem column variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of colsol() until changed by another call to setColsol() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.12.3.17 virtual void OsiCpxSolverInterface::setRowPrice (const double * *rowprice*) [virtual]

Set dual solution vector.

rowprice[numrows()] is an array of values of the problem row dual variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of rowprice() until changed by another call to setRowprice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.12.3.18 virtual void OsiCpxSolverInterface::addCol (const CoinPackedVectorBase & *vec*, const double *collb*, const double *colub*, const double *obj*) [virtual]

Add a column (primal variable) to the problem.

Implements OsiSolverInterface.

5.12.3.19 virtual void OsiCpxSolverInterface::addCols (const int *numcols*, const CoinPackedVectorBase *const * *cols*, const double * *collb*, const double * *colub*, const double * *obj*) [virtual]

Add a set of columns (primal variables) to the problem.

The default implementation simply makes repeated calls to addCol().

Reimplemented from OsiSolverInterface.

5.12.3.20 virtual void OsiCpxSolverInterface::deleteCols (const int *num*, const int * *collndices*) [virtual]

Remove a set of columns (primal variables) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted variables are nonbasic.

Implements OsiSolverInterface.

5.12.3.21 virtual void OsiCpxSolverInterface::addRow (const CoinPackedVectorBase & *vec*, const double *rowlb*, const double *rowub*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.12.3.22 virtual void OsiCpxSolverInterface::addRow (const CoinPackedVectorBase & *vec*, const char *rowsen*, const double *rowrhs*, const double *rowrng*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.12.3.23 virtual void OsiCpxSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const double * *rowlb*, const double * *rowub*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.12.3.24 virtual void OsiCpxSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.12.3.25 virtual void OsiCpxSolverInterface::deleteRows (const int *num*, const int * *rowIndices*) [virtual]

Delete a set of rows (constraints) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted rows are loose.

Implements OsiSolverInterface.

5.12.3.26 virtual void OsiCpxSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Implements OsiSolverInterface.

5.12.3.27 virtual void OsiCpxSolverInterface::assignProblem (CoinPackedMatrix *& *matrix*, double *& *collb*, double *& *colub*, double *& *obj*, double *& *rowlb*, double *& *rowub*) [virtual]

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.12.3.28 virtual void OsiCpxSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity

- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are >=
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

Implements OsiSolverInterface.

5.12.3.29 **virtual void OsiCpxSolverInterface::assignProblem (CoinPackedMatrix *& *matrix,* double *& *collb,* double *& *colub,* double *& *obj,* char *& *rowsen,* double *& *rowrhs,* double *& *rowrng*) [virtual]**

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.12.3.30 **virtual void OsiCpxSolverInterface::loadProblem (const int *numcols,* const int *numrows,* const int * *start,* const int * *index,* const double * *value,* const double * *collb,* const double * *colub,* const double * *obj,* const double * *rowlb,* const double * *rowub*) [virtual]**

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.12.3.31 **virtual void OsiCpxSolverInterface::loadProblem (const int *numcols,* const int *numrows,* const int * *start,* const int * *index,* const double * *value,* const double * *collb,* const double * *colub,* const double * *obj,* const char * *rowsen,* const double * *rowrhs,* const double * *rowrng*) [virtual]**

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.12.3.32 **virtual void OsiCpxSolverInterface::writeMps (const char * *filename,* const char * *extension* = "mps", double *objSense* = 0.0) const [virtual]**

Write the problem into an mps file of the given filename.

If objSense is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants

Implements OsiSolverInterface.

5.12.3.33 **virtual void OsiCpxSolverInterface::applyColCut (const OsiColCut & *cc*) [protected, virtual]**

Apply a column cut (bound adjustment).

Return true if cut was applied.

Implements OsiSolverInterface.

5.12.4 Friends And Related Function Documentation

5.12.4.1 void OsiCpxSolverInterfaceUnitTest (const std::string & *mpsDir,* const std::string & *netlibDir*) [friend]

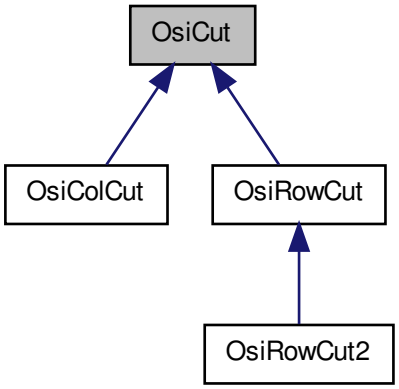
A function that tests the methods in the OsiCpxSolverInterface class.

The documentation for this class was generated from the following file:

- OsiCpxSolverInterface.hpp

5.13 OsiCut Class Reference

Inheritance diagram for OsiCut:



Public Member Functions

Effectiveness

- void setEffectiveness (double e)
  Set effectiveness.
- double effectiveness () const
  Get effectiveness.

GloballyValid

- void setGloballyValid (bool trueFalse)
  Set globallyValid (nonzero true)
- void **setGloballyValid** ()
- void **setNotGloballyValid** ()
- bool globallyValid () const
  Get globallyValid.
- void setGloballyValidAsInteger (int trueFalse)
  Set globallyValid as integer (nonzero true)
- int globallyValidAsInteger () const
  Get globallyValid.

Debug stuff

- virtual void print () const
  Print cuts in collection.

Comparison operators

- virtual bool operator== (const OsiCut &rhs) const
  equal. 2 cuts are equal if there effectiveness are equal
- virtual bool operator!= (const OsiCut &rhs) const
  not equal
- virtual bool operator< (const OsiCut &rhs) const
  less than. True if this.effectiveness < rhs.effectiveness
- virtual bool operator> (const OsiCut &rhs) const
  less than. True if this.effectiveness > rhs.effectiveness

Sanity checks on cut

- virtual bool consistent () const =0
  Returns true if the cut is consistent with respect to itself, without considering any data in the model.
- virtual bool consistent (const OsiSolverInterface &si) const =0
  Returns true if cut is consistent when considering the solver interface's model.
- virtual bool infeasible (const OsiSolverInterface &si) const =0
  Returns true if the cut is infeasible "with respect to itself" and cannot be satisfied.
- virtual double violated (const double *solution) const =0
  Returns infeasibility of the cut with respect to solution passed in i.e.

Protected Member Functions

Constructors and destructors

- OsiCut ()
  Default Constructor.
- OsiCut (const OsiCut &)
  Copy constructor.
- OsiCut & operator= (const OsiCut &rhs)
  Assignment operator.
- virtual ~OsiCut ()
  Destructor.

5.13.1 Detailed Description

Definition at line 36 of file OsiCut.hpp.

5.13.2 Member Function Documentation

5.13.2.1 virtual bool OsiCut::consistent ( ) const [inline, pure virtual]

Returns true if the cut is consistent with respect to itself, without considering any data in the model.

For example, it might check to ensure that a column index is not negative.

Implemented in OsiColCut, and OsiRowCut.

5.13.2.2 virtual bool OsiCut::consistent (const OsiSolverInterface & *si*) const [inline, pure virtual]

Returns true if cut is consistent when considering the solver interface's model.

For example, it might check to ensure that a column index is not greater than the number of columns in the model. Assumes consistent() is true.

Implemented in OsiColCut, and OsiRowCut.

5.13.2.3 virtual bool OsiCut::infeasible (const OsiSolverInterface & *si*) const [inline, pure virtual]

Returns true if the cut is infeasible "with respect to itself" and cannot be satisfied.

This method does NOT check whether adding the cut to the solver interface's model will make the -model- infeasble. A cut which returns !infeasible(si) may very well make the model infeasible. (Of course, adding a cut with returns infeasible(si) will make the model infeasible.)

The "with respect to itself" is in quotes becaues in the case where the cut simply replaces existing bounds, it may make sense to test infeasibility with respect to the current bounds held in the solver interface's model. For example, if the cut has a single variable in it, it might check that the maximum of new and existing lower bounds is greater than the minium of the new and existing upper bounds.

Assumes that consistent(si) is true.

Infeasible cuts can be a useful mechanism for a cut generator to inform the solver interface that its detected infeasibility of the problem.

Implemented in OsiColCut, and OsiRowCut.

5.13.2.4 virtual double OsiCut::violated (const double * *solution*) const [pure virtual]

Returns infeasibility of the cut with respect to solution passed in i.e.

is positive if cuts off that solution. solution is getNumCols() long..

Implemented in OsiColCut, and OsiRowCut.

The documentation for this class was generated from the following file:

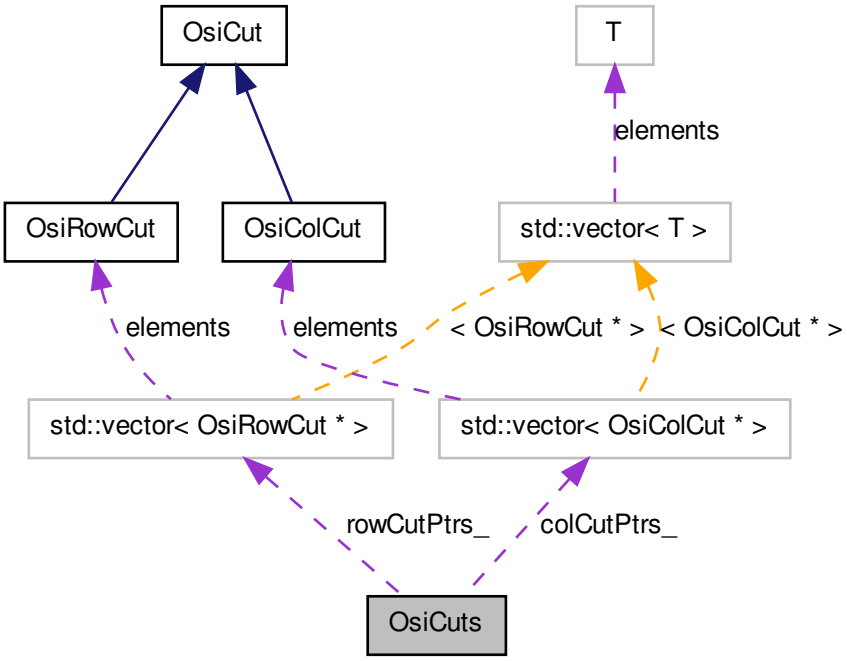
- OsiCut.hpp

5.14 OsiCuts Class Reference

Collections of row cuts and column cuts.

`#include <OsiCuts.hpp>`

Collaboration diagram for OsiCuts:



Classes

- class const_iterator

  Const Iterator.
- class iterator

  Iterator.

- class **OsiCutCompare**

Public Member Functions

Inserting a cut into collection

- void insert (const OsiRowCut &rc)
  Insert a row cut.
- void insertIfNotDuplicate (OsiRowCut &rc, CoinAbsFltEq treatAsSame=CoinAbsFltEq(1.0e-12))
  Insert a row cut unless it is a duplicate - cut may get sorted.
- void insertIfNotDuplicate (OsiRowCut &rc, CoinRelFltEq treatAsSame)
  Insert a row cut unless it is a duplicate - cut may get sorted.
- void insert (const OsiColCut &cc)
  Insert a column cut.
- void insert (OsiRowCut *&rcPtr)
  Insert a row cut.
- void insert (OsiColCut *&ccPtr)
  Insert a column cut.
- void insert (const OsiCuts &cs)
  Insert a set of cuts.

Number of cuts in collection

- int sizeRowCuts () const
  Number of row cuts in collection.
- int sizeColCuts () const
  Number of column cuts in collection.
- int sizeCuts () const
  Number of cuts in collection.

Debug stuff

- void printCuts () const
  Print cuts in collection.

Get a cut from collection

- OsiRowCut * rowCutPtr (int i)
  Get pointer to i'th row cut.
- const OsiRowCut * rowCutPtr (int i) const
  Get const pointer to i'th row cut.
- OsiColCut * colCutPtr (int i)
  Get pointer to i'th column cut.
- const OsiColCut * colCutPtr (int i) const
  Get const pointer to i'th column cut.
- OsiRowCut & rowCut (int i)
  Get reference to i'th row cut.
- const OsiRowCut & rowCut (int i) const

Get const reference to i'th row cut.

- OsiColCut & colCut (int i)
  Get reference to i'th column cut.
- const OsiColCut & colCut (int i) const
  Get const reference to i'th column cut.
- const OsiCut * mostEffectiveCutPtr () const
  Get const pointer to the most effective cut.
- OsiCut * mostEffectiveCutPtr ()
  Get pointer to the most effective cut.

Deleting cut from collection

- void eraseRowCut (int i)
  Remove i'th row cut from collection.
- void eraseColCut (int i)
  Remove i'th column cut from collection.
- OsiRowCut * rowCutPtrAndZap (int i)
  Get pointer to i'th row cut and remove ptr from collection.
- void dumpCuts ()
  Clear all row cuts without deleting them.
- void eraseAndDumpCuts (const std::vector< int > to_erase)
  Selective delete and clear for row cuts.

Sorting collection

- void sort ()
  Cuts with greatest effectiveness are first.

Iterators

Example of using an iterator to sum effectiveness of all cuts in the collection.

```
double sumEff=0.0;
for ( OsiCuts::iterator it=cuts.begin(); it!=cuts.end(); ++it )
      sumEff+= (*it)->effectiveness();
```

- iterator begin ()
  Get iterator to beginning of collection.
- const_iterator begin () const
  Get const iterator to beginning of collection.
- iterator end ()
  Get iterator to end of collection.
- const_iterator end () const
  Get const iterator to end of collection.

Constructors and destructors

- OsiCuts ()
  Default constructor.
- OsiCuts (const OsiCuts &)
  Copy constructor.
- OsiCuts & operator= (const OsiCuts &rhs)
  Assignment operator.
- virtual ~OsiCuts ()
  Destructor.

Friends

- void OsiCutsUnitTest ()

  A function that tests the methods in the OsiCuts class.

5.14.1 Detailed Description

Collections of row cuts and column cuts.

Definition at line 19 of file OsiCuts.hpp.

5.14.2 Member Function Documentation

5.14.2.1 void OsiCuts::insertIfNotDuplicate (OsiRowCut & *rc*, CoinAbsFltEq *treatAsSame* = `CoinAbsFltEq(1.0e-12)`)

Insert a row cut unless it is a duplicate - cut may get sorted.

Duplicate is defined as CoinAbsFltEq says same

5.14.2.2 void OsiCuts::insertIfNotDuplicate (OsiRowCut & *rc*, CoinRelFltEq *treatAsSame*)

Insert a row cut unless it is a duplicate - cut may get sorted.

Duplicate is defined as CoinRelFltEq says same

5.14.2.3 void OsiCuts::insert (OsiRowCut *& *rcPtr*) `[inline]`

Insert a row cut.

The OsiCuts object takes control of the cut object. On return, `rcPtr` is NULL.

Definition at line 319 of file OsiCuts.hpp.

5.14.2.4 void OsiCuts::insert (OsiColCut *& *ccPtr*) `[inline]`

Insert a column cut.

The OsiCuts object takes control of the cut object. On return `ccPtr` is NULL.

Definition at line 324 of file OsiCuts.hpp.

5.14.2.5 void OsiCuts::dumpCuts ( ) `[inline]`

Clear all row cuts without deleting them.

Handy in case one wants to use CGL without managing cuts in one of the OSI containers. Client is ultimately responsible for deleting the data structures holding the row cuts.

Definition at line 461 of file OsiCuts.hpp.

5.14.2.6 void OsiCuts::eraseAndDumpCuts (const std::vector< int > *to_erase*) [inline]

Selective delete and clear for row cuts.

Deletes the cuts specified in `to_erase` then clears remaining cuts without deleting them. A hybrid of eraseRowCut(int) and dumpCuts(). Client is ultimately responsible for deleting the data structures for row cuts not specified in `to_erase`.

Definition at line 465 of file OsiCuts.hpp.

5.14.3 Friends And Related Function Documentation

5.14.3.1 void OsiCutsUnitTest ( ) [friend]

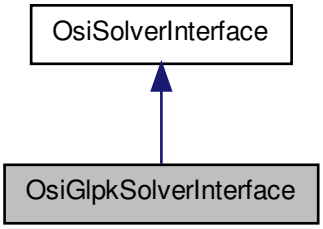
A function that tests the methods in the OsiCuts class.

The documentation for this class was generated from the following file:

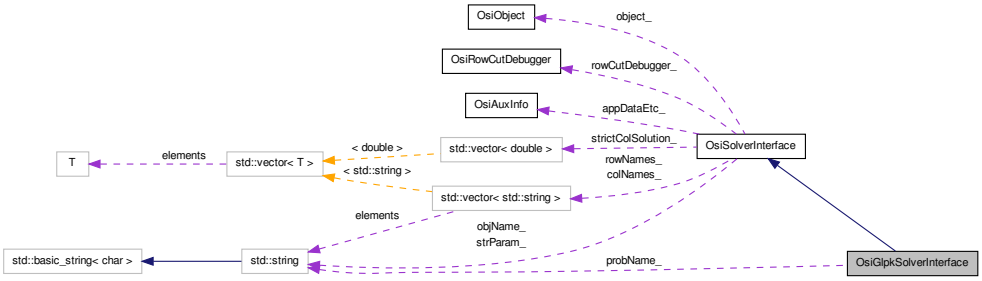
- OsiCuts.hpp

5.15 OsiGlpkSolverInterface Class Reference

Inheritance diagram for OsiGlpkSolverInterface:



Collaboration diagram for OsiGlpkSolverInterface:



Public Member Functions

- virtual void setObjSense (double s)

  Set objective function sense (1 for min (default), -1 for max,)
- virtual void setColSolution (const double ∗colsol)

  Set the primal solution column values.
- virtual void setRowPrice (const double ∗rowprice)

  Set dual solution vector.

Solve methods

- virtual void initialSolve ()

  Solve initial LP relaxation.
- virtual void resolve ()

  Resolve an LP relaxation after problem modification.
- virtual void branchAndBound ()

  Invoke solver's built-in enumeration algorithm.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the volume algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

- bool setIntParam (OsiIntParam key, int value)

Set an integer parameter.

- bool setDblParam (OsiDblParam key, double value)

  Set a double parameter.
- bool setStrParam (OsiStrParam key, const std::string &value)

  Set a string parameter.
- bool setHintParam (OsiHintParam key, bool sense=true, OsiHintStrength strength=OsiHintTry, void *info=0)

  Set a hint parameter.
- bool getIntParam (OsiIntParam key, int &value) const

  Get an integer parameter.
- bool getDblParam (OsiDblParam key, double &value) const

  Get a double parameter.
- bool getStrParam (OsiStrParam key, std::string &value) const

  Get a string parameter.

Methods returning info on how the solution process terminated

- virtual bool isAbandoned () const

  Are there a numerical difficulties?
- virtual bool isProvenOptimal () const

  Is optimality proven?
- virtual bool isProvenPrimalInfeasible () const

  Is primal infeasiblity proven?
- virtual bool isProvenDualInfeasible () const

  Is dual infeasiblity proven?
- virtual bool isPrimalObjectiveLimitReached () const

  Is the given primal objective limit reached?
- virtual bool isDualObjectiveLimitReached () const

  Is the given dual objective limit reached?
- virtual bool isIterationLimitReached () const

  Iteration limit reached?
- virtual bool isTimeLimitReached () const

  Time limit reached?
- virtual bool isFeasible () const

  (Integer) Feasible solution found?

WarmStart related methods

- CoinWarmStart * getEmptyWarmStart () const

  Get an empty warm start object.
- virtual CoinWarmStart * getWarmStart () const

  Get warmstarting information.
- virtual bool setWarmStart (const CoinWarmStart *warmstart)

  Set warmstarting information.

**Hotstart related methods (primarily used in strong branching).
**

The user can create a hotstart (a snapshot) of the optimization process then reoptimize over and over again always starting from there.

***NOTE**: between hotstarted optimizations only bound changes are allowed.*

- virtual void markHotStart ()

  Create a hotstart point of the optimization process.
- virtual void solveFromHotStart ()

  Optimize starting from the hotstart.
- virtual void unmarkHotStart ()

  Delete the snapshot.

Methods related to querying the input data

- virtual int getNumCols () const

  Get number of columns.
- virtual int getNumRows () const

  Get number of rows.
- virtual int getNumElements () const

  Get number of nonzero elements.
- virtual const double * getColLower () const

  Get pointer to array[getNumCols()] of column lower bounds.
- virtual const double * getColUpper () const

  Get pointer to array[getNumCols()] of column upper bounds.
- virtual const char * getRowSense () const

  Get pointer to array[getNumRows()] of row constraint senses.
- virtual const double * getRightHandSide () const

  Get pointer to array[getNumRows()] of rows right-hand sides.
- virtual const double * getRowRange () const

  Get pointer to array[getNumRows()] of row ranges.
- virtual const double * getRowLower () const

  Get pointer to array[getNumRows()] of row lower bounds.
- virtual const double * getRowUpper () const

  Get pointer to array[getNumRows()] of row upper bounds.
- virtual const double * getObjCoefficients () const

  Get pointer to array[getNumCols()] of objective function coefficients.
- virtual double getObjSense () const

  Get objective function sense (1 for min (default), -1 for max)
- virtual bool isContinuous (int colNumber) const

  Return true if column is continuous.
- virtual const CoinPackedMatrix * getMatrixByRow () const

  Get pointer to row-wise copy of matrix.
- virtual const CoinPackedMatrix * getMatrixByCol () const

  Get pointer to column-wise copy of matrix.
- virtual double getInfinity () const

  Get solver's value for infinity.

Methods related to querying the solution

- virtual const double * getColSolution () const
  Get pointer to array[getNumCols()] of primal solution vector.
- virtual const double * getRowPrice () const
  Get pointer to array[getNumRows()] of dual prices.
- virtual const double * getReducedCost () const
  Get a pointer to array[getNumCols()] of reduced costs.
- virtual const double * getRowActivity () const
  Get pointer to array[getNumRows()] of row activity levels (constraint matrix times the solution vector.
- virtual double getObjValue () const
  Get objective function value.
- virtual int getIterationCount () const
  Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.
- virtual std::vector< double * > getDualRays (int maxNumRays, bool fullRay=false) const
  Get as many dual rays as the solver can provide.
- virtual std::vector< double * > getPrimalRays (int maxNumRays) const
  Get as many primal rays as the solver can provide.

Changing bounds on variables and constraints

- virtual void setObjCoeff (int elementIndex, double elementValue)
  Set an objective function coefficient.
- virtual void setColLower (int elementIndex, double elementValue)
  Set a single column lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setColUpper (int elementIndex, double elementValue)
  Set a single column upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setColBounds (int elementIndex, double lower, double upper)
  Set a single column lower and upper bound
  The default implementation just invokes setColLower() and setColUpper()
- virtual void setColSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)
  Set the bounds on a number of columns simultaneously
  The default implementation just invokes setColLower() and setColUpper() over and over again.
- virtual void setRowLower (int elementIndex, double elementValue)
  Set a single row lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setRowUpper (int elementIndex, double elementValue)
  Set a single row upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setRowBounds (int elementIndex, double lower, double upper)
  Set a single row lower and upper bound
  The default implementation just invokes setRowLower() and setRowUpper()
- virtual void setRowType (int index, char sense, double rightHandSide, double range)

Set the type of a single row

- virtual void setRowSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

  Set the bounds on a number of rows simultaneously
  The default implementation just invokes setRowLower() and setRowUpper() over and over again.
- virtual void setRowSetTypes (const int *indexFirst, const int *indexLast, const char *senseList, const double *rhsList, const double *rangeList)

  Set the type of a number of rows simultaneously
  The default implementation just invokes setRowType() over and over again.

Integrality related changing methods

- virtual void setContinuous (int index)

  Set the index-th variable to be a continuous variable.
- virtual void setInteger (int index)

  Set the index-th variable to be an integer variable.
- virtual void setContinuous (const int *indices, int len)

  Set the variables listed in indices (which is of length len) to be continuous variables.
- virtual void setInteger (const int *indices, int len)

  Set the variables listed in indices (which is of length len) to be integer variables.

**Methods to expand a problem.
**

Note that if a column is added then by default it will correspond to a continuous variable.

- virtual void addCol (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)

  Add a column (primal variable) to the problem.
- virtual void addCols (const int numcols, const CoinPackedVectorBase *const *cols, const double *collb, const double *colub, const double *obj)

  Add a set of columns (primal variables) to the problem.
- virtual void deleteCols (const int num, const int *colIndices)

  Remove a set of columns (primal variables) from the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)

  Add a row (constraint) to the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)

  Add a row (constraint) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase *const *rows, const double *rowlb, const double *rowub)

  Add a set of rows (constraints) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase *const *rows, const char *rowsen, const double *rowrhs, const double *rowrng)

  Add a set of rows (constraints) to the problem.
- virtual void deleteRows (const int num, const int *rowIndices)

  Delete a set of rows (constraints) from the problem.

Methods to input a problem

- virtual void loadProblem (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

  Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void assignProblem (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, double *&rowlb, double *&rowub)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void loadProblem (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)

  Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void assignProblem (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, char *&rowsen, double *&rowrhs, double *&rowrng)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void loadProblem (const int numcols, const int numrows, const int *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual void loadProblem (const int numcols, const int numrows, const int *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual int readMps (const char *filename, const char *extension="mps")

  Read an mps file from the given filename.
- virtual void writeMps (const char *filename, const char *extension="mps", double objSense=0.0) const

  Write the problem into an mps file of the given filename.

Methods for row and column names.

Only the set methods need to be overridden to ensure consistent names between OsiGlpk and the OSI base class.

- void setObjName (std::string name)

  Set the objective function name.
- void setRowName (int ndx, std::string name)

  Set a row name.
- void setColName (int ndx, std::string name)

  Set a column name.

Constructors and destructor

- OsiGlpkSolverInterface ()

  Default Constructor.
- virtual OsiSolverInterface * clone (bool copyData=true) const

  Clone.
- OsiGlpkSolverInterface (const OsiGlpkSolverInterface &)

  Copy constructor.
- OsiGlpkSolverInterface & operator= (const OsiGlpkSolverInterface &rhs)

  Assignment operator.
- virtual ~OsiGlpkSolverInterface ()

  Destructor.
- virtual void reset ()

  Resets as if default constructor.

Static Public Member Functions

Static instance counter methods

- static void incrementInstanceCounter ()

  GLPK has a context which must be freed after all GLPK LPs (or MIPs) are freed.
- static void decrementInstanceCounter ()

  GLPK has a context which must be freed after all GLPK LPs (or MIPs) are freed.
- static unsigned int getNumInstances ()

  Return the number of LP/MIP instances of instantiated objects using the GLPK environment.

Protected Member Functions

Protected methods

- virtual void applyRowCut (const OsiRowCut &rc)

  Apply a row cut. Return true if cut was applied.
- virtual void applyColCut (const OsiColCut &cc)

  Apply a column cut (bound adjustment).
- LPX * getMutableModelPtr () const

  Pointer to the model.

Friends

- void OsiGlpkSolverInterfaceUnitTest (const std::string &mpsDir, const std::string &netlibDir)

  A function that tests the methods in the OsiGlpkSolverInterface class.

GLPK specific public interfaces

- enum keepCachedFlag {

  KEEPCACHED_NONE = 0, KEEPCACHED_COLUMN = 1, KEEPCACHED_ROW = 2, KEEPCACHED_MATRIX = 4,

  KEEPCACHED_RESULTS = 8, KEEPCACHED_PROBLEM = KEEPCACHED_COLUMN | KEEPCACHED_ROW | KEEPCACHED_MATRIX, KEEPCACHED_ALL = KEEPCACHED_PROBLEM | KEEPCACHED_RESULTS, FREECACHED_COLUMN = KEEPCACHED_PROBLEM & ∼KEEPCACHED_COLUMN,

  FREECACHED_ROW = KEEPCACHED_PROBLEM & ∼KEEPCACHED_ROW, FREECACHED_MATRIX = KEEPCACHED_PROBLEM & ∼KEEPCACHED_MATRIX, FREECACHED_RESULTS = KEEPCACHED_ALL & ∼KEEPCACHED_RESULTS
  }
- LPX ∗ getModelPtr ()

  Get pointer to GLPK model.

5.15.1 Detailed Description

Definition at line 32 of file OsiGlpkSolverInterface.hpp.

5.15.2 Member Enumeration Documentation

5.15.2.1 enum OsiGlpkSolverInterface::keepCachedFlag

Enumerator:

KEEPCACHED_NONE discard all cached data (default)

KEEPCACHED_COLUMN column information: objective values, lower and upper bounds, variable types

KEEPCACHED_ROW row information: right hand sides, ranges and senses, lower and upper bounds for row

KEEPCACHED_MATRIX problem matrix: matrix ordered by column and by row

KEEPCACHED_RESULTS LP solution: primal and dual solution, reduced costs, row activities.

KEEPCACHED_PROBLEM only discard cached LP solution

KEEPCACHED_ALL keep all cached data (similar to getMutableLpPtr())

FREECACHED_COLUMN free only cached column and LP solution information

FREECACHED_ROW free only cached row and LP solution information

FREECACHED_MATRIX free only cached matrix and LP solution information

FREECACHED_RESULTS free only cached LP solution information

Definition at line 633 of file OsiGlpkSolverInterface.hpp.

5.15.3 Member Function Documentation

5.15.3.1 bool OsiGlpkSolverInterface::setHintParam (OsiHintParam *key*, bool *yesNo* = true, OsiHintStrength *strength* = OsiHintTry, void * = 0) [virtual]

Set a hint parameter.

The otherInformation parameter can be used to pass in an arbitrary block of information which is interpreted by the OSI and the underlying solver. Users are cautioned that this hook is solver-specific.

Implementors: The default implementation completely ignores otherInformation and always throws an exception for OsiForceDo. This is almost certainly not the behaviour you want; you really should override this method.

Reimplemented from OsiSolverInterface.

5.15.3.2 CoinWarmStart* OsiGlpkSolverInterface::getEmptyWarmStart ( ) const [inline, virtual]

Get an empty warm start object.

This routine returns an empty CoinWarmStartBasis object. Its purpose is to provide a way to give a client a warm start basis object of the appropriate type, which can resized and modified as desired.

Implements OsiSolverInterface.

Definition at line 115 of file OsiGlpkSolverInterface.hpp.

5.15.3.3 virtual bool OsiGlpkSolverInterface::setWarmStart (const CoinWarmStart * *warmstart*) [virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

Implements OsiSolverInterface.

5.15.3.4 virtual const char* OsiGlpkSolverInterface::getRowSense ( ) const [virtual]

Get pointer to array[getNumRows()] of row constraint senses.

- 'L': <= constraint
- 'E': = constraint
- 'G': >= constraint
- 'R': ranged constraint
- 'N': free constraint

Implements OsiSolverInterface.

5.15.3.5 virtual const double* OsiGlpkSolverInterface::getRightHandSide ( ) const [virtual]

Get pointer to array[getNumRows()] of rows right-hand sides.

- if rowsense()[i] == 'L' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'G' then rhs()[i] == rowlower()[i]
- if rowsense()[i] == 'R' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'N' then rhs()[i] == 0.0

Implements OsiSolverInterface.

5.15.3.6 virtual const double* OsiGlpkSolverInterface::getRowRange ( ) const [virtual]

Get pointer to array[getNumRows()] of row ranges.

- if rowsense()[i] == 'R' then rowrange()[i] == rowupper()[i] - rowlower()[i]
- if rowsense()[i] != 'R' then rowrange()[i] is 0.0

Implements OsiSolverInterface.

5.15.3.7 virtual int OsiGlpkSolverInterface::getIterationCount ( ) const [virtual]

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.

Implements OsiSolverInterface.

5.15.3.8 virtual std::vector<double*> OsiGlpkSolverInterface::getDualRays (int *maxNumRays*, bool *fullRay* = false) const [virtual]

Get as many dual rays as the solver can provide.

(In case of proven primal infeasibility there should be at least one.)

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumRows() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.15.3.9 virtual std::vector<double*> OsiGlpkSolverInterface::getPrimalRays (int *maxNumRays*) const [virtual]

Get as many primal rays as the solver can provide.

(In case of proven dual infeasibility there should be at least one.)

The first getNumRows() ray components will always be associated with the row duals (as returned by getRowPrice()). If `fullRay` is true, the final getNumCols() entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumCols() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.15.3.10 virtual void OsiGlpkSolverInterface::setColLower (int *elementIndex*, double *elementValue*) [virtual]

Set a single column lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.15.3.11 virtual void OsiGlpkSolverInterface::setColUpper (int *elementIndex*, double *elementValue*) [virtual]

Set a single column upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.15.3.12 virtual void OsiGlpkSolverInterface::setColSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [virtual]

Set the bounds on a number of columns simultaneously

The default implementation just invokes setColLower() and setColUpper() over and over again.

Parameters

index-First,indexLas	pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes
boundList	the new lower/upper bound pairs for the variables

Reimplemented from OsiSolverInterface.

5.15.3.13 virtual void OsiGlpkSolverInterface::setRowLower (int *elementIndex*, double *elementValue*) [virtual]

Set a single row lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.15.3.14 virtual void OsiGlpkSolverInterface::setRowUpper (int *elementIndex*, double *elementValue*) [virtual]

Set a single row upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.15.3.15 virtual void OsiGlpkSolverInterface::setRowSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [virtual]

Set the bounds on a number of rows simultaneously

The default implementation just invokes setRowLower() and setRowUpper() over and over again.

Parameters

index-First,indexLas	pointers to the beginning and after the end of the array of the indices of the constraints whose *either* bound changes
boundList	the new lower/upper bound pairs for the constraints

Reimplemented from OsiSolverInterface.

5.15.3.16 virtual void OsiGlpkSolverInterface::setRowSetTypes (const int * *indexFirst*, const int * *indexLast*, const char * *senseList*, const double * *rhsList*, const double * *rangeList*) [virtual]

Set the type of a number of rows simultaneously

The default implementation just invokes setRowType() over and over again.

Parameters

index-First,indexLas	pointers to the beginning and after the end of the array of the indices of the constraints whose *any* characteristics changes
senseList	the new senses
rhsList	the new right hand sides
rangeList	the new ranges

Reimplemented from OsiSolverInterface.

5.15.3.17 virtual void OsiGlpkSolverInterface::setColSolution (const double * *colsol*) [virtual]

Set the primal solution column values.

colsol[numcols()] is an array of values of the problem column variables. These values are copied to memory owned by the solver object or the solver. They will be returned as

the result of colsol() until changed by another call to setColsol() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.15.3.18 virtual void OsiGlpkSolverInterface::setRowPrice (const double * *rowprice*) [virtual]

Set dual solution vector.

rowprice[numrows()] is an array of values of the problem row dual variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of rowprice() until changed by another call to setRowprice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.15.3.19 virtual void OsiGlpkSolverInterface::addCol (const CoinPackedVectorBase & *vec,* const double *collb,* const double *colub,* const double *obj*) [virtual]

Add a column (primal variable) to the problem.

Implements OsiSolverInterface.

5.15.3.20 virtual void OsiGlpkSolverInterface::addCols (const int *numcols,* const CoinPackedVectorBase *const * *cols,* const double * *collb,* const double * *colub,* const double * *obj*) [virtual]

Add a set of columns (primal variables) to the problem.

The default implementation simply makes repeated calls to addCol().

Reimplemented from OsiSolverInterface.

5.15.3.21 virtual void OsiGlpkSolverInterface::deleteCols (const int *num,* const int * *collndices*) [virtual]

Remove a set of columns (primal variables) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted variables are nonbasic.

Implements OsiSolverInterface.

5.15.3.22 virtual void OsiGlpkSolverInterface::addRow (const CoinPackedVectorBase & *vec,* const double *rowlb,* const double *rowub*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.15.3.23 virtual void OsiGlpkSolverInterface::addRow (const CoinPackedVectorBase & *vec,* const char *rowsen,* const double *rowrhs,* const double *rowrng*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.15.3.24 virtual void OsiGlpkSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const double * *rowlb*, const double * *rowub*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.15.3.25 virtual void OsiGlpkSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.15.3.26 virtual void OsiGlpkSolverInterface::deleteRows (const int *num*, const int * *rowIndices*) [virtual]

Delete a set of rows (constraints) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted rows are loose.

Implements OsiSolverInterface.

5.15.3.27 virtual void OsiGlpkSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Implements OsiSolverInterface.

5.15.3.28 virtual void OsiGlpkSolverInterface::assignProblem (CoinPackedMatrix *& *matrix*, double *& *collb*, double *& *colub*, double *& *obj*, double *& *rowlb*, double *& *rowub*) [virtual]

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.15.3.29 virtual void OsiGlpkSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are >=
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

Implements OsiSolverInterface.

5.15.3.30 virtual void OsiGlpkSolverInterface::assignProblem (CoinPackedMatrix *& *matrix*, double *& *collb*, double *& *colub*, double *& *obj*, char *& *rowsen*, double *& *rowrhs*, double *& *rowrng*) [virtual]

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.15.3.31 virtual void OsiGlpkSolverInterface::loadProblem (const int *numcols*, const int *numrows*, const int * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [virtual]

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.15.3.32 virtual void OsiGlpkSolverInterface::loadProblem (const int *numcols*, const int *numrows*, const int * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.15.3.33 virtual void OsiGlpkSolverInterface::writeMps (const char * *filename*, const char * *extension* = "mps", double *objSense* = 0.0) const [virtual]

Write the problem into an mps file of the given filename.

If objSense is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants

Implements OsiSolverInterface.

5.15.3.34 void OsiGlpkSolverInterface::setRowName (int *ndx*, std::string *name*) [virtual]

Set a row name.

Quietly does nothing if the name discipline (#OsiNameDiscipline) is auto. Quietly fails if the row index is invalid.

Reimplemented from OsiSolverInterface.

5.15.3.35 void OsiGlpkSolverInterface::setColName (int *ndx*, std::string *name*) [virtual]

Set a column name.

Quietly does nothing if the name discipline (#OsiNameDiscipline) is auto. Quietly fails if the column index is invalid.

Reimplemented from OsiSolverInterface.

5.15.3.36 static void OsiGlpkSolverInterface::incrementInstanceCounter ( ) [inline, static]

GLPK has a context which must be freed after all GLPK LPs (or MIPs) are freed.

It is automatically created when the first LP is created. This method:

- Increments by 1 the number of uses of the GLPK environment.

Definition at line 672 of file OsiGlpkSolverInterface.hpp.

5.15.3.37 static void OsiGlpkSolverInterface::decrementInstanceCounter ( ) [static]

GLPK has a context which must be freed after all GLPK LPs (or MIPs) are freed.

This method:

- Decrements by 1 the number of uses of the GLPK environment.
- Deletes the GLPK environment when the number of uses is change to 0 from 1.

5.15.3.38 virtual void OsiGlpkSolverInterface::applyColCut (const OsiColCut & *cc*) [protected, virtual]

Apply a column cut (bound adjustment).

Return true if cut was applied.

Implements OsiSolverInterface.

5.15.4 Friends And Related Function Documentation

5.15.4.1 void OsiGlpkSolverInterfaceUnitTest (const std::string & *mpsDir,* const std::string & *netlibDir*) [friend]

A function that tests the methods in the OsiGlpkSolverInterface class.

