Performance World: An Online Forum for Perfomance Testing

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Agenda

- Introduction to Performance World

- Libraries

- Performance Tools

- Links / Other

- Conclusions and Future Direction

Background and Motivation

Performance World is:

- devoted to all aspects of performance testing of solvers for mathematical programming problems

- a forum for discussion and dissemination of information and tools
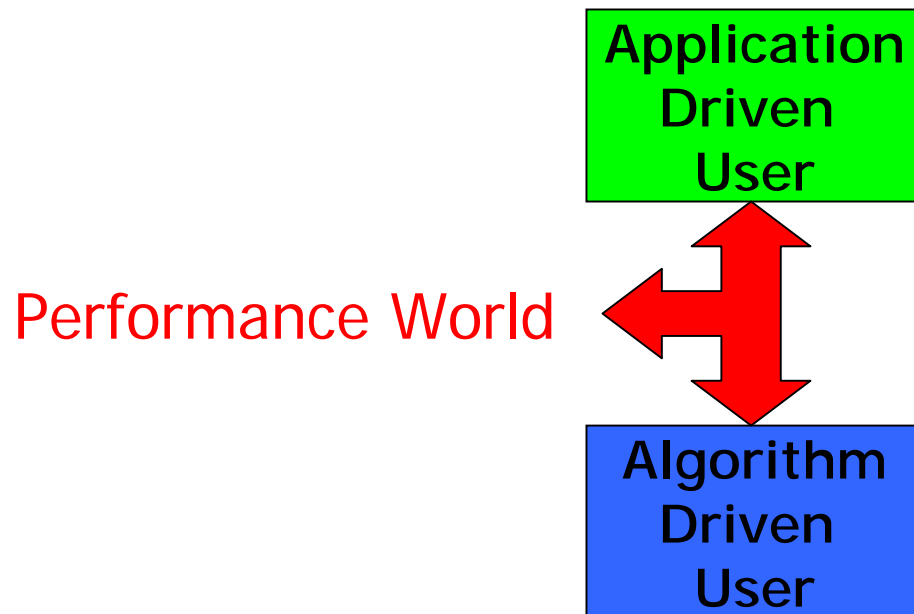
Background (cont.)

Driven by user needs:

- Finding the most reliable way to solve a proprietary or classified model

- Testing a new algorithm against a set of existing test problems and competing approaches

- Reproducibility of quality assurance results

Background (cont.)

Concerned with:

- Solver performance under default solver options

Performance World

- Solver performance under advanced solver options

Performance World

Performance World provides:

- Uniform access to a comprehensive set of established and new test problems

- Automation tools for collecting performance measurements

- Tools for analyzing and visualizing test results

Performance World

Performance World

Welcome to the Performance World!

Performance World is a forum for discussion and dissemination of information and tools about all aspects of performance testing of mathematical programming problems. This world has been established in response to user demands for independent and reproducible performance results.

Overall performance highly depends on problem formulation, solver, and tuning parameters. Our performance tools are designed to serve the different needs of our user community. One user may be interested in finding the most reliable way to solve a proprietary or classified model. On the other hand, an academic researcher may be interested in testing a new algorithm against a set of existing test problems and competing approaches. The main features are:

- Uniform access to a comprehensive set of established and new test problems
- Automation tools for collecting performance measurements
- Tools for analyzing and visualizing test results

What's New:

- Try our online PAVER Server for automated performance analysis and batch file creation
- New tools for analyzing non-convex or discrete models
- MINLP type models from the MINLP World have been added to the PerformanceLib A tutorial (August, 2002)

Editorial Board

PerformanceLib

Performance Tools

Performance List

Related Links

Search

Contact

Libraries

Test cases:

- Widely available collection of standardized test instances:
    - MIPLIB, NETLIB, MacMINLP, COPS, etc.
- Client models
    - In scalar format to hide proprietary data

Libraries (cont.)

A collection of libraries from GAMS World:

- LINLib: LP and MIP

- GlobalLib: NLP

- MINLPLib: MINLP

- MPECLib: MPEC

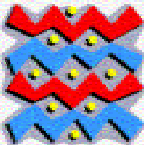Models being added continuously…

Libraries (cont.)

Model pages:

- Browse models by author, size, origin

- Contain model statistics

- Solution points

- References and original source

Libraries (cont.)

[**MINLP World Home** | **Board** | **Solvers** | **MINLPLib** | **Links** | **MINLP-List** | **Search** | **Contact**]

MINLPLib Model Statistics

Name	#Eqns	#Vars	#DVars	#NZ	#NNZ	BestInt	at Point
4stufen	99	150	48	319	87	116329.7000	p1
alan	8	9	4	24	3	2.9250	p1
batch	74	47	24	191	22	285506.5000	p1
batchdes	20	20	9	53	10	167427.7000	p1
beuster	115	158	52	398	159	116348.0000	p1
cecil_13	899	841	162	2812	360	-115570.3000	p1
contvar	285	297	87	1281	530	809149.8000	p1
csched1	23	77	63	174	8	-30639.2600	p1
csched2	138	401	308	958	58	-166102.0000	p1
deb10	130	183	11	692	432	209.4278	p1
deb6	508	476	20	2342	1432	201.7393	p1
deb7	898	814	10	4116	2816	116.5846	p1
deb8	898	824	10	4136	2816	116.5846	p1
deb9	918	814	10	4156	2816	116.5846	p1
detf1	6206	4408	400	26610	15400	12.7753	p1
dosemin2d	119	166	32	4379	4080	173.9806	p1
dosemin3d	1003	1047	18	24614	22095	1.4626	p1
du-opt5	10	21	12	47	20	8.0737	p1
du-opt	10	21	13	47	20	3.5563	p1
eg_all_s	28	8	7	220	196	8.2377	p1
eg_disc_s	28	8	4	220	196	5.7605	p1

Libraries (cont.)

4stufen.gms:

Reference:

* GAMS Development, GAMS Software Client Models.

Point: p1
Best known point: p1 with value 116329.7000

```
*   MINLP written by GAMS Convert at 04/17/01 16:35:04
*
*   Equation counts
*      Total          E          G          L          N          X
*         99         95          4          0          0          0
*
*   Variable counts
*                     x          b          i        s1s        s2s         sc         si
*      Total       cont     binary    integer       sos1       sos2      scont       sint
*        150        102         48          0          0          0          0          0
*   FX     0          0          0          0          0          0          0          0
*
*   Nonzero counts
*      Total      const         NL        DLL
*        319        232         87          0
*
*   Solve m using MINLP minimizing objvar;


Variables  x1,x2,x3,x4,x5,x6,x7,x8,x9,x10,x11,x12,x13,x14,x15,x16,x17,x18,x19
          ,x20,x21,x22,x23,x24,x25,x26,x27,x28,x29,x30,x31,x32,x33,x34,x35,x36
          ,x37,x38,x39,x40,x41,x42,x43,x44,x45,x46,x47,x48,x49,x50,x51,x52,x53
          ,x54,x55,x56,x57,x58,x59,x60,x61,x62,x63,x64,x65,x66,x67,x68,x69,x70
          ,x71,x72,x73,x74,x75,x76,x77,x78,x79,x80,x81,x82,x83,x84,x85,x86,x87
```

Performance Tools

- Data collection tools
  - Automatic collection of solution and statistics

- Data analysis tools
  - Standard quality and performance measurements
  - Analysis and visualization

- PAVER Server for automation

Data Collection Tools

- Automatic GAMS batch file creation:
  - GