New developments in OSiL, OSoL and OS

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Overview

• Introduction
• Robust Optimization
• Special ordered sets
• OSoL parser
• Other recent additions
• Future work
What is Optimization Services?

• Set of standards for optimization
  – OSiL: Problem instances
  – OSrL: Optimization result
  – OSoL: Solver options

• Parsers and solver interfaces for local and distributed computing

• COIN-OR project
User interface

AML

Data interchange

Corporate databases

Solvers

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OSiL: Optimization Services instance Language

- XML schema for deterministic and stochastic programs:
  - <variables>
  - <objectives>
  - <constraints>
  - <linearConstraintCoefficients>
  - <quadraticCoefficients>
  - <nonlinearExpressions>
  - <specialOrderedSets>
  - <robustOptimization>
  - ...

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Robust optimization

• Example:

\[
\begin{align*}
\min & \quad \max \ f(x,c) \\
\text{s.t.} & \quad F(x,c) \leq 0 \\
& \quad H(c) \leq 0 \\
& \quad l_x \leq x \leq u_x \\
& \quad l_c \leq c \leq u_c
\end{align*}
\]

Under suitable conditions, the complexity of the problem is not changed by the introduction of uncertain parameters.
OSiL: `<robustOptimization>`
Special ordered sets

• SOS Type 1
  – At most one variable in the set can be nonzero
• SOS Type 2
  – At most two variables in the set can be nonzero …
  – … and they must be consecutive
• SOS Type 3
  – Like SOS1, but there is an explicit convexity row
OSiL: <specialOrderedSets>

- **attributes**
  - **numberOfSpecialOrderedSets**

**specialOrderedSets**
- experiment

**sos1**
- experiment

**sos2**
- experiment

**sos3**
- experiment

**sos1Var**
- attributes
  - **idx**
  - **mult**
  - **incr**

Number of `var` elements must match `numberOfSpecialOrderedSets` after sequences have been accounted for appropriately.
OSoL: Optimization Services option Language

- XML schema for solver options
  - General options for distributed computing
    - Username, password, location, etc.
  - System options
    - Disk space, CPU requirements
  - Job options
    - Dependency on other jobs, file and directory options, time limits, etc.
  - Solver options
    - Tolerances, initial values, priority rules for SOS, etc.
- Parser added to OS trunk on October 4
Other recent additions

• Added solver support
  – DyLP
  – Bonmin
• Lossless I/O for transmitting OSiL files
• GAMSlinks
• Visual Studio 9.0 support
• Sparsity patterns for Hessian computation (CppAd)
• Excel VBA interface
• Precompiled Windows binaries
• Current stable version 1.1.1 (released 30 September)
Future work

• Support for stochastic programs
  – Deterministic equivalent
  – Decomposition solver
• Disjunctions
• Cone programming