The documentation for this class was generated from the following file:

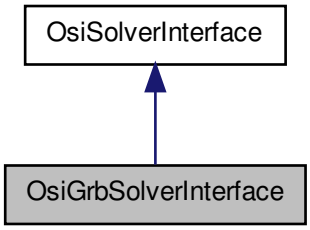
- OsiGlpkSolverInterface.hpp

5.16 OsiGrbSolverInterface Class Reference

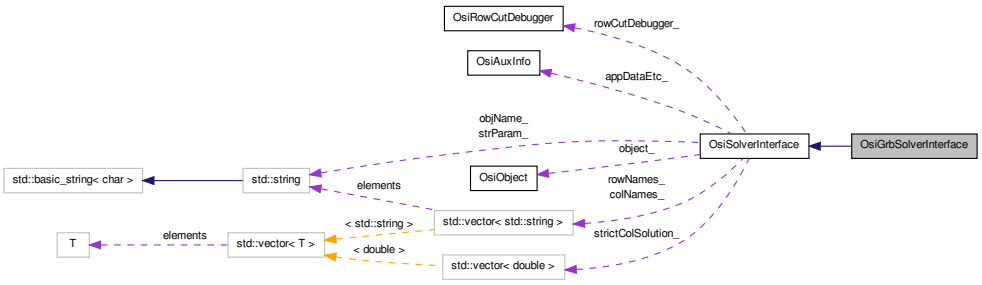
Gurobi Solver Interface.

`#include <OsiGrbSolverInterface.hpp>`

Inheritance diagram for OsiGrbSolverInterface:



Collaboration diagram for OsiGrbSolverInterface:



Public Member Functions

- virtual void setObjSense (double s)

  Set objective function sense (1 for min (default), -1 for max,)
- virtual void setColSolution (const double ∗colsol)

  Set the primal solution column values.
- virtual void setRowPrice (const double ∗rowprice)

  Set dual solution vector.
- const char ∗ getCtype () const

  return a vector of variable types (continous, binary, integer)

Solve methods

- virtual void initialSolve ()

Solve initial LP relaxation.

- virtual void resolve ()

  Resolve an LP relaxation after problem modification.

- virtual void branchAndBound ()

  Invoke solver's built-in enumeration algorithm.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the volume algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

- bool setIntParam (OsiIntParam key, int value)

  Set an integer parameter.

- bool setDblParam (OsiDblParam key, double value)

  Set a double parameter.

- bool setStrParam (OsiStrParam key, const std::string &value)

  Set a string parameter.

- bool setHintParam (OsiHintParam key, bool yesNo=true, OsiHintStrength strength=OsiHintTry, void *=NULL)

  Set a hint parameter.

- bool getIntParam (OsiIntParam key, int &value) const

  Get an integer parameter.

- bool getDblParam (OsiDblParam key, double &value) const

  Get a double parameter.

- bool getStrParam (OsiStrParam key, std::string &value) const

  Get a string parameter.

- bool getHintParam (OsiHintParam key, bool &yesNo, OsiHintStrength &strength, void *&otherInformation) const

  Get a hint parameter (all information)

- bool getHintParam (OsiHintParam key, bool &yesNo, OsiHintStrength &strength) const

  Get a hint parameter (sense and strength only)

- bool getHintParam (OsiHintParam key, bool &yesNo) const

  Get a hint parameter (sense only)

- void **setMipStart** (bool value)
- bool **getMipStart** () const

Methods returning info on how the solution process terminated

- virtual bool isAbandoned () const

  Are there a numerical difficulties?

- virtual bool isProvenOptimal () const
  Is optimality proven?
- virtual bool isProvenPrimalInfeasible () const
  Is primal infeasiblity proven?
- virtual bool isProvenDualInfeasible () const
  Is dual infeasiblity proven?
- virtual bool isPrimalObjectiveLimitReached () const
  Is the given primal objective limit reached?
- virtual bool isDualObjectiveLimitReached () const
  Is the given dual objective limit reached?
- virtual bool isIterationLimitReached () const
  Iteration limit reached?

WarmStart related methods

- CoinWarmStart * getEmptyWarmStart () const
  Get an empty warm start object.
- virtual CoinWarmStart * getWarmStart () const
  Get warmstarting information.
- virtual bool setWarmStart (const CoinWarmStart *warmstart)
  Set warmstarting information.

Hotstart related methods (primarily used in strong branching).

The user can create a hotstart (a snapshot) of the optimization process then reoptimize over and over again always starting from there.

***NOTE**: between hotstarted optimizations only bound changes are allowed.*

- virtual void markHotStart ()
  Create a hotstart point of the optimization process.
- virtual void solveFromHotStart ()
  Optimize starting from the hotstart.
- virtual void unmarkHotStart ()
  Delete the snapshot.

Methods related to querying the input data

- virtual int getNumCols () const
  Get number of columns.
- virtual int getNumRows () const
  Get number of rows.
- virtual int getNumElements () const
  Get number of nonzero elements.
- virtual const double * getColLower () const
  Get pointer to array[getNumCols()] of column lower bounds.
- virtual const double * getColUpper () const
  Get pointer to array[getNumCols()] of column upper bounds.
- virtual const char * getRowSense () const

Get pointer to array[getNumRows()] of row constraint senses.

- virtual const double * getRightHandSide () const

  Get pointer to array[getNumRows()] of rows right-hand sides.
- virtual const double * getRowRange () const

  Get pointer to array[getNumRows()] of row ranges.
- virtual const double * getRowLower () const

  Get pointer to array[getNumRows()] of row lower bounds.
- virtual const double * getRowUpper () const

  Get pointer to array[getNumRows()] of row upper bounds.
- virtual const double * getObjCoefficients () const

  Get pointer to array[getNumCols()] of objective function coefficients.
- virtual double getObjSense () const

  Get objective function sense (1 for min (default), -1 for max)
- virtual bool isContinuous (int colNumber) const

  Return true if column is continuous.
- virtual const CoinPackedMatrix * getMatrixByRow () const

  Get pointer to row-wise copy of matrix.
- virtual const CoinPackedMatrix * getMatrixByCol () const

  Get pointer to column-wise copy of matrix.
- virtual double getInfinity () const

  Get solver's value for infinity.

Methods related to querying the solution

- virtual const double * getColSolution () const

  Get pointer to array[getNumCols()] of primal solution vector.
- virtual const double * getRowPrice () const

  Get pointer to array[getNumRows()] of dual prices.
- virtual const double * getReducedCost () const

  Get a pointer to array[getNumCols()] of reduced costs.
- virtual const double * getRowActivity () const

  Get pointer to array[getNumRows()] of row activity levels (constraint matrix times the solution vector.
- virtual double getObjValue () const

  Get objective function value.
- virtual int getIterationCount () const

  Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.
- virtual std::vector< double * > getDualRays (int maxNumRays, bool fullRay=false) const

  Get as many dual rays as the solver can provide.
- virtual std::vector< double * > getPrimalRays (int maxNumRays) const

  Get as many primal rays as the solver can provide.

Changing bounds on variables and constraints

- virtual void setObjCoeff (int elementIndex, double elementValue)

  Set an objective function coefficient.

- virtual void setObjCoeffSet (const int *indexFirst, const int *indexLast, const double *coeffList)

  Set a a set of objective function coefficients.
- virtual void setColLower (int elementIndex, double elementValue)

  Set a single column lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setColUpper (int elementIndex, double elementValue)

  Set a single column upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setColBounds (int elementIndex, double lower, double upper)

  Set a single column lower and upper bound
  The default implementation just invokes `setColLower()` and `setColUpper()`
- virtual void setColSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

  Set the bounds on a number of columns simultaneously
  The default implementation just invokes `setCollower()` and `setColupper()` over and over again.
- virtual void setRowLower (int elementIndex, double elementValue)

  Set a single row lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setRowUpper (int elementIndex, double elementValue)

  Set a single row upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setRowBounds (int elementIndex, double lower, double upper)

  Set a single row lower and upper bound
  The default implementation just invokes `setRowLower()` and `setRowUpper()`
- virtual void setRowType (int index, char sense, double rightHandSide, double range)

  Set the type of a single row
- virtual void setRowSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

  Set the bounds on a number of rows simultaneously
  The default implementation just invokes `setRowLower()` and `setRowUpper()` over and over again.
- virtual void setRowSetTypes (const int *indexFirst, const int *indexLast, const char *senseList, const double *rhsList, const double *rangeList)

  Set the type of a number of rows simultaneously
  The default implementation just invokes `setRowType()` and over and over again.

Integrality related changing methods

- virtual void setContinuous (int index)

  Set the index-th variable to be a continuous variable.
- virtual void setInteger (int index)

  Set the index-th variable to be an integer variable.
- virtual void setContinuous (const int *indices, int len)

  Set the variables listed in indices (which is of length len) to be continuous variables.
- virtual void setInteger (const int *indices, int len)

  Set the variables listed in indices (which is of length len) to be integer variables.

Naming methods

- virtual void setRowName (int ndx, std::string name)

  Set a row name.
- virtual void setColName (int ndx, std::string name)

  Set a column name.

Methods to expand a problem.

Note that if a column is added then by default it will correspond to a continuous variable.

- virtual void addCol (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)

  Add a column (primal variable) to the problem.
- virtual void addCols (const int numcols, const CoinPackedVectorBase *const *cols, const double *collb, const double *colub, const double *obj)

  Add a set of columns (primal variables) to the problem.
- virtual void deleteCols (const int num, const int *colIndices)

  Remove a set of columns (primal variables) from the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)

  Add a row (constraint) to the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)

  Add a row (constraint) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase *const *rows, const double *rowlb, const double *rowub)

  Add a set of rows (constraints) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase *const *rows, const char *rowsen, const double *rowrhs, const double *rowrng)

  Add a set of rows (constraints) to the problem.
- virtual void deleteRows (const int num, const int *rowIndices)

  Delete a set of rows (constraints) from the problem.

Methods to input a problem

- virtual void loadProblem (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

  Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void assignProblem (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, double *&rowlb, double *&rowub)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void loadProblem (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)

  Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

- virtual void assignProblem (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, char *&rowsen, double *&rowrhs, double *&rowrng)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void loadProblem (const int numcols, const int numrows, const int *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual void loadProblem (const int numcols, const int numrows, const int *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual int readMps (const char *filename, const char *extension="mps")

  Read an mps file from the given filename.
- virtual void writeMps (const char *filename, const char *extension="mps", double objSense=0.0) const

  Write the problem into an mps file of the given filename.

Constructors and destructor

- OsiGrbSolverInterface (bool use_local_env=false)

  Default Constructor.
- OsiGrbSolverInterface (GRBenv *localgrbenv)

  Constructor that takes a gurobi environment and assumes membership.
- virtual OsiSolverInterface * clone (bool copyData=true) const

  Clone.
- OsiGrbSolverInterface (const OsiGrbSolverInterface &)

  Copy constructor.
- OsiGrbSolverInterface & operator= (const OsiGrbSolverInterface &rhs)

  Assignment operator.
- virtual ~OsiGrbSolverInterface ()

  Destructor.
- virtual void reset ()

  Resets as if default constructor.

OsiSimplexInterface methods

Gurobi adds a slack with coeff +1 in "<=" and "=" constraints, with coeff -1 in ">=", slack being non negative.

We switch in order to get a "Clp tableau" where all the slacks have coefficient +1 in the original tableau.

If a slack for ">=" is non basic, invB is not changed; column of the slack in the optimal tableau is flipped.

If a slack for ">=" is basic, corresp. row of invB is flipped; whole row of the optimal tableau is flipped; then whole column for the slack in opt tableau is flipped.

Ranged rows are not supported. It might work, but no garantee is given.

- virtual int canDoSimplexInterface () const

  Returns 1 if can just do getBInv etc 2 if has all OsiSimplex methods and 0 if it has none.
- virtual void enableSimplexInterface (int doingPrimal)

  Useless function, defined only for compatibility with OsiSimplexInterface.
- virtual void disableSimplexInterface ()

  Useless function, defined only for compatibility with OsiSimplexInterface.
- virtual void enableFactorization () const

  Useless function, defined only for compatibility with OsiSimplexInterface.
- virtual void disableFactorization () const

  Useless function, defined only for compatibility with OsiSimplexInterface.
- virtual bool basisIsAvailable () const

  Returns true if a basis is available.
- virtual void getBasisStatus (int ∗cstat, int ∗rstat) const

  Returns a basis status of the structural/artificial variables At present as warm start i.e 0: free, 1: basic, 2: upper, 3: lower.
- void switchToLP ()

  Get indices of the pivot variable in each row (order of indices corresponds to the order of elements in a vector retured by getBInvACol() and getBInvCol()).
- void switchToMIP ()

  switches Gurobi to prob type MIP

Static Public Member Functions

Static instance counter methods

- static void incrementInstanceCounter ()

  Gurobi has a context which must be created prior to all other Gurobi calls.
- static void decrementInstanceCounter ()

  Gurobi has a context which should be deleted after Gurobi calls.
- static void setEnvironment (GRBenv ∗globalenv)

  sets the global gurobi environment to a user given one
- static unsigned int getNumInstances ()

  Return the number of instances of instantiated objects using Gurobi services.

Protected Member Functions

Protected methods

- virtual void applyRowCut (const OsiRowCut &rc)

  Apply a row cut. Return true if cut was applied.
- virtual void applyColCut (const OsiColCut &cc)

  Apply a column cut (bound adjustment).

Friends

- void OsiGrbSolverInterfaceUnitTest (const std::string &mpsDir, const std::string &netlibDir)

  A function that tests the methods in the OsiGrbSolverInterface class.

Gurobi specific public interfaces

- enum keepCachedFlag {

  KEEPCACHED_NONE = 0, KEEPCACHED_COLUMN = 1, KEEPCACHED_ROW = 2, KEEPCACHED_MATRIX = 4,

  KEEPCACHED_RESULTS = 8, KEEPCACHED_PROBLEM = KEEPCACHED_COLUMN | KEEPCACHED_ROW | KEEPCACHED_MATRIX, KEEPCACHED_ALL = KEEPCACHED_PROBLEM | KEEPCACHED_RESULTS, FREECACHED_COLUMN = KEEPCACHED_PROBLEM & ~KEEPCACHED_COLUMN,

  FREECACHED_ROW = KEEPCACHED_PROBLEM & ~KEEPCACHED_ROW, FREECACHED_MATRIX = KEEPCACHED_PROBLEM & ~KEEPCACHED_MATRIX, FREECACHED_RESULTS = KEEPCACHED_ALL & ~KEEPCACHED_RESULTS }

  Get pointer to Gurobi model and free all specified cached data entries (combined with logical or-operator '|'):
- GRBmodel * **getLpPtr** (int keepCached=KEEPCACHED_NONE)
- GRBenv * getEnvironmentPtr () const

  Method to access Gurobi environment pointer.
- bool isDemoLicense () const

  Return whether the current Gurobi environment runs in demo mode.

5.16.1 Detailed Description

Gurobi Solver Interface.

Instantiation of OsiGrbSolverInterface for Gurobi

Definition at line 29 of file OsiGrbSolverInterface.hpp.

5.16.2 Member Enumeration Documentation

5.16.2.1 enum OsiGrbSolverInterface::keepCachedFlag

Get pointer to Gurobi model and free all specified cached data entries (combined with logical or-operator '|'):

Enumerator:

KEEPCACHED_NONE discard all cached data (default)

KEEPCACHED_COLUMN column information: objective values, lower and upper bounds, variable types

KEEPCACHED_ROW row information: right hand sides, ranges and senses, lower and upper bounds for row

KEEPCACHED_MATRIX problem matrix: matrix ordered by column and by row

KEEPCACHED_RESULTS LP solution: primal and dual solution, reduced costs, row activities.

KEEPCACHED_PROBLEM only discard cached LP solution

KEEPCACHED_ALL keep all cached data (similar to getMutableLpPtr())

FREECACHED_COLUMN free only cached column and LP solution information

FREECACHED_ROW free only cached row and LP solution information

FREECACHED_MATRIX free only cached matrix and LP solution information

FREECACHED_RESULTS free only cached LP solution information

Definition at line 546 of file OsiGrbSolverInterface.hpp.

5.16.3 Member Function Documentation

5.16.3.1 bool OsiGrbSolverInterface::setHintParam (OsiHintParam *key*, bool *yesNo* = `true`, OsiHintStrength *strength* = `OsiHintTry`, void * = `NULL`) `[virtual]`

Set a hint parameter.

The `otherInformation` parameter can be used to pass in an arbitrary block of information which is interpreted by the OSI and the underlying solver. Users are cautioned that this hook is solver-specific.

Implementors: The default implementation completely ignores `otherInformation` and always throws an exception for OsiForceDo. This is almost certainly not the behaviour you want; you really should override this method.

Reimplemented from OsiSolverInterface.

5.16.3.2 bool OsiGrbSolverInterface::getHintParam (OsiHintParam *key*, bool & *yesNo*, OsiHintStrength & *strength*, void *& *otherInformation*) const `[virtual]`

Get a hint parameter (all information)

Return all available information for the hint: sense, strength, and any extra information associated with the hint.

Implementors: The default implementation will always set `otherInformation` to NULL. This is almost certainly not the behaviour you want; you really should override this method.

Reimplemented from OsiSolverInterface.

5.16.3.3 bool OsiGrbSolverInterface::getHintParam (OsiHintParam *key*, bool & *yesNo*, OsiHintStrength & *strength*) const `[virtual]`

Get a hint parameter (sense and strength only)

Return only the sense and strength of the hint.

Reimplemented from OsiSolverInterface.

5.16.3.4 bool OsiGrbSolverInterface::getHintParam (OsiHintParam *key*, bool & *yesNo*) const `[virtual]`

Get a hint parameter (sense only)

Return only the sense (true/false) of the hint.

Reimplemented from OsiSolverInterface.

5.16.3.5 CoinWarmStart* OsiGrbSolverInterface::getEmptyWarmStart ( ) const [virtual]

Get an empty warm start object.

This routine returns an empty CoinWarmStartBasis object. Its purpose is to provide a way to give a client a warm start basis object of the appropriate type, which can resized and modified as desired.

Implements OsiSolverInterface.

5.16.3.6 virtual bool OsiGrbSolverInterface::setWarmStart (const CoinWarmStart * *warmstart*) [virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

Implements OsiSolverInterface.

5.16.3.7 virtual const char* OsiGrbSolverInterface::getRowSense ( ) const [virtual]

Get pointer to array[getNumRows()] of row constraint senses.

- 'L': <= constraint
- 'E': = constraint
- 'G': >= constraint
- 'R': ranged constraint
- 'N': free constraint

Implements OsiSolverInterface.

5.16.3.8 virtual const double* OsiGrbSolverInterface::getRightHandSide ( ) const [virtual]

Get pointer to array[getNumRows()] of rows right-hand sides.

- if rowsense()[i] == 'L' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'G' then rhs()[i] == rowlower()[i]
- if rowsense()[i] == 'R' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'N' then rhs()[i] == 0.0

Implements OsiSolverInterface.

5.16.3.9 virtual const double* OsiGrbSolverInterface::getRowRange ( ) const [virtual]

Get pointer to array[getNumRows()] of row ranges.

- if rowsense()[i] == 'R' then rowrange()[i] == rowupper()[i] - rowlower()[i]
- if rowsense()[i] != 'R' then rowrange()[i] is 0.0

Implements OsiSolverInterface.

5.16.3.10 virtual int OsiGrbSolverInterface::getIterationCount ( ) const [virtual]

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.

Implements OsiSolverInterface.

5.16.3.11 virtual std::vector<double*> OsiGrbSolverInterface::getDualRays (int *maxNumRays*, bool *fullRay* = false) const [virtual]

Get as many dual rays as the solver can provide.

(In case of proven primal infeasibility there should be at least one.)

The first getNumRows() ray components will always be associated with the row duals (as returned by getRowPrice()). If fullRay is true, the final getNumCols() entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumRows() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.16.3.12 virtual std::vector<double*> OsiGrbSolverInterface::getPrimalRays (int *maxNumRays*) const [virtual]

Get as many primal rays as the solver can provide.

(In case of proven dual infeasibility there should be at least one.)

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumCols() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.16.3.13 virtual void OsiGrbSolverInterface::setColLower (int *elementIndex,* double *elementValue*) [virtual]

Set a single column lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.16.3.14 virtual void OsiGrbSolverInterface::setColUpper (int *elementIndex,* double *elementValue*) [virtual]

Set a single column upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.16.3.15 virtual void OsiGrbSolverInterface::setColSetBounds (const int * *indexFirst,* const int * *indexLast,* const double * *boundList*) [virtual]

Set the bounds on a number of columns simultaneously

The default implementation just invokes `setCollower()` and `setColupper()` over and over again.

Parameters

<*code*>[*inde*	contains the indices of the constraints whose either bound changes
boundList	the new lower/upper bound pairs for the variables

Reimplemented from OsiSolverInterface.

5.16.3.16 virtual void OsiGrbSolverInterface::setRowLower (int *elementIndex,* double *elementValue*) [virtual]

Set a single row lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.16.3.17 virtual void OsiGrbSolverInterface::setRowUpper (int *elementIndex,* double *elementValue*) [virtual]

Set a single row upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.16.3.18 virtual void OsiGrbSolverInterface::setRowSetBounds (const int * *indexFirst,* const int * *indexLast,* const double * *boundList*) [virtual]

Set the bounds on a number of rows simultaneously

The default implementation just invokes `setRowLower()` and `setRowUpper()` over and over again.

Parameters

<*code*>*[inde*	contains the indices of the constraints whose either bound changes
boundList	the new lower/upper bound pairs for the constraints

Reimplemented from OsiSolverInterface.

5.16.3.19 **virtual void OsiGrbSolverInterface::setRowSetTypes (const int * *indexFirst*, const int * *indexLast*, const char * *senseList*, const double * *rhsList*, const double * *rangeList*)** `[virtual]`

Set the type of a number of rows simultaneously

The default implementation just invokes `setRowType()` and over and over again.

Parameters

<*code*>*[inde*	contains the indices of the constraints whose type changes
senseList	the new senses
rhsList	the new right hand sides
rangeList	the new ranges

Reimplemented from OsiSolverInterface.

5.16.3.20 **virtual void OsiGrbSolverInterface::setColSolution (const double * *colsol*)** `[virtual]`

Set the primal solution column values.

colsol[numcols()] is an array of values of the problem column variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of colsol() until changed by another call to setColsol() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.16.3.21 **virtual void OsiGrbSolverInterface::setRowPrice (const double * *rowprice*)** `[virtual]`

Set dual solution vector.

rowprice[numrows()] is an array of values of the problem row dual variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of rowprice() until changed by another call to setRowprice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.16.3.22 virtual void OsiGrbSolverInterface::addCol (const CoinPackedVectorBase & *vec,* const double *collb,* const double *colub,* const double *obj*) [virtual]

Add a column (primal variable) to the problem.

Implements OsiSolverInterface.

5.16.3.23 virtual void OsiGrbSolverInterface::addCols (const int *numcols,* const CoinPackedVectorBase *const * *cols,* const double * *collb,* const double * *colub,* const double * *obj*) [virtual]

Add a set of columns (primal variables) to the problem.

The default implementation simply makes repeated calls to addCol().

Reimplemented from OsiSolverInterface.

5.16.3.24 virtual void OsiGrbSolverInterface::deleteCols (const int *num,* const int * *collndices*) [virtual]

Remove a set of columns (primal variables) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted variables are nonbasic.

Implements OsiSolverInterface.

5.16.3.25 virtual void OsiGrbSolverInterface::addRow (const CoinPackedVectorBase & *vec,* const double *rowlb,* const double *rowub*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.16.3.26 virtual void OsiGrbSolverInterface::addRow (const CoinPackedVectorBase & *vec,* const char *rowsen,* const double *rowrhs,* const double *rowrng*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.16.3.27 virtual void OsiGrbSolverInterface::addRows (const int *numrows,* const CoinPackedVectorBase *const * *rows,* const double * *rowlb,* const double * *rowub*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.16.3.28 virtual void OsiGrbSolverInterface::addRows (const int *numrows,* const CoinPackedVectorBase *const * *rows,* const char * *rowsen,* const double * *rowrhs,* const double * *rowrng*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.16.3.29 virtual void OsiGrbSolverInterface::deleteRows (const int *num*, const int * *rowIndices*) [virtual]

Delete a set of rows (constraints) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted rows are loose.

Implements OsiSolverInterface.

5.16.3.30 virtual void OsiGrbSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Implements OsiSolverInterface.

5.16.3.31 virtual void OsiGrbSolverInterface::assignProblem (CoinPackedMatrix *& *matrix*, double *& *collb*, double *& *colub*, double *& *obj*, double *& *rowlb*, double *& *rowub*) [virtual]

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.16.3.32 virtual void OsiGrbSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are >=
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

Implements OsiSolverInterface.

5.16.3.33 **virtual void OsiGrbSolverInterface::assignProblem (CoinPackedMatrix *& *matrix,* double *& *collb,* double *& *colub,* double *& *obj,* char *& *rowsen,* double *& *rowrhs,* double *& *rowrng*) [virtual]**

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.16.3.34 **virtual void OsiGrbSolverInterface::loadProblem (const int *numcols,* const int *numrows,* const int * *start,* const int * *index,* const double * *value,* const double * *collb,* const double * *colub,* const double * *obj,* const double * *rowlb,* const double * *rowub*) [virtual]**

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.16.3.35 **virtual void OsiGrbSolverInterface::loadProblem (const int *numcols,* const int *numrows,* const int * *start,* const int * *index,* const double * *value,* const double * *collb,* const double * *colub,* const double * *obj,* const char * *rowsen,* const double * *rowrhs,* const double * *rowrng*) [virtual]**

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.16.3.36 **virtual void OsiGrbSolverInterface::writeMps (const char * *filename,* const char * *extension* = "mps", double *objSense* = 0.0) const [virtual]**

Write the problem into an mps file of the given filename.

If objSense is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants

Implements OsiSolverInterface.

5.16.3.37 static void OsiGrbSolverInterface::incrementInstanceCounter ( ) [static]

Gurobi has a context which must be created prior to all other Gurobi calls.

This method:

- Increments by 1 the number of uses of the Gurobi environment.
- Creates the Gurobi context when the number of uses is change to 1 from 0.

5.16.3.38 static void OsiGrbSolverInterface::decrementInstanceCounter ( ) [static]

Gurobi has a context which should be deleted after Gurobi calls.

This method:

- Decrements by 1 the number of uses of the Gurobi environment.
- Deletes the Gurobi context when the number of uses is change to 0 from 1.

5.16.3.39 void OsiGrbSolverInterface::switchToLP ( )

Get indices of the pivot variable in each row (order of indices corresponds to the order of elements in a vector retured by getBInvACol() and getBInvCol()).

switches Gurobi to prob type LP

5.16.3.40 virtual void OsiGrbSolverInterface::applyColCut (const OsiColCut & *cc*) [protected, virtual]

Apply a column cut (bound adjustment).

Return true if cut was applied.

Implements OsiSolverInterface.

5.16.4 Friends And Related Function Documentation

5.16.4.1 void OsiGrbSolverInterfaceUnitTest (const std::string & *mpsDir,* const std::string & *netlibDir*) [friend]

A function that tests the methods in the OsiGrbSolverInterface class.

The documentation for this class was generated from the following file:

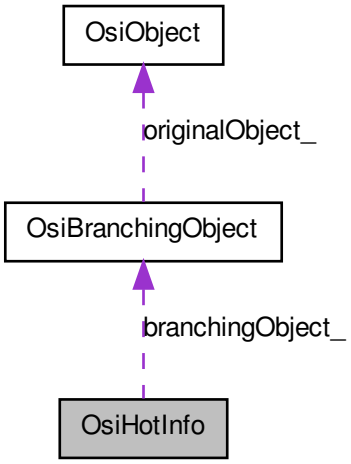
- OsiGrbSolverInterface.hpp

5.17 OsiHotInfo Class Reference

This class contains the result of strong branching on a variable When created it stores enough information for strong branching.

`#include <OsiChooseVariable.hpp>`

Collaboration diagram for OsiHotInfo:



Public Member Functions

- OsiHotInfo ()

  Default Constructor.
- OsiHotInfo (OsiSolverInterface ∗solver, const OsiBranchingInformation ∗info, const OsiObject ∗const ∗objects, int whichObject)

  Constructor from useful information.
- OsiHotInfo (const OsiHotInfo &)

  Copy constructor.
- OsiHotInfo & operator= (const OsiHotInfo &rhs)

  Assignment operator.
- virtual OsiHotInfo ∗ clone () const

  Clone.
- virtual ∼OsiHotInfo ()

  Destructor.
- int updateInformation (const OsiSolverInterface ∗solver, const OsiBranchingInformation ∗info, OsiChooseVariable ∗choose)

  Fill in useful information after strong branch.
- double originalObjectiveValue () const

  Original objective value.

- double upChange () const

  Up change - invalid if n-way.
- double downChange () const

  Down change - invalid if n-way.
- void setUpChange (double value)

  Set up change - invalid if n-way.
- void setDownChange (double value)

  Set down change - invalid if n-way.
- double change (int k) const

  Change on way k.
- int upIterationCount () const

  Up iteration count - invalid if n-way.
- int downIterationCount () const

  Down iteration count - invalid if n-way.
- int iterationCount (int k) const

  Iteration count on way k.
- int upStatus () const

  Up status - invalid if n-way.
- int downStatus () const

  Down status - invalid if n-way.
- void setUpStatus (int value)

  Set up status - invalid if n-way.
- void setDownStatus (int value)

  Set down status - invalid if n-way.
- int status (int k) const

  Status on way k.
- OsiBranchingObject * branchingObject () const

  Branching object.

Protected Attributes

- double originalObjectiveValue_

  Original objective value.
- double * changes_

  Objective changes.
- int * iterationCounts_

  Iteration counts.
- int * statuses_

  Status.
- OsiBranchingObject * branchingObject_

  Branching object.
- int whichObject_

  Which object on list.

5.17.1 Detailed Description

This class contains the result of strong branching on a variable When created it stores enough information for strong branching.

Definition at line 432 of file OsiChooseVariable.hpp.

5.17.2 Member Function Documentation

5.17.2.1 int OsiHotInfo::updateInformation (const OsiSolverInterface * *solver,* const OsiBranchingInformation * *info,* OsiChooseVariable * *choose*)

Fill in useful information after strong branch.

Return status

5.17.3 Member Data Documentation

5.17.3.1 int* OsiHotInfo::statuses_ [protected]

Status.

-1 - not done 0 - feasible and finished 1 - infeasible 2 - not finished

Definition at line 526 of file OsiChooseVariable.hpp.

The documentation for this class was generated from the following file:

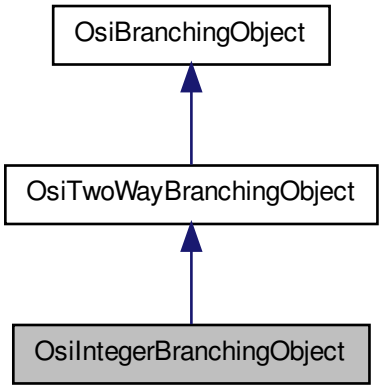
- OsiChooseVariable.hpp

5.18 OsiIntegerBranchingObject Class Reference

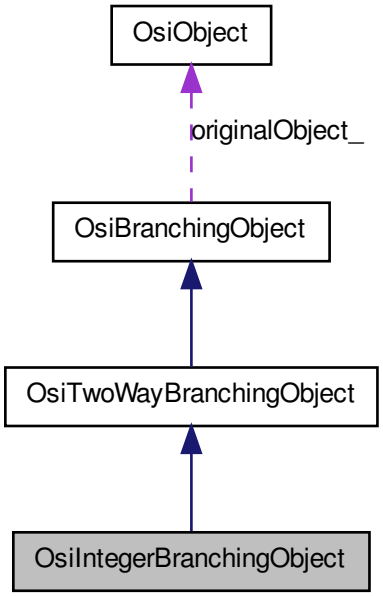
Simple branching object for an integer variable.

`#include <OsiBranchingObject.hpp>`

Inheritance diagram for OsiIntegerBranchingObject:



Collaboration diagram for OsiIntegerBranchingObject:



Public Member Functions

- OsiIntegerBranchingObject ()

  Default constructor.
- OsiIntegerBranchingObject (OsiSolverInterface ∗solver, const OsiSimpleInteger ∗originalObject, int way, double value)

  Create a standard floor/ceiling branch object.
- OsiIntegerBranchingObject (OsiSolverInterface ∗solver, const OsiSimpleInteger ∗originalObject, int way, double value, double downUpperBound, double upLowerBound)

  Create a standard floor/ceiling branch object.
- OsiIntegerBranchingObject (const OsiIntegerBranchingObject &)

  Copy constructor.
- OsiIntegerBranchingObject & operator= (const OsiIntegerBranchingObject &rhs)

  Assignment operator.
- virtual OsiBranchingObject ∗ clone () const

  Clone.

- virtual ~OsiIntegerBranchingObject ()

  Destructor.
- virtual double branch (OsiSolverInterface *solver)

  Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.
- virtual void print (const OsiSolverInterface *solver=NULL)

  Print something about branch - only if log level high.

Protected Attributes

- double down_ [2]

  Lower [0] and upper [1] bounds for the down arm (way_ = -1)
- double up_ [2]

  Lower [0] and upper [1] bounds for the up arm (way_ = 1)

5.18.1 Detailed Description

Simple branching object for an integer variable.

This object can specify a two-way branch on an integer variable. For each arm of the branch, the upper and lower bounds on the variable can be independently specified. 0 -> down, 1-> up.

Definition at line 607 of file OsiBranchingObject.hpp.

5.18.2 Constructor & Destructor Documentation

5.18.2.1 OsiIntegerBranchingObject::OsiIntegerBranchingObject (OsiSolverInterface * *solver,* const OsiSimpleInteger * *originalObject,* int *way,* double *value*)

Create a standard floor/ceiling branch object.

Specifies a simple two-way branch. Let `value` = x*. One arm of the branch will be lb <= x <= floor(x*), the other ceil(x*) <= x <= ub. Specify way = -1 to set the object state to perform the down arm first, way = 1 for the up arm.

5.18.2.2 OsiIntegerBranchingObject::OsiIntegerBranchingObject (OsiSolverInterface * *solver,* const OsiSimpleInteger * *originalObject,* int *way,* double *value,* double *downUpperBound,* double *upLowerBound*)

Create a standard floor/ceiling branch object.

Specifies a simple two-way branch in a more flexible way. One arm of the branch will be lb <= x <= downUpperBound, the other upLowerBound <= x <= ub. Specify way = -1 to set the object state to perform the down arm first, way = 1 for the up arm.

5.18.3 Member Function Documentation

5.18.3.1 virtual double OsiIntegerBranchingObject::branch (OsiSolverInterface * *solver*) [virtual]

Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.

state. Returns change in guessed objective on next branch

Implements OsiTwoWayBranchingObject.

The documentation for this class was generated from the following file:

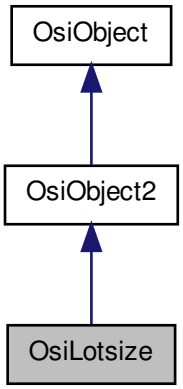
- OsiBranchingObject.hpp

5.19 OsiLotsize Class Reference

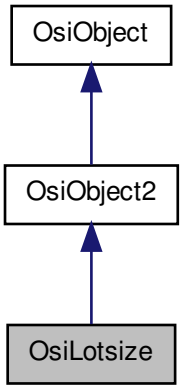
Lotsize class.

`#include <OsiBranchingObject.hpp>`

Inheritance diagram for OsiLotsize:



Collaboration diagram for OsiLotsize:



Public Member Functions

- virtual OsiObject ∗ clone () const

  Clone.
- virtual double infeasibility (const OsiBranchingInformation ∗info, int &whichWay) const

  Infeasibility - large is 0.5.
- virtual double feasibleRegion (OsiSolverInterface ∗solver, const OsiBranchingInformation ∗info) const

  Set bounds to contain the current solution.
- virtual OsiBranchingObject ∗ createBranch (OsiSolverInterface ∗solver, const OsiBranchingInformation ∗info, int way) const

  Creates a branching object.
- void setColumnNumber (int value)

  Set solver column number.
- virtual int columnNumber () const

  Column number if single column object -1 otherwise, so returns >= 0 Used by heuristics.
- virtual void resetBounds (const OsiSolverInterface ∗solver)

  Reset original upper and lower bound values from the solver.
- bool findRange (double value, double integerTolerance) const

  Finds range of interest so value is feasible in range range_ or infeasible between hi[range_] and lo[range_+1].

- virtual void floorCeiling (double &floorLotsize, double &ceilingLotsize, double value, double tolerance) const

  Returns floor and ceiling.
- double originalLowerBound () const

  Original bounds.
- int rangeType () const

  Type - 1 points, 2 ranges.
- int numberRanges () const

  Number of points.
- double * bound () const

  Ranges.
- virtual void resetSequenceEtc (int numberColumns, const int *originalColumns)

  Change column numbers after preprocessing.
- virtual double upEstimate () const

  Return "up" estimate (default 1.0e-5)
- virtual double downEstimate () const

  Return "down" estimate (default 1.0e-5)
- virtual bool canHandleShadowPrices () const

  Return true if knows how to deal with Pseudo Shadow Prices.
- virtual bool canDoHeuristics () const

  Return true if object can take part in normal heuristics.

5.19.1 Detailed Description

Lotsize class.

Definition at line 827 of file OsiBranchingObject.hpp.

5.19.2 Member Function Documentation

5.19.2.1 virtual double OsiLotsize::feasibleRegion (OsiSolverInterface * *solver,* const OsiBranchingInformation * *info*) const [virtual]

Set bounds to contain the current solution.

More precisely, for the variable associated with this object, take the value given in the current solution, force it within the current bounds if required, then set the bounds to fix the variable at the integer nearest the solution value. Returns amount it had to move variable.

Implements OsiObject.

5.19.2.2 virtual OsiBranchingObject* OsiLotsize::createBranch (OsiSolverInterface * *solver,* const OsiBranchingInformation * *info,* int *way*) const [virtual]

Creates a branching object.

The preferred direction is set by `way`, 0 for down, 1 for up.

Reimplemented from OsiObject.

5.19.2.3 virtual void OsiLotsize::resetBounds (const OsiSolverInterface * *solver*) [virtual]

Reset original upper and lower bound values from the solver.

Handy for updating bounds held in this object after bounds held in the solver have been tightened.

Reimplemented from OsiObject.

5.19.2.4 bool OsiLotsize::findRange (double *value,* double *integerTolerance*) const

Finds range of interest so value is feasible in range range_ or infeasible between hi[range_-] and lo[range_+1].

Returns true if feasible.

The documentation for this class was generated from the following file:

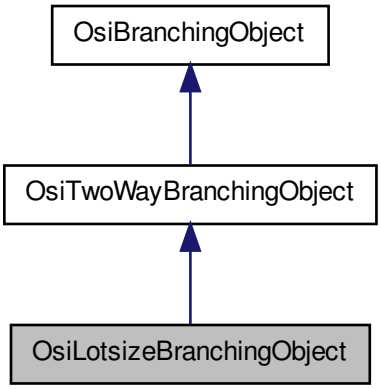
- OsiBranchingObject.hpp

5.20 OsiLotsizeBranchingObject Class Reference

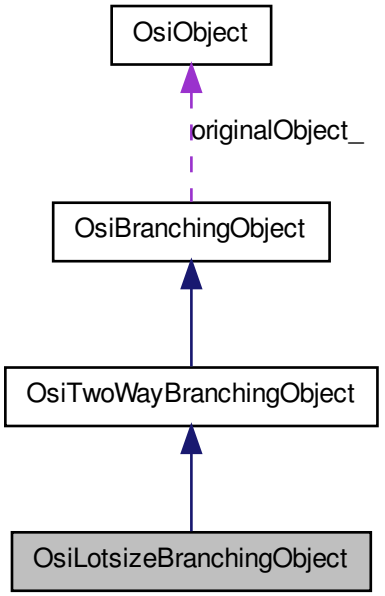
Lotsize branching object.

`#include <OsiBranchingObject.hpp>`

Inheritance diagram for OsiLotsizeBranchingObject:



Collaboration diagram for OsiLotsizeBranchingObject:



Public Member Functions

- OsiLotsizeBranchingObject ()

  Default constructor.
- OsiLotsizeBranchingObject (OsiSolverInterface ∗solver, const OsiLotsize ∗originalObject, int way, double value)

  Create a lotsize floor/ceiling branch object.
- OsiLotsizeBranchingObject (const OsiLotsizeBranchingObject &)

  Copy constructor.
- OsiLotsizeBranchingObject & operator= (const OsiLotsizeBranchingObject &rhs)

  Assignment operator.
- virtual OsiBranchingObject ∗ clone () const

  Clone.
- virtual ∼OsiLotsizeBranchingObject ()

  Destructor.
- virtual double branch (OsiSolverInterface ∗solver)

Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.

- virtual void print (const OsiSolverInterface *solver=NULL)

  Print something about branch - only if log level high.

Protected Attributes

- double down_ [2]

  Lower [0] and upper [1] bounds for the down arm (way_ = -1)
- double up_ [2]

  Lower [0] and upper [1] bounds for the up arm (way_ = 1)

5.20.1 Detailed Description

Lotsize branching object.

This object can specify a two-way branch on an integer variable. For each arm of the branch, the upper and lower bounds on the variable can be independently specified.

Variable_ holds the index of the integer variable in the integerVariable_ array of the model.

Definition at line 957 of file OsiBranchingObject.hpp.

5.20.2 Constructor & Destructor Documentation

5.20.2.1 OsiLotsizeBranchingObject::OsiLotsizeBranchingObject (OsiSolverInterface * *solver,* const OsiLotsize * *originalObject,* int *way,* double *value*)

Create a lotsize floor/ceiling branch object.

Specifies a simple two-way branch. Let `value` = x*. One arm of the branch will be is lb <= x <= valid range below(x*), the other valid range above(x*) <= x <= ub. Specify way = -1 to set the object state to perform the down arm first, way = 1 for the up arm.

5.20.3 Member Function Documentation

5.20.3.1 virtual double OsiLotsizeBranchingObject::branch (OsiSolverInterface * *solver*) [virtual]

Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.

state. Returns change in guessed objective on next branch

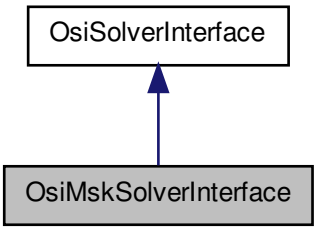
Implements OsiTwoWayBranchingObject.

The documentation for this class was generated from the following file:

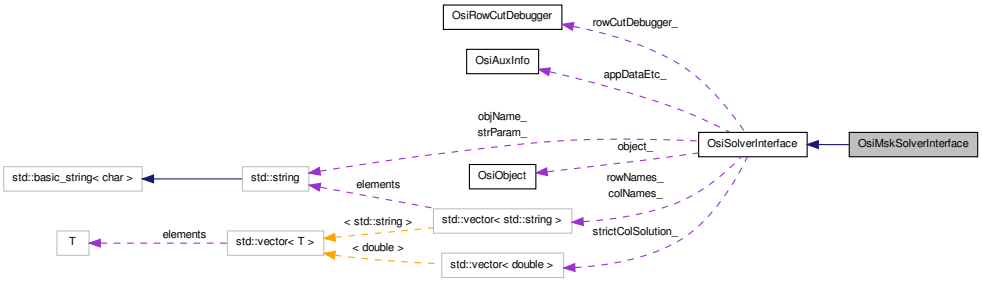
- OsiBranchingObject.hpp

5.21 OsiMskSolverInterface Class Reference

Inheritance diagram for OsiMskSolverInterface:



Collaboration diagram for OsiMskSolverInterface:



Public Member Functions

- virtual void setObjSense (double s)

  Set objective function sense (1 for min (default), -1 for max,)
- virtual void setColSolution (const double ∗colsol)

  Set the primal solution column values.
- virtual void setRowPrice (const double ∗rowprice)

  Set dual solution vector.
- const char ∗ getCtype () const

  return a vector of variable types (continous, binary, integer)

Solve methods

- virtual void initialSolve ()
  Solve initial LP relaxation.
- virtual void resolve ()
  Resolve an LP relaxation after problem modification.
- virtual void branchAndBound ()
  Invoke solver's built-in enumeration algorithm.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the volume algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

- bool setIntParam (OsiIntParam key, int value)
  Set an integer parameter.
- bool setDblParam (OsiDblParam key, double value)
  Set a double parameter.
- bool setStrParam (OsiStrParam key, const std::string &value)
  Set a string parameter.
- bool getIntParam (OsiIntParam key, int &value) const
  Get an integer parameter.
- bool getDblParam (OsiDblParam key, double &value) const
  Get a double parameter.
- bool getStrParam (OsiStrParam key, std::string &value) const
  Get a string parameter.

Methods returning info on how the solution process terminated

- virtual bool isAbandoned () const
  Are there a numerical difficulties?
- virtual bool isProvenOptimal () const
  Is optimality proven?
- virtual bool isProvenPrimalInfeasible () const
  Is primal infeasiblity proven?
- virtual bool isProvenDualInfeasible () const
  Is dual infeasiblity proven?
- virtual bool isPrimalObjectiveLimitReached () const
  Is the given primal objective limit reached?
- virtual bool isDualObjectiveLimitReached () const
  Is the given dual objective limit reached?
- virtual bool isIterationLimitReached () const
  Iteration limit reached?
- virtual bool isLicenseError () const
  Has there been a license problem?

WarmStart related methods

- CoinWarmStart * getEmptyWarmStart () const
  Get an empty warm start object.
- virtual CoinWarmStart * getWarmStart () const
  Get warmstarting information.
- virtual bool setWarmStart (const CoinWarmStart *warmstart)
  Set warmstarting information.

**Hotstart related methods (primarily used in strong branching).
**

The user can create a hotstart (a snapshot) of the optimization process then reoptimize over and over again always starting from there.

***NOTE**: between hotstarted optimizations only bound changes are allowed.*

- virtual void markHotStart ()
  Create a hotstart point of the optimization process.
- virtual void solveFromHotStart ()
  Optimize starting from the hotstart.
- virtual void unmarkHotStart ()
  Delete the snapshot.

Methods related to querying the input data

- virtual int getNumCols () const
  Get number of columns.
- virtual int getNumRows () const
  Get number of rows.
- virtual int getNumElements () const
  Get number of nonzero elements.
- virtual const double * getColLower () const
  Get pointer to array[getNumCols()] of column lower bounds.
- virtual const double * getColUpper () const
  Get pointer to array[getNumCols()] of column upper bounds.
- virtual const char * getRowSense () const
  Get pointer to array[getNumRows()] of row constraint senses.
- virtual const double * getRightHandSide () const
  Get pointer to array[getNumRows()] of rows right-hand sides.
- virtual const double * getRowRange () const
  Get pointer to array[getNumRows()] of row ranges.
- virtual const double * getRowLower () const
  Get pointer to array[getNumRows()] of row lower bounds.
- virtual const double * getRowUpper () const
  Get pointer to array[getNumRows()] of row upper bounds.
- virtual const double * getObjCoefficients () const
  Get pointer to array[getNumCols()] of objective function coefficients.
- virtual double getObjSense () const
  Get objective function sense (1 for min (default), -1 for max)
- virtual bool isContinuous (int colNumber) const

Return true if column is continuous.

- virtual const CoinPackedMatrix * getMatrixByRow () const

  Get pointer to row-wise copy of matrix.
- virtual const CoinPackedMatrix * getMatrixByCol () const

  Get pointer to column-wise copy of matrix.
- virtual double getInfinity () const

  Get solver's value for infinity.

Methods related to querying the solution

- virtual const double * getColSolution () const

  Get pointer to array[getNumCols()] of primal solution vector.
- virtual const double * getRowPrice () const

  Get pointer to array[getNumRows()] of dual prices.
- virtual const double * getReducedCost () const

  Get a pointer to array[getNumCols()] of reduced costs.
- virtual const double * getRowActivity () const

  Get pointer to array[getNumRows()] of row activity levels (constraint matrix times the solution vector.
- virtual double getObjValue () const

  Get objective function value.
- virtual int getIterationCount () const

  Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.
- virtual std::vector< double * > getDualRays (int maxNumRays, bool fullRay=false) const

  Get as many dual rays as the solver can provide.
- virtual std::vector< double * > getPrimalRays (int maxNumRays) const

  Get as many primal rays as the solver can provide.

Changing bounds on variables and constraints

- virtual void setObjCoeff (int elementIndex, double elementValue)

  Set an objective function coefficient.
- virtual void setObjCoeffSet (const int *indexFirst, const int *indexLast, const double *coeffList)

  Set a a set of objective function coefficients.
- virtual void setColLower (int elementIndex, double elementValue)

  Set a single column lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setColUpper (int elementIndex, double elementValue)

  Set a single column upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setColBounds (int elementIndex, double lower, double upper)

  Set a single column lower and upper bound
  The default implementation just invokes `setColLower()` and `setColUpper()`
- virtual void setColSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

Set the bounds on a number of columns simultaneously
The default implementation just invokes `setCollower()` *and* `setColupper()` *over and over again.*

- virtual void setRowLower (int elementIndex, double elementValue)
  Set a single row lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setRowUpper (int elementIndex, double elementValue)
  Set a single row upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setRowBounds (int elementIndex, double lower, double upper)
  Set a single row lower and upper bound
  The default implementation just invokes `setRowLower()` *and* `setRowUpper()`
- virtual void setRowType (int index, char sense, double rightHandSide, double range)
  Set the type of a single row
- virtual void setRowSetBounds (const int ∗indexFirst, const int ∗indexLast, const double ∗boundList)
  Set the bounds on a number of rows simultaneously
  The default implementation just invokes `setRowLower()` *and* `setRowUpper()` *over and over again.*
- virtual void setRowSetTypes (const int ∗indexFirst, const int ∗indexLast, const char ∗senseList, const double ∗rhsList, const double ∗rangeList)
  Set the type of a number of rows simultaneously
  The default implementation just invokes `setRowType()` *and over and over again.*

Integrality related changing methods

- virtual void setContinuous (int index)
  Set the index-th variable to be a continuous variable.
- virtual void setInteger (int index)
  Set the index-th variable to be an integer variable.
- virtual void setContinuous (const int ∗indices, int len)
  Set the variables listed in indices (which is of length len) to be continuous variables.
- virtual void setInteger (const int ∗indices, int len)
  Set the variables listed in indices (which is of length len) to be integer variables.

**Methods to expand a problem.
**

Note that if a column is added then by default it will correspond to a continuous variable.

- virtual void addCol (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)
  Add a column (primal variable) to the problem.
- virtual void addCols (const int numcols, const CoinPackedVectorBase ∗const ∗cols, const double ∗collb, const double ∗colub, const double ∗obj)
  Add a set of columns (primal variables) to the problem.
- virtual void deleteCols (const int num, const int ∗colIndices)
  Remove a set of columns (primal variables) from the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)

Add a row (constraint) to the problem.

- virtual void addRow (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)

  Add a row (constraint) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase ∗const ∗rows, const double ∗rowlb, const double ∗rowub)

  Add a set of rows (constraints) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase ∗const ∗rows, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

  Add a set of rows (constraints) to the problem.
- virtual void deleteRows (const int num, const int ∗rowIndices)

  Delete a set of rows (constraints) from the problem.

Methods to input a problem

- virtual void loadProblem (const CoinPackedMatrix &matrix, const double ∗collb, const double ∗colub, const double ∗obj, const double ∗rowlb, const double ∗rowub)

  Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void assignProblem (CoinPackedMatrix ∗&matrix, double ∗&collb, double ∗&colub, double ∗&obj, double ∗&rowlb, double ∗&rowub)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void loadProblem (const CoinPackedMatrix &matrix, const double ∗collb, const double ∗colub, const double ∗obj, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

  Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void assignProblem (CoinPackedMatrix ∗&matrix, double ∗&collb, double ∗&colub, double ∗&obj, char ∗&rowsen, double ∗&rowrhs, double ∗&rowrng)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void loadProblem (const int numcols, const int numrows, const int ∗start, const int ∗index, const double ∗value, const double ∗collb, const double ∗colub, const double ∗obj, const double ∗rowlb, const double ∗rowub)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual void loadProblem (const int numcols, const int numrows, const int ∗start, const int ∗index, const double ∗value, const double ∗collb, const double ∗colub, const double ∗obj, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual int readMps (const char ∗filename, const char ∗extension="mps")

  Read an mps file from the given filename.
- virtual void writeMps (const char ∗filename, const char ∗extension="mps", double objSense=0.0) const

  Write the problem into an mps file of the given filename.

Message handling

- void passInMessageHandler (CoinMessageHandler *handler)

  Pass in a message handler It is the client's responsibility to destroy a message handler installed by this routine; it will not be destroyed when the solver interface is destroyed.

Constructors and destructor

- OsiMskSolverInterface (MSKenv_t mskenv=NULL)

  Default Constructor optional argument mskenv can be used to reach in an initialized user environment OsiMsk assumes membership of mskenv, so it will be freed when the last instanciation of OsiMsk is deleted.
- virtual OsiSolverInterface * clone (bool copyData=true) const

  Clone.
- OsiMskSolverInterface (const OsiMskSolverInterface &)

  Copy constructor.
- OsiMskSolverInterface & operator= (const OsiMskSolverInterface &rhs)

  Assignment operator.
- virtual ~OsiMskSolverInterface ()

  Destructor.

Static Public Member Functions

Static instance counter methods

- static void incrementInstanceCounter ()

  MOSEK has a context which must be created prior to all other MOSEK calls.
- static void decrementInstanceCounter ()

  MOSEK has a context which should be deleted after MOSEK calls.
- static unsigned int getNumInstances ()

  Return the number of instances of instantiated objects using MOSEK services.

Public Attributes

Private member data

- MSKtask_t task_

  MOSEK model represented by this class instance.
- int * hotStartCStat_

  Hotstart information.
- int **hotStartCStatSize_**
- int * **hotStartRStat_**
- int **hotStartRStatSize_**
- int **hotStartMaxIteration_**

Cached information derived from the MOSEK model

- double * obj_
  Pointer to objective vector.
- double * collower_
  Pointer to dense vector of variable lower bounds.
- double * colupper_
  Pointer to dense vector of variable lower bounds.
- char * rowsense_
  Pointer to dense vector of row sense indicators.
- double * rhs_
  Pointer to dense vector of row right-hand side values.
- double * rowrange_
  Pointer to dense vector of slack upper bounds for range constraints (undefined for non-range rows)
- double * rowlower_
  Pointer to dense vector of row lower bounds.
- double * rowupper_
  Pointer to dense vector of row upper bounds.
- double * colsol_
  Pointer to primal solution vector.
- double * rowsol_
  Pointer to dual solution vector.
- double * redcost_
  Pointer to reduced cost vector.
- double * rowact_
  Pointer to row activity (slack) vector.
- CoinPackedMatrix * matrixByRow_
  Pointer to row-wise copy of problem matrix coefficients.
- CoinPackedMatrix * matrixByCol_
  Pointer to row-wise copy of problem matrix coefficients.

Additional information needed for storing MIP problems

- char * coltype_
  Pointer to dense vector of variable types (continous, binary, integer)
- int coltypesize_
  Size of allocated memory for coltype_.
- bool probtypemip_
  Stores whether MOSEK' prob type is currently set to MIP.

Protected Member Functions

Protected methods

- virtual void applyRowCut (const OsiRowCut &rc)
  Apply a row cut. Return true if cut was applied.
- virtual void applyColCut (const OsiColCut &cc)
  Apply a column cut (bound adjustment).

Friends

- void OsiMskSolverInterfaceUnitTest (const std::string &mpsDir, const std::string &netlibDir)

  A function that tests the methods in the OsiMskSolverInterface class.

MOSEK specific public interfaces

- enum keepCachedFlag {

  KEEPCACHED_NONE = 0, KEEPCACHED_COLUMN = 1, KEEPCACHED_ROW = 2, KEEPCACHED_MATRIX = 4,

  KEEPCACHED_RESULTS = 8, KEEPCACHED_PROBLEM = KEEPCACHED_COLUMN | KEEPCACHED_ROW | KEEPCACHED_MATRIX, KEEPCACHED_ALL = KEEPCACHED_PROBLEM | KEEPCACHED_RESULTS, FREECACHED_COLUMN = KEEPCACHED_PROBLEM & ~KEEPCACHED_COLUMN,

  FREECACHED_ROW = KEEPCACHED_PROBLEM & ~KEEPCACHED_ROW, FREECACHED_MATRIX = KEEPCACHED_PROBLEM & ~KEEPCACHED_MATRIX, FREECACHED_RESULTS = KEEPCACHED_ALL & ~KEEPCACHED_RESULTS }

  Get pointer to MOSEK model and free all specified cached data entries (combined with logical or-operator '|'):
- MSKtask_t **getLpPtr** (int keepCached=KEEPCACHED_NONE)
- MSKenv_t getEnvironmentPtr ()

  Method to access MOSEK environment pointer.

Private methods

- MSKtask_t getMutableLpPtr () const

  Get task Pointer for const methods.
- void gutsOfCopy (const OsiMskSolverInterface &source)

  The real work of a copy constructor (used by copy and assignment)
- void gutsOfConstructor ()

  The real work of the constructor.
- void gutsOfDestructor ()

  The real work of the destructor.
- void freeCachedColRim ()

  free cached column rim vectors
- void freeCachedRowRim ()

  free cached row rim vectors
- void freeCachedResults ()

  free cached result vectors
- void freeCachedMatrix ()

  free cached matrices
- void freeCachedData (int keepCached=KEEPCACHED_NONE)

free all cached data (except specified entries, see getLpPtr())

- void freeAllMemory ()

  free all allocated memory

5.21.1 Detailed Description

Definition at line 23 of file OsiMskSolverInterface.hpp.

5.21.2 Member Enumeration Documentation

5.21.2.1 enum OsiMskSolverInterface::keepCachedFlag

Get pointer to MOSEK model and free all specified cached data entries (combined with logical or-operator '|'):

Enumerator:

KEEPCACHED_NONE discard all cached data (default)

KEEPCACHED_COLUMN column information: objective values, lower and upper bounds, variable types

KEEPCACHED_ROW row information: right hand sides, ranges and senses, lower and upper bounds for row

KEEPCACHED_MATRIX problem matrix: matrix ordered by column and by row

KEEPCACHED_RESULTS LP solution: primal and dual solution, reduced costs, row activities.

KEEPCACHED_PROBLEM only discard cached LP solution

KEEPCACHED_ALL keep all cached data (similar to getMutableLpPtr())

FREECACHED_COLUMN free only cached column and LP solution information

FREECACHED_ROW free only cached row and LP solution information

FREECACHED_MATRIX free only cached matrix and LP solution information

FREECACHED_RESULTS free only cached LP solution information

Definition at line 596 of file OsiMskSolverInterface.hpp.

5.21.3 Member Function Documentation

5.21.3.1 CoinWarmStart* OsiMskSolverInterface::getEmptyWarmStart ( ) const [virtual]

Get an empty warm start object.

This routine returns an empty CoinWarmStartBasis object. Its purpose is to provide a way to give a client a warm start basis object of the appropriate type, which can resized and modified as desired.

Implements OsiSolverInterface.

5.21.3.2 virtual bool OsiMskSolverInterface::setWarmStart (const CoinWarmStart * *warmstart*) [virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

Implements OsiSolverInterface.

5.21.3.3 virtual const char* OsiMskSolverInterface::getRowSense ( ) const [virtual]

Get pointer to array[getNumRows()] of row constraint senses.

- 'L': <= constraint
- 'E': = constraint
- 'G': >= constraint
- 'R': ranged constraint
- 'N': free constraint

Implements OsiSolverInterface.

5.21.3.4 virtual const double* OsiMskSolverInterface::getRightHandSide ( ) const [virtual]

Get pointer to array[getNumRows()] of rows right-hand sides.

- if rowsense()[i] == 'L' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'G' then rhs()[i] == rowlower()[i]
- if rowsense()[i] == 'R' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'N' then rhs()[i] == 0.0

Implements OsiSolverInterface.

5.21.3.5 virtual const double* OsiMskSolverInterface::getRowRange ( ) const [virtual]

Get pointer to array[getNumRows()] of row ranges.

- if rowsense()[i] == 'R' then rowrange()[i] == rowupper()[i] - rowlower()[i]
- if rowsense()[i] != 'R' then rowrange()[i] is 0.0

Implements OsiSolverInterface.

5.21.3.6 virtual int OsiMskSolverInterface::getIterationCount ( ) const [virtual]

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.

Implements OsiSolverInterface.

5.21.3.7 virtual std::vector<double*> OsiMskSolverInterface::getDualRays (int *maxNumRays,* bool *fullRay* = `false`) const [virtual]

Get as many dual rays as the solver can provide.

(In case of proven primal infeasibility there should be at least one.)

The first getNumRows() ray components will always be associated with the row duals (as returned by getRowPrice()). If `fullRay` is true, the final getNumCols() entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumRows() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.21.3.8 virtual std::vector<double*> OsiMskSolverInterface::getPrimalRays (int *maxNumRays*) const [virtual]

Get as many primal rays as the solver can provide.

(In case of proven dual infeasibility there should be at least one.)

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumCols() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.21.3.9 virtual void OsiMskSolverInterface::setColLower (int *elementIndex,* double *elementValue*) [virtual]

Set a single column lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.21.3.10 virtual void OsiMskSolverInterface::setColUpper (int *elementIndex,* double *elementValue*) [virtual]

Set a single column upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.21.3.11 virtual void OsiMskSolverInterface::setColSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [virtual]

Set the bounds on a number of columns simultaneously

The default implementation just invokes `setCollower()` and `setColupper()` over and over again.

Parameters

<*code*>*[inde*	contains the indices of the constraints whose either bound changes
boundList	the new lower/upper bound pairs for the variables

Reimplemented from OsiSolverInterface.

5.21.3.12 virtual void OsiMskSolverInterface::setRowLower (int *elementIndex*, double *elementValue*) [virtual]

Set a single row lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.21.3.13 virtual void OsiMskSolverInterface::setRowUpper (int *elementIndex*, double *elementValue*) [virtual]

Set a single row upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.21.3.14 virtual void OsiMskSolverInterface::setRowSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [virtual]

Set the bounds on a number of rows simultaneously

The default implementation just invokes `setRowLower()` and `setRowUpper()` over and over again.

Parameters

<*code*>*[inde*	contains the indices of the constraints whose either bound changes
boundList	the new lower/upper bound pairs for the constraints

Reimplemented from OsiSolverInterface.

5.21.3.15 virtual void OsiMskSolverInterface::setRowSetTypes (const int * *indexFirst,* const int * *indexLast,* const char * *senseList,* const double * *rhsList,* const double * *rangeList*) [virtual]

Set the type of a number of rows simultaneously

The default implementation just invokes `setRowType()` and over and over again.

Parameters

<*code*>*[inde*	contains the indices of the constraints whose type changes
senseList	the new senses
rhsList	the new right hand sides
rangeList	the new ranges

Reimplemented from OsiSolverInterface.

5.21.3.16 virtual void OsiMskSolverInterface::setColSolution (const double * *colsol*) [virtual]

Set the primal solution column values.

colsol[numcols()] is an array of values of the problem column variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of colsol() until changed by another call to setColsol() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.21.3.17 virtual void OsiMskSolverInterface::setRowPrice (const double * *rowprice*) [virtual]

Set dual solution vector.

rowprice[numrows()] is an array of values of the problem row dual variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of rowprice() until changed by another call to setRowprice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.21.3.18 virtual void OsiMskSolverInterface::addCol (const CoinPackedVectorBase & *vec,* const double *collb,* const double *colub,* const double *obj*) [virtual]

Add a column (primal variable) to the problem.

Implements OsiSolverInterface.

5.21.3.19 virtual void OsiMskSolverInterface::addCols (const int *numcols*, const CoinPackedVectorBase *const * *cols*, const double * *collb*, const double * *colub*, const double * *obj*) [virtual]

Add a set of columns (primal variables) to the problem.

The default implementation simply makes repeated calls to addCol().

Reimplemented from OsiSolverInterface.

5.21.3.20 virtual void OsiMskSolverInterface::deleteCols (const int *num*, const int * *collndices*) [virtual]

Remove a set of columns (primal variables) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted variables are nonbasic.

Implements OsiSolverInterface.

5.21.3.21 virtual void OsiMskSolverInterface::addRow (const CoinPackedVectorBase & *vec*, const double *rowlb*, const double *rowub*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.21.3.22 virtual void OsiMskSolverInterface::addRow (const CoinPackedVectorBase & *vec*, const char *rowsen*, const double *rowrhs*, const double *rowrng*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.21.3.23 virtual void OsiMskSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const double * *rowlb*, const double * *rowub*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.21.3.24 virtual void OsiMskSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.21.3.25 virtual void OsiMskSolverInterface::deleteRows (const int *num*, const int * *rowIndices*) [virtual]

Delete a set of rows (constraints) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted rows are loose.

Implements OsiSolverInterface.

5.21.3.26 virtual void OsiMskSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Implements OsiSolverInterface.

5.21.3.27 virtual void OsiMskSolverInterface::assignProblem (CoinPackedMatrix *& *matrix*, double *& *collb*, double *& *colub*, double *& *obj*, double *& *rowlb*, double *& *rowub*) [virtual]

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.21.3.28 virtual void OsiMskSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity

- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are >=
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

Implements OsiSolverInterface.

5.21.3.29 **virtual void OsiMskSolverInterface::assignProblem (CoinPackedMatrix *& *matrix,* double *& *collb,* double *& *colub,* double *& *obj,* char *& *rowsen,* double *& *rowrhs,* double *& *rowrng*)** `[virtual]`

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.21.3.30 **virtual void OsiMskSolverInterface::loadProblem (const int *numcols,* const int *numrows,* const int * *start,* const int * *index,* const double * *value,* const double * *collb,* const double * *colub,* const double * *obj,* const double * *rowlb,* const double * *rowub*)** `[virtual]`

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.21.3.31 **virtual void OsiMskSolverInterface::loadProblem (const int *numcols,* const int *numrows,* const int * *start,* const int * *index,* const double * *value,* const double * *collb,* const double * *colub,* const double * *obj,* const char * *rowsen,* const double * *rowrhs,* const double * *rowrng*)** `[virtual]`

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.21.3.32 **virtual void OsiMskSolverInterface::writeMps (const char * *filename,* const char * *extension* = `"mps"`, double *objSense* = `0.0`) const** `[virtual]`

Write the problem into an mps file of the given filename.

If objSense is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants

Implements OsiSolverInterface.

5.21.3.33 **static void OsiMskSolverInterface::incrementInstanceCounter ( )** `[static]`

MOSEK has a context which must be created prior to all other MOSEK calls.

This method:

- Increments by 1 the number of uses of the MOSEK environment.
- Creates the MOSEK context when the number of uses is change to 1 from 0.

5.21.3.34 static void OsiMskSolverInterface::decrementInstanceCounter ( ) [static]

MOSEK has a context which should be deleted after MOSEK calls.

This method:

- Decrements by 1 the number of uses of the MOSEK environment.
- Deletes the MOSEK context when the number of uses is change to 0 from 1.

5.21.3.35 virtual void OsiMskSolverInterface::applyColCut (const OsiColCut & *cc*) [protected, virtual]

Apply a column cut (bound adjustment).

Return true if cut was applied.

Implements OsiSolverInterface.

The documentation for this class was generated from the following file:

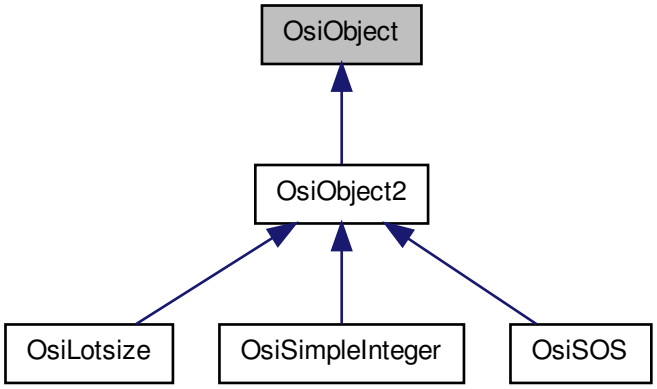
- OsiMskSolverInterface.hpp

5.22 OsiObject Class Reference

Abstract base class for 'objects'.

`#include <OsiBranchingObject.hpp>`

Inheritance diagram for OsiObject:



Public Member Functions

- OsiObject ()

  Default Constructor.
- OsiObject (const OsiObject &)

  Copy constructor.
- OsiObject & operator= (const OsiObject &rhs)

  Assignment operator.
- virtual OsiObject * clone () const =0

  Clone.
- virtual ~OsiObject ()

  Destructor.
- double infeasibility (const OsiSolverInterface *solver, int &whichWay) const

  Infeasibility of the object.
- virtual double feasibleRegion (OsiSolverInterface *solver) const

  For the variable(s) referenced by the object, look at the current solution and set bounds to match the solution.
- virtual double feasibleRegion (OsiSolverInterface *solver, const OsiBranchingInformation *info) const =0

  For the variable(s) referenced by the object, look at the current solution and set bounds to match the solution.
- virtual OsiBranchingObject * createBranch (OsiSolverInterface *, const OsiBranchingInformation *, int) const

  Create a branching object and indicate which way to branch first.

- virtual bool canDoHeuristics () const

  Return true if object can take part in normal heuristics.
- virtual bool canMoveToNearest () const

  Return true if object can take part in move to nearest heuristic.
- virtual int columnNumber () const

  Column number if single column object -1 otherwise, Used by heuristics.
- int priority () const

  Return Priority - note 1 is highest priority.
- void setPriority (int priority)

  Set priority.
- virtual bool boundBranch () const

  Return true if branch should only bound variables.
- virtual bool canHandleShadowPrices () const

  Return true if knows how to deal with Pseudo Shadow Prices.
- int numberWays () const

  Return maximum number of ways branch may have.
- void setNumberWays (int numberWays)

  Set maximum number of ways branch may have.
- void setWhichWay (int way)

  Return preferred way to branch.
- int whichWay () const

  Return current preferred way to branch.
- virtual int preferredWay () const

  Get pre-emptive preferred way of branching - -1 off, 0 down, 1 up (for 2-way)
- double infeasibility () const

  Return infeasibility.
- virtual double upEstimate () const

  Return "up" estimate (default 1.0e-5)
- virtual double downEstimate () const

  Return "down" estimate (default 1.0e-5)
- virtual void resetBounds (const OsiSolverInterface *)

  Reset variable bounds to their original values.
- virtual void resetSequenceEtc (int, const int *)

  Change column numbers after preprocessing.
- virtual void updateBefore (const OsiObject *)

  Updates stuff like pseudocosts before threads.
- virtual void updateAfter (const OsiObject *, const OsiObject *)

  Updates stuff like pseudocosts after threads finished.

Protected Attributes

- double infeasibility_

  data
- short whichWay_

  Computed preferred way to branch.
- short numberWays_

  Maximum number of ways on branch.
- int priority_

  Priority.

5.22.1 Detailed Description

Abstract base class for 'objects'.

The branching model used in Osi is based on the idea of an *object*. In the abstract, an object is something that has a feasible region, can be evaluated for infeasibility, can be branched on (*i.e.*, there's some constructive action to be taken to move toward feasibility), and allows comparison of the effect of branching.

This class (OsiObject) is the base class for an object. To round out the branching model, the class OsiBranchingObject describes how to perform a branch, and the class OsiBranchDecision describes how to compare two OsiBranchingObjects.

To create a new type of object you need to provide three methods: infeasibility(), feasibleRegion(), and createBranch(), described below.

This base class is primarily virtual to allow for any form of structure. Any form of discontinuity is allowed.

As there is an overhead in getting information from solvers and because other useful information is available there is also an OsiBranchingInformation class which can contain pointers to information. If used it must at minimum contain pointers to current value of objective, maximum allowed objective and pointers to arrays for bounds and solution and direction of optimization. Also integer and primal tolerance.

Classes which inherit might have other information such as depth, number of solutions, pseudo-shadow prices etc etc. May be easier just to throw in here - as I keep doing

Definition at line 56 of file OsiBranchingObject.hpp.

5.22.2 Member Function Documentation

5.22.2.1 double OsiObject::infeasibility (const OsiSolverInterface * *solver,* int & *whichWay*) const

Infeasibility of the object.

This is some measure of the infeasibility of the object. 0.0 indicates that the object is satisfied.

The preferred branching direction is returned in whichWay, where for normal two-way branching 0 is down, 1 is up

This is used to prepare for strong branching but should also think of case when no strong branching

The object may also compute an estimate of cost of going "up" or "down". This will probably be based on pseudo-cost ideas

This should also set mutable infeasibility_ and whichWay_ This is for instant re-use for speed

Default for this just calls infeasibility with OsiBranchingInformation NOTE - Convention says that an infeasibility of COIN_DBL_MAX means object has worked out it can't be satisfied!

5.22.2.2 virtual double OsiObject::feasibleRegion (OsiSolverInterface * *solver*) const [virtual]

For the variable(s) referenced by the object, look at the current solution and set bounds to match the solution.

Returns measure of how much it had to move solution to make feasible

5.22.2.3 virtual double OsiObject::feasibleRegion (OsiSolverInterface * *solver,* const OsiBranchingInformation * *info*) const [pure virtual]

For the variable(s) referenced by the object, look at the current solution and set bounds to match the solution.

Returns measure of how much it had to move solution to make feasible Faster version

Implemented in OsiSimpleInteger, OsiSOS, and OsiLotsize.

5.22.2.4 virtual OsiBranchingObject* OsiObject::createBranch (OsiSolverInterface *, const OsiBranchingInformation *, int) const [inline, virtual]

Create a branching object and indicate which way to branch first.

The branching object has to know how to create branches (fix variables, etc.)

Reimplemented in OsiSimpleInteger, OsiSOS, and OsiLotsize.

Definition at line 119 of file OsiBranchingObject.hpp.

5.22.2.5 void OsiObject::setWhichWay (int *way*) [inline]

Return preferred way to branch.

If two then way=0 means down and 1 means up, otherwise way points to preferred branch

Definition at line 158 of file OsiBranchingObject.hpp.

5.22.2.6 int OsiObject::whichWay ( ) const [inline]

Return current preferred way to branch.

If two then way=0 means down and 1 means up, otherwise way points to preferred branch

Definition at line 164 of file OsiBranchingObject.hpp.

5.22.2.7 virtual void OsiObject::resetBounds (const OsiSolverInterface *) [inline, virtual]

Reset variable bounds to their original values.

Bounds may be tightened, so it may be good to be able to reset them to their original values.

Reimplemented in OsiSimpleInteger, and OsiLotsize.

Definition at line 180 of file OsiBranchingObject.hpp.

5.22.3 Member Data Documentation

5.22.3.1 double OsiObject::infeasibility_ [mutable, protected]

data

Computed infeasibility

Definition at line 193 of file OsiBranchingObject.hpp.

The documentation for this class was generated from the following file:

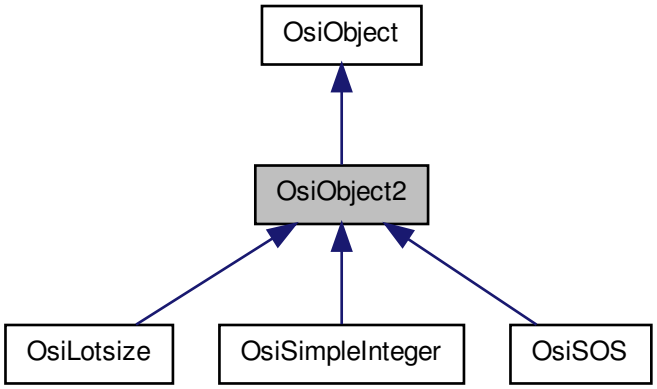
- OsiBranchingObject.hpp

5.23 OsiObject2 Class Reference

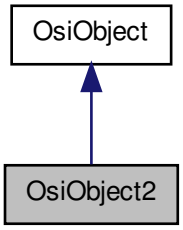
Define a class to add a bit of complexity to OsiObject This assumes 2 way branching.

`#include <OsiBranchingObject.hpp>`

Inheritance diagram for OsiObject2:



Collaboration diagram for OsiObject2:



Public Member Functions

- OsiObject2 ()

  Default Constructor.
- OsiObject2 (const OsiObject2 &)

  Copy constructor.
- OsiObject2 & operator= (const OsiObject2 &rhs)

Assignment operator.

- virtual ~OsiObject2 ()

  Destructor.

- void setPreferredWay (int value)

  Set preferred way of branching - -1 off, 0 down, 1 up (for 2-way)

- virtual int preferredWay () const

  Get preferred way of branching - -1 off, 0 down, 1 up (for 2-way)

Protected Attributes

- int preferredWay_

  Preferred way of branching - -1 off, 0 down, 1 up (for 2-way)

- double otherInfeasibility_

  "Infeasibility" on other way

5.23.1 Detailed Description

Define a class to add a bit of complexity to OsiObject This assumes 2 way branching.

Definition at line 206 of file OsiBranchingObject.hpp.

The documentation for this class was generated from the following file:

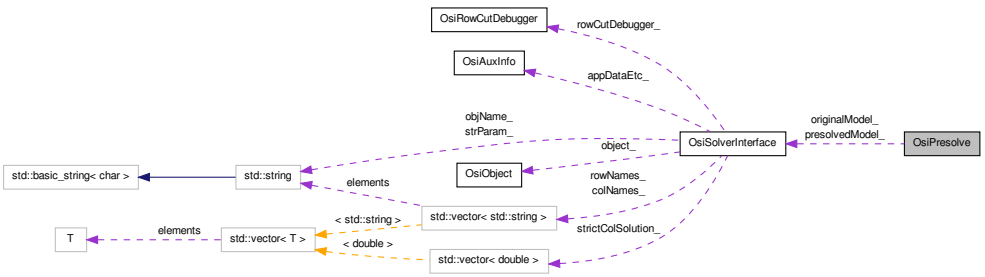
- OsiBranchingObject.hpp

5.24 OsiPresolve Class Reference

OSI interface to COIN problem simplification capabilities.

`#include <OsiPresolve.hpp>`

Collaboration diagram for OsiPresolve:



Public Member Functions

- OsiPresolve ()

  Default constructor (empty object)
- virtual ~OsiPresolve ()

  Virtual destructor.
- virtual OsiSolverInterface * presolvedModel (OsiSolverInterface &origModel, double feasibilityTolerance=0.0, bool keepIntegers=true, int numberPasses=5, const char *prohibited=NULL, bool doStatus=true, const char *rowProhibited=NULL)

  Create a new OsiSolverInterface loaded with the presolved problem.
- virtual void postsolve (bool updateStatus=true)

  Restate the solution to the presolved problem in terms of the original problem and load it into the original model.
- OsiSolverInterface * model () const

  Return a pointer to the presolved model.
- OsiSolverInterface * originalModel () const

  Return a pointer to the original model.
- void setOriginalModel (OsiSolverInterface *model)

  Set the pointer to the original model.
- const int * originalColumns () const

  Return a pointer to the original columns.
- const int * originalRows () const

  Return a pointer to the original rows.
- int getNumRows () const

  Return number of rows in original model.
- int getNumCols () const

  Return number of columns in original model.
- void setNonLinearValue (double value)

  "Magic" number.
- void setPresolveActions (int action)

  Whether we want to skip dual part of presolve etc.

Protected Member Functions

- virtual const CoinPresolveAction * presolve (CoinPresolveMatrix *prob)

  Apply presolve transformations to the problem.
- virtual void postsolve (CoinPostsolveMatrix &prob)

  Reverse presolve transformations to recover the solution to the original problem.
- void gutsOfDestroy ()

  Destroys queued postsolve actions.

5.24.1 Detailed Description

OSI interface to COIN problem simplification capabilities.

COIN provides a number of classes which implement problem simplification algorithms (CoinPresolveAction, CoinPrePostsolveMatrix, and derived classes). The model of operation is as follows:

- Create a copy of the original problem.
- Subject the copy to a series of transformations (the *presolve* methods) to produce a presolved model. Each transformation is also expected to provide a method to reverse the transformation (the *postsolve* method). The postsolve methods are collected in a linked list; the postsolve method for the final presolve transformation is at the head of the list.
- Hand the presolved problem to the solver for optimization.
- Apply the collected postsolve methods to the presolved problem and solution, restating the solution in terms of the original problem.

The COIN presolve algorithms are unaware of OSI. The OsiPresolve class takes care of the interface. Given an OsiSolverInterface `origModel`, it will take care of creating a clone properly loaded with the presolved problem and ready for optimization. After optimization, it will apply postsolve transformations and load the result back into `origModel`.

Assuming a problem has been loaded into an `OsiSolverInterface origModel`, a bare-bones application looks like this:

```
OsiPresolve pinfo ;
OsiSolverInterface *presolvedModel ;
// Return an OsiSolverInterface loaded with the presolved problem.
presolvedModel = pinfo.presolvedModel(*origModel,1.0e-8,false,numberPasses) ;
presolvedModel->initialSolve() ;
// Restate the solution and load it back into origModel.
pinfo.postsolve(true) ;
delete presolvedModel ;
```

Definition at line 62 of file OsiPresolve.hpp.

5.24.2 Member Function Documentation

5.24.2.1 virtual OsiSolverInterface* OsiPresolve::presolvedModel (OsiSolverInterface & *origModel*, double *feasibilityTolerance* = `0.0`, bool *keepIntegers* = `true`, int *numberPasses* = `5`, const char * *prohibited* = `NULL`, bool *doStatus* = `true`, const char * *rowProhibited* = `NULL`) [virtual]

Create a new OsiSolverInterface loaded with the presolved problem.

This method implements the first two steps described in the class documentation. It clones `origModel` and applies presolve transformations, storing the resulting list of postsolve transformations. It returns a pointer to a new OsiSolverInterface loaded

with the presolved problem, or NULL if the problem is infeasible or unbounded. If `keepIntegers` is true then bounds may be tightened in the original. Bounds will be moved by up to `feasibilityTolerance` to try and stay feasible. When `doStatus` is true, the current solution will be transformed to match the presolved model.

This should be paired with postsolve(). It is up to the client to destroy the returned OsiSolverInterface, *after* calling postsolve().

This method is virtual. Override this method if you need to customize the steps of creating a model to apply presolve transformations.

In some sense, a wrapper for presolve(CoinPresolveMatrix∗).

5.24.2.2 virtual void OsiPresolve::postsolve (bool *updateStatus* = `true`) [virtual]

Restate the solution to the presolved problem in terms of the original problem and load it into the original model.

postsolve() restates the solution in terms of the original problem and updates the original OsiSolverInterface supplied to presolvedModel(). If the problem has not been solved to optimality, there are no guarantees. If you are using an algorithm like simplex that has a concept of a basic solution, then set updateStatus

The advantage of going back to the original problem is that it will be exactly as it was, *i.e.*, 0.0 will not become 1.0e-19.

Note that if you modified the original problem after presolving, then you must "undo" these modifications before calling postsolve().

In some sense, a wrapper for postsolve(CoinPostsolveMatrix&).

5.24.2.3 OsiSolverInterface∗ OsiPresolve::model ( ) const

Return a pointer to the presolved model.

5.24.2.4 void OsiPresolve::setNonLinearValue (double *value*) [inline]

"Magic" number.

If this is non-zero then any elements with this value may change and so presolve is very limited in what can be done to the row and column. This is for non-linear problems.

Definition at line 144 of file OsiPresolve.hpp.

5.24.2.5 void OsiPresolve::setPresolveActions (int *action*) [inline]

Whether we want to skip dual part of presolve etc.

1 bit allows duplicate column processing on integer columns and dual stuff on integers 2 bit set switches off actions which can change +1 to something else 4 bit set transfers costs to integer variables 8 bit set stops x+y+z=1 transform 16 bit set allows doing presolve things which don't easily unroll 32 bit set allows dubious gub element reduction

Definition at line 157 of file OsiPresolve.hpp.

5.24.2.6 virtual const CoinPresolveAction* OsiPresolve::presolve (CoinPresolveMatrix * *prob*) [protected, virtual]

Apply presolve transformations to the problem.

Handles the core activity of applying presolve transformations.

If you want to apply the individual presolve routines differently, or perhaps add your own to the mix, define a derived class and override this method

5.24.2.7 virtual void OsiPresolve::postsolve (CoinPostsolveMatrix & *prob*) [protected, virtual]

Reverse presolve transformations to recover the solution to the original problem.

Handles the core activity of applying postsolve transformations.

Postsolving is pretty generic; just apply the transformations in reverse order. You will probably only be interested in overriding this method if you want to add code to test for consistency while debugging new presolve techniques.

5.24.2.8 void OsiPresolve::gutsOfDestroy ( ) [protected]

Destroys queued postsolve actions.

E.g., when presolve() determines the problem is infeasible, so that it will not be necessary to actually solve the presolved problem and convert the result back to the original problem.

The documentation for this class was generated from the following file:

- OsiPresolve.hpp

5.25 OsiPseudoCosts Class Reference

This class is the placeholder for the pseudocosts used by OsiChooseStrong.

`#include <OsiChooseVariable.hpp>`

Public Member Functions

- int numberBeforeTrusted () const

  Number of times before trusted.
- void setNumberBeforeTrusted (int value)

  Set number of times before trusted.
- void initialize (int n)

  Initialize the pseudocosts with n entries.
- int numberObjects () const

  Give the number of objects for which pseudo costs are stored.
- virtual void updateInformation (const OsiBranchingInformation *info, int branch, OsiHotInfo *hotInfo)

Given a candidate fill in useful information e.g. estimates.

- virtual void updateInformation (int whichObject, int branch, double changeInObjective, double changeInValue, int status)

  Given a branch fill in useful information e.g. estimates.

Accessor methods to pseudo costs data

- double * **upTotalChange** ()
- const double * **upTotalChange** () const
- double * **downTotalChange** ()
- const double * **downTotalChange** () const
- int * **upNumber** ()
- const int * **upNumber** () const
- int * **downNumber** ()
- const int * **downNumber** () const

Protected Attributes

- double * upTotalChange_

  Total of all changes up.
- double * downTotalChange_

  Total of all changes down.
- int * upNumber_

  Number of times up.
- int * downNumber_

  Number of times down.
- int numberObjects_

  Number of objects (could be found from solver)
- int numberBeforeTrusted_

  Number before we trust.

5.25.1 Detailed Description

This class is the placeholder for the pseudocosts used by OsiChooseStrong.

It can also be used by any other pseudocost based strong branching algorithm.

Definition at line 240 of file OsiChooseVariable.hpp.

The documentation for this class was generated from the following file:

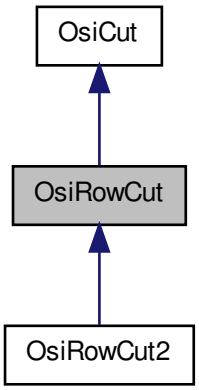
- OsiChooseVariable.hpp

5.26 OsiRowCut Class Reference

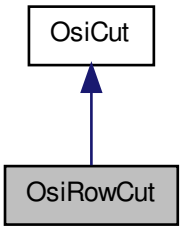
Row Cut Class.

`#include <OsiRowCut.hpp>`

Inheritance diagram for OsiRowCut:



Collaboration diagram for OsiRowCut:



Public Member Functions

- void sortIncrIndex ()

Allow access row sorting function.

Row bounds

- OsiRowCut_inline double lb () const
  Get lower bound.
- OsiRowCut_inline void setLb (double lb)
  Set lower bound.
- OsiRowCut_inline double ub () const
  Get upper bound.
- OsiRowCut_inline void setUb (double ub)
  Set upper bound.

Row rhs, sense, range

- char sense () const
  Get sense ('E', 'G', 'L', 'N', 'R')
- double rhs () const
  Get right-hand side.
- double range () const
  Get range (ub - lb for 'R' rows, 0 otherwise)

Row elements

- OsiRowCut_inline void setRow (int size, const int *colIndices, const double *elements, bool testForDuplicateIndex=COIN_DEFAULT_VALUE_FOR_DUPLICATE)
  Set row elements.
- OsiRowCut_inline void setRow (const CoinPackedVector &v)
  Set row elements from a packed vector.
- OsiRowCut_inline const CoinPackedVector & row () const
  Get row elements.
- OsiRowCut_inline CoinPackedVector & mutableRow ()
  Get row elements for changing.

Comparison operators

- OsiRowCut_inline bool operator== (const OsiRowCut &rhs) const
  equal - true if lower bound, upper bound, row elements, and OsiCut are equal.
- OsiRowCut_inline bool operator!= (const OsiRowCut &rhs) const
  not equal

Sanity checks on cut

- OsiRowCut_inline bool consistent () const
  Returns true if the cut is consistent.
- OsiRowCut_inline bool consistent (const OsiSolverInterface &im) const
  Returns true if cut is consistent with respect to the solver interface's model.
- OsiRowCut_inline bool infeasible (const OsiSolverInterface &im) const
  Returns true if the row cut itself is infeasible and cannot be satisfied.
- virtual double violated (const double *solution) const
  Returns infeasibility of the cut with respect to solution passed in i.e.

Arithmetic operators. Apply CoinPackedVector methods to the vector

- void operator+= (double value)
  add `value` *to every vector entry*
- void operator-= (double value)
  subtract `value` *from every vector entry*
- void operator∗= (double value)
  multiply every vector entry by `value`
- void operator/= (double value)
  divide every vector entry by `value`

Constructors and destructors

- OsiRowCut & operator= (const OsiRowCut &rhs)
  Assignment operator.
- OsiRowCut (const OsiRowCut &)
  Copy constructor.
- virtual OsiRowCut ∗ clone () const
  Clone.
- OsiRowCut ()
  Default Constructor.
- OsiRowCut (double cutlb, double cutub, int capacity, int size, int ∗&colIndices, double ∗&elements)
  Ownership Constructor.
- virtual ∼OsiRowCut ()
  Destructor.

Debug stuff

- virtual void print () const
  Print cuts in collection.

Friends

- void OsiRowCutUnitTest (const OsiSolverInterface ∗baseSiP, const std::string &mpsDir)
  A function that tests the methods in the OsiRowCut class.

5.26.1 Detailed Description

Row Cut Class.

A row cut has:

- a lower bound
- an upper bound
- a vector of row elements

Definition at line 29 of file OsiRowCut.hpp.

5.26.2 Constructor & Destructor Documentation

5.26.2.1 OsiRowCut::OsiRowCut (double *cutlb,* double *cutub,* int *capacity,* int *size,* int *&* *colIndices,* double *&* *elements*)

Ownership Constructor.

This constructor assumes ownership of the vectors passed as parameters for indices and elements. `colIndices` and `elements` will be NULL on return.

5.26.3 Member Function Documentation

5.26.3.1 OsiRowCut_inline bool OsiRowCut::consistent ( ) const [virtual]

Returns true if the cut is consistent.

This checks to ensure that:

- The row element vector does not have duplicate indices
- The row element vector indices are >= 0

Implements OsiCut.

5.26.3.2 OsiRowCut_inline bool OsiRowCut::consistent (const OsiSolverInterface & *im*) const [virtual]

Returns true if cut is consistent with respect to the solver interface's model.

This checks to ensure that

- The row element vector indices are < the number of columns in the model

Implements OsiCut.

5.26.3.3 OsiRowCut_inline bool OsiRowCut::infeasible (const OsiSolverInterface & *im*) const [virtual]

Returns true if the row cut itself is infeasible and cannot be satisfied.

This checks whether

- the lower bound is strictly greater than the upper bound.

Implements OsiCut.

5.26.3.4 virtual double OsiRowCut::violated (const double * *solution*) const [virtual]

Returns infeasibility of the cut with respect to solution passed in i.e.

is positive if cuts off that solution. solution is getNumCols() long..

Implements OsiCut.

5.26.4 Friends And Related Function Documentation

5.26.4.1 void OsiRowCutUnitTest (const OsiSolverInterface * *baseSiP*, const std::string & *mpsDir*) [friend]

A function that tests the methods in the OsiRowCut class.

The documentation for this class was generated from the following file:

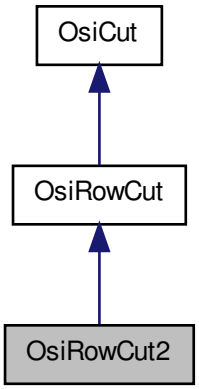
- OsiRowCut.hpp

5.27 OsiRowCut2 Class Reference

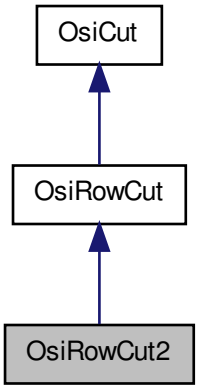
Row Cut Class which refers back to row which created it.

`#include <OsiRowCut.hpp>`

Inheritance diagram for OsiRowCut2:



Collaboration diagram for OsiRowCut2:



Public Member Functions

Which row

- int whichRow () const
  Get row.
- void setWhichRow (int row)
  Set row.

Constructors and destructors

- OsiRowCut2 & operator= (const OsiRowCut2 &rhs)
  Assignment operator.
- OsiRowCut2 (const OsiRowCut2 &)
  Copy constructor.
- virtual OsiRowCut ∗ clone () const
  Clone.
- OsiRowCut2 (int row=-1)
  Default Constructor.
- virtual ∼OsiRowCut2 ()
  Destructor.

5.27.1 Detailed Description

Row Cut Class which refers back to row which created it.

It may be useful to strengthen a row rather than add a cut. To do this we need to know which row is strengthened. This trivial extension to OsiRowCut does that.

Definition at line 290 of file OsiRowCut.hpp.

The documentation for this class was generated from the following file:

- OsiRowCut.hpp

5.28 OsiRowCutDebugger Class Reference

Validate cuts against a known solution.

`#include <OsiRowCutDebugger.hpp>`

Public Member Functions

Validate Row Cuts

Check that the specified cuts do not cut off the known solution.

- virtual int validateCuts (const OsiCuts &cs, int first, int last) const
  Check that the set of cuts does not cut off the solution known to the debugger.
- virtual bool invalidCut (const OsiRowCut &rowcut) const
  Check that the cut does not cut off the solution known to the debugger.
- bool onOptimalPath (const OsiSolverInterface &si) const
  Returns true if the solution held in the solver is compatible with the known solution.

Activate the Debugger

The debugger is considered to be active when it holds a known solution.

- bool activate (const OsiSolverInterface &si, const char *model)
  Activate a debugger using the name of a problem.
- bool activate (const OsiSolverInterface &si, const double *solution, bool keepContinuous=false)
  Activate a debugger using a full solution array.
- bool active () const
  Returns true if the debugger is active.

Query or Manipulate the Known Solution

- const double * optimalSolution () const
  Return the known solution.
- int numberColumns () const
  Return the number of columns in the known solution.
- double optimalValue () const
  Return the value of the objective for the known solution.
- void redoSolution (int numberColumns, const int *originalColumns)
  Edit the known solution to reflect column changes.
- int printOptimalSolution (const OsiSolverInterface &si) const
  Print optimal solution (returns -1 bad debug, 0 on optimal, 1 not)

Constructors and Destructors

- OsiRowCutDebugger ()
  Default constructor - no checking.
- OsiRowCutDebugger (const OsiSolverInterface &si, const char *model)
  Constructor with name of model.
- OsiRowCutDebugger (const OsiSolverInterface &si, const double *solution, bool enforceOptimality=false)
  Constructor with full solution.
- OsiRowCutDebugger (const OsiRowCutDebugger &)
  Copy constructor.
- OsiRowCutDebugger & operator= (const OsiRowCutDebugger &rhs)
  Assignment operator.
- virtual ~OsiRowCutDebugger ()
  Destructor.

Friends

- void OsiRowCutDebuggerUnitTest (const OsiSolverInterface *siP, const std::string &mpsDir)
  A function that tests the methods in the OsiRowCutDebugger class.

5.28.1 Detailed Description

Validate cuts against a known solution.

OsiRowCutDebugger provides a facility for validating cuts against a known solution for a problem. The debugger knows an optimal solution for many of the miplib3 problems. Check the source for activate(const OsiSolverInterface&,const char*) in OsiRowCutDebugger.cpp for the full set of known problems.

A full solution vector can be supplied as a parameter with (activate(const OsiSolverInterface&,const double*,bool)). Only the integer values need to be valid. The default behaviour is to solve an lp relaxation with the integer variables fixed to the specified values and use the optimal solution to fill in the continuous variables in the solution. The debugger can be instructed to preserve the continuous variables (useful when debugging solvers where the linear relaxation doesn't capture all the constraints).

Note that the solution must match the problem held in the solver interface. If you want to use the row cut debugger on a problem after applying presolve transformations, your solution must match the presolved problem. (But see redoSolution().)

Definition at line 42 of file OsiRowCutDebugger.hpp.

5.28.2 Constructor & Destructor Documentation

5.28.2.1 OsiRowCutDebugger::OsiRowCutDebugger (const OsiSolverInterface & *si*, const char * *model*)

Constructor with name of model.

See activate(const OsiSolverInterface&,const char*).

5.28.2.2 OsiRowCutDebugger::OsiRowCutDebugger (const OsiSolverInterface & *si,* const double * *solution,* bool *enforceOptimality* = `false`)

Constructor with full solution.

See activate(const OsiSolverInterface&,const double*,bool).

5.28.3 Member Function Documentation

5.28.3.1 virtual int OsiRowCutDebugger::validateCuts (const OsiCuts & *cs,* int *first,* int *last*) const [virtual]

Check that the set of cuts does not cut off the solution known to the debugger.

Check if any generated cuts cut off the solution known to the debugger! If so then print offending cuts. Return the number of invalid cuts.

5.28.3.2 virtual bool OsiRowCutDebugger::invalidCut (const OsiRowCut & *rowcut*) const [virtual]

Check that the cut does not cut off the solution known to the debugger.

Return true if cut is invalid

5.28.3.3 bool OsiRowCutDebugger::onOptimalPath (const OsiSolverInterface & *si*) const

Returns true if the solution held in the solver is compatible with the known solution.

More specifically, returns true if the known solution satisfies the column bounds held in the solver.

5.28.3.4 bool OsiRowCutDebugger::activate (const OsiSolverInterface & *si,* const char * *model*)

Activate a debugger using the name of a problem.

The debugger knows an optimal solution for most of miplib3. Check the source code for the full list. Returns true if the debugger is successfully activated.

5.28.3.5 bool OsiRowCutDebugger::activate (const OsiSolverInterface & *si,* const double * *solution,* bool *keepContinuous* = `false`)

Activate a debugger using a full solution array.

The solution must have one entry for every variable, but only the entries for integer values are used. By default the debugger will solve an lp relaxation with the integer variables fixed and fill in values for the continuous variables from this solution. If the debugger should preserve the given values for the continuous variables, set `keepContinuous` to `true`.

Returns true if debugger activates successfully.

5.28.3.6 void OsiRowCutDebugger::redoSolution (int *numberColumns,* const int * *originalColumns*)

Edit the known solution to reflect column changes.

Given a translation array `originalColumns`[numberColumns] which can translate current column indices to original column indices, this method will edit the solution held in the debugger so that it matches the current set of columns.

Useful when the original problem is preprocessed prior to cut generation. The debugger does keep a record of the changes.

5.28.4 Friends And Related Function Documentation

5.28.4.1 void OsiRowCutDebuggerUnitTest (const OsiSolverInterface * *siP,* const std::string & *mpsDir*) `[friend]`

A function that tests the methods in the OsiRowCutDebugger class.

The documentation for this class was generated from the following file:

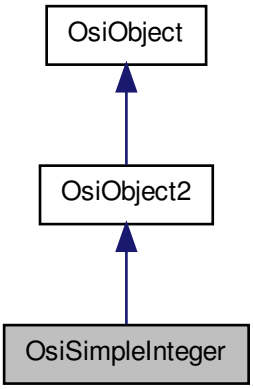
- OsiRowCutDebugger.hpp

5.29 OsiSimpleInteger Class Reference

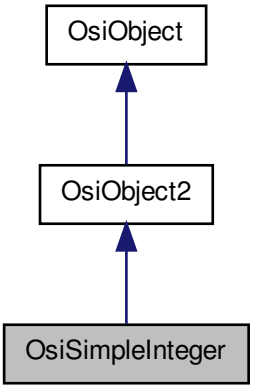
Define a single integer class.

`#include <OsiBranchingObject.hpp>`

Inheritance diagram for OsiSimpleInteger:



Collaboration diagram for OsiSimpleInteger:



Public Member Functions

- OsiSimpleInteger ()

  Default Constructor.
- OsiSimpleInteger (const OsiSolverInterface ∗solver, int iColumn)

  Useful constructor - passed solver index.
- OsiSimpleInteger (int iColumn, double lower, double upper)

  Useful constructor - passed solver index and original bounds.
- OsiSimpleInteger (const OsiSimpleInteger &)

  Copy constructor.
- virtual OsiObject ∗ clone () const

  Clone.
- OsiSimpleInteger & operator= (const OsiSimpleInteger &rhs)

  Assignment operator.
- virtual ∼OsiSimpleInteger ()

  Destructor.
- virtual double infeasibility (const OsiBranchingInformation ∗info, int &whichWay) const

  Infeasibility - large is 0.5.
- virtual double feasibleRegion (OsiSolverInterface ∗solver, const OsiBranchingInformation ∗info) const

  Set bounds to fix the variable at the current (integer) value.
- virtual OsiBranchingObject ∗ createBranch (OsiSolverInterface ∗solver, const OsiBranchingInformation ∗info, int way) const

Creates a branching object.

- void setColumnNumber (int value)

  Set solver column number.
- virtual int columnNumber () const

  Column number if single column object -1 otherwise, so returns >= 0 Used by heuristics.
- double originalLowerBound () const

  Original bounds.
- virtual void resetBounds (const OsiSolverInterface *solver)

  Reset variable bounds to their original values.
- virtual void resetSequenceEtc (int numberColumns, const int *originalColumns)

  Change column numbers after preprocessing.
- virtual double upEstimate () const

  Return "up" estimate (default 1.0e-5)
- virtual double downEstimate () const

  Return "down" estimate (default 1.0e-5)
- virtual bool canHandleShadowPrices () const

  Return true if knows how to deal with Pseudo Shadow Prices.

Protected Attributes

- double originalLower_

  data Original lower bound
- double originalUpper_

  Original upper bound.
- int columnNumber_

  Column number in solver.

5.29.1 Detailed Description

Define a single integer class.

Definition at line 511 of file OsiBranchingObject.hpp.

5.29.2 Member Function Documentation

5.29.2.1 virtual double OsiSimpleInteger::feasibleRegion (OsiSolverInterface * *solver*, const OsiBranchingInformation * *info*) const [virtual]

Set bounds to fix the variable at the current (integer) value.

Given an integer value, set the lower and upper bounds to fix the variable. Returns amount it had to move variable.

Implements OsiObject.

5.29.2.2 virtual OsiBranchingObject* OsiSimpleInteger::createBranch (OsiSolverInterface * *solver,* const OsiBranchingInformation * *info,* int *way*) const [virtual]

Creates a branching object.

The preferred direction is set by `way`, 0 for down, 1 for up.

Reimplemented from OsiObject.

5.29.2.3 virtual void OsiSimpleInteger::resetBounds (const OsiSolverInterface * *solver*) [virtual]

Reset variable bounds to their original values.

Bounds may be tightened, so it may be good to be able to reset them to their original values.

Reimplemented from OsiObject.

The documentation for this class was generated from the following file:

- OsiBranchingObject.hpp

5.30 OsiSolverBranch Class Reference

Solver Branch Class.

`#include <OsiSolverBranch.hpp>`

Public Member Functions

Add and Get methods

- void addBranch (int iColumn, double value)
  Add a simple branch (i.e. first sets ub of floor(value), second lb of ceil(value))
- void addBranch (int way, int numberTighterLower, const int *whichLower, const double *newLower, int numberTighterUpper, const int *whichUpper, const double *newUpper)
  Add bounds - way =-1 is first , +1 is second.
- void addBranch (int way, int numberColumns, const double *oldLower, const double *newLower, const double *oldUpper, const double *newUpper)
  Add bounds - way =-1 is first , +1 is second.
- void applyBounds (OsiSolverInterface &solver, int way) const
  Apply bounds.
- bool feasibleOneWay (const OsiSolverInterface &solver) const
  Returns true if current solution satsifies one side of branch.
- const int * starts () const
  Starts.
- const int * which () const
  Which variables.
- const double * bounds () const
  Bounds.

Constructors and destructors

- OsiSolverBranch ()
  Default Constructor.
- OsiSolverBranch (const OsiSolverBranch &rhs)
  Copy constructor.
- OsiSolverBranch & operator= (const OsiSolverBranch &rhs)
  Assignment operator.
- ~OsiSolverBranch ()
  Destructor.

5.30.1 Detailed Description

Solver Branch Class.

This provides information on a branch as a set of tighter bounds on both ways

Definition at line 18 of file OsiSolverBranch.hpp.

The documentation for this class was generated from the following file:

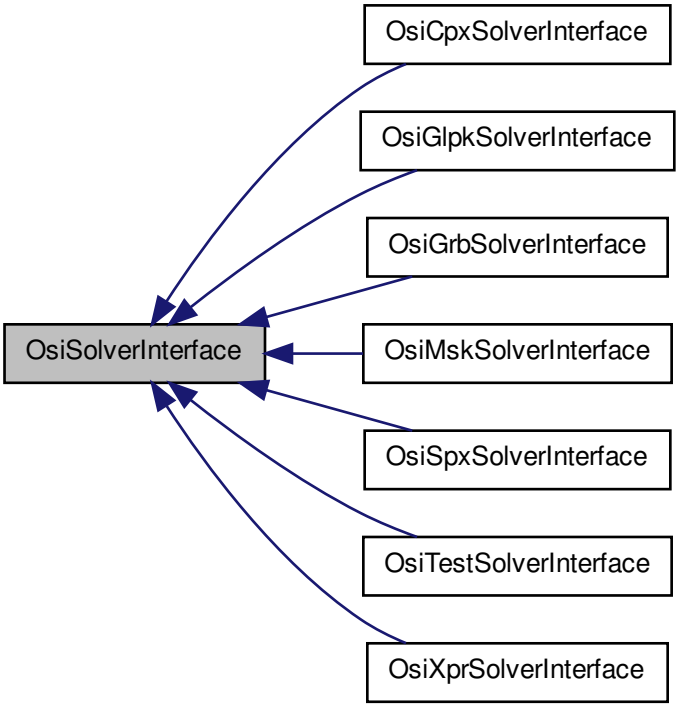
- OsiSolverBranch.hpp

5.31 OsiSolverInterface Class Reference

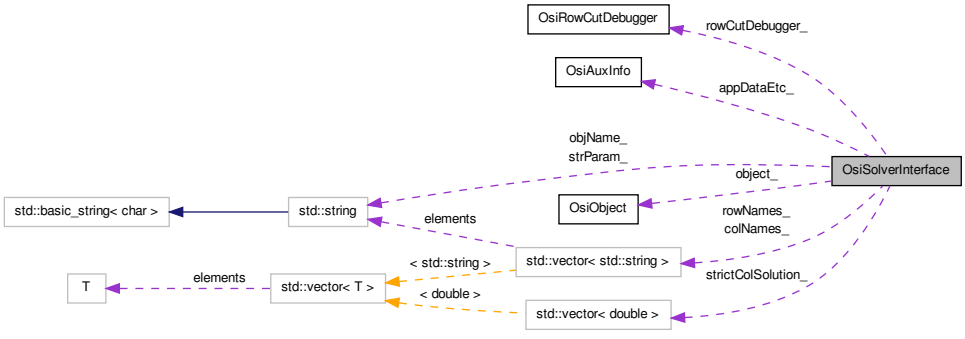
Abstract Base Class for describing an interface to a solver.

```
#include <OsiSolverInterface.hpp>
```

Inheritance diagram for OsiSolverInterface:



Collaboration diagram for OsiSolverInterface:



Classes

- class ApplyCutsReturnCode

  Internal class for obtaining status from the applyCuts method.

Public Types

- typedef std::vector< std::string > OsiNameVec

  Data type for name vectors.

Public Member Functions

Solve methods

- virtual void initialSolve ()=0

  Solve initial LP relaxation.
- virtual void resolve ()=0

  Resolve an LP relaxation after problem modification.
- virtual void branchAndBound ()=0

  Invoke solver's built-in enumeration algorithm.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

When a set method returns false, the original value (if any) should be unchanged. There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the volume algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

Note

There is a default implementation of the set/get methods, namely to store/retrieve the given value using an array in the base class. A specific solver implementation can use this feature, for example, to store parameters that should be used later on. Implementors of a solver interface should overload these functions to provide the proper interface to and accurately reflect the capabilities of a specific solver.

The format for hints is slightly different in that a boolean specifies the sense of the hint and an enum specifies the strength of the hint. Hints should be initialised when a solver is instantiated. (See OsiSolverParameters.hpp for defined hint parameters and strength.) When specifying the sense of the hint, a value of true means to work with the hint, false to work against it. For example,

- `setHintParam(OsiDoScale,true,OsiHintTry)`
  is a mild suggestion to the solver to scale the constraint system.
- `setHintParam(OsiDoScale,false,OsiForceDo)`
  tells the solver to disable scaling, or throw an exception if it cannot comply.

As another example, a solver interface could use the value and strength of the `OsiDoReducePrint` hint to adjust the amount of information printed by the interface and/or solver. The extent to which a solver obeys hints is left to the solver. The value and strength returned by `getHintParam` will match the most recent call to `setHintParam`, and will not necessarily reflect the solver's ability to comply with the hint. If the hint strength is `OsiForceDo`, the solver is required to throw an exception if it cannot perform the specified action.

Note

As with the other set/get methods, there is a default implementation which maintains arrays in the base class for hint sense and strength. The default implementation does not store the `otherInformation` pointer, and always throws an exception for strength `OsiForceDo`. Implementors of a solver interface should override these functions to provide the proper interface to and accurately reflect the capabilities of a specific solver.

- virtual bool setIntParam (OsiIntParam key, int value)
  Set an integer parameter.
- virtual bool setDblParam (OsiDblParam key, double value)
  Set a double parameter.
- virtual bool setStrParam (OsiStrParam key, const std::string &value)
  Set a string parameter.
- virtual bool setHintParam (OsiHintParam key, bool yesNo=true, OsiHintStrength strength=OsiHintTry, void *=NULL)
  Set a hint parameter.
- virtual bool getIntParam (OsiIntParam key, int &value) const
  Get an integer parameter.
- virtual bool getDblParam (OsiDblParam key, double &value) const
  Get a double parameter.
- virtual bool getStrParam (OsiStrParam key, std::string &value) const
  Get a string parameter.
- virtual bool getHintParam (OsiHintParam key, bool &yesNo, OsiHintStrength &strength, void *&otherInformation) const
  Get a hint parameter (all information)
- virtual bool getHintParam (OsiHintParam key, bool &yesNo, OsiHintStrength &strength) const
  Get a hint parameter (sense and strength only)
- virtual bool getHintParam (OsiHintParam key, bool &yesNo) const
  Get a hint parameter (sense only)
- void copyParameters (OsiSolverInterface &rhs)
  Copy all parameters in this section from one solver to another.
- double getIntegerTolerance () const
  Return the integrality tolerance of the underlying solver.

Methods returning info on how the solution process terminated

- virtual bool isAbandoned () const =0
  Are there numerical difficulties?
- virtual bool isProvenOptimal () const =0
  Is optimality proven?
- virtual bool isProvenPrimalInfeasible () const =0
  Is primal infeasibility proven?
- virtual bool isProvenDualInfeasible () const =0
  Is dual infeasibility proven?
- virtual bool isPrimalObjectiveLimitReached () const
  Is the given primal objective limit reached?
- virtual bool isDualObjectiveLimitReached () const
  Is the given dual objective limit reached?
- virtual bool isIterationLimitReached () const =0
  Iteration limit reached?

Warm start methods

Note that the warm start methods return a generic CoinWarmStart object.

The precise characteristics of this object are solver-dependent. Clients who wish to maintain a maximum degree of solver independence should take care to avoid unnecessary assumptions about the properties of a warm start object.

- virtual CoinWarmStart * getEmptyWarmStart () const =0
  Get an empty warm start object.
- virtual CoinWarmStart * getWarmStart () const =0
  Get warm start information.
- virtual CoinWarmStart * getPointerToWarmStart (bool &mustDelete)
  Get warm start information.
- virtual bool setWarmStart (const CoinWarmStart *warmstart)=0
  Set warm start information.

Hot start methods

Primarily used in strong branching.

The user can create a hot start object --- a snapshot of the optimization process --- then reoptimize over and over again, starting from the same point.

Note

- *Between hot started optimizations only bound changes are allowed.*
- *The copy constructor and assignment operator should NOT copy any hot start information.*
- *The default implementation simply extracts a warm start object in* `markHotStart`*, resets to the warm start object in* `solveFromHotStart`*, and deletes the warm start object in* `unmarkHotStart`*. Actual solver implementations are encouraged to do better.*

- virtual void markHotStart ()

Create a hot start snapshot of the optimization process.

- virtual void solveFromHotStart ()

  Optimize starting from the hot start snapshot.

- virtual void unmarkHotStart ()

  Delete the hot start snapshot.

Problem query methods

Querying a problem that has no data associated with it will result in zeros for the number of rows and columns, and NULL pointers from the methods that return vectors.

Const pointers returned from any data-query method are valid as long as the data is unchanged and the solver is not called.

- virtual int getNumCols () const =0

  Get the number of columns.

- virtual int getNumRows () const =0

  Get the number of rows.

- virtual int getNumElements () const =0

  Get the number of nonzero elements.

- virtual int getNumIntegers () const

  Get the number of integer variables.

- virtual const double * getColLower () const =0

  Get a pointer to an array[getNumCols()] of column lower bounds.

- virtual const double * getColUpper () const =0

  Get a pointer to an array[getNumCols()] of column upper bounds.

- virtual const char * getRowSense () const =0

  Get a pointer to an array[getNumRows()] of row constraint senses.

- virtual const double * getRightHandSide () const =0

  Get a pointer to an array[getNumRows()] of row right-hand sides.

- virtual const double * getRowRange () const =0

  Get a pointer to an array[getNumRows()] of row ranges.

- virtual const double * getRowLower () const =0

  Get a pointer to an array[getNumRows()] of row lower bounds.

- virtual const double * getRowUpper () const =0

  Get a pointer to an array[getNumRows()] of row upper bounds.

- virtual const double * getObjCoefficients () const =0

  Get a pointer to an array[getNumCols()] of objective function coefficients.

- virtual double getObjSense () const =0

  Get the objective function sense.

- virtual bool isContinuous (int colIndex) const =0

  Return true if the variable is continuous.

- virtual bool isBinary (int colIndex) const

  Return true if the variable is binary.

- virtual bool isInteger (int colIndex) const

  Return true if the variable is integer.

- virtual bool isIntegerNonBinary (int colIndex) const

  Return true if the variable is general integer.

- virtual bool isFreeBinary (int colIndex) const
  Return true if the variable is binary and not fixed.
- const char * columnType (bool refresh=false) const
  Return an array[getNumCols()] of column types.
- virtual const char * getColType (bool refresh=false) const
  Return an array[getNumCols()] of column types.
- virtual const CoinPackedMatrix * getMatrixByRow () const =0
  Get a pointer to a row-wise copy of the matrix.
- virtual const CoinPackedMatrix * getMatrixByCol () const =0
  Get a pointer to a column-wise copy of the matrix.
- virtual CoinPackedMatrix * getMutableMatrixByRow () const
  Get a pointer to a mutable row-wise copy of the matrix.
- virtual CoinPackedMatrix * getMutableMatrixByCol () const
  Get a pointer to a mutable column-wise copy of the matrix.
- virtual double getInfinity () const =0
  Get the solver's value for infinity.

Solution query methods

- virtual const double * getColSolution () const =0
  Get a pointer to an array[getNumCols()] of primal variable values.
- virtual const double * getStrictColSolution ()
  Get a pointer to an array[getNumCols()] of primal variable values guaranteed to be between the column lower and upper bounds.
- virtual const double * getRowPrice () const =0
  Get pointer to array[getNumRows()] of dual variable values.
- virtual const double * getReducedCost () const =0
  Get a pointer to an array[getNumCols()] of reduced costs.
- virtual const double * getRowActivity () const =0
  Get a pointer to array[getNumRows()] of row activity levels.
- virtual double getObjValue () const =0
  Get the objective function value.
- virtual int getIterationCount () const =0
  Get the number of iterations it took to solve the problem (whatever 'iteration' means to the solver).
- virtual std::vector< double * > getDualRays (int maxNumRays, bool fullRay=false) const =0
  Get as many dual rays as the solver can provide.
- virtual std::vector< double * > getPrimalRays (int maxNumRays) const =0
  Get as many primal rays as the solver can provide.
- virtual OsiVectorInt getFractionalIndices (const double etol=1.e-05) const
  Get vector of indices of primal variables which are integer variables but have fractional values in the current solution.

Methods to modify the objective, bounds, and solution

For functions which take a set of indices as parameters (`setObjCoeffSet()`, `setColSetBounds()`, `setRowSetBounds()`, `setRowSetTypes()`), the parameters follow the C++ STL iterator convention: `indexFirst` points to the first index in the set, and `indexLast` points to a position one past the last index in the set.

- virtual void setObjCoeff (int elementIndex, double elementValue)=0

  Set an objective function coefficient.
- virtual void setObjCoeffSet (const int *indexFirst, const int *indexLast, const double *coeffList)

  Set a set of objective function coefficients.
- virtual void setObjective (const double *array)

  Set the objective coefficients for all columns.
- virtual void setObjSense (double s)=0

  Set the objective function sense.
- virtual void setColLower (int elementIndex, double elementValue)=0

  Set a single column lower bound.
- virtual void setColLower (const double *array)

  Set the lower bounds for all columns.
- virtual void setColUpper (int elementIndex, double elementValue)=0

  Set a single column upper bound.
- virtual void setColUpper (const double *array)

  Set the upper bounds for all columns.
- virtual void setColBounds (int elementIndex, double lower, double upper)

  Set a single column lower and upper bound.
- virtual void setColSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

  Set the upper and lower bounds of a set of columns.
- virtual void setRowLower (int elementIndex, double elementValue)=0

  Set a single row lower bound.
- virtual void setRowUpper (int elementIndex, double elementValue)=0

  Set a single row upper bound.
- virtual void setRowBounds (int elementIndex, double lower, double upper)

  Set a single row lower and upper bound.
- virtual void setRowSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

  Set the bounds on a set of rows.
- virtual void setRowType (int index, char sense, double rightHandSide, double range)=0

  Set the type of a single row.
- virtual void setRowSetTypes (const int *indexFirst, const int *indexLast, const char *senseList, const double *rhsList, const double *rangeList)

  Set the type of a set of rows.
- virtual void setColSolution (const double *colsol)=0

  Set the primal solution variable values.
- virtual void setRowPrice (const double *rowprice)=0

  Set dual solution variable values.
- virtual int reducedCostFix (double gap, bool justInteger=true)

  Fix variables at bound based on reduced cost.

Methods to set variable type

- virtual void setContinuous (int index)=0

  Set the index-th variable to be a continuous variable.
- virtual void setInteger (int index)=0

  Set the index-th variable to be an integer variable.

- virtual void setContinuous (const int *indices, int len)

  Set the variables listed in indices (which is of length len) to be continuous variables.
- virtual void setInteger (const int *indices, int len)

  Set the variables listed in indices (which is of length len) to be integer variables.

Methods for row and column names

Osi defines three name management disciplines: 'auto names' (0), 'lazy names' (1), and 'full names' (2).

See the description of #OsiNameDiscipline for details. Changing the name discipline (via setIntParam()) will not automatically add or remove name information, but setting the discipline to auto will make existing information inaccessible until the discipline is reset to lazy or full.

By definition, a row index of getNumRows() (i.e., one larger than the largest valid row index) refers to the objective function.

OSI users and implementors: While the OSI base class can define an interface and provide rudimentary support, use of names really depends on support by the OsiXXX class to ensure that names are managed correctly. If an OsiXXX class does not support names, it should return false for calls to getIntParam() or setIntParam() that reference OsiNameDiscipline.

- virtual std::string dfltRowColName (char rc, int ndx, unsigned digits=7) const

  Generate a standard name of the form Rnnnnnnn or Cnnnnnnn.
- virtual std::string getObjName (unsigned maxLen=static_cast< unsigned >(std::string::npos)) const

  Return the name of the objective function.
- virtual void setObjName (std::string name)

  Set the name of the objective function.
- virtual std::string getRowName (int rowIndex, unsigned maxLen=static_cast< unsigned >(std::string::npos)) const

  Return the name of the row.
- virtual const OsiNameVec & getRowNames ()

  Return a pointer to a vector of row names.
- virtual void setRowName (int ndx, std::string name)

  Set a row name.
- virtual void setRowNames (OsiNameVec &srcNames, int srcStart, int len, int tgtStart)

  Set multiple row names.
- virtual void deleteRowNames (int tgtStart, int len)

  Delete len row names starting at index tgtStart.
- virtual std::string getColName (int colIndex, unsigned maxLen=static_cast< unsigned >(std::string::npos)) const

  Return the name of the column.
- virtual const OsiNameVec & getColNames ()

  Return a pointer to a vector of column names.
- virtual void setColName (int ndx, std::string name)

  Set a column name.
- virtual void setColNames (OsiNameVec &srcNames, int srcStart, int len, int tgtStart)

Set multiple column names.

- virtual void deleteColNames (int tgtStart, int len)

  Delete len column names starting at index tgtStart.
- void setRowColNames (const CoinMpsIO &mps)

  Set row and column names from a CoinMpsIO object.
- void setRowColNames (CoinModel &mod)

  Set row and column names from a CoinModel object.
- void setRowColNames (CoinLpIO &mod)

  Set row and column names from a CoinLpIO object.

Methods to modify the constraint system.

Note that new columns are added as continuous variables.

- virtual void addCol (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)=0

  Add a column (primal variable) to the problem.
- virtual void addCol (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj, std::string name)

  Add a named column (primal variable) to the problem.
- virtual void addCol (int numberElements, const int ∗rows, const double ∗elements, const double collb, const double colub, const double obj)

  Add a column (primal variable) to the problem.
- virtual void addCol (int numberElements, const int ∗rows, const double ∗elements, const double collb, const double colub, const double obj, std::string name)

  Add a named column (primal variable) to the problem.
- virtual void addCols (const int numcols, const CoinPackedVectorBase ∗const ∗cols, const double ∗collb, const double ∗colub, const double ∗obj)

  Add a set of columns (primal variables) to the problem.
- virtual void addCols (const int numcols, const int ∗columnStarts, const int ∗rows, const double ∗elements, const double ∗collb, const double ∗colub, const double ∗obj)

  Add a set of columns (primal variables) to the problem.
- void addCols (const CoinBuild &buildObject)

  Add columns using a CoinBuild object.
- int addCols (CoinModel &modelObject)

  Add columns from a model object.
- virtual void deleteCols (const int num, const int ∗colIndices)=0

  Remove a set of columns (primal variables) from the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)=0

  Add a row (constraint) to the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const double rowlb, const double rowub, std::string name)

  Add a named row (constraint) to the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)=0

  Add a row (constraint) to the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng, std::string name)

Add a named row (constraint) to the problem.

- virtual void addRow (int numberElements, const int ∗columns, const double ∗element, const double rowlb, const double rowub)

  Add a row (constraint) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase ∗const ∗rows, const double ∗rowlb, const double ∗rowub)

  Add a set of rows (constraints) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase ∗const ∗rows, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

  Add a set of rows (constraints) to the problem.
- virtual void addRows (const int numrows, const int ∗rowStarts, const int ∗columns, const double ∗element, const double ∗rowlb, const double ∗rowub)

  Add a set of rows (constraints) to the problem.
- void addRows (const CoinBuild &buildObject)

  Add rows using a CoinBuild object.
- int addRows (CoinModel &modelObject)

  Add rows from a CoinModel object.
- virtual void deleteRows (const int num, const int ∗rowIndices)=0

  Delete a set of rows (constraints) from the problem.
- virtual void replaceMatrixOptional (const CoinPackedMatrix &)

  Replace the constraint matrix.
- virtual void replaceMatrix (const CoinPackedMatrix &)

  Replace the constraint matrix.
- virtual void saveBaseModel ()

  Save a copy of the base model.
- virtual void restoreBaseModel (int numberRows)

  Reduce the constraint system to the specified number of constraints.
- virtual ApplyCutsReturnCode applyCuts (const OsiCuts &cs, double effectivenessLb=0.0)

  Apply a collection of cuts.
- virtual void applyRowCuts (int numberCuts, const OsiRowCut ∗cuts)

  Apply a collection of row cuts which are all effective.
- virtual void applyRowCuts (int numberCuts, const OsiRowCut ∗∗cuts)

  Apply a collection of row cuts which are all effective.
- void deleteBranchingInfo (int numberDeleted, const int ∗which)

  Deletes branching information before columns deleted.

Methods for problem input and output

- virtual void loadProblem (const CoinPackedMatrix &matrix, const double ∗collb, const double ∗colub, const double ∗obj, const double ∗rowlb, const double ∗rowub)=0

  Load in a problem by copying the arguments.
- virtual void assignProblem (CoinPackedMatrix ∗&matrix, double ∗&collb, double ∗&colub, double ∗&obj, double ∗&rowlb, double ∗&rowub)=0

  Load in a problem by assuming ownership of the arguments.
- virtual void loadProblem (const CoinPackedMatrix &matrix, const double ∗collb, const double ∗colub, const double ∗obj, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)=0

  Load in a problem by copying the arguments.

- virtual void assignProblem (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, char *&rowsen, double *&rowrhs, double *&rowrng)=0

  Load in a problem by assuming ownership of the arguments.
- virtual void loadProblem (const int numcols, const int numrows, const CoinBigIndex *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)=0

  Load in a problem by copying the arguments.
- virtual void loadProblem (const int numcols, const int numrows, const CoinBigIndex *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)=0

  Load in a problem by copying the arguments.
- virtual int loadFromCoinModel (CoinModel &modelObject, bool keepSolution=false)

  Load a model from a CoinModel object.
- virtual int readMps (const char *filename, const char *extension="mps")

  Read a problem in MPS format from the given filename.
- virtual int readMps (const char *filename, const char *extension, int &numberSets, CoinSet **&sets)

  Read a problem in MPS format from the given full filename.
- virtual int readGMPL (const char *filename, const char *dataname=NULL)

  Read a problem in GMPL format from the given filenames.
- virtual void writeMps (const char *filename, const char *extension="mps", double objSense=0.0) const =0

  Write the problem in MPS format to the specified file.
- int writeMpsNative (const char *filename, const char **rowNames, const char **columnNames, int formatType=0, int numberAcross=2, double objSense=0.0, int numberSOS=0, const CoinSet *setInfo=NULL) const

  Write the problem in MPS format to the specified file with more control over the output.
- virtual void writeLp (const char *filename, const char *extension="lp", double epsilon=1e-5, int numberAcross=10, int decimals=5, double objSense=0.0, bool useRowNames=true) const

  Write the problem into an Lp file of the given filename with the specified extension.
- virtual void writeLp (FILE *fp, double epsilon=1e-5, int numberAcross=10, int decimals=5, double objSense=0.0, bool useRowNames=true) const

  Write the problem into the file pointed to by the parameter fp.
- int writeLpNative (const char *filename, char const *const *const rowNames, char const *const *const columnNames, const double epsilon=1.0e-5, const int numberAcross=10, const int decimals=5, const double objSense=0.0, const bool useRowNames=true) const

  Write the problem into an Lp file.
- int writeLpNative (FILE *fp, char const *const *const rowNames, char const *const *const columnNames, const double epsilon=1.0e-5, const int numberAcross=10, const int decimals=5, const double objSense=0.0, const bool useRowNames=true) const

  Write the problem into the file pointed to by the parameter fp.
- virtual int readLp (const char *filename, const double epsilon=1e-5)

Read file in LP format from file with name filename.

- int readLp (FILE *fp, const double epsilon=1e-5)

  Read file in LP format from the file pointed to by fp.

Setting/Accessing application data

- void setApplicationData (void *appData)

  Set application data.
- void setAuxiliaryInfo (OsiAuxInfo *auxiliaryInfo)

  Create a clone of an Auxiliary Information object.
- void * getApplicationData () const

  Get application data.
- OsiAuxInfo * getAuxiliaryInfo () const

  Get pointer to auxiliary info object.

Message handling

See the COIN library documentation for additional information about COIN message facilities.

- virtual void passInMessageHandler (CoinMessageHandler *handler)

  Pass in a message handler.
- void newLanguage (CoinMessages::Language language)

  Set language.
- void **setLanguage** (CoinMessages::Language language)
- CoinMessageHandler * messageHandler () const

  Return a pointer to the current message handler.
- CoinMessages messages ()

  Return the current set of messages.
- CoinMessages * messagesPointer ()

  Return a pointer to the current set of messages.
- bool defaultHandler () const

  Return true if default handler.

Methods for dealing with discontinuities other than integers.

Osi should be able to know about SOS and other types.

This is an optional section where such information can be stored.

- void findIntegers (bool justCount)

  Identify integer variables and create corresponding objects.
- virtual int findIntegersAndSOS (bool justCount)

  Identify integer variables and SOS and create corresponding objects.
- int numberObjects () const

  Get the number of objects.
- void setNumberObjects (int number)

  Set the number of objects.
- OsiObject ** objects () const

  Get the array of objects.
- const OsiObject * object (int which) const

Get the specified object.

- OsiObject * modifiableObject (int which) const

  Get the specified object.
- void deleteObjects ()

  Delete all object information.
- void addObjects (int numberObjects, OsiObject **objects)

  Add in object information.
- double forceFeasible ()

  Use current solution to set bounds so current integer feasible solution will stay feasible.

Methods related to testing generated cuts

See the documentation for OsiRowCutDebugger for additional details.

- virtual void activateRowCutDebugger (const char *modelName)

  Activate the row cut debugger.
- virtual void activateRowCutDebugger (const double *solution, bool enforceOptimality=true)

  Activate the row cut debugger using a full solution array.
- const OsiRowCutDebugger * getRowCutDebugger () const

  Get the row cut debugger provided the solution known to the debugger is within the feasible region held in the solver.
- OsiRowCutDebugger * getRowCutDebuggerAlways () const

  Get the row cut debugger object.

OsiSimplexInterface

Simplex Interface

Methods for an advanced interface to a simplex solver. The interface comprises two groups of methods. Group 1 contains methods for tableau access. Group 2 contains methods for dictating individual simplex pivots.

- virtual int canDoSimplexInterface () const

  Return the simplex implementation level.

OsiSimplex Group 1

Tableau access methods.

This group of methods provides access to rows and columns of the basis inverse and to rows and columns of the tableau.

- virtual void enableFactorization () const

  Prepare the solver for the use of tableau access methods.
- virtual void disableFactorization () const

  Undo the effects of enableFactorization.
- virtual bool basisIsAvailable () const

  Check if an optimal basis is available.
- bool optimalBasisIsAvailable () const

  Synonym for basisIsAvailable.

- virtual void getBasisStatus (int ∗cstat, int ∗rstat) const
  Retrieve status information for column and row variables.
- virtual int setBasisStatus (const int ∗cstat, const int ∗rstat)
  Set the status of column and row variables and update the basis factorization and solution.
- virtual void getReducedGradient (double ∗columnReducedCosts, double ∗duals, const double ∗c) const
  Calculate duals and reduced costs for the given objective coefficients.
- virtual void getBInvARow (int row, double ∗z, double ∗slack=NULL) const
  Get a row of the tableau.
- virtual void getBInvRow (int row, double ∗z) const
  Get a row of the basis inverse.
- virtual void getBInvACol (int col, double ∗vec) const
  Get a column of the tableau.
- virtual void getBInvCol (int col, double ∗vec) const
  Get a column of the basis inverse.
- virtual void getBasics (int ∗index) const
  Get indices of basic variables.

OsiSimplex Group 2

Pivoting methods

This group of methods provides for control of individual pivots by a simplex solver.

- virtual void enableSimplexInterface (bool doingPrimal)
  Enables normal operation of subsequent functions.
- virtual void disableSimplexInterface ()
  Undo whatever setting changes the above method had to make.
- virtual int pivot (int colIn, int colOut, int outStatus)
  Perform a pivot by substituting a colIn for colOut in the basis.
- virtual int primalPivotResult (int colIn, int sign, int &colOut, int &outStatus, double &t, CoinPackedVector ∗dx)
  Obtain a result of the primal pivot Outputs: colOut -- leaving column, outStatus -- its status, t -- step size, and, if dx!=NULL, ∗dx -- primal ray direction.
- virtual int dualPivotResult (int &colIn, int &sign, int colOut, int outStatus, double &t, CoinPackedVector ∗dx)
  Obtain a result of the dual pivot (similar to the previous method) Differences: entering variable and a sign of its change are now the outputs, the leaving variable and its statuts -- the inputs If dx!=NULL, then ∗dx contains dual ray Return code: same.

Constructors and destructors

- OsiSolverInterface ()
  Default Constructor.
- virtual OsiSolverInterface ∗ clone (bool copyData=true) const =0
  Clone.
- OsiSolverInterface (const OsiSolverInterface &)
  Copy constructor.
- OsiSolverInterface & operator= (const OsiSolverInterface &rhs)
  Assignment operator.
- virtual ∼OsiSolverInterface ()
  Destructor.
- virtual void reset ()
  Reset the solver interface.

Protected Member Functions

Protected methods

- virtual void applyRowCut (const OsiRowCut &rc)=0

  Apply a row cut (append to the constraint matrix).
- virtual void applyColCut (const OsiColCut &cc)=0

  Apply a column cut (adjust the bounds of one or more variables).
- void convertBoundToSense (const double lower, const double upper, char &sense, double &right, double &range) const

  A quick inlined function to convert from the lb/ub style of constraint definition to the sense/rhs/range style.
- void convertSenseToBound (const char sense, const double right, const double range, double &lower, double &upper) const

  A quick inlined function to convert from the sense/rhs/range style of constraint definition to the lb/ub style.
- template<class T >
  T forceIntoRange (const T value, const T lower, const T upper) const

  A quick inlined function to force a value to be between a minimum and a maximum value.
- void setInitialData ()

  Set OsiSolverInterface object state for default constructor.

Protected Attributes

Protected member data

- OsiRowCutDebugger * rowCutDebugger_

  Pointer to row cut debugger object.
- CoinMessageHandler * handler_

  Message handler.
- bool defaultHandler_

  Flag to say if the currrent handler is the default handler.
- CoinMessages messages_

  Messages.
- int numberIntegers_

  Number of integers.
- int numberObjects_

  Total number of objects.
- OsiObject ** object_

  Integer and ... information (integer info normally at beginning)
- char * columnType_

  Column type 0 - continuous 1 - binary (may get fixed later) 2 - general integer (may get fixed later)

Friends

- void OsiSolverInterfaceCommonUnitTest (const OsiSolverInterface *emptySi, const std::string &mpsDir, const std::string &netlibDir)

  A function that tests the methods in the OsiSolverInterface class.
- void OsiSolverInterfaceMpsUnitTest (const std::vector< OsiSolverInterface * > &vecSiP, const std::string &mpsDir)

  A function that tests that a lot of problems given in MPS files (mostly the NETLIB problems) solve properly with all the specified solvers.

5.31.1 Detailed Description

Abstract Base Class for describing an interface to a solver.

Many OsiSolverInterface query methods return a const pointer to the requested read-only data. If the model data is changed or the solver is called, these pointers may no longer be valid and should be refreshed by invoking the member function to obtain an updated copy of the pointer. For example:

```
OsiSolverInterface solverInterfacePtr ;
const double * ruBnds = solverInterfacePtr->getRowUpper();
solverInterfacePtr->applyCuts(someSetOfCuts);
// ruBnds is no longer a valid pointer and must be refreshed
ruBnds = solverInterfacePtr->getRowUpper();
```

Querying a problem that has no data associated with it will result in zeros for the number of rows and columns, and NULL pointers from the methods that return vectors.

Definition at line 60 of file OsiSolverInterface.hpp.

5.31.2 Member Typedef Documentation

5.31.2.1 typedef std::vector<std::string> OsiSolverInterface::OsiNameVec

Data type for name vectors.

Definition at line 881 of file OsiSolverInterface.hpp.

5.31.3 Member Function Documentation

5.31.3.1 virtual void OsiSolverInterface::resolve ( ) [pure virtual]

Resolve an LP relaxation after problem modification.

Note the 're-' in 'resolve'. initialSolve() should be used to solve the problem for the first time.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.2 virtual bool OsiSolverInterface::setHintParam (OsiHintParam *key*, bool *yesNo* = `true`, OsiHintStrength *strength* = `OsiHintTry`, void * = `NULL`) [inline, virtual]

Set a hint parameter.

The `otherInformation` parameter can be used to pass in an arbitrary block of information which is interpreted by the OSI and the underlying solver. Users are cautioned that this hook is solver-specific.

Implementors: The default implementation completely ignores `otherInformation` and always throws an exception for OsiForceDo. This is almost certainly not the behaviour you want; you really should override this method.

Reimplemented in OsiGlpkSolverInterface, and OsiGrbSolverInterface.

Definition at line 287 of file OsiSolverInterface.hpp.

5.31.3.3 virtual bool OsiSolverInterface::getHintParam (OsiHintParam *key*, bool & *yesNo*, OsiHintStrength & *strength*, void *& *otherInformation*) const [inline, virtual]

Get a hint parameter (all information)

Return all available information for the hint: sense, strength, and any extra information associated with the hint.

Implementors: The default implementation will always set `otherInformation` to NULL. This is almost certainly not the behaviour you want; you really should override this method.

Reimplemented in OsiGrbSolverInterface.

Definition at line 326 of file OsiSolverInterface.hpp.

5.31.3.4 virtual bool OsiSolverInterface::getHintParam (OsiHintParam *key*, bool & *yesNo*, OsiHintStrength & *strength*) const [inline, virtual]

Get a hint parameter (sense and strength only)

Return only the sense and strength of the hint.

Reimplemented in OsiGrbSolverInterface.

Definition at line 340 of file OsiSolverInterface.hpp.

5.31.3.5 virtual bool OsiSolverInterface::getHintParam (OsiHintParam *key*, bool & *yesNo*) const [inline, virtual]

Get a hint parameter (sense only)

Return only the sense (true/false) of the hint.

Reimplemented in OsiGrbSolverInterface.

Definition at line 352 of file OsiSolverInterface.hpp.

5.31.3.6 void OsiSolverInterface::copyParameters (OsiSolverInterface & *rhs*)

Copy all parameters in this section from one solver to another.

Note that the current implementation also copies the appData block, message handler, and rowCutDebugger. Arguably these should have independent copy methods.

5.31.3.7 double OsiSolverInterface::getIntegerTolerance ( ) const [inline]

Return the integrality tolerance of the underlying solver.

We should be able to get an integrality tolerance, but until that time just use the primal tolerance

Definition at line 379 of file OsiSolverInterface.hpp.

5.31.3.8 virtual CoinWarmStart* OsiSolverInterface::getEmptyWarmStart ( ) const [pure virtual]

Get an empty warm start object.

This routine returns an empty warm start object. Its purpose is to provide a way for a client to acquire a warm start object of the appropriate type for the solver, which can then be resized and modified as desired.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.9 virtual CoinWarmStart* OsiSolverInterface::getWarmStart ( ) const [pure virtual]

Get warm start information.

Return warm start information for the current state of the solver interface. If there is no valid warm start information, an empty warm start object wil be returned.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.10 virtual CoinWarmStart* OsiSolverInterface::getPointerToWarmStart (bool & *mustDelete*) [virtual]

Get warm start information.

Return warm start information for the current state of the solver interface. If there is no valid warm start information, an empty warm start object wil be returned. This does not necessarily create an object - may just point to one. must Delete set true if user should delete returned object.

5.31.3.11 virtual bool OsiSolverInterface::setWarmStart (const CoinWarmStart * *warmstart*) [pure virtual]

Set warm start information.

Return true or false depending on whether the warm start information was accepted or not. By definition, a call to setWarmStart with a null parameter should cause the solver interface to refresh its warm start information from the underlying solver.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.12 virtual const char* OsiSolverInterface::getRowSense ( ) const [pure virtual]

Get a pointer to an array[getNumRows()] of row constraint senses.

- 'L': <= constraint
- 'E': = constraint
- 'G': >= constraint
- 'R': ranged constraint
- 'N': free constraint

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.13 virtual const double* OsiSolverInterface::getRightHandSide ( ) const [pure virtual]

Get a pointer to an array[getNumRows()] of row right-hand sides.

- if getRowSense()[i] == 'L' then getRightHandSide()[i] == getRowUpper()[i]
- if getRowSense()[i] == 'G' then getRightHandSide()[i] == getRowLower()[i]
- if getRowSense()[i] == 'R' then getRightHandSide()[i] == getRowUpper()[i]
- if getRowSense()[i] == 'N' then getRightHandSide()[i] == 0.0

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.14 virtual const double* OsiSolverInterface::getRowRange ( ) const [pure virtual]

Get a pointer to an array[getNumRows()] of row ranges.

- if getRowSense()[i] == 'R' then getRowRange()[i] == getRowUpper()[i] - getRowLower()[i]
- if getRowSense()[i] != 'R' then getRowRange()[i] is 0.0

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.15 virtual double OsiSolverInterface::getObjSense ( ) const [pure virtual]

Get the objective function sense.

- 1 for minimisation (default)
- -1 for maximisation

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.16 virtual bool OsiSolverInterface::isInteger (int *colIndex*) const [virtual]

Return true if the variable is integer.

This method returns true if the variable is binary or general integer.

5.31.3.17 const char* OsiSolverInterface::columnType (bool *refresh* = false) const [inline]

Return an array[getNumCols()] of column types.

Deprecated

See getColType

Definition at line 586 of file OsiSolverInterface.hpp.

5.31.3.18 virtual const char* OsiSolverInterface::getColType (bool *refresh* = false) const [virtual]

Return an array[getNumCols()] of column types.

- 0 - continuous
- 1 - binary
- 2 - general integer

If `refresh` is true, the classification of integer variables as binary or general integer will be reevaluated. If the current bounds are [0,1], or if the variable is fixed at 0 or 1, it will be classified as binary, otherwise it will be classified as general integer.

5.31.3.19 virtual CoinPackedMatrix* OsiSolverInterface::getMutableMatrixByRow ( ) const [inline, virtual]

Get a pointer to a mutable row-wise copy of the matrix.

Returns NULL if the request is not meaningful (i.e., the OSI will not recognise any modifications to the matrix).

Definition at line 613 of file OsiSolverInterface.hpp.

5.31.3.20 virtual CoinPackedMatrix* OsiSolverInterface::getMutableMatrixByCol ( ) const [inline, virtual]

Get a pointer to a mutable column-wise copy of the matrix.

Returns NULL if the request is not meaningful (i.e., the OSI will not recognise any modifications to the matrix).

Definition at line 620 of file OsiSolverInterface.hpp.

5.31.3.21 virtual const double* OsiSolverInterface::getRowActivity ( ) const [pure virtual]

Get a pointer to array[getNumRows()] of row activity levels.

The row activity for a row is the left-hand side evaluated at the current solution.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.22 virtual std::vector<double*> OsiSolverInterface::getDualRays (int *maxNumRays,* bool *fullRay* = false) const [pure virtual]

Get as many dual rays as the solver can provide.

In case of proven primal infeasibility there should (with high probability) be at least one.

The first getNumRows() ray components will always be associated with the row duals (as returned by getRowPrice()). If fullRay is true, the final getNumCols() entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

Note

Implementors of solver interfaces note that the double pointers in the vector should point to arrays of length getNumRows() (fullRay = false) or (getNumRows()+getNumCols()) (fullRay = true) and they should be allocated with new[].
Clients of solver interfaces note that it is the client's responsibility to free the double pointers in the vector using delete[]. Clients are reminded that a problem can be dual and primal infeasible.

Implementedin OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.23 virtual std::vector<double*> OsiSolverInterface::getPrimalRays (int *maxNumRays*) const [pure virtual]

Get as many primal rays as the solver can provide.

In case of proven dual infeasibility there should (with high probability) be at least one.

Note

Implementors of solver interfaces note that the double pointers in the vector should point to arrays of length getNumCols() and they should be allocated with new[]. Clients of solver interfaces note that it is the client's responsibility to free the double pointers in the vector using delete[]. Clients are reminded that a problem can be dual and primal infeasible.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.24 virtual OsiVectorInt OsiSolverInterface::getFractionalIndices (const double *etol* = 1.e-05) const [virtual]

Get vector of indices of primal variables which are integer variables but have fractional values in the current solution.

5.31.3.25 virtual void OsiSolverInterface::setObjective (const double * *array*) [virtual]

Set the objective coefficients for all columns.

array [getNumCols()] is an array of values for the objective. This defaults to a series of set operations and is here for speed.

5.31.3.26 virtual void OsiSolverInterface::setObjSense (double *s*) [pure virtual]

Set the objective function sense.

Use 1 for minimisation (default), -1 for maximisation.

Note

Implementors note that objective function sense is a parameter of the OSI, not a property of the problem. Objective sense can be set prior to problem load and should not be affected by loading a new problem.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.27 virtual void OsiSolverInterface::setColLower (int *elementIndex*, double *elementValue*) [pure virtual]

Set a single column lower bound.

Use -getInfinity() for -infinity.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.28 virtual void OsiSolverInterface::setColLower (const double * *array*) [virtual]

Set the lower bounds for all columns.

array [getNumCols()] is an array of values for the lower bounds. This defaults to a series of set operations and is here for speed.

5.31.3.29 virtual void OsiSolverInterface::setColUpper (int *elementIndex,* double *elementValue*) [pure virtual]

Set a single column upper bound.

Use getInfinity() for infinity.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.30 virtual void OsiSolverInterface::setColUpper (const double * *array*) [virtual]

Set the upper bounds for all columns.

array [getNumCols()] is an array of values for the upper bounds. This defaults to a series of set operations and is here for speed.

5.31.3.31 virtual void OsiSolverInterface::setColBounds (int *elementIndex,* double *lower,* double *upper*) [inline, virtual]

Set a single column lower and upper bound.

The default implementation just invokes setColLower() and setColUpper()

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

Definition at line 771 of file OsiSolverInterface.hpp.

5.31.3.32 virtual void OsiSolverInterface::setColSetBounds (const int * *indexFirst,* const int * *indexLast,* const double * *boundList*) [virtual]

Set the upper and lower bounds of a set of columns.

The default implementation just invokes setColBounds() over and over again. For each column, boundList must contain both a lower and upper bound, in that order.

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.33 virtual void OsiSolverInterface::setRowLower (int *elementIndex,* double *elementValue*) [pure virtual]

Set a single row lower bound.

Use -getInfinity() for -infinity.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface,

OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.34 virtual void OsiSolverInterface::setRowUpper (int *elementIndex,* double *elementValue*) [pure virtual]

Set a single row upper bound.

Use getInfinity() for infinity.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.35 virtual void OsiSolverInterface::setRowBounds (int *elementIndex,* double *lower,* double *upper*) [inline, virtual]

Set a single row lower and upper bound.

The default implementation just invokes setRowLower() and setRowUpper()

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

Definition at line 798 of file OsiSolverInterface.hpp.

5.31.3.36 virtual void OsiSolverInterface::setRowSetBounds (const int * *indexFirst,* const int * *indexLast,* const double * *boundList*) [virtual]

Set the bounds on a set of rows.

The default implementation just invokes setRowBounds() over and over again. For each row, boundList must contain both a lower and upper bound, in that order.

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.37 virtual void OsiSolverInterface::setRowSetTypes (const int * *indexFirst,* const int * *indexLast,* const char * *senseList,* const double * *rhsList,* const double * *rangeList*) [virtual]

Set the type of a set of rows.

The default implementation just invokes setRowType() over and over again.

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.38 virtual void OsiSolverInterface::setColSolution (const double * *colsol*) [pure virtual]

Set the primal solution variable values.

colsol[getNumCols()] is an array of values for the primal variables. These values are copied to memory owned by the solver interface object or the solver. They will be re-

turned as the result of getColSolution() until changed by another call to setColSolution() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.39 virtual void OsiSolverInterface::setRowPrice (const double * *rowprice*) [pure virtual]

Set dual solution variable values.

rowprice[getNumRows()] is an array of values for the dual variables. These values are copied to memory owned by the solver interface object or the solver. They will be returned as the result of getRowPrice() until changed by another call to setRowPrice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.40 virtual int OsiSolverInterface::reducedCostFix (double *gap,* bool *justInteger* = true) [virtual]

Fix variables at bound based on reduced cost.

For variables currently at bound, fix the variable at bound if the reduced cost exceeds the gap. Return the number of variables fixed.

If justInteger is set to false, the routine will also fix continuous variables, but the test still assumes a delta of 1.0.

5.31.3.41 virtual std::string OsiSolverInterface::dfltRowColName (char *rc,* int *ndx,* unsigned *digits* = 7) const [virtual]

Generate a standard name of the form Rnnnnnnn or Cnnnnnnn.

Set rc to 'r' for a row name, 'c' for a column name. The 'nnnnnnn' part is generated from ndx and will contain 7 digits by default, padded with zeros if necessary. As a special case, ndx = getNumRows() is interpreted as a request for the name of the objective function. OBJECTIVE is returned, truncated to digits+1 characters to match the row and column names.

5.31.3.42 virtual std::string OsiSolverInterface::getRowName (int *rowIndex,* unsigned *maxLen* = static_cast< unsigned >(std::string::npos)) const [virtual]

Return the name of the row.

The routine will *always* return some name, regardless of the name discipline or the level of support by an OsiXXX derived class. Use maxLen to limit the length.

5.31.3.43 virtual const OsiNameVec& OsiSolverInterface::getRowNames ( ) [virtual]

Return a pointer to a vector of row names.

If the name discipline (#OsiNameDiscipline) is auto, the return value will be a vector of length zero. If the name discipline is lazy, the vector will contain only names supplied by the client and will be no larger than needed to hold those names; entries not supplied will be null strings. In particular, the objective name is *not* included in the vector for lazy names. If the name discipline is full, the vector will have getNumRows() names, either supplied or generated, plus one additional entry for the objective name.

5.31.3.44 virtual void OsiSolverInterface::setRowName (int *ndx,* std::string *name*) [virtual]

Set a row name.

Quietly does nothing if the name discipline (#OsiNameDiscipline) is auto. Quietly fails if the row index is invalid.

Reimplemented in OsiGlpkSolverInterface, and OsiGrbSolverInterface.

5.31.3.45 virtual void OsiSolverInterface::setRowNames (OsiNameVec & *srcNames,* int *srcStart,* int *len,* int *tgtStart*) [virtual]

Set multiple row names.

The run of len entries starting at srcNames[srcStart] are installed as row names starting at row index tgtStart. The base class implementation makes repeated calls to setRowName.

5.31.3.46 virtual void OsiSolverInterface::deleteRowNames (int *tgtStart,* int *len*) [virtual]

Delete len row names starting at index tgtStart.

The specified row names are removed and the remaining row names are copied down to close the gap.

5.31.3.47 virtual std::string OsiSolverInterface::getColName (int *colIndex,* unsigned *maxLen* = static_cast< unsigned >(std::string::npos)) const [virtual]

Return the name of the column.

The routine will *always* return some name, regardless of the name discipline or the level of support by an OsiXXX derived class. Use maxLen to limit the length.

5.31.3.48 virtual const OsiNameVec& OsiSolverInterface::getColNames ( ) [virtual]

Return a pointer to a vector of column names.

If the name discipline (#OsiNameDiscipline) is auto, the return value will be a vector of length zero. If the name discipline is lazy, the vector will contain only names supplied by the client and will be no larger than needed to hold those names; entries not supplied will be null strings. If the name discipline is full, the vector will have getNumCols() names,

either supplied or generated.

5.31.3.49 virtual void OsiSolverInterface::setColName (int *ndx,* std::string *name*) [virtual]

Set a column name.

Quietly does nothing if the name discipline (#OsiNameDiscipline) is auto. Quietly fails if the column index is invalid.

Reimplemented in OsiGlpkSolverInterface, and OsiGrbSolverInterface.

5.31.3.50 virtual void OsiSolverInterface::setColNames (OsiNameVec & *srcNames,* int *srcStart,* int *len,* int *tgtStart*) [virtual]

Set multiple column names.

The run of len entries starting at srcNames[srcStart] are installed as column names starting at column index tgtStart. The base class implementation makes repeated calls to setColName.

5.31.3.51 virtual void OsiSolverInterface::deleteColNames (int *tgtStart,* int *len*) [virtual]

Delete len column names starting at index tgtStart.

The specified column names are removed and the remaining column names are copied down to close the gap.

5.31.3.52 void OsiSolverInterface::setRowColNames (const CoinMpsIO & *mps*)

Set row and column names from a CoinMpsIO object.

Also sets the name of the objective function. If the name discipline is auto, you get what you asked for. This routine does not use setRowName or setColName.

5.31.3.53 void OsiSolverInterface::setRowColNames (CoinModel & *mod*)

Set row and column names from a CoinModel object.

If the name discipline is auto, you get what you asked for. This routine does not use setRowName or setColName.

5.31.3.54 void OsiSolverInterface::setRowColNames (CoinLpIO & *mod*)

Set row and column names from a CoinLpIO object.

Also sets the name of the objective function. If the name discipline is auto, you get what you asked for. This routine does not use setRowName or setColName.

5.31.3.55 virtual void OsiSolverInterface::addCol (const CoinPackedVectorBase & *vec,* const double *collb,* const double *colub,* const double *obj*) [pure virtual]

Add a column (primal variable) to the problem.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface,

OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.56 virtual void OsiSolverInterface::addCol (const CoinPackedVectorBase & *vec,* const double *collb,* const double *colub,* const double *obj,* std::string *name*) [virtual]

Add a named column (primal variable) to the problem.

The default implementation adds the column, then changes the name. This can surely be made more efficient within an OsiXXX class.

5.31.3.57 virtual void OsiSolverInterface::addCol (int *numberElements,* const int * *rows,* const double * *elements,* const double *collb,* const double *colub,* const double *obj*) [virtual]

Add a column (primal variable) to the problem.

5.31.3.58 virtual void OsiSolverInterface::addCol (int *numberElements,* const int * *rows,* const double * *elements,* const double *collb,* const double *colub,* const double *obj,* std::string *name*) [virtual]

Add a named column (primal variable) to the problem.

The default implementation adds the column, then changes the name. This can surely be made more efficient within an OsiXXX class.

5.31.3.59 virtual void OsiSolverInterface::addCols (const int *numcols,* const CoinPackedVectorBase *const * *cols,* const double * *collb,* const double * *colub,* const double * *obj*) [virtual]

Add a set of columns (primal variables) to the problem.

The default implementation simply makes repeated calls to addCol().

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.60 virtual void OsiSolverInterface::addCols (const int *numcols,* const int * *columnStarts,* const int * *rows,* const double * *elements,* const double * *collb,* const double * *colub,* const double * *obj*) [virtual]

Add a set of columns (primal variables) to the problem.

The default implementation simply makes repeated calls to addCol().

5.31.3.61 int OsiSolverInterface::addCols (CoinModel & *modelObject*)

Add columns from a model object.

returns -1 if object in bad state (i.e. has row information) otherwise number of errors modelObject non const as can be regularized as part of build

5.31.3.62 virtual void OsiSolverInterface::deleteCols (const int *num*, const int * *colIndices*) [pure virtual]

Remove a set of columns (primal variables) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted variables are nonbasic.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.63 virtual void OsiSolverInterface::addRow (const CoinPackedVectorBase & *vec*, const double *rowlb*, const double *rowub*) [pure virtual]

Add a row (constraint) to the problem.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.64 virtual void OsiSolverInterface::addRow (const CoinPackedVectorBase & *vec*, const double *rowlb*, const double *rowub*, std::string *name*) [virtual]

Add a named row (constraint) to the problem.

The default implementation adds the row, then changes the name. This can surely be made more efficient within an OsiXXX class.

5.31.3.65 virtual void OsiSolverInterface::addRow (const CoinPackedVectorBase & *vec*, const char *rowsen*, const double *rowrhs*, const double *rowrng*) [pure virtual]

Add a row (constraint) to the problem.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.66 virtual void OsiSolverInterface::addRow (const CoinPackedVectorBase & *vec*, const char *rowsen*, const double *rowrhs*, const double *rowrng*, std::string *name*) [virtual]

Add a named row (constraint) to the problem.

The default implementation adds the row, then changes the name. This can surely be made more efficient within an OsiXXX class.

5.31.3.67 virtual void OsiSolverInterface::addRow (int *numberElements*, const int * *columns*, const double * *element*, const double *rowlb*, const double *rowub*) [virtual]

Add a row (constraint) to the problem.

Converts to addRow(CoinPackedVectorBase&,const double,const double).

5.31.3.68 virtual void OsiSolverInterface::addRows (const int *numrows,* const CoinPackedVectorBase ∗const ∗ *rows,* const double ∗ *rowlb,* const double ∗ *rowub*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.69 virtual void OsiSolverInterface::addRows (const int *numrows,* const CoinPackedVectorBase ∗const ∗ *rows,* const char ∗ *rowsen,* const double ∗ *rowrhs,* const double ∗ *rowrng*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.70 virtual void OsiSolverInterface::addRows (const int *numrows,* const int ∗ *rowStarts,* const int ∗ *columns,* const double ∗ *element,* const double ∗ *rowlb,* const double ∗ *rowub*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

5.31.3.71 int OsiSolverInterface::addRows (CoinModel & *modelObject*)

Add rows from a CoinModel object.

Returns -1 if the object is in the wrong state (*i.e.*, has column-major information), otherwise the number of errors.

The modelObject is not const as it can be regularized as part of the build.

5.31.3.72 virtual void OsiSolverInterface::deleteRows (const int *num,* const int ∗ *rowIndices*) [pure virtual]

Delete a set of rows (constraints) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted rows are loose.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.73 virtual void OsiSolverInterface::replaceMatrixOptional (const CoinPackedMatrix &) [inline, virtual]

Replace the constraint matrix.

I (JJF) am getting annoyed because I can't just replace a matrix. The default behavior of this is do nothing so only use where that would not matter, e.g. strengthening a matrix for MIP.

Definition at line 1221 of file OsiSolverInterface.hpp.

5.31.3.74 virtual void OsiSolverInterface::replaceMatrix (const CoinPackedMatrix &) [inline, virtual]

Replace the constraint matrix.

And if it does matter (not used at present)

Definition at line 1227 of file OsiSolverInterface.hpp.

5.31.3.75 virtual void OsiSolverInterface::saveBaseModel ( ) [inline, virtual]

Save a copy of the base model.

If solver wants it can save a copy of "base" (continuous) model here.

Definition at line 1233 of file OsiSolverInterface.hpp.

5.31.3.76 virtual void OsiSolverInterface::restoreBaseModel (int *numberRows*) [virtual]

Reduce the constraint system to the specified number of constraints.

If solver wants it can restore a copy of "base" (continuous) model here.

Note

The name is somewhat misleading. Implementors should consider the opportunity to optimise behaviour in the common case where `numberRows` is exactly the number of original constraints. Do not, however, neglect the possibility that `numberRows` does not equal the number of original constraints.

5.31.3.77 virtual ApplyCutsReturnCode OsiSolverInterface::applyCuts (const OsiCuts & *cs*, double *effectivenessLb* = `0.0`) [virtual]

Apply a collection of cuts.

Only cuts which have an `effectiveness >= effectivenessLb` are applied.

- ReturnCode.getNumineffective() -- number of cuts which were not applied because they had an `effectiveness < effectivenessLb`
- ReturnCode.getNuminconsistent() -- number of invalid cuts
- ReturnCode.getNuminconsistentWrtIntegerModel() -- number of cuts that are invalid with respect to this integer model
- ReturnCode.getNuminfeasible() -- number of cuts that would make this integer model infeasible

- ReturnCode.getNumApplied() -- number of integer cuts which were applied to the integer model
- cs.size() == getNumineffective() + getNuminconsistent() + getNuminconsistentWrtIntegerModel() + getNuminfeasible() + getNumApplied()

5.31.3.78 virtual void OsiSolverInterface::applyRowCuts (int *numberCuts,* const OsiRowCut * *cuts*) [virtual]

Apply a collection of row cuts which are all effective.

applyCuts seems to do one at a time which seems inefficient. Would be even more efficient to pass an array of pointers.

5.31.3.79 virtual void OsiSolverInterface::applyRowCuts (int *numberCuts,* const OsiRowCut ** *cuts*) [virtual]

Apply a collection of row cuts which are all effective.

This is passed in as an array of pointers.

5.31.3.80 virtual void OsiSolverInterface::loadProblem (const CoinPackedMatrix & *matrix,* const double * *collb,* const double * *colub,* const double * *obj,* const double * *rowlb,* const double * *rowub*) [pure virtual]

Load in a problem by copying the arguments.

The constraints on the rows are given by lower and upper bounds.

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Note that the default values for rowub and rowlb produce the constraint -infty <= ax <= infty. This is probably not what you want.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.81 virtual void OsiSolverInterface::assignProblem (CoinPackedMatrix *& *matrix,* double *& *collb,* double *& *colub,* double *& *obj,* double *& *rowlb,* double *& *rowub*) [pure virtual]

Load in a problem by assuming ownership of the arguments.

The constraints on the rows are given by lower and upper bounds.

For default argument values see the matching loadProblem method.

Warning

The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.82 **virtual void OsiSolverInterface::loadProblem (const CoinPackedMatrix & *matrix,* const double * *collb,* const double * *colub,* const double * *obj,* const char * *rowsen,* const double * *rowrhs,* const double * *rowrng*) [pure virtual]**

Load in a problem by copying the arguments.

The constraints on the rows are given by sense/rhs/range triplets.

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are >=
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

Note that the default values for rowsen, rowrhs, and rowrng produce the constraint ax >= 0.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.83 **virtual void OsiSolverInterface::assignProblem (CoinPackedMatrix *& *matrix,* double *& *collb,* double *& *colub,* double *& *obj,* char *& *rowsen,* double *& *rowrhs,* double *& *rowrng*) [pure virtual]**

Load in a problem by assuming ownership of the arguments.

The constraints on the rows are given by sense/rhs/range triplets.

For default argument values see the matching loadProblem method.

Warning

The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.84 virtual void OsiSolverInterface::loadProblem (const int *numcols*, const int *numrows*, const CoinBigIndex * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [pure virtual]

Load in a problem by copying the arguments.

The constraint matrix is is specified with standard column-major column starts / row indices / coefficients vectors. The constraints on the rows are given by lower and upper bounds.

The matrix vectors must be gap-free. Note that `start` must have `numcols+1` entries so that the length of the last column can be calculated as `start[numcols]-start[numcols-1]`.

See the previous loadProblem method using rowlb and rowub for default argument values.

5.31.3.85 virtual void OsiSolverInterface::loadProblem (const int *numcols*, const int *numrows*, const CoinBigIndex * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [pure virtual]

Load in a problem by copying the arguments.

The constraint matrix is is specified with standard column-major column starts / row indices / coefficients vectors. The constraints on the rows are given by sense/rhs/range triplets.

The matrix vectors must be gap-free. Note that `start` must have `numcols+1` entries so that the length of the last column can be calculated as `start[numcols]-start[numcols-1]`.

See the previous loadProblem method using sense/rhs/range for default argument values.

5.31.3.86 virtual int OsiSolverInterface::loadFromCoinModel (CoinModel & *modelObject*, bool *keepSolution* = `false`) [virtual]

Load a model from a CoinModel object.

Return the number of errors encountered.

The modelObject parameter cannot be const as it may be changed as part of process. If keepSolution is true will try and keep warmStart.

5.31.3.87 virtual int OsiSolverInterface::readMps (const char * *filename*, const char * *extension* = `"mps"`) [virtual]

Read a problem in MPS format from the given filename.

The default implementation uses CoinMpsIO::readMps() to read the MPS file and returns the number of errors encountered.

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.88 virtual int OsiSolverInterface::readMps (const char * *filename*, const char * *extension*, int & *numberSets*, CoinSet **& *sets*) [virtual]

Read a problem in MPS format from the given full filename.

This uses CoinMpsIO::readMps() to read the MPS file and returns the number of errors encountered. It also may return an array of set information

5.31.3.89 virtual int OsiSolverInterface::readGMPL (const char * *filename*, const char * *dataname* = NULL) [virtual]

Read a problem in GMPL format from the given filenames.

The default implementation uses CoinMpsIO::readGMPL(). This capability is available only if the third-party package Glpk is installed.

5.31.3.90 virtual void OsiSolverInterface::writeMps (const char * *filename*, const char * *extension* = "mps", double *objSense* = 0.0) const [pure virtual]

Write the problem in MPS format to the specified file.

If objSense is non-zero, a value of -1.0 causes the problem to be written with a maximization objective; +1.0 forces a minimization objective. If objSense is zero, the choice is left to the implementation.

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.91 int OsiSolverInterface::writeMpsNative (const char * *filename*, const char ** *rowNames*, const char ** *columnNames*, int *formatType* = 0, int *numberAcross* = 2, double *objSense* = 0.0, int *numberSOS* = 0, const CoinSet * *setInfo* = NULL) const

Write the problem in MPS format to the specified file with more control over the output.

Row and column names may be null. formatType is

- 0 - normal
- 1 - extra accuracy
- 2 - IEEE hex

Returns non-zero on I/O error

5.31.3.92 virtual void OsiSolverInterface::writeLp (const char * *filename*, const char * *extension* = "lp", double *epsilon* = 1e-5, int *numberAcross* = 10, int *decimals* = 5, double *objSense* = 0.0, bool *useRowNames* = true) const [virtual]

Write the problem into an Lp file of the given filename with the specified extension.

Coefficients with value less than epsilon away from an integer value are written as integers. Write at most numberAcross monomials on a line. Write non integer numbers with decimals digits after the decimal point.

The written problem is always a minimization problem. If the current problem is a maximization problem, the intended objective function for the written problem is the current objective function multiplied by -1. If the current problem is a minimization problem, the intended objective function for the written problem is the current objective function. If objSense $<$ 0, the intended objective function is multiplied by -1 before writing the problem. It is left unchanged otherwise.

Write objective function name and constraint names if useRowNames is true. This version calls writeLpNative().

5.31.3.93 **virtual void OsiSolverInterface::writeLp (FILE * *fp*, double *epsilon* = `1e-5`, int *numberAcross* = `10`, int *decimals* = `5`, double *objSense* = `0.0`, bool *useRowNames* = `true`) const** `[virtual]`

Write the problem into the file pointed to by the parameter fp.

Other parameters are similar to those of writeLp() with first parameter filename.

5.31.3.94 **int OsiSolverInterface::writeLpNative (const char * *filename*, char const *const *const *rowNames*, char const *const *const *columnNames*, const double *epsilon* = `1.0e-5`, const int *numberAcross* = `10`, const int *decimals* = `5`, const double *objSense* = `0.0`, const bool *useRowNames* = `true`) const**

Write the problem into an Lp file.

Parameters are similar to those of writeLp(), but in addition row names and column names may be given.

Parameter rowNames may be NULL, in which case default row names are used. If rowNames is not NULL, it must have exactly one entry per row in the problem and one additional entry (rowNames[getNumRows()] with the objective function name. These getNumRows()+1 entries must be distinct. If this is not the case, default row names are used. In addition, format restrictions are imposed on names (see CoinLpIO::is_invalid_name() for details).

Similar remarks can be made for the parameter columnNames which must either be NULL or have exactly getNumCols() distinct entries.

Write objective function name and constraint names if useRowNames is true.

5.31.3.95 **int OsiSolverInterface::writeLpNative (FILE * *fp*, char const *const *const *rowNames*, char const *const *const *columnNames*, const double *epsilon* = `1.0e-5`, const int *numberAcross* = `10`, const int *decimals* = `5`, const double *objSense* = `0.0`, const bool *useRowNames* = `true`) const**

Write the problem into the file pointed to by the parameter fp.

Other parameters are similar to those of writeLpNative() with first parameter filename.

5.31.3.96 virtual int OsiSolverInterface::readLp (const char * *filename,* const double *epsilon =* 1e-5) [virtual]

Read file in LP format from file with name filename.

See class CoinLpIO for description of this format.

5.31.3.97 int OsiSolverInterface::readLp (FILE * *fp,* const double *epsilon =* 1e-5)

Read file in LP format from the file pointed to by fp.

See class CoinLpIO for description of this format.

5.31.3.98 void OsiSolverInterface::setApplicationData (void * *appData*)

Set application data.

This is a pointer that the application can store into and retrieve from the solver interface. This field is available for the application to optionally define and use.

5.31.3.99 void OsiSolverInterface::setAuxiliaryInfo (OsiAuxInfo * *auxiliaryInfo*)

Create a clone of an Auxiliary Information object.

The base class just stores an application data pointer but can be more general. Application data pointer is designed for one user while this can be extended to cope with more general extensions.

5.31.3.100 virtual void OsiSolverInterface::passInMessageHandler (CoinMessageHandler * *handler*) [virtual]

Pass in a message handler.

It is the client's responsibility to destroy a message handler installed by this routine; it will not be destroyed when the solver interface is destroyed.

Reimplemented in OsiCpxSolverInterface, OsiMskSolverInterface, and OsiXprSolverInterface.

5.31.3.101 void OsiSolverInterface::findIntegers (bool *justCount*)

Identify integer variables and create corresponding objects.

Record integer variables and create an OsiSimpleInteger object for each one. All existing OsiSimpleInteger objects will be destroyed. If justCount then no objects created and we just store numberIntegers_

5.31.3.102 virtual int OsiSolverInterface::findIntegersAndSOS (bool *justCount*) [virtual]

Identify integer variables and SOS and create corresponding objects.

Record integer variables and create an OsiSimpleInteger object for each one. All existing OsiSimpleInteger objects will be destroyed. If the solver supports SOS then do the same for SOS.

If justCount then no objects created and we just store numberIntegers_ Returns number of SOS

5.31.3.103 void OsiSolverInterface::addObjects (int *numberObjects,* OsiObject ** *objects*)

Add in object information.

Objects are cloned; the owner can delete the originals.

5.31.3.104 double OsiSolverInterface::forceFeasible ( )

Use current solution to set bounds so current integer feasible solution will stay feasible.

Only feasible bounds will be used, even if current solution outside bounds. The amount of such violation will be returned (and if small can be ignored)

5.31.3.105 virtual void OsiSolverInterface::activateRowCutDebugger (const char * *modelName*) [virtual]

Activate the row cut debugger.

If `modelName` is in the set of known models then all cuts are checked to see that they do NOT cut off the optimal solution known to the debugger.

5.31.3.106 virtual void OsiSolverInterface::activateRowCutDebugger (const double * *solution,* bool *enforceOptimality* = `true`) [virtual]

Activate the row cut debugger using a full solution array.

Activate the debugger for a model not included in the debugger's internal database. Cuts will be checked to see that they do NOT cut off the given solution.

`solution` must be a full solution vector, but only the integer variables need to be correct. The debugger will fill in the continuous variables by solving an lp relaxation with the integer variables fixed as specified. If the given values for the continuous variables should be preserved, set `keepContinuous` to true.

5.31.3.107 const OsiRowCutDebugger* OsiSolverInterface::getRowCutDebugger ( ) const

Get the row cut debugger provided the solution known to the debugger is within the feasible region held in the solver.

If there is a row cut debugger object associated with model AND if the solution known to the debugger is within the solver's current feasible region (i.e., the column bounds held in the solver are compatible with the known solution) then a pointer to the debugger is returned which may be used to test validity of cuts.

Otherwise NULL is returned

5.31.3.108 OsiRowCutDebugger* OsiSolverInterface::getRowCutDebuggerAlways ( ) const

Get the row cut debugger object.

Return the row cut debugger object if it exists. One common usage of this method is

to obtain a debugger object in order to execute OsiRowCutDebugger::redoSolution (so that the stored solution is again compatible with the problem held in the solver).

5.31.3.109 virtual int OsiSolverInterface::canDoSimplexInterface ( ) const [virtual]

Return the simplex implementation level.

The return codes are:

- 0: the simplex interface is not implemented.
- 1: the Group 1 (tableau access) methods are implemented.
- 2: the Group 2 (pivoting) methods are implemented

The codes are cumulative - a solver which implements Group 2 also implements Group 1.

Reimplemented in OsiCpxSolverInterface, and OsiGrbSolverInterface.

5.31.3.110 virtual void OsiSolverInterface::enableFactorization ( ) const [virtual]

Prepare the solver for the use of tableau access methods.

Prepares the solver for the use of the tableau access methods, if any such preparation is required.

The `const` attribute is required due to the places this method may be called (e.g., within CglCutGenerator::generateCuts()).

Reimplemented in OsiCpxSolverInterface, and OsiGrbSolverInterface.

5.31.3.111 virtual void OsiSolverInterface::disableFactorization ( ) const [virtual]

Undo the effects of enableFactorization.

Reimplemented in OsiCpxSolverInterface, and OsiGrbSolverInterface.

5.31.3.112 virtual bool OsiSolverInterface::basisIsAvailable ( ) const [virtual]

Check if an optimal basis is available.

Returns true if the problem has been solved to optimality and a basis is available. This should be used to see if the tableau access operations are possible and meaningful.

Note

Implementors please note that this method may be called before enableFactorization.

Reimplemented in OsiCpxSolverInterface, and OsiGrbSolverInterface.

5.31.3.113 virtual void OsiSolverInterface::getBasisStatus (int * *cstat*, int * *rstat*) const [virtual]

Retrieve status information for column and row variables.

This method returns status as integer codes:

- 0: free
- 1: basic
- 2: nonbasic at upper bound
- 3: nonbasic at lower bound

The getWarmStart method provides essentially the same functionality for a simplex-oriented solver, but the implementation details are very different.

Note

Logical variables associated with rows are all assumed to have +1 coefficients, so for a <= constraint the logical will be at lower bound if the constraint is tight. Implementors may choose to implement this method as a wrapper which converts a CoinWarmStartBasis to the requested representation.

Reimplemented in OsiCpxSolverInterface, and OsiGrbSolverInterface.

5.31.3.114 **virtual int OsiSolverInterface::setBasisStatus (const int * *cstat,* const int * *rstat*)** `[virtual]`

Set the status of column and row variables and update the basis factorization and solution.

Status information should be coded as documented for getBasisStatus. Returns 0 if all goes well, 1 if something goes wrong.

This method differs from setWarmStart in the format of the input and in its immediate effect. Think of it as setWarmStart immediately followed by resolve, but no pivots are allowed.

Note

Implementors may choose to implement this method as a wrapper that calls setWarmStart and resolve if the no pivot requirement can be satisfied.

5.31.3.115 **virtual void OsiSolverInterface::getReducedGradient (double * *columnReducedCosts,* double * *duals,* const double * *c*) const** `[virtual]`

Calculate duals and reduced costs for the given objective coefficients.

The solver's objective coefficient vector is not changed.

5.31.3.116 **virtual void OsiSolverInterface::getBInvARow (int *row,* double * *z,* double * *slack* = NULL) const** `[virtual]`

Get a row of the tableau.

If `slack` is not null, it will be loaded with the coefficients for the artificial (logical) variables (i.e., the row of the basis inverse).

Reimplemented in OsiCpxSolverInterface.

5.31.3.117 virtual void OsiSolverInterface::getBasics (int * *index*) const [virtual]

Get indices of basic variables.

If the logical (artificial) for row i is basic, the index should be coded as (getNumCols + i). The order of indices must match the order of elements in the vectors returned by getBInvACol and getBInvCol.

Reimplemented in OsiCpxSolverInterface.

5.31.3.118 virtual void OsiSolverInterface::enableSimplexInterface (bool *doingPrimal*) [virtual]

Enables normal operation of subsequent functions.

This method is supposed to ensure that all typical things (like reduced costs, etc.) are updated when individual pivots are executed and can be queried by other methods. says whether will be doing primal or dual

5.31.3.119 virtual int OsiSolverInterface::pivot (int *colIn,* int *colOut,* int *outStatus*) [virtual]

Perform a pivot by substituting a colIn for colOut in the basis.

The status of the leaving variable is given in outStatus. Where 1 is to upper bound, -1 to lower bound Return code was undefined - now for OsiClp is 0 for okay, 1 if inaccuracy forced re-factorization (should be okay) and -1 for singular factorization

5.31.3.120 virtual int OsiSolverInterface::primalPivotResult (int *colIn,* int *sign,* int & *colOut,* int & *outStatus,* double & *t,* CoinPackedVector * *dx*) [virtual]

Obtain a result of the primal pivot Outputs: colOut -- leaving column, outStatus -- its status, t -- step size, and, if dx!=NULL, *dx -- primal ray direction.

Inputs: colIn -- entering column, sign -- direction of its change (+/-1). Both for colIn and colOut, artificial variables are index by the negative of the row index minus 1. Return code (for now): 0 -- leaving variable found, -1 -- everything else? Clearly, more informative set of return values is required Primal and dual solutions are updated

5.31.3.121 virtual OsiSolverInterface* OsiSolverInterface::clone (bool *copyData* = true) const [pure virtual]

Clone.

The result of calling clone(false) is defined to be equivalent to calling the default constructor OsiSolverInterface().

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.122 virtual void OsiSolverInterface::reset ( ) [virtual]

Reset the solver interface.

A call to reset() returns the solver interface to the same state as it would have if it had just been constructed by calling the default constructor OsiSolverInterface().

Reimplemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, and OsiGrbSolverInterface.

5.31.3.123 virtual void OsiSolverInterface::applyRowCut (const OsiRowCut & *rc*) [protected, pure virtual]

Apply a row cut (append to the constraint matrix).

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.124 virtual void OsiSolverInterface::applyColCut (const OsiColCut & *cc*) [protected, pure virtual]

Apply a column cut (adjust the bounds of one or more variables).

Implemented in OsiCpxSolverInterface, OsiGlpkSolverInterface, OsiGrbSolverInterface, OsiMskSolverInterface, OsiSpxSolverInterface, OsiXprSolverInterface, and OsiTestSolverInterface.

5.31.3.125 void OsiSolverInterface::setInitialData ( ) [protected]

Set OsiSolverInterface object state for default constructor.

This routine establishes the initial values of data fields in the OsiSolverInterface object when the object is created using the default constructor.

5.31.4 Friends And Related Function Documentation

5.31.4.1 void OsiSolverInterfaceCommonUnitTest (const OsiSolverInterface * *emptySi,* const std::string & *mpsDir,* const std::string & *netlibDir*) [friend]

A function that tests the methods in the OsiSolverInterface class.

Some time ago, if this method is compiled with optimization, the compilation took 10-15 minutes and the machine pages (has 256M core memory!)...

5.31.4.2 void OsiSolverInterfaceMpsUnitTest (const std::vector< OsiSolverInterface * > & *vecSiP,* const std::string & *mpsDir*) [friend]

A function that tests that a lot of problems given in MPS files (mostly the NETLIB problems) solve properly with all the specified solvers.

The routine creates a vector of NetLib problems (problem name, objective, various other characteristics), and a vector of solvers to be tested.

Each solver is run on each problem. The run is deemed successful if the solver reports the correct problem size after loading and returns the correct objective value after optimization.

If multiple solvers are available, the results are compared pairwise against the results reported by adjacent solvers in the solver vector. Due to limitations of the volume solver, it must be the last solver in vecEmptySiP.

5.31.5 Member Data Documentation

5.31.5.1 OsiRowCutDebugger* OsiSolverInterface::rowCutDebugger_ [mutable, protected]

Pointer to row cut debugger object.

Mutable so that we can update the solution held in the debugger while maintaining const'ness for the Osi object.

Definition at line 2002 of file OsiSolverInterface.hpp.

5.31.5.2 bool OsiSolverInterface::defaultHandler_ [protected]

Flag to say if the currrent handler is the default handler.

Indicates if the solver interface object is responsible for destruction of the handler (true) or if the client is responsible (false).

Definition at line 2011 of file OsiSolverInterface.hpp.

The documentation for this class was generated from the following file:

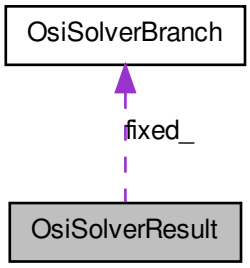
- OsiSolverInterface.hpp

5.32 OsiSolverResult Class Reference

Solver Result Class.

`#include <OsiSolverBranch.hpp>`

Collaboration diagram for OsiSolverResult:



Public Member Functions

Add and Get methods

- void createResult (const OsiSolverInterface &solver, const double *lowerBefore, const double *upperBefore)
  Create result.
- void restoreResult (OsiSolverInterface &solver) const
  Restore result.
- const CoinWarmStartBasis & basis () const
  Get basis.
- double objectiveValue () const
  Objective value (as minimization)
- const double * primalSolution () const
  Primal solution.
- const double * dualSolution () const
  Dual solution.
- const OsiSolverBranch & fixed () const
  Extra fixed.

Constructors and destructors

- OsiSolverResult ()
  Default Constructor.
- OsiSolverResult (const OsiSolverInterface &solver, const double *lowerBefore, const double *upperBefore)
  Constructor from solver.
- OsiSolverResult (const OsiSolverResult &rhs)
  Copy constructor.
- OsiSolverResult & operator= (const OsiSolverResult &rhs)
  Assignment operator.
- ~OsiSolverResult ()
  Destructor.

5.32.1 Detailed Description

Solver Result Class.

This provides information on a result as a set of tighter bounds on both ways

Definition at line 83 of file OsiSolverBranch.hpp.

The documentation for this class was generated from the following file:

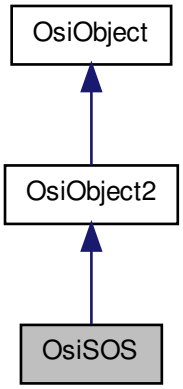
- OsiSolverBranch.hpp

5.33 OsiSOS Class Reference

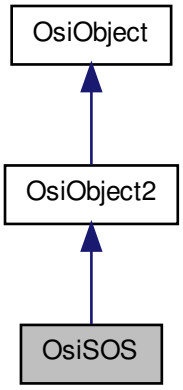
Define Special Ordered Sets of type 1 and 2.

`#include <OsiBranchingObject.hpp>`

Inheritance diagram for OsiSOS:



Collaboration diagram for OsiSOS:



Public Member Functions

- OsiSOS (const OsiSolverInterface ∗solver, int numberMembers, const int ∗which, const double ∗weights, int type=1)

  Useful constructor - which are indices and weights are also given.
- virtual OsiObject ∗ clone () const

  Clone.
- virtual double infeasibility (const OsiBranchingInformation ∗info, int &whichWay) const

  Infeasibility - large is 0.5.
- virtual double feasibleRegion (OsiSolverInterface ∗solver, const OsiBranchingInformation ∗info) const

  Set bounds to fix the variable at the current (integer) value.
- virtual OsiBranchingObject ∗ createBranch (OsiSolverInterface ∗solver, const OsiBranchingInformation ∗info, int way) const

  Creates a branching object.
- virtual double upEstimate () const

  Return "up" estimate (default 1.0e-5)
- virtual double downEstimate () const

  Return "down" estimate (default 1.0e-5)
- virtual void resetSequenceEtc (int numberColumns, const int ∗originalColumns)

  Redoes data when sequence numbers change.
- int numberMembers () const

  Number of members.

- const int * members () const

  Members (indices in range 0 ... numberColumns-1)
- int sosType () const

  SOS type.
- int setType () const

  SOS type.
- const double * weights () const

  Array of weights.
- virtual bool canDoHeuristics () const

  Return true if object can take part in normal heuristics.
- void setIntegerValued (bool yesNo)

  Set whether set is integer valued or not.
- virtual bool canHandleShadowPrices () const

  Return true if knows how to deal with Pseudo Shadow Prices.
- void setNumberMembers (int value)

  Set number of members.
- int * mutableMembers () const

  Members (indices in range 0 ... numberColumns-1)
- void setSosType (int value)

  Set SOS type.
- double * mutableWeights () const

  Array of weights.

Protected Attributes

- int * members_

  data
- double * weights_

  Weights.
- int numberMembers_

  Number of members.
- int sosType_

  SOS type.
- bool integerValued_

  Whether integer valued.

5.33.1 Detailed Description

Define Special Ordered Sets of type 1 and 2.

These do not have to be integer - so do not appear in lists of integers.

which_ points columns of matrix

Definition at line 674 of file OsiBranchingObject.hpp.

5.33.2 Constructor & Destructor Documentation

5.33.2.1 OsiSOS::OsiSOS (const OsiSolverInterface * *solver,* int *numberMembers,* const int * *which,* const double * *weights,* int *type* = 1)

Useful constructor - which are indices and weights are also given.

If null then 0,1,2.. type is SOS type

5.33.3 Member Function Documentation

5.33.3.1 virtual double OsiSOS::feasibleRegion (OsiSolverInterface * *solver,* const OsiBranchingInformation * *info*) const [virtual]

Set bounds to fix the variable at the current (integer) value.

Given an integer value, set the lower and upper bounds to fix the variable. Returns amount it had to move variable.

Implements OsiObject.

5.33.3.2 virtual OsiBranchingObject* OsiSOS::createBranch (OsiSolverInterface * *solver,* const OsiBranchingInformation * *info,* int *way*) const [virtual]

Creates a branching object.

The preferred direction is set by `way`, 0 for down, 1 for up.

Reimplemented from OsiObject.

5.33.4 Member Data Documentation

5.33.4.1 int* OsiSOS::members_ [protected]

data

Members (indices in range 0 ... numberColumns-1)

Definition at line 774 of file OsiBranchingObject.hpp.

The documentation for this class was generated from the following file:

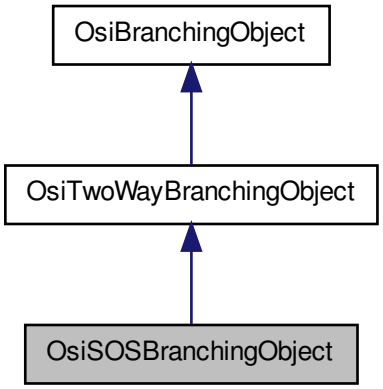
- OsiBranchingObject.hpp

5.34 OsiSOSBranchingObject Class Reference

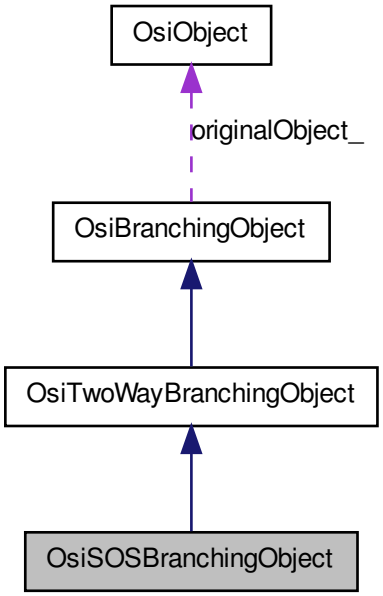
Branching object for Special ordered sets.

`#include <OsiBranchingObject.hpp>`

Inheritance diagram for OsiSOSBranchingObject:



Collaboration diagram for OsiSOSBranchingObject:



Public Member Functions

- virtual OsiBranchingObject * clone () const

  Clone.
- virtual double branch (OsiSolverInterface *solver)

  Does next branch and updates state.
- virtual void print (const OsiSolverInterface *solver=NULL)

  Print something about branch - only if log level high.

5.34.1 Detailed Description

Branching object for Special ordered sets.

Definition at line 789 of file OsiBranchingObject.hpp.

The documentation for this class was generated from the following file:

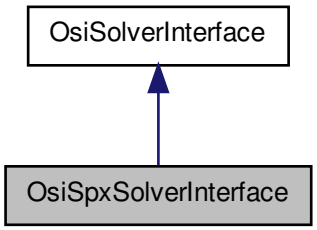
- OsiBranchingObject.hpp

5.35 OsiSpxSolverInterface Class Reference

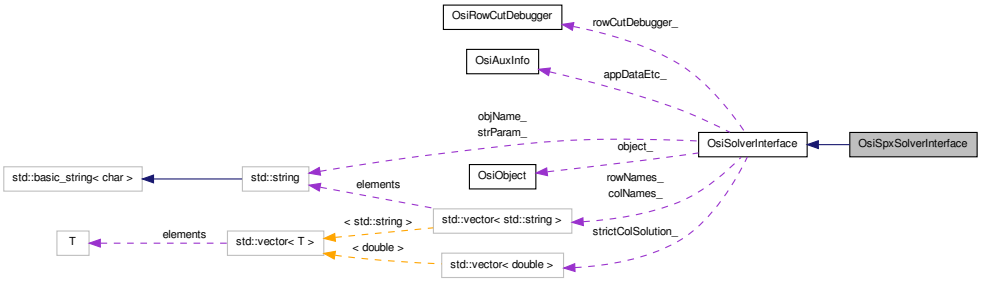
SoPlex Solver Interface Instantiation of OsiSpxSolverInterface for SoPlex.

`#include <OsiSpxSolverInterface.hpp>`

Inheritance diagram for OsiSpxSolverInterface:



Collaboration diagram for OsiSpxSolverInterface:



Public Member Functions

- virtual void setObjSense (double s)

  Set objective function sense (1 for min (default), -1 for max,)
- virtual void setColSolution (const double ∗colsol)

  Set the primal solution column values.
- virtual void setRowPrice (const double ∗rowprice)

  Set dual solution vector.

Solve methods

- virtual void initialSolve ()
  Solve initial LP relaxation.
- virtual void resolve ()
  Resolve an LP relaxation after problem modification.
- virtual void branchAndBound ()
  Invoke solver's built-in enumeration algorithm.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the volume algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

- bool setIntParam (OsiIntParam key, int value)
  Set an integer parameter.
- bool setDblParam (OsiDblParam key, double value)
  Set a double parameter.
- bool getIntParam (OsiIntParam key, int &value) const
  Get an integer parameter.
- bool getDblParam (OsiDblParam key, double &value) const
  Get a double parameter.
- bool getStrParam (OsiStrParam key, std::string &value) const
  Get a string parameter.
- void **setTimeLimit** (double value)
- double **getTimeLimit** () const

Methods returning info on how the solution process terminated

- virtual bool isAbandoned () const
  Are there a numerical difficulties?
- virtual bool isProvenOptimal () const
  Is optimality proven?
- virtual bool isProvenPrimalInfeasible () const
  Is primal infeasiblity proven?
- virtual bool isProvenDualInfeasible () const
  Is dual infeasiblity proven?
- virtual bool isDualObjectiveLimitReached () const
  Is the given dual objective limit reached?
- virtual bool isIterationLimitReached () const
  Iteration limit reached?
- virtual bool isTimeLimitReached () const
  Time limit reached?

WarmStart related methods

- CoinWarmStart * getEmptyWarmStart () const
  Get empty warm start object.
- virtual CoinWarmStart * getWarmStart () const
  Get warmstarting information.
- virtual bool setWarmStart (const CoinWarmStart *warmstart)
  Set warmstarting information.

**Hotstart related methods (primarily used in strong branching).
**

The user can create a hotstart (a snapshot) of the optimization process then reoptimize over and over again always starting from there.

***NOTE**: between hotstarted optimizations only bound changes are allowed.*

- virtual void markHotStart ()
  Create a hotstart point of the optimization process.
- virtual void solveFromHotStart ()
  Optimize starting from the hotstart.
- virtual void unmarkHotStart ()
  Delete the snapshot.

Methods related to querying the input data

- virtual int getNumCols () const
  Get number of columns.
- virtual int getNumRows () const
  Get number of rows.
- virtual int getNumElements () const
  Get number of nonzero elements.
- virtual const double * getColLower () const
  Get pointer to array[getNumCols()] of column lower bounds.
- virtual const double * getColUpper () const
  Get pointer to array[getNumCols()] of column upper bounds.
- virtual const char * getRowSense () const
  Get pointer to array[getNumRows()] of row constraint senses.
- virtual const double * getRightHandSide () const
  Get pointer to array[getNumRows()] of rows right-hand sides.
- virtual const double * getRowRange () const
  Get pointer to array[getNumRows()] of row ranges.
- virtual const double * getRowLower () const
  Get pointer to array[getNumRows()] of row lower bounds.
- virtual const double * getRowUpper () const
  Get pointer to array[getNumRows()] of row upper bounds.
- virtual const double * getObjCoefficients () const
  Get pointer to array[getNumCols()] of objective function coefficients.
- virtual double getObjSense () const
  Get objective function sense (1 for min (default), -1 for max)
- virtual bool isContinuous (int colNumber) const

Return true if column is continuous.

- virtual const CoinPackedMatrix * getMatrixByRow () const

  Get pointer to row-wise copy of matrix.
- virtual const CoinPackedMatrix * getMatrixByCol () const

  Get pointer to column-wise copy of matrix.
- virtual double getInfinity () const

  Get solver's value for infinity.

Methods related to querying the solution

- virtual const double * getColSolution () const

  Get pointer to array[getNumCols()] of primal solution vector.
- virtual const double * getRowPrice () const

  Get pointer to array[getNumRows()] of dual prices.
- virtual const double * getReducedCost () const

  Get a pointer to array[getNumCols()] of reduced costs.
- virtual const double * getRowActivity () const

  Get pointer to array[getNumRows()] of row activity levels (constraint matrix times the solution vector.
- virtual double getObjValue () const

  Get objective function value.
- virtual int getIterationCount () const

  Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.
- virtual std::vector< double * > getDualRays (int maxNumRays, bool fullRay=false) const

  Get as many dual rays as the solver can provide.
- virtual std::vector< double * > getPrimalRays (int maxNumRays) const

  Get as many primal rays as the solver can provide.

Changing bounds on variables and constraints

- virtual void setObjCoeff (int elementIndex, double elementValue)

  Set an objective function coefficient.
- virtual void setColLower (int elementIndex, double elementValue)

  Set a single column lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setColUpper (int elementIndex, double elementValue)

  Set a single column upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setColBounds (int elementIndex, double lower, double upper)

  Set a single column lower and upper bound
  The default implementation just invokes `setColLower` *and* `setColUpper`
- virtual void setRowLower (int elementIndex, double elementValue)

  Set a single row lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setRowUpper (int elementIndex, double elementValue)

  Set a single row upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setRowBounds (int elementIndex, double lower, double upper)

Set a single row lower and upper bound
The default implementation just invokes `setRowUower` *and* `setRowUpper`

- virtual void setRowType (int index, char sense, double rightHandSide, double range)

  Set the type of a single row

Integrality related changing methods

- virtual void setContinuous (int index)

  Set the index-th variable to be a continuous variable.
- virtual void setInteger (int index)

  Set the index-th variable to be an integer variable.

Methods to expand a problem.

Note that if a column is added then by default it will correspond to a continuous variable.

- virtual void addCol (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)

  Add a column (primal variable) to the problem.
- virtual void deleteCols (const int num, const int *colIndices)

  Remove a set of columns (primal variables) from the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)

  Add a row (constraint) to the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)

  Add a row (constraint) to the problem.
- virtual void deleteRows (const int num, const int *rowIndices)

  Delete a set of rows (constraints) from the problem.

Methods to input a problem

- virtual void loadProblem (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

  Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void assignProblem (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, double *&rowlb, double *&rowub)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void loadProblem (const CoinPackedMatrix &matrix, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)

  Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void assignProblem (CoinPackedMatrix *&matrix, double *&collb, double *&colub, double *&obj, char *&rowsen, double *&rowrhs, double *&rowrng)

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

- virtual void loadProblem (const int numcols, const int numrows, const int *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const double *rowlb, const double *rowub)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual void loadProblem (const int numcols, const int numrows, const int *start, const int *index, const double *value, const double *collb, const double *colub, const double *obj, const char *rowsen, const double *rowrhs, const double *rowrng)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual int readMps (const char *filename, const char *extension="mps")

  Read an mps file from the given filename.
- virtual void writeMps (const char *filename, const char *extension="mps", double objSense=0.0) const

  Write the problem into an mps file of the given filename.

Constructors and destructor

- OsiSpxSolverInterface ()

  Default Constructor.
- virtual OsiSolverInterface * clone (bool copyData=true) const

  Clone.
- OsiSpxSolverInterface (const OsiSpxSolverInterface &)

  Copy constructor.
- OsiSpxSolverInterface & operator= (const OsiSpxSolverInterface &rhs)

  Assignment operator.
- virtual ~OsiSpxSolverInterface ()

  Destructor.

Protected Member Functions

Protected methods

- virtual void applyRowCut (const OsiRowCut &rc)

  Apply a row cut. Return true if cut was applied.
- virtual void applyColCut (const OsiColCut &cc)

  Apply a column cut (bound adjustment).

Protected Attributes

Protected member data

- soplex::SoPlex * soplex_

  SoPlex solver object.

Friends

- void OsiSpxSolverInterfaceUnitTest (const std::string &mpsDir, const std::string &netlibDir)

  A function that tests the methods in the OsiSpxSolverInterface class.

5.35.1 Detailed Description

SoPlex Solver Interface Instantiation of OsiSpxSolverInterface for SoPlex.

Definition at line 32 of file OsiSpxSolverInterface.hpp.

5.35.2 Member Function Documentation

5.35.2.1 virtual bool OsiSpxSolverInterface::setWarmStart (const CoinWarmStart * *warmstart*) [virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

Implements OsiSolverInterface.

5.35.2.2 virtual const char* OsiSpxSolverInterface::getRowSense ( ) const [virtual]

Get pointer to array[getNumRows()] of row constraint senses.

- 'L': <= constraint
- 'E': = constraint
- 'G': >= constraint
- 'R': ranged constraint
- 'N': free constraint

Implements OsiSolverInterface.

5.35.2.3 virtual const double* OsiSpxSolverInterface::getRightHandSide ( ) const [virtual]

Get pointer to array[getNumRows()] of rows right-hand sides.

- if rowsense()[i] == 'L' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'G' then rhs()[i] == rowlower()[i]
- if rowsense()[i] == 'R' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'N' then rhs()[i] == 0.0

Implements OsiSolverInterface.

5.35.2.4 virtual const double* OsiSpxSolverInterface::getRowRange ( ) const [virtual]

Get pointer to array[getNumRows()] of row ranges.

- if rowsense()[i] == 'R' then rowrange()[i] == rowupper()[i] - rowlower()[i]
- if rowsense()[i] != 'R' then rowrange()[i] is 0.0

Implements OsiSolverInterface.

5.35.2.5 virtual int OsiSpxSolverInterface::getIterationCount ( ) const [virtual]

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.

Implements OsiSolverInterface.

5.35.2.6 virtual std::vector<double*> OsiSpxSolverInterface::getDualRays (int *maxNumRays*, bool *fullRay* = false) const [virtual]

Get as many dual rays as the solver can provide.

(In case of proven primal infeasibility there should be at least one.)

The first getNumRows() ray components will always be associated with the row duals (as returned by getRowPrice()). If fullRay is true, the final getNumCols() entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumRows() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.35.2.7 virtual std::vector<double*> OsiSpxSolverInterface::getPrimalRays (int *maxNumRays*) const [virtual]

Get as many primal rays as the solver can provide.

(In case of proven dual infeasibility there should be at least one.)

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumCols() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.35.2.8 virtual void OsiSpxSolverInterface::setColLower (int *elementIndex*, double *elementValue*) [virtual]

Set a single column lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.35.2.9 virtual void OsiSpxSolverInterface::setColUpper (int *elementIndex*, double *elementValue*) [virtual]

Set a single column upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.35.2.10 virtual void OsiSpxSolverInterface::setRowLower (int *elementIndex*, double *elementValue*) [virtual]

Set a single row lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.35.2.11 virtual void OsiSpxSolverInterface::setRowUpper (int *elementIndex*, double *elementValue*) [virtual]

Set a single row upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.35.2.12 virtual void OsiSpxSolverInterface::setColSolution (const double * *colsol*) [virtual]

Set the primal solution column values.

colsol[numcols()] is an array of values of the problem column variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of colsol() until changed by another call to setColsol() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.35.2.13 virtual void OsiSpxSolverInterface::setRowPrice (const double * *rowprice*) [virtual]

Set dual solution vector.

rowprice[numrows()] is an array of values of the problem row dual variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of rowprice() until changed by another call to setRowprice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is

solver-dependent.

Implements OsiSolverInterface.

5.35.2.14 virtual void OsiSpxSolverInterface::addCol (const CoinPackedVectorBase & *vec,* const double *collb,* const double *colub,* const double *obj*) [virtual]

Add a column (primal variable) to the problem.

Implements OsiSolverInterface.

5.35.2.15 virtual void OsiSpxSolverInterface::deleteCols (const int *num,* const int * *colIndices*) [virtual]

Remove a set of columns (primal variables) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted variables are nonbasic.

Implements OsiSolverInterface.

5.35.2.16 virtual void OsiSpxSolverInterface::addRow (const CoinPackedVectorBase & *vec,* const double *rowlb,* const double *rowub*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.35.2.17 virtual void OsiSpxSolverInterface::addRow (const CoinPackedVectorBase & *vec,* const char *rowsen,* const double *rowrhs,* const double *rowrng*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.35.2.18 virtual void OsiSpxSolverInterface::deleteRows (const int *num,* const int * *rowIndices*) [virtual]

Delete a set of rows (constraints) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted rows are loose.

Implements OsiSolverInterface.

5.35.2.19 virtual void OsiSpxSolverInterface::loadProblem (const CoinPackedMatrix & *matrix,* const double * *collb,* const double * *colub,* const double * *obj,* const double * *rowlb,* const double * *rowub*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0

- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Implements OsiSolverInterface.

5.35.2.20 **virtual void OsiSpxSolverInterface::assignProblem (CoinPackedMatrix ∗& *matrix,* double ∗& *collb,* double ∗& *colub,* double ∗& *obj,* double ∗& *rowlb,* double ∗& *rowub*)** `[virtual]`

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.35.2.21 **virtual void OsiSpxSolverInterface::loadProblem (const CoinPackedMatrix & *matrix,* const double ∗ *collb,* const double ∗ *colub,* const double ∗ *obj,* const char ∗ *rowsen,* const double ∗ *rowrhs,* const double ∗ *rowrng*)** `[virtual]`

Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are >=
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

Implements OsiSolverInterface.

5.35.2.22 **virtual void OsiSpxSolverInterface::assignProblem (CoinPackedMatrix ∗& *matrix,* double ∗& *collb,* double ∗& *colub,* double ∗& *obj,* char ∗& *rowsen,* double ∗& *rowrhs,* double ∗& *rowrng*)** `[virtual]`

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.35.2.23 virtual void OsiSpxSolverInterface::loadProblem (const int *numcols*, const int *numrows*, const int * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [virtual]

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.35.2.24 virtual void OsiSpxSolverInterface::loadProblem (const int *numcols*, const int *numrows*, const int * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.35.2.25 virtual void OsiSpxSolverInterface::writeMps (const char * *filename*, const char * *extension* = "mps", double *objSense* = 0.0) const [virtual]

Write the problem into an mps file of the given filename.

If objSense is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants

Implements OsiSolverInterface.

5.35.2.26 virtual void OsiSpxSolverInterface::applyColCut (const OsiColCut & *cc*) [protected, virtual]

Apply a column cut (bound adjustment).

Return true if cut was applied.

Implements OsiSolverInterface.

5.35.3 Friends And Related Function Documentation

5.35.3.1 void OsiSpxSolverInterfaceUnitTest (const std::string & *mpsDir*, const std::string & *netlibDir*) [friend]

A function that tests the methods in the OsiSpxSolverInterface class.

The documentation for this class was generated from the following file:

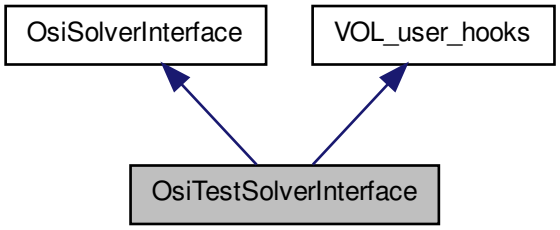
- OsiSpxSolverInterface.hpp

5.36 OsiTestSolverInterface Class Reference

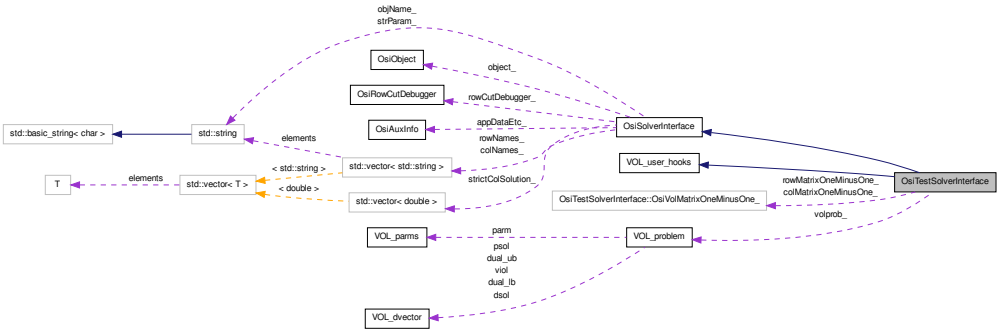
Vol(ume) Solver Interface.

`#include <OsiTestSolverInterface.hpp>`

Inheritance diagram for OsiTestSolverInterface:



Collaboration diagram for OsiTestSolverInterface:



Classes

- class **OsiVolMatrixOneMinusOne_**

Public Member Functions

- virtual void setObjSense (double s)

  Set objective function sense (1 for min (default), -1 for max,)
- virtual void setColSolution (const double ∗colsol)

  Set the primal solution column values.
- virtual void setRowPrice (const double ∗rowprice)

  Set dual solution vector.

Solve methods

- virtual void initialSolve ()
  Solve initial LP relaxation.
- virtual void resolve ()
  Resolve an LP relaxation after problem modification.
- virtual void branchAndBound ()
  Invoke solver's built-in enumeration algorithm.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the volume algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

- bool setIntParam (OsiIntParam key, int value)
  Set an integer parameter.
- bool setDblParam (OsiDblParam key, double value)
  Set a double parameter.
- bool setStrParam (OsiStrParam key, const std::string &value)
  Set a string parameter.
- bool getIntParam (OsiIntParam key, int &value) const
  Get an integer parameter.
- bool getDblParam (OsiDblParam key, double &value) const
  Get a double parameter.
- bool getStrParam (OsiStrParam key, std::string &value) const
  Get a string parameter.

Methods returning info on how the solution process terminated

- virtual bool isAbandoned () const
  Are there a numerical difficulties?
- virtual bool isProvenOptimal () const
  Is optimality proven?
- virtual bool isProvenPrimalInfeasible () const
  Is primal infeasiblity proven?
- virtual bool isProvenDualInfeasible () const
  Is dual infeasiblity proven?
- virtual bool isPrimalObjectiveLimitReached () const
  Is the given primal objective limit reached?
- virtual bool isDualObjectiveLimitReached () const
  Is the given dual objective limit reached?
- virtual bool isIterationLimitReached () const
  Iteration limit reached?

WarmStart related methods

- virtual CoinWarmStart * getEmptyWarmStart () const
  Get an empty warm start object.
- virtual CoinWarmStart * getWarmStart () const
  Get warmstarting information.
- virtual bool setWarmStart (const CoinWarmStart *warmstart)
  Set warmstarting information.

**Hotstart related methods (primarily used in strong branching).
**

The user can create a hotstart (a snapshot) of the optimization process then reoptimize over and over again always starting from there.

***NOTE**: between hotstarted optimizations only bound changes are allowed.*

- virtual void markHotStart ()
  Create a hotstart point of the optimization process.
- virtual void solveFromHotStart ()
  Optimize starting from the hotstart.
- virtual void unmarkHotStart ()
  Delete the snapshot.

Methods related to querying the input data

- virtual int getNumCols () const
  Get number of columns.
- virtual int getNumRows () const
  Get number of rows.
- virtual int getNumElements () const
  Get number of nonzero elements.
- virtual const double * getColLower () const
  Get pointer to array[getNumCols()] of column lower bounds.
- virtual const double * getColUpper () const
  Get pointer to array[getNumCols()] of column upper bounds.
- virtual const char * getRowSense () const
  Get pointer to array[getNumRows()] of row constraint senses.
- virtual const double * getRightHandSide () const
  Get pointer to array[getNumRows()] of rows right-hand sides.
- virtual const double * getRowRange () const
  Get pointer to array[getNumRows()] of row ranges.
- virtual const double * getRowLower () const
  Get pointer to array[getNumRows()] of row lower bounds.
- virtual const double * getRowUpper () const
  Get pointer to array[getNumRows()] of row upper bounds.
- virtual const double * getObjCoefficients () const
  Get pointer to array[getNumCols()] of objective function coefficients.
- virtual double getObjSense () const
  Get objective function sense (1 for min (default), -1 for max)
- virtual bool isContinuous (int colNumber) const

Return true if column is continuous.

- virtual const CoinPackedMatrix * getMatrixByRow () const

  Get pointer to row-wise copy of matrix.
- virtual const CoinPackedMatrix * getMatrixByCol () const

  Get pointer to column-wise copy of matrix.
- virtual double getInfinity () const

  Get solver's value for infinity.

Methods related to querying the solution

- virtual const double * getColSolution () const

  Get pointer to array[getNumCols()] of primal solution vector.
- virtual const double * getRowPrice () const

  Get pointer to array[getNumRows()] of dual prices.
- virtual const double * getReducedCost () const

  Get a pointer to array[getNumCols()] of reduced costs.
- virtual const double * getRowActivity () const

  Get pointer to array[getNumRows()] of row activity levels (constraint matrix times the solution vector.
- virtual double getObjValue () const

  Get objective function value.
- virtual int getIterationCount () const

  Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.
- virtual std::vector< double * > getDualRays (int maxNumRays, bool fullRay=false) const

  Get as many dual rays as the solver can provide.
- virtual std::vector< double * > getPrimalRays (int maxNumRays) const

  Get as many primal rays as the solver can provide.

Changing bounds on variables and constraints

- virtual void setObjCoeff (int elementIndex, double elementValue)

  Set an objective function coefficient.
- virtual void setColLower (int elementIndex, double elementValue)

  Set a single column lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setColUpper (int elementIndex, double elementValue)

  Set a single column upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setColBounds (int elementIndex, double lower, double upper)

  Set a single column lower and upper bound.
- virtual void setColSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

  Set the bounds on a number of columns simultaneously
  The default implementation just invokes setColLower() and setColUpper() over and over again.
- virtual void setRowLower (int elementIndex, double elementValue)

  Set a single row lower bound
  Use -COIN_DBL_MAX for -infinity.

- virtual void setRowUpper (int elementIndex, double elementValue)

  Set a single row upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setRowBounds (int elementIndex, double lower, double upper)

  Set a single row lower and upper bound.
- virtual void setRowType (int index, char sense, double rightHandSide, double range)

  Set the type of a single row
- virtual void setRowSetBounds (const int ∗indexFirst, const int ∗indexLast, const double ∗boundList)

  Set the bounds on a number of rows simultaneously
  The default implementation just invokes setRowLower() and setRowUpper() over and over again.
- virtual void setRowSetTypes (const int ∗indexFirst, const int ∗indexLast, const char ∗senseList, const double ∗rhsList, const double ∗rangeList)

  Set the type of a number of rows simultaneously
  The default implementation just invokes setRowType() over and over again.

Integrality related changing methods

- virtual void setContinuous (int index)

  Set the index-th variable to be a continuous variable.
- virtual void setInteger (int index)

  Set the index-th variable to be an integer variable.
- virtual void setContinuous (const int ∗indices, int len)

  Set the variables listed in indices (which is of length len) to be continuous variables.
- virtual void setInteger (const int ∗indices, int len)

  Set the variables listed in indices (which is of length len) to be integer variables.

Methods to expand a problem.

Note that if a column is added then by default it will correspond to a continuous variable.

- virtual void addCol (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)

  Add a column (primal variable) to the problem.
- virtual void addCols (const int numcols, const CoinPackedVectorBase ∗const ∗cols, const double ∗collb, const double ∗colub, const double ∗obj)

  Add a set of columns (primal variables) to the problem.
- virtual void deleteCols (const int num, const int ∗colIndices)

  Remove a set of columns (primal variables) from the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)

  Add a row (constraint) to the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)

  Add a row (constraint) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase ∗const ∗rows, const double ∗rowlb, const double ∗rowub)

Add a set of rows (constraints) to the problem.

- virtual void addRows (const int numrows, const CoinPackedVectorBase ∗const ∗rows, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

  Add a set of rows (constraints) to the problem.
- virtual void deleteRows (const int num, const int ∗rowIndices)

  Delete a set of rows (constraints) from the problem.

Methods to input a problem

- virtual void loadProblem (const CoinPackedMatrix &matrix, const double ∗collb, const double ∗colub, const double ∗obj, const double ∗rowlb, const double ∗rowub)

  Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void assignProblem (CoinPackedMatrix ∗&matrix, double ∗&collb, double ∗&colub, double ∗&obj, double ∗&rowlb, double ∗&rowub)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void loadProblem (const CoinPackedMatrix &matrix, const double ∗collb, const double ∗colub, const double ∗obj, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

  Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void assignProblem (CoinPackedMatrix ∗&matrix, double ∗&collb, double ∗&colub, double ∗&obj, char ∗&rowsen, double ∗&rowrhs, double ∗&rowrng)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void loadProblem (const int numcols, const int numrows, const int ∗start, const int ∗index, const double ∗value, const double ∗collb, const double ∗colub, const double ∗obj, const double ∗rowlb, const double ∗rowub)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual void loadProblem (const int numcols, const int numrows, const int ∗start, const int ∗index, const double ∗value, const double ∗collb, const double ∗colub, const double ∗obj, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual int readMps (const char ∗filename, const char ∗extension="mps")

  Read an mps file from the given filename.
- virtual void writeMps (const char ∗filename, const char ∗extension="mps", double objSense=0.0) const

  Write the problem into an mps file of the given filename.

OSL specific public interfaces

- VOL_problem ∗ volprob ()

  Get pointer to Vol model.

Constructors and destructors

- OsiTestSolverInterface ()
  Default Constructor.
- virtual OsiSolverInterface ∗ clone (bool copyData=true) const
  Clone.
- OsiTestSolverInterface (const OsiTestSolverInterface &)
  Copy constructor.
- OsiTestSolverInterface & operator= (const OsiTestSolverInterface &rhs)
  Assignment operator.
- virtual ∼OsiTestSolverInterface ()
  Destructor.

Protected Member Functions

Helper methods for problem input

- void **initFromRlbRub** (const int rownum, const double ∗rowlb, const double ∗rowub)
- void **initFromRhsSenseRange** (const int rownum, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)
- void **initFromClbCubObj** (const int colnum, const double ∗collb, const double ∗colub, const double ∗obj)

Protected methods

- virtual void applyRowCut (const OsiRowCut &rc)
  Apply a row cut (append to constraint matrix).
- virtual void applyColCut (const OsiColCut &cc)
  Apply a column cut (adjust one or more bounds).

Friends

- void OsiTestSolverInterfaceUnitTest (const std::string &mpsDir, const std::string &netlibDir)
  A function that tests the methods in the OsiTestSolverInterface class.

5.36.1 Detailed Description

Vol(ume) Solver Interface.

Instantiation of OsiTestSolverInterface for the Volume Algorithm

Definition at line 27 of file OsiTestSolverInterface.hpp.

5.36.2 Member Function Documentation

5.36.2.1 virtual CoinWarmStart* OsiTestSolverInterface::getEmptyWarmStart ( ) const [virtual]

Get an empty warm start object.

This routine returns an empty warm start object. Its purpose is to provide a way to give a client a warm start object of the appropriate type, which can resized and modified as desired.

Implements OsiSolverInterface.

5.36.2.2 virtual bool OsiTestSolverInterface::setWarmStart (const CoinWarmStart * *warmstart*) [virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

Implements OsiSolverInterface.

5.36.2.3 virtual const char* OsiTestSolverInterface::getRowSense ( ) const [inline, virtual]

Get pointer to array[getNumRows()] of row constraint senses.

- 'L' <= constraint
- 'E' = constraint
- 'G' >= constraint
- 'R' ranged constraint
- 'N' free constraint

Implements OsiSolverInterface.

Definition at line 196 of file OsiTestSolverInterface.hpp.

5.36.2.4 virtual const double* OsiTestSolverInterface::getRightHandSide ( ) const [inline, virtual]

Get pointer to array[getNumRows()] of rows right-hand sides.

- if rowsense()[i] == 'L' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'G' then rhs()[i] == rowlower()[i]
- if rowsense()[i] == 'R' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'N' then rhs()[i] == 0.0

Implements OsiSolverInterface.

Definition at line 206 of file OsiTestSolverInterface.hpp.

5.36.2.5 virtual const double* OsiTestSolverInterface::getRowRange ( ) const [inline, virtual]

Get pointer to array[getNumRows()] of row ranges.

- if rowsense()[i] == 'R' then rowrange()[i] == rowupper()[i] - rowlower()[i]
- if rowsense()[i] != 'R' then rowrange()[i] is undefined

Implements OsiSolverInterface.

Definition at line 216 of file OsiTestSolverInterface.hpp.

5.36.2.6 virtual int OsiTestSolverInterface::getIterationCount ( ) const [inline, virtual]

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.

Implements OsiSolverInterface.

Definition at line 287 of file OsiTestSolverInterface.hpp.

5.36.2.7 virtual std::vector<double*> OsiTestSolverInterface::getDualRays (int *maxNumRays*, bool *fullRay* = false) const [virtual]

Get as many dual rays as the solver can provide.

(In case of proven primal infeasibility there should be at least one.)

The first getNumRows() ray components will always be associated with the row duals (as returned by getRowPrice()). If `fullRay` is true, the final getNumCols() entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumRows() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.36.2.8 virtual std::vector<double*> OsiTestSolverInterface::getPrimalRays (int *maxNumRays*) const [virtual]

Get as many primal rays as the solver can provide.

(In case of proven dual infeasibility there should be at least one.)

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumCols() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.36.2.9 virtual void OsiTestSolverInterface::setColLower (int *elementIndex*, double *elementValue*) [inline, virtual]

Set a single column lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

Definition at line 345 of file OsiTestSolverInterface.hpp.

5.36.2.10 virtual void OsiTestSolverInterface::setColUpper (int *elementIndex*, double *elementValue*) [inline, virtual]

Set a single column upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

Definition at line 352 of file OsiTestSolverInterface.hpp.

5.36.2.11 virtual void OsiTestSolverInterface::setColSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [virtual]

Set the bounds on a number of columns simultaneously

The default implementation just invokes setColLower() and setColUpper() over and over again.

Parameters

indexFirst,indexLast	pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes
boundList	the new lower/upper bound pairs for the variables

Reimplemented from OsiSolverInterface.

5.36.2.12 virtual void OsiTestSolverInterface::setRowLower (int *elementIndex*, double *elementValue*) [inline, virtual]

Set a single row lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

Definition at line 377 of file OsiTestSolverInterface.hpp.

5.36.2.13 virtual void OsiTestSolverInterface::setRowUpper (int *elementIndex*, double *elementValue*) [inline, virtual]

Set a single row upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

Definition at line 386 of file OsiTestSolverInterface.hpp.

5.36.2.14 virtual void OsiTestSolverInterface::setRowSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [virtual]

Set the bounds on a number of rows simultaneously

The default implementation just invokes setRowLower() and setRowUpper() over and over again.

Parameters

indexFirst,indexLas	pointers to the beginning and after the end of the array of the indices of the constraints whose *either* bound changes
boundList	the new lower/upper bound pairs for the constraints

Reimplemented from OsiSolverInterface.

5.36.2.15 virtual void OsiTestSolverInterface::setRowSetTypes (const int * *indexFirst*, const int * *indexLast*, const char * *senseList*, const double * *rhsList*, const double * *rangeList*) [virtual]

Set the type of a number of rows simultaneously

The default implementation just invokes setRowType() over and over again.

Parameters

indexFirst,indexLas	pointers to the beginning and after the end of the array of the indices of the constraints whose *any* characteristics changes
senseList	the new senses
rhsList	the new right hand sides
rangeList	the new ranges

Reimplemented from OsiSolverInterface.

5.36.2.16 virtual void OsiTestSolverInterface::setColSolution (const double * *colsol*) [virtual]

Set the primal solution column values.

colsol[numcols()] is an array of values of the problem column variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of colsol() until changed by another call to setColsol() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.36.2.17 virtual void OsiTestSolverInterface::setRowPrice (const double * *rowprice*) [virtual]

Set dual solution vector.

rowprice[numrows()] is an array of values of the problem row dual variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of rowprice() until changed by another call to setRowprice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.36.2.18 virtual void OsiTestSolverInterface::addCol (const CoinPackedVectorBase & *vec,* const double *collb,* const double *colub,* const double *obj*) [virtual]

Add a column (primal variable) to the problem.

Implements OsiSolverInterface.

5.36.2.19 virtual void OsiTestSolverInterface::addCols (const int *numcols,* const CoinPackedVectorBase *const * *cols,* const double * *collb,* const double * *colub,* const double * *obj*) [virtual]

Add a set of columns (primal variables) to the problem.

The default implementation simply makes repeated calls to addCol().

Reimplemented from OsiSolverInterface.

5.36.2.20 virtual void OsiTestSolverInterface::deleteCols (const int *num,* const int * *collndices*) [virtual]

Remove a set of columns (primal variables) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted variables are nonbasic.

Implements OsiSolverInterface.

5.36.2.21 virtual void OsiTestSolverInterface::addRow (const CoinPackedVectorBase & *vec,* const double *rowlb,* const double *rowub*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.36.2.22 virtual void OsiTestSolverInterface::addRow (const CoinPackedVectorBase & *vec,* const char *rowsen,* const double *rowrhs,* const double *rowrng*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.36.2.23 virtual void OsiTestSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const double * *rowlb*, const double * *rowub*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.36.2.24 virtual void OsiTestSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.36.2.25 virtual void OsiTestSolverInterface::deleteRows (const int *num*, const int * *rowIndices*) [virtual]

Delete a set of rows (constraints) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted rows are loose.

Implements OsiSolverInterface.

5.36.2.26 virtual void OsiTestSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Implements OsiSolverInterface.

5.36.2.27 virtual void OsiTestSolverInterface::assignProblem (CoinPackedMatrix *& *matrix*, double *& *collb*, double *& *colub*, double *& *obj*, double *& *rowlb*, double *& *rowub*) [virtual]

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.36.2.28 **virtual void OsiTestSolverInterface::loadProblem (const CoinPackedMatrix & *matrix,* const double * *collb,* const double * *colub,* const double * *obj,* const char * *rowsen,* const double * *rowrhs,* const double * *rowrng*)** `[virtual]`

Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are >=
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

Implements OsiSolverInterface.

5.36.2.29 **virtual void OsiTestSolverInterface::assignProblem (CoinPackedMatrix *& *matrix,* double *& *collb,* double *& *colub,* double *& *obj,* char *& *rowsen,* double *& *rowrhs,* double *& *rowrng*)** `[virtual]`

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.36.2.30 **virtual void OsiTestSolverInterface::loadProblem (const int *numcols,* const int *numrows,* const int * *start,* const int * *index,* const double * *value,* const double * *collb,* const double * *colub,* const double * *obj,* const double * *rowlb,* const double * *rowub*)** `[virtual]`

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.36.2.31 virtual void OsiTestSolverInterface::loadProblem (const int *numcols*, const int *numrows*, const int * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.36.2.32 virtual void OsiTestSolverInterface::writeMps (const char * *filename*, const char * *extension* = "mps", double *objSense* = 0.0) const [virtual]

Write the problem into an mps file of the given filename.

If objSense is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants

Implements OsiSolverInterface.

5.36.2.33 virtual void OsiTestSolverInterface::applyRowCut (const OsiRowCut & *rc*) [protected, virtual]

Apply a row cut (append to constraint matrix).

Implements OsiSolverInterface.

5.36.2.34 virtual void OsiTestSolverInterface::applyColCut (const OsiColCut & *cc*) [protected, virtual]

Apply a column cut (adjust one or more bounds).

Implements OsiSolverInterface.

5.36.3 Friends And Related Function Documentation

5.36.3.1 void OsiTestSolverInterfaceUnitTest (const std::string & *mpsDir*, const std::string & *netlibDir*) [friend]

A function that tests the methods in the OsiTestSolverInterface class.

The documentation for this class was generated from the following file:

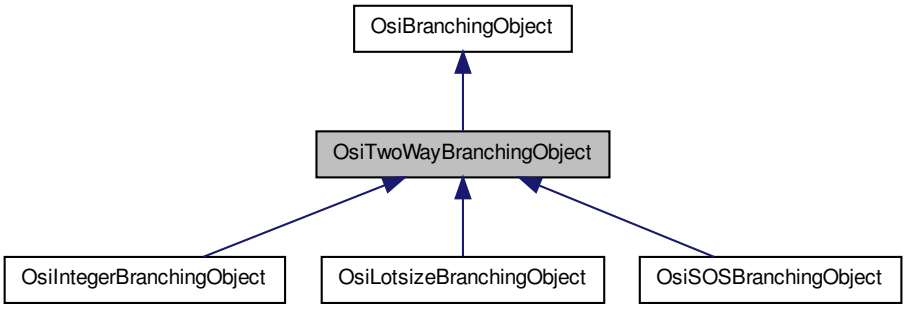
- OsiTestSolverInterface.hpp

5.37 OsiTwoWayBranchingObject Class Reference

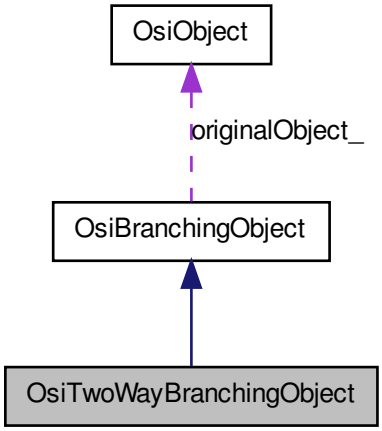
This just adds two-wayness to a branching object.

```
#include <OsiBranchingObject.hpp>
```

Inheritance diagram for OsiTwoWayBranchingObject:



Collaboration diagram for OsiTwoWayBranchingObject:



Public Member Functions

- OsiTwoWayBranchingObject ()

  Default constructor.
- OsiTwoWayBranchingObject (OsiSolverInterface ∗solver, const OsiObject ∗originalObject, int way, double value)

Create a standard tw0-way branch object.

- OsiTwoWayBranchingObject (const OsiTwoWayBranchingObject &)

  Copy constructor.
- OsiTwoWayBranchingObject & operator= (const OsiTwoWayBranchingObject &rhs)

  Assignment operator.
- virtual ~OsiTwoWayBranchingObject ()

  Destructor.
- virtual double branch (OsiSolverInterface *solver)=0

  Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.
- int way () const

  Way returns -1 on down +1 on up.

Protected Attributes

- int firstBranch_

  Which way was first branch -1 = down, +1 = up.

5.37.1 Detailed Description

This just adds two-wayness to a branching object.

Definition at line 467 of file OsiBranchingObject.hpp.

5.37.2 Constructor & Destructor Documentation

5.37.2.1 OsiTwoWayBranchingObject::OsiTwoWayBranchingObject (OsiSolverInterface * *solver,* const OsiObject * *originalObject,* int *way,* double *value*)

Create a standard tw0-way branch object.

Specifies a simple two-way branch. Specify way = -1 to set the object state to perform the down arm first, way = 1 for the up arm.

5.37.3 Member Function Documentation

5.37.3.1 virtual double OsiTwoWayBranchingObject::branch (OsiSolverInterface * *solver*) [pure virtual]

Sets the bounds for the variable according to the current arm of the branch and advances the object state to the next arm.

state. Returns change in guessed objective on next branch

Implements OsiBranchingObject.

Implemented in OsiIntegerBranchingObject, OsiSOSBranchingObject, and OsiLotsize-BranchingObject.

The documentation for this class was generated from the following file:

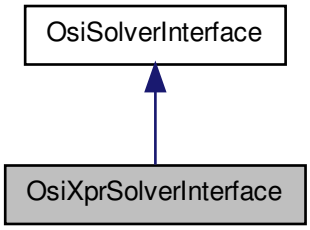
- OsiBranchingObject.hpp

5.38 OsiXprSolverInterface Class Reference

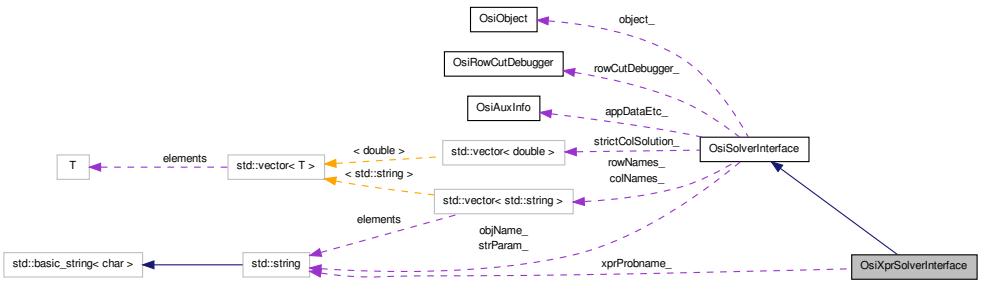
XPRESS-MP Solver Interface.

`#include <OsiXprSolverInterface.hpp>`

Inheritance diagram for OsiXprSolverInterface:



Collaboration diagram for OsiXprSolverInterface:



Public Member Functions

- virtual void setObjSense (double s)

Set objective function sense (1 for min (default), -1 for max,)

- virtual void setColSolution (const double *colsol)

  Set the primal solution column values.

- virtual void setRowPrice (const double *rowprice)

  Set dual solution vector.

Solve methods

- virtual void initialSolve ()

  Solve initial LP relaxation.

- virtual void resolve ()

  Resolve an LP relaxation after problem modification.

- virtual void branchAndBound ()

  Invoke solver's built-in enumeration algorithm.

Parameter set/get methods

The set methods return true if the parameter was set to the given value, false otherwise.

There can be various reasons for failure: the given parameter is not applicable for the solver (e.g., refactorization frequency for the volume algorithm), the parameter is not yet implemented for the solver or simply the value of the parameter is out of the range the solver accepts. If a parameter setting call returns false check the details of your solver.

The get methods return true if the given parameter is applicable for the solver and is implemented. In this case the value of the parameter is returned in the second argument. Otherwise they return false.

- bool setIntParam (OsiIntParam key, int value)

  Set an integer parameter.

- bool setDblParam (OsiDblParam key, double value)

  Set a double parameter.

- bool setStrParam (OsiStrParam key, const std::string &value)

  Set a string parameter.

- bool getIntParam (OsiIntParam key, int &value) const

  Get an integer parameter.

- bool getDblParam (OsiDblParam key, double &value) const

  Get a double parameter.

- bool getStrParam (OsiStrParam key, std::string &value) const

  Get a string parameter.

- void **setMipStart** (bool value)
- bool **getMipStart** () const

Methods returning info on how the solution process terminated

- virtual bool isAbandoned () const

  Are there a numerical difficulties?

- virtual bool isProvenOptimal () const

Is optimality proven?

- virtual bool isProvenPrimalInfeasible () const

  Is primal infeasiblity proven?
- virtual bool isProvenDualInfeasible () const

  Is dual infeasiblity proven?
- virtual bool isPrimalObjectiveLimitReached () const

  Is the given primal objective limit reached?
- virtual bool isDualObjectiveLimitReached () const

  Is the given dual objective limit reached?
- virtual bool isIterationLimitReached () const

  Iteration limit reached?

WarmStart related methods

- CoinWarmStart * getEmptyWarmStart () const

  Get empty warm start object.
- virtual CoinWarmStart * getWarmStart () const

  Get warmstarting information.
- virtual bool setWarmStart (const CoinWarmStart *warmstart)

  Set warmstarting information.

Hotstart related methods (primarily used in strong branching).

The user can create a hotstart (a snapshot) of the optimization process then reoptimize over and over again always starting from there.

***NOTE**: between hotstarted optimizations only bound changes are allowed.*

- virtual void markHotStart ()

  Create a hotstart point of the optimization process.
- virtual void solveFromHotStart ()

  Optimize starting from the hotstart.
- virtual void unmarkHotStart ()

  Delete the snapshot.

Methods related to querying the input data

- virtual int getNumCols () const

  Get number of columns.
- virtual int getNumRows () const

  Get number of rows.
- virtual int getNumElements () const

  Get number of nonzero elements.
- virtual const double * getColLower () const

  Get pointer to array[getNumCols()] of column lower bounds.
- virtual const double * getColUpper () const

  Get pointer to array[getNumCols()] of column upper bounds.
- virtual const char * getRowSense () const

  Get pointer to array[getNumRows()] of row constraint senses.
- virtual const double * getRightHandSide () const

Get pointer to array[getNumRows()] of rows right-hand sides.

- virtual const double * getRowRange () const

  Get pointer to array[getNumRows()] of row ranges.
- virtual const double * getRowLower () const

  Get pointer to array[getNumRows()] of row lower bounds.
- virtual const double * getRowUpper () const

  Get pointer to array[getNumRows()] of row upper bounds.
- virtual const double * getObjCoefficients () const

  Get pointer to array[getNumCols()] of objective function coefficients.
- virtual double getObjSense () const

  Get objective function sense (1 for min (default), -1 for max)
- virtual bool isContinuous (int colIndex) const

  Return true if variable is continuous.
- virtual const CoinPackedMatrix * getMatrixByRow () const

  Get pointer to row-wise copy of matrix.
- virtual const CoinPackedMatrix * getMatrixByCol () const

  Get pointer to column-wise copy of matrix.
- virtual double getInfinity () const

  Get solver's value for infinity.

Methods related to querying the solution

- virtual const double * getColSolution () const

  Get pointer to array[getNumCols()] of primal solution vector.
- virtual const double * getRowPrice () const

  Get pointer to array[getNumRows()] of dual prices.
- virtual const double * getReducedCost () const

  Get a pointer to array[getNumCols()] of reduced costs.
- virtual const double * getRowActivity () const

  Get pointer to array[getNumRows()] of row activity levels (constraint matrix times the solution vector.
- virtual double getObjValue () const

  Get objective function value.
- virtual int getIterationCount () const

  Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.
- virtual std::vector< double * > getDualRays (int maxNumRays, bool fullRay=false) const

  Get as many dual rays as the solver can provide.
- virtual std::vector< double * > getPrimalRays (int maxNumRays) const

  Get as many primal rays as the solver can provide.

Changing bounds on variables and constraints

- virtual void setObjCoeff (int elementIndex, double elementValue)

  Set an objective function coefficient.
- virtual void setColLower (int elementIndex, double elementValue)

  Set a single column lower bound
  Use -COIN_DBL_MAX for -infinity.

- virtual void setColUpper (int elementIndex, double elementValue)

  Set a single column upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setColBounds (int elementIndex, double lower, double upper)

  Set a single column lower and upper bound
  The default implementation just invokes setColLower() and setColUpper()
- virtual void setColSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

  Set the bounds on a number of columns simultaneously
  The default implementation just invokes setColLower() and setColUpper() over and over again.
- virtual void setRowLower (int elementIndex, double elementValue)

  Set a single row lower bound
  Use -COIN_DBL_MAX for -infinity.
- virtual void setRowUpper (int elementIndex, double elementValue)

  Set a single row upper bound
  Use COIN_DBL_MAX for infinity.
- virtual void setRowBounds (int elementIndex, double lower, double upper)

  Set a single row lower and upper bound
  The default implementation just invokes setRowLower() and setRowUpper()
- virtual void setRowType (int index, char sense, double rightHandSide, double range)

  Set the type of a single row
- virtual void setRowSetBounds (const int *indexFirst, const int *indexLast, const double *boundList)

  Set the bounds on a number of rows simultaneously
  The default implementation just invokes setRowLower() and setRowUpper() over and over again.
- virtual void setRowSetTypes (const int *indexFirst, const int *indexLast, const char *senseList, const double *rhsList, const double *rangeList)

  Set the type of a number of rows simultaneously
  The default implementation just invokes setRowType() over and over again.

Integrality related changing methods

- virtual void setContinuous (int index)

  Set the index-th variable to be a continuous variable.
- virtual void setInteger (int index)

  Set the index-th variable to be an integer variable.
- virtual void setContinuous (const int *indices, int len)

  Set the variables listed in indices (which is of length len) to be continuous variables.
- virtual void setInteger (const int *indices, int len)

  Set the variables listed in indices (which is of length len) to be integer variables.

Methods to expand a problem.

Note that if a column is added then by default it will correspond to a continuous variable.

- virtual void addCol (const CoinPackedVectorBase &vec, const double collb, const double colub, const double obj)

Add a column (primal variable) to the problem.

- virtual void addCols (const int numcols, const CoinPackedVectorBase ∗const ∗cols, const double ∗collb, const double ∗colub, const double ∗obj)

  Add a set of columns (primal variables) to the problem.
- virtual void deleteCols (const int num, const int ∗colIndices)

  Remove a set of columns (primal variables) from the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const double rowlb, const double rowub)

  Add a row (constraint) to the problem.
- virtual void addRow (const CoinPackedVectorBase &vec, const char rowsen, const double rowrhs, const double rowrng)

  Add a row (constraint) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase ∗const ∗rows, const double ∗rowlb, const double ∗rowub)

  Add a set of rows (constraints) to the problem.
- virtual void addRows (const int numrows, const CoinPackedVectorBase ∗const ∗rows, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

  Add a set of rows (constraints) to the problem.
- virtual void deleteRows (const int num, const int ∗rowIndices)

  Delete a set of rows (constraints) from the problem.

Methods to input a problem

- virtual void loadProblem (const CoinPackedMatrix &matrix, const double ∗collb, const double ∗colub, const double ∗obj, const double ∗rowlb, const double ∗rowub)

  Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void assignProblem (CoinPackedMatrix ∗&matrix, double ∗&collb, double ∗&colub, double ∗&obj, double ∗&rowlb, double ∗&rowub)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).
- virtual void loadProblem (const CoinPackedMatrix &matrix, const double ∗collb, const double ∗colub, const double ∗obj, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

  Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void assignProblem (CoinPackedMatrix ∗&matrix, double ∗&collb, double ∗&colub, double ∗&obj, char ∗&rowsen, double ∗&rowrhs, double ∗&rowrng)

  Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).
- virtual void loadProblem (const int numcols, const int numrows, const int ∗start, const int ∗index, const double ∗value, const double ∗collb, const double ∗colub, const double ∗obj, const double ∗rowlb, const double ∗rowub)

  Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).
- virtual void loadProblem (const int numcols, const int numrows, const int ∗start, const int ∗index, const double ∗value, const double ∗collb, const double ∗colub, const double ∗obj, const char ∗rowsen, const double ∗rowrhs, const double ∗rowrng)

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

- virtual int readMps (const char *filename, const char *extension="mps")

  Read an mps file from the given filename.
- virtual void writeMps (const char *filename, const char *extension="mps", double objSense=0.0) const

  Write the problem into an mps file of the given filename.

Message handling

- void passInMessageHandler (CoinMessageHandler *handler)

  Pass in a message handler It is the client's responsibility to destroy a message handler installed by this routine; it will not be destroyed when the solver interface is destroyed.

Constructors and destructors

- OsiXprSolverInterface (int newrows=50, int newnz=100)

  Default Constructor.
- virtual OsiSolverInterface * clone (bool copyData=true) const

  Clone.
- OsiXprSolverInterface (const OsiXprSolverInterface &)

  Copy constructor.
- OsiXprSolverInterface & operator= (const OsiXprSolverInterface &rhs)

  Assignment operator.
- virtual ~OsiXprSolverInterface ()

  Destructor.

Static Public Member Functions

- static int version ()

  Return XPRESS-MP Version number.

Protected Member Functions

Protected methods

- virtual void applyRowCut (const OsiRowCut &rc)

  Apply a row cut. Return true if cut was applied.
- virtual void applyColCut (const OsiColCut &cc)

  Apply a column cut (bound adjustment).

Friends

- void OsiXprSolverInterfaceUnitTest (const std::string &mpsDir, const std::string &netlibDir)

  A function that tests the methods in the OsiXprSolverInterface class.

Static instance counter methods

- XPRSprob getLpPtr ()

  Return a pointer to the XPRESS problem.
- static void incrementInstanceCounter ()

  XPRESS has a context that must be created prior to all other XPRESS calls.
- static void decrementInstanceCounter ()

  XPRESS has a context that should be deleted after XPRESS calls.
- static unsigned int getNumInstances ()

  Return the number of instances of instantiated objects using XPRESS services.

Log File

- static int **iXprCallCount_**
- static FILE * getLogFilePtr ()

  *Get logfile FILE *.*
- static void setLogFileName (const char *filename)

  Set logfile name.

5.38.1 Detailed Description

XPRESS-MP Solver Interface.

Instantiation of OsiSolverInterface for XPRESS-MP

Definition at line 21 of file OsiXprSolverInterface.hpp.

5.38.2 Member Function Documentation

5.38.2.1 virtual bool OsiXprSolverInterface::setWarmStart (const CoinWarmStart * *warmstart*) [virtual]

Set warmstarting information.

Return true/false depending on whether the warmstart information was accepted or not.

Implements OsiSolverInterface.

5.38.2.2 virtual const char* OsiXprSolverInterface::getRowSense ( ) const [virtual]

Get pointer to array[getNumRows()] of row constraint senses.

- 'L': <= constraint
- 'E': = constraint
- 'G': >= constraint
- 'R': ranged constraint

- 'N': free constraint

Implements OsiSolverInterface.

5.38.2.3 virtual const double* OsiXprSolverInterface::getRightHandSide ( ) const [virtual]

Get pointer to array[getNumRows()] of rows right-hand sides.

- if rowsense()[i] == 'L' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'G' then rhs()[i] == rowlower()[i]
- if rowsense()[i] == 'R' then rhs()[i] == rowupper()[i]
- if rowsense()[i] == 'N' then rhs()[i] == 0.0

Implements OsiSolverInterface.

5.38.2.4 virtual const double* OsiXprSolverInterface::getRowRange ( ) const [virtual]

Get pointer to array[getNumRows()] of row ranges.

- if rowsense()[i] == 'R' then rowrange()[i] == rowupper()[i] - rowlower()[i]
- if rowsense()[i] != 'R' then rowrange()[i] is 0.0

Implements OsiSolverInterface.

5.38.2.5 virtual int OsiXprSolverInterface::getIterationCount ( ) const [virtual]

Get how many iterations it took to solve the problem (whatever "iteration" mean to the solver.

Implements OsiSolverInterface.

5.38.2.6 virtual std::vector<double*> OsiXprSolverInterface::getDualRays (int *maxNumRays*, bool *fullRay* = false) const [virtual]

Get as many dual rays as the solver can provide.

(In case of proven primal infeasibility there should be at least one.)

The first getNumRows() ray components will always be associated with the row duals (as returned by getRowPrice()). If `fullRay` is true, the final getNumCols() entries will correspond to the ray components associated with the nonbasic variables. If the full ray is requested and the method cannot provide it, it will throw an exception.

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumRows() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.38.2.7 virtual std::vector<double*> OsiXprSolverInterface::getPrimalRays (int *maxNumRays*) const [virtual]

Get as many primal rays as the solver can provide.

(In case of proven dual infeasibility there should be at least one.)

NOTE for implementers of solver interfaces:

The double pointers in the vector should point to arrays of length getNumCols() and they should be allocated via new[].

NOTE for users of solver interfaces:

It is the user's responsibility to free the double pointers in the vector using delete[].

Implements OsiSolverInterface.

5.38.2.8 virtual void OsiXprSolverInterface::setColLower (int *elementIndex,* double *elementValue*) [virtual]

Set a single column lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.38.2.9 virtual void OsiXprSolverInterface::setColUpper (int *elementIndex,* double *elementValue*) [virtual]

Set a single column upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.38.2.10 virtual void OsiXprSolverInterface::setColSetBounds (const int * *indexFirst,* const int * *indexLast,* const double * *boundList*) [virtual]

Set the bounds on a number of columns simultaneously

The default implementation just invokes setColLower() and setColUpper() over and over again.

Parameters

indexFirst,indexLast	pointers to the beginning and after the end of the array of the indices of the variables whose *either* bound changes
boundList	the new lower/upper bound pairs for the variables

Reimplemented from OsiSolverInterface.

5.38.2.11 virtual void OsiXprSolverInterface::setRowLower (int *elementIndex*, double *elementValue*) [virtual]

Set a single row lower bound

Use -COIN_DBL_MAX for -infinity.

Implements OsiSolverInterface.

5.38.2.12 virtual void OsiXprSolverInterface::setRowUpper (int *elementIndex*, double *elementValue*) [virtual]

Set a single row upper bound

Use COIN_DBL_MAX for infinity.

Implements OsiSolverInterface.

5.38.2.13 virtual void OsiXprSolverInterface::setRowSetBounds (const int * *indexFirst*, const int * *indexLast*, const double * *boundList*) [virtual]

Set the bounds on a number of rows simultaneously

The default implementation just invokes setRowLower() and setRowUpper() over and over again.

Parameters

index-First,indexLas	pointers to the beginning and after the end of the array of the indices of the constraints whose *either* bound changes
boundList	the new lower/upper bound pairs for the constraints

Reimplemented from OsiSolverInterface.

5.38.2.14 virtual void OsiXprSolverInterface::setRowSetTypes (const int * *indexFirst*, const int * *indexLast*, const char * *senseList*, const double * *rhsList*, const double * *rangeList*) [virtual]

Set the type of a number of rows simultaneously

The default implementation just invokes setRowType() over and over again.

Parameters

index-First,indexLas	pointers to the beginning and after the end of the array of the indices of the constraints whose *any* characteristics changes
senseList	the new senses
rhsList	the new right hand sides
rangeList	the new ranges

Reimplemented from OsiSolverInterface.

5.38.2.15 virtual void OsiXprSolverInterface::setColSolution (const double * *colsol*) [virtual]

Set the primal solution column values.

colsol[numcols()] is an array of values of the problem column variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of colsol() until changed by another call to setColsol() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.38.2.16 virtual void OsiXprSolverInterface::setRowPrice (const double * *rowprice*) [virtual]

Set dual solution vector.

rowprice[numrows()] is an array of values of the problem row dual variables. These values are copied to memory owned by the solver object or the solver. They will be returned as the result of rowprice() until changed by another call to setRowprice() or by a call to any solver routine. Whether the solver makes use of the solution in any way is solver-dependent.

Implements OsiSolverInterface.

5.38.2.17 virtual void OsiXprSolverInterface::addCol (const CoinPackedVectorBase & *vec,* const double *collb,* const double *colub,* const double *obj*) [virtual]

Add a column (primal variable) to the problem.

Implements OsiSolverInterface.

5.38.2.18 virtual void OsiXprSolverInterface::addCols (const int *numcols,* const CoinPackedVectorBase *const * *cols,* const double * *collb,* const double * *colub,* const double * *obj*) [virtual]

Add a set of columns (primal variables) to the problem.

The default implementation simply makes repeated calls to addCol().

Reimplemented from OsiSolverInterface.

5.38.2.19 virtual void OsiXprSolverInterface::deleteCols (const int *num,* const int * *collndices*) [virtual]

Remove a set of columns (primal variables) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted variables are nonbasic.

Implements OsiSolverInterface.

5.38.2.20 virtual void OsiXprSolverInterface::addRow (const CoinPackedVectorBase & *vec,* const double *rowlb,* const double *rowub*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.38.2.21 virtual void OsiXprSolverInterface::addRow (const CoinPackedVectorBase & *vec*, const char *rowsen*, const double *rowrhs*, const double *rowrng*) [virtual]

Add a row (constraint) to the problem.

Implements OsiSolverInterface.

5.38.2.22 virtual void OsiXprSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const double * *rowlb*, const double * *rowub*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.38.2.23 virtual void OsiXprSolverInterface::addRows (const int *numrows*, const CoinPackedVectorBase *const * *rows*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Add a set of rows (constraints) to the problem.

The default implementation simply makes repeated calls to addRow().

Reimplemented from OsiSolverInterface.

5.38.2.24 virtual void OsiXprSolverInterface::deleteRows (const int *num*, const int * *rowIndices*) [virtual]

Delete a set of rows (constraints) from the problem.

The solver interface for a basis-oriented solver will maintain valid warm start information if all deleted rows are loose.

Implements OsiSolverInterface.

5.38.2.25 virtual void OsiXprSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by lower and upper bounds).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `rowub`: all rows have upper bound infinity
- `rowlb`: all rows have lower bound -infinity
- `obj`: all variables have 0 objective coefficient

Implements OsiSolverInterface.

5.38.2.26 virtual void OsiXprSolverInterface::assignProblem (CoinPackedMatrix *& *matrix*, double *& *collb*, double *& *colub*, double *& *obj*, double *& *rowlb*, double *& *rowub*) [virtual]

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by lower and upper bounds).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.38.2.27 virtual void OsiXprSolverInterface::loadProblem (const CoinPackedMatrix & *matrix*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Load in an problem by copying the arguments (the constraints on the rows are given by sense/rhs/range triplets).

If a pointer is 0 then the following values are the default:

- `colub`: all columns have upper bound infinity
- `collb`: all columns have lower bound 0
- `obj`: all variables have 0 objective coefficient
- `rowsen`: all rows are >=
- `rowrhs`: all right hand sides are 0
- `rowrng`: 0 for the ranged rows

Implements OsiSolverInterface.

5.38.2.28 virtual void OsiXprSolverInterface::assignProblem (CoinPackedMatrix *& *matrix*, double *& *collb*, double *& *colub*, double *& *obj*, char *& *rowsen*, double *& *rowrhs*, double *& *rowrng*) [virtual]

Load in an problem by assuming ownership of the arguments (the constraints on the rows are given by sense/rhs/range triplets).

For default values see the previous method.

WARNING: The arguments passed to this method will be freed using the C++ `delete` and `delete[]` functions.

Implements OsiSolverInterface.

5.38.2.29 virtual void OsiXprSolverInterface::loadProblem (const int *numcols*, const int *numrows*, const int * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const double * *rowlb*, const double * *rowub*) [virtual]

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.38.2.30 virtual void OsiXprSolverInterface::loadProblem (const int *numcols*, const int *numrows*, const int * *start*, const int * *index*, const double * *value*, const double * *collb*, const double * *colub*, const double * *obj*, const char * *rowsen*, const double * *rowrhs*, const double * *rowrng*) [virtual]

Just like the other loadProblem() methods except that the matrix is given in a standard column major ordered format (without gaps).

5.38.2.31 virtual void OsiXprSolverInterface::writeMps (const char * *filename*, const char * *extension* = "mps", double *objSense* = 0.0) const [virtual]

Write the problem into an mps file of the given filename.

If objSense is non zero then -1.0 forces the code to write a maximization objective and +1.0 to write a minimization one. If 0.0 then solver can do what it wants

Implements OsiSolverInterface.

5.38.2.32 static void OsiXprSolverInterface::incrementInstanceCounter ( ) [static]

XPRESS has a context that must be created prior to all other XPRESS calls.

This method:

- Increments by 1 the number of uses of the XPRESS environment.
- Creates the XPRESS context when the number of uses is changed to 1 from 0.

5.38.2.33 static void OsiXprSolverInterface::decrementInstanceCounter ( ) [static]

XPRESS has a context that should be deleted after XPRESS calls.

This method:

- Decrements by 1 the number of uses of the XPRESS environment.
- Deletes the XPRESS context when the number of uses is change to 0 from 1.

5.38.2.34 static unsigned int OsiXprSolverInterface::getNumInstances ( ) [static]

Return the number of instances of instantiated objects using XPRESS services.

5.38.2.35 static void OsiXprSolverInterface::setLogFileName (const char * *filename*) [static]

Set logfile name.

The logfile is an attempt to capture the calls to Xpress functions for debugging.

5.38.2.36 virtual void OsiXprSolverInterface::applyColCut (const OsiColCut & *cc*) [protected, virtual]

Apply a column cut (bound adjustment).

Return true if cut was applied.

Implements OsiSolverInterface.

5.38.3 Friends And Related Function Documentation

5.38.3.1 void OsiXprSolverInterfaceUnitTest (const std::string & *mpsDir,* const std::string & *netlibDir*) [friend]

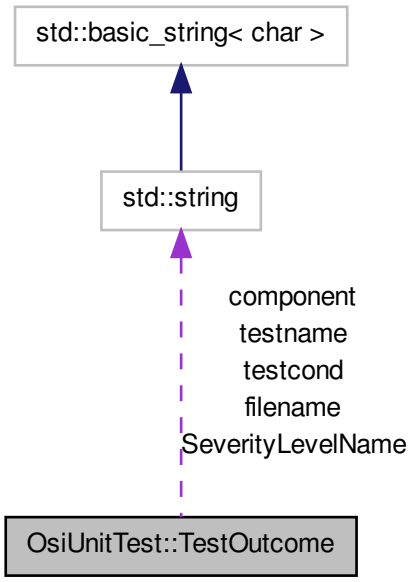
A function that tests the methods in the OsiXprSolverInterface class.

The documentation for this class was generated from the following file:

- OsiXprSolverInterface.hpp

5.39 OsiUnitTest::TestOutcome Class Reference

Collaboration diagram for OsiUnitTest::TestOutcome:



5.39.1 Detailed Description

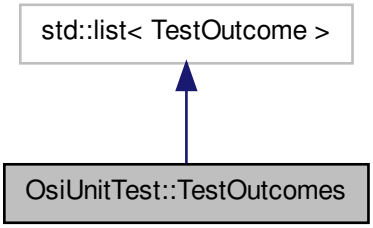
Definition at line 108 of file OsiUnitTests.hpp.

The documentation for this class was generated from the following file:

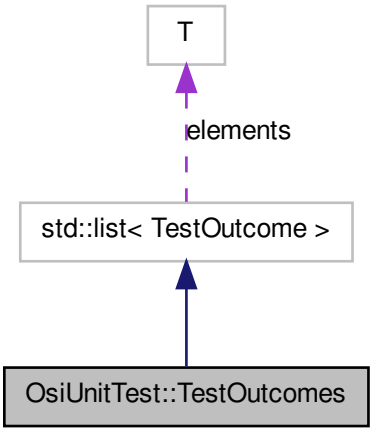
- OsiUnitTests.hpp

5.40 OsiUnitTest::TestOutcomes Class Reference

Inheritance diagram for OsiUnitTest::TestOutcomes:



Collaboration diagram for OsiUnitTest::TestOutcomes:



Public Member Functions

- void getCountBySeverity (TestOutcome::SeverityLevel sev, int &total, int &expected) const

given a severity level, computes the total and the expected number of outcomes for this severity level this is implemented as O(1) operation

5.40.1 Detailed Description

Definition at line 136 of file OsiUnitTests.hpp.

The documentation for this class was generated from the following file:

- OsiUnitTests.hpp

5.41 VOL_alpha_factor Class Reference

5.41.1 Detailed Description

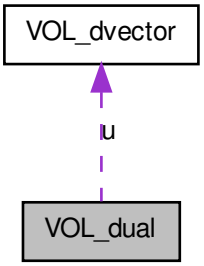
Definition at line 490 of file OsiTestSolver.hpp.

The documentation for this class was generated from the following file:

- OsiTestSolver.hpp

5.42 VOL_dual Class Reference

Collaboration diagram for VOL_dual:



5.42.1 Detailed Description

Definition at line 355 of file OsiTestSolver.hpp.

The documentation for this class was generated from the following file:

- OsiTestSolver.hpp

5.43 VOL_dvector Class Reference

vector of doubles.

`#include <OsiTestSolver.hpp>`

Public Member Functions

- VOL_dvector (const int s)

  Construct a vector of size s.
- VOL_dvector ()

  Default constructor creates a vector of size 0.
- VOL_dvector (const VOL_dvector &x)

  Copy constructor makes a replica of x.
- ~VOL_dvector ()

  The destructor deletes the data array.
- int size () const

  Return the size of the vector.
- double & operator[] (const int i)

  Return a reference to the `i`-th entry.
- double operator[] (const int i) const

  Return the `i`-th entry.
- void clear ()

  Delete the content of the vector and replace it with a vector of length 0.
- void cc (const double gamma, const VOL_dvector &w)

  Convex combination.
- void allocate (const int s)

  delete the current vector and allocate space for a vector of size `s`.
- void swap (VOL_dvector &w)

  swaps the vector with `w`.
- VOL_dvector & operator= (const VOL_dvector &w)

  Copy `w` into the vector.
- VOL_dvector & operator= (const double w)

  Replace every entry in the vector with `w`.

Public Attributes

- double * v

  The array holding the vector.
- int sz

  The size of the vector.

5.43.1 Detailed Description

vector of doubles.

It is used for most vector operations.

Note: If `VOL_DEBUG` is `#defined` to be 1 then each time an entry is accessed in the vector the index of the entry is tested for nonnegativity and for being less than the size of the vector. It's good to turn this on while debugging, but in final runs it should be turned off (beause of the performance hit).

Definition at line 149 of file OsiTestSolver.hpp.

5.43.2 Constructor & Destructor Documentation

5.43.2.1 VOL_dvector::VOL_dvector (const int *s*) [inline]

Construct a vector of size s.

The content of the vector is undefined.

Definition at line 158 of file OsiTestSolver.hpp.

5.43.2.2 VOL_dvector::VOL_dvector ( ) [inline]

Default constructor creates a vector of size 0.

Definition at line 163 of file OsiTestSolver.hpp.

5.43.2.3 VOL_dvector::VOL_dvector (const VOL_dvector & *x*) [inline]

Copy constructor makes a replica of x.

Definition at line 165 of file OsiTestSolver.hpp.

5.43.2.4 VOL_dvector::~VOL_dvector ( ) [inline]

The destructor deletes the data array.

Definition at line 173 of file OsiTestSolver.hpp.

5.43.3 Member Function Documentation

5.43.3.1 int VOL_dvector::size ( ) const [inline]

Return the size of the vector.

Definition at line 176 of file OsiTestSolver.hpp.

5.43.3.2 double& VOL_dvector::operator[] (const int *i*) [inline]

Return a reference to the `i`-th entry.

Definition at line 179 of file OsiTestSolver.hpp.

5.43.3.3 double VOL_dvector::operator[] (const int *i*) const [inline]

Return the `i`-th entry.

Definition at line 185 of file OsiTestSolver.hpp.

5.43.3.4 void VOL_dvector::clear ( ) [inline]

Delete the content of the vector and replace it with a vector of length 0.

Definition at line 192 of file OsiTestSolver.hpp.

5.43.3.5 void VOL_dvector::cc (const double *gamma,* const VOL_dvector & *w*) [inline]

Convex combination.

Replace the current vector `v` with `v = (1-gamma) v + gamma w`.

Definition at line 199 of file OsiTestSolver.hpp.

5.43.3.6 void VOL_dvector::allocate (const int *s*) [inline]

delete the current vector and allocate space for a vector of size `s`.

Definition at line 215 of file OsiTestSolver.hpp.

5.43.3.7 void VOL_dvector::swap (VOL_dvector & *w*) [inline]

swaps the vector with `w`.

Definition at line 222 of file OsiTestSolver.hpp.

5.43.3.8 VOL_dvector& VOL_dvector::operator= (const VOL_dvector & *w*)

Copy `w` into the vector.

5.43.3.9 VOL_dvector& VOL_dvector::operator= (const double *w*)

Replace every entry in the vector with `w`.

The documentation for this class was generated from the following file:

- OsiTestSolver.hpp

5.44 VOL_indc Class Reference

5.44.1 Detailed Description

Definition at line 539 of file OsiTestSolver.hpp.

The documentation for this class was generated from the following file:

- OsiTestSolver.hpp

5.45 VOL_ivector Class Reference

vector of ints.

`#include <OsiTestSolver.hpp>`

Public Member Functions

- VOL_ivector (const int s)

  Construct a vector of size s.
- VOL_ivector ()

  Default constructor creates a vector of size 0.
- VOL_ivector (const VOL_ivector &x)

  Copy constructor makes a replica of x.
- ~VOL_ivector ()

  The destructor deletes the data array.
- int size () const

  Return the size of the vector.
- int & operator[] (const int i)

  Return a reference to the `i`-th entry.
- int operator[] (const int i) const

  Return the `i`-th entry.
- void clear ()

  Delete the content of the vector and replace it with a vector of length 0.
- void allocate (const int s)

  delete the current vector and allocate space for a vector of size `s`.
- void swap (VOL_ivector &w)

  swaps the vector with `w`.
- VOL_ivector & operator= (const VOL_ivector &v)

  Copy `w` into the vector.
- VOL_ivector & operator= (const int w)

  Replace every entry in the vector with `w`.

Public Attributes

- int * v

  The array holding the vector.
- int sz

  The size of the vector.

5.45.1 Detailed Description

vector of ints.

It's used to store indices, it has similar functions as VOL_dvector.

Note: If `VOL_DEBUG` is `#defined` to be 1 then each time an entry is accessed in the vector the index of the entry is tested for nonnegativity and for being less than the size of the vector. It's good to turn this on while debugging, but in final runs it should be turned off (beause of the performance hit).

Definition at line 243 of file OsiTestSolver.hpp.

5.45.2 Constructor & Destructor Documentation

5.45.2.1 VOL_ivector::VOL_ivector (const int *s*) [inline]

Construct a vector of size s.

The content of the vector is undefined.

Definition at line 251 of file OsiTestSolver.hpp.

5.45.2.2 VOL_ivector::VOL_ivector ( ) [inline]

Default constructor creates a vector of size 0.

Definition at line 256 of file OsiTestSolver.hpp.

5.45.2.3 VOL_ivector::VOL_ivector (const VOL_ivector & *x*) [inline]

Copy constructor makes a replica of x.

Definition at line 258 of file OsiTestSolver.hpp.

5.45.2.4 VOL_ivector::~VOL_ivector ( ) [inline]

The destructor deletes the data array.

Definition at line 266 of file OsiTestSolver.hpp.

5.45.3 Member Function Documentation

5.45.3.1 int VOL_ivector::size ( ) const [inline]

Return the size of the vector.

Definition at line 271 of file OsiTestSolver.hpp.

5.45.3.2 int& VOL_ivector::operator[] (const int *i*) [inline]

Return a reference to the `i`-th entry.

Definition at line 273 of file OsiTestSolver.hpp.

5.45.3.3 int VOL_ivector::operator[] (const int *i*) const [inline]

Return the `i`-th entry.

Definition at line 279 of file OsiTestSolver.hpp.

5.45.3.4 void VOL_ivector::clear ( ) [inline]

Delete the content of the vector and replace it with a vector of length 0.

Definition at line 286 of file OsiTestSolver.hpp.

5.45.3.5 void VOL_ivector::allocate (const int *s*) [inline]

delete the current vector and allocate space for a vector of size `s`.

Definition at line 294 of file OsiTestSolver.hpp.

5.45.3.6 void VOL_ivector::swap (VOL_ivector & *w*) [inline]

swaps the vector with `w`.

Definition at line 301 of file OsiTestSolver.hpp.

5.45.3.7 VOL_ivector& VOL_ivector::operator= (const VOL_ivector & *v*)

Copy `w` into the vector.

5.45.3.8 VOL_ivector& VOL_ivector::operator= (const int *w*)

Replace every entry in the vector with `w`.

5.45.4 Member Data Documentation

5.45.4.1 int* VOL_ivector::v

The array holding the vector.

Definition at line 246 of file OsiTestSolver.hpp.

5.45.4.2 int VOL_ivector::sz

The size of the vector.

Definition at line 248 of file OsiTestSolver.hpp.

The documentation for this class was generated from the following file:

- OsiTestSolver.hpp

5.46 VOL_parms Struct Reference

This class contains the parameters controlling the Volume Algorithm.

`#include <OsiTestSolver.hpp>`

Public Attributes

- double lambdainit

  initial value of lambda
- double alphainit

  initial value of alpha
- double alphamin

  minimum value for alpha
- double alphafactor

  when little progress is being done, we multiply alpha by alphafactor
- double ubinit

  initial upper bound of the value of an integer solution
- double primal_abs_precision

  accept if max abs viol is less than this
- double gap_abs_precision

  accept if abs gap is less than this
- double gap_rel_precision

  accept if rel gap is less than this
- double granularity

  terminate if best_ub - lcost < granularity
- double minimum_rel_ascent

  terminate if the relative increase in lcost through `ascent_check_invl` *steps is less than this*
- int ascent_first_check

  when to check for sufficient relative ascent the first time
- int ascent_check_invl

  through how many iterations does the relative ascent have to reach a minimum
- int maxsgriters

  maximum number of iterations
- int printflag

  controls the level of printing.
- int printinvl

  controls how often do we print
- int heurinvl

  controls how often we run the primal heuristic
- int greentestinvl

  how many consecutive green iterations are allowed before changing lambda
- int yellowtestinvl

  how many consecutive yellow iterations are allowed before changing lambda
- int redtestinvl

  how many consecutive red iterations are allowed before changing lambda

- int alphaint

  number of iterations before we check if alpha should be decreased
- char * temp_dualfile

  name of file for saving dual solution

5.46.1 Detailed Description

This class contains the parameters controlling the Volume Algorithm.

Definition at line 72 of file OsiTestSolver.hpp.

5.46.2 Member Data Documentation

5.46.2.1 int VOL_parms::printflag

controls the level of printing.

The flag should the the 'OR'-d value of the following options:

- 0 - print nothing
- 1 - print iteration information
- 2 - add lambda information
- 4 - add number of Red, Yellow, Green iterations

Default: 3

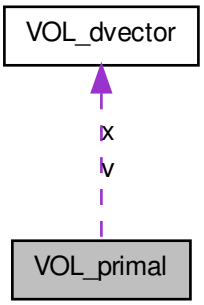
Definition at line 116 of file OsiTestSolver.hpp.

The documentation for this struct was generated from the following file:

- OsiTestSolver.hpp

5.47 VOL_primal Class Reference

Collaboration diagram for VOL_primal:



5.47.1 Detailed Description

Definition at line 314 of file OsiTestSolver.hpp.

The documentation for this class was generated from the following file:

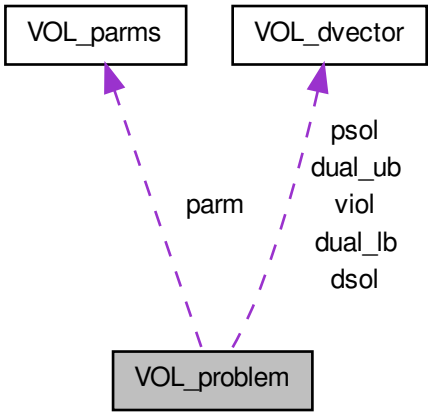
- OsiTestSolver.hpp

5.48 VOL_problem Class Reference

This class holds every data for the Volume Algorithm and its `solve` method must be invoked to solve the problem.

`#include <OsiTestSolver.hpp>`

Collaboration diagram for VOL_problem:



Public Member Functions

Constructors and destructor

- VOL_problem ()
  Default constructor.
- VOL_problem (const char *filename)
  Create a a `VOL_problem` object and read in the parameters from `filename`.
- ~VOL_problem ()
  Destruct the object.

Method to solve the problem.

- int solve (VOL_user_hooks &hooks, const bool use_preset_dual=false)
  Solve the problem using the `hooks`.

Methods returning final data

- int iter () const
  returns the iteration number
- double alpha () const
  returns the value of alpha
- double lambda () const
  returns the value of lambda

Public Attributes

- int iter_

  iteration number

External data (containing the result after solve)

- double value

  final lagrangian value (OUTPUT)
- VOL_dvector dsol

  final dual solution (INPUT/OUTPUT)
- VOL_dvector psol

  final primal solution (OUTPUT)
- VOL_dvector viol

  violations (b-Ax) for the relaxed constraints

External data (may be changed by the user before calling solve)

- VOL_parms parm

  The parameters controlling the Volume Algorithm (INPUT)
- int psize

  length of primal solution (INPUT)
- int dsize

  length of dual solution (INPUT)
- VOL_dvector dual_lb

  lower bounds for the duals (if 0 length, then filled with -inf) (INPUT)
- VOL_dvector dual_ub

  upper bounds for the duals (if 0 length, then filled with +inf) (INPUT)

5.48.1 Detailed Description

This class holds every data for the Volume Algorithm and its `solve` method must be invoked to solve the problem.

The INPUT fields must be filled out completely before `solve` is invoked. `dsol` have to be filled out if and only if the last argument to `solve` is `true`.

Definition at line 606 of file OsiTestSolver.hpp.

5.48.2 Constructor & Destructor Documentation

5.48.2.1 VOL_problem::VOL_problem ( )

Default constructor.

5.48.2.2 VOL_problem::VOL_problem (const char * *filename*)

Create a a `VOL_problem` object and read in the parameters from `filename`.

5.48.2.3 VOL_problem::~VOL_problem ( )

Destruct the object.

5.48.3 Member Function Documentation

5.48.3.1 int VOL_problem::solve (VOL_user_hooks & *hooks,* const bool *use_preset_dual* = false)

Solve the problem using the `hooks`.

Any information needed in the hooks must be stored in the structure `user_data` points to.

The documentation for this class was generated from the following file:

- OsiTestSolver.hpp

5.49 VOL_swing Class Reference

5.49.1 Detailed Description

Definition at line 391 of file OsiTestSolver.hpp.

The documentation for this class was generated from the following file:

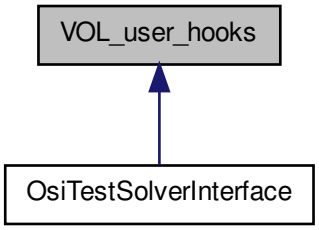
- OsiTestSolver.hpp

5.50 VOL_user_hooks Class Reference

The user hooks should be overridden by the user to provide the problem specific routines for the volume algorithm.

`#include <OsiTestSolver.hpp>`

Inheritance diagram for VOL_user_hooks:



Public Member Functions

- virtual int compute_rc (const VOL_dvector &u, VOL_dvector &rc)=0

  compute reduced costs
- virtual int solve_subproblem (const VOL_dvector &dual, const VOL_dvector &rc, double &lcost, VOL_dvector &x, VOL_dvector &v, double &pcost)=0

  Solve the subproblem for the subgradient step.
- virtual int heuristics (const VOL_problem &p, const VOL_dvector &x, double &heur_val)=0

  Starting from the primal vector x, run a heuristic to produce an integer solution.

5.50.1 Detailed Description

The user hooks should be overridden by the user to provide the problem specific routines for the volume algorithm.

The user should derive a class ...

for all hooks: return value of -1 means that volume should quit

Definition at line 564 of file OsiTestSolver.hpp.

5.50.2 Member Function Documentation

5.50.2.1 virtual int VOL_user_hooks::compute_rc (const VOL_dvector & *u*, VOL_dvector & *rc*) [pure virtual]

compute reduced costs

Parameters

u	(IN) the dual variables
rc	(OUT) the reduced cost with respect to the dual values

5.50.2.2 virtual int VOL_user_hooks::solve_subproblem (const VOL_dvector & *dual,* const VOL_dvector & *rc,* double & *lcost,* VOL_dvector & *x,* VOL_dvector & *v,* double & *pcost*) [pure virtual]

Solve the subproblem for the subgradient step.

Parameters

dual	(IN) the dual variables
rc	(IN) the reduced cost with respect to the dual values
lcost	(OUT) the lagrangean cost with respect to the dual values
x	(OUT) the primal result of solving the subproblem
v	(OUT) b-Ax for the relaxed constraints
pcost	(OUT) the primal objective value of `x`

5.50.2.3 virtual int VOL_user_hooks::heuristics (const VOL_problem & *p,* const VOL_dvector & *x,* double & *heur_val*) [pure virtual]

Starting from the primal vector x, run a heuristic to produce an integer solution.

Parameters

x	(IN) the primal vector
heur_val	(OUT) the value of the integer solution (return `COIN_DBL_MAX` here if no feas sol was found

The documentation for this class was generated from the following file:

- OsiTestSolver.hpp

5.51 VOL_vh Class Reference

5.51.1 Detailed Description

Definition at line 516 of file OsiTestSolver.hpp.

The documentation for this class was generated from the following file:

- OsiTestSolver.hpp

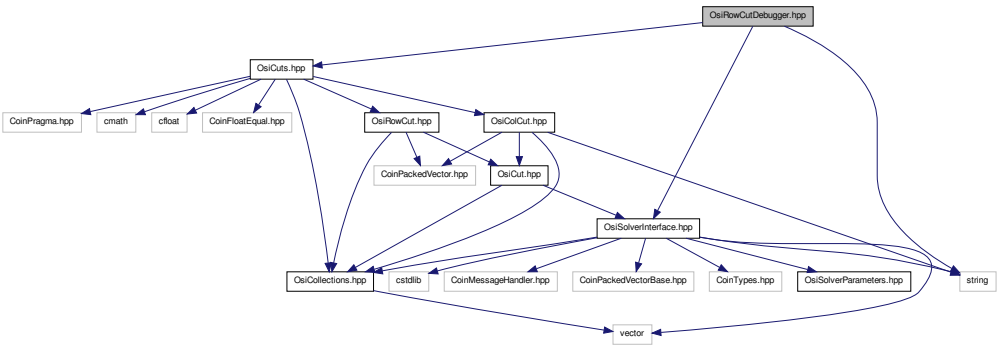
6 File Documentation

6.1 OsiRowCutDebugger.hpp File Reference

Provides a facility to validate cut constraints to ensure that they do not cut off a given solution.

```
#include <string>
#include "OsiCuts.hpp"
#include "OsiSolverInterface.hpp"
```

Include dependency graph for OsiRowCutDebugger.hpp:



Classes

- class OsiRowCutDebugger

  Validate cuts against a known solution.

6.1.1 Detailed Description

Provides a facility to validate cut constraints to ensure that they do not cut off a given solution.

Definition in file OsiRowCutDebugger.hpp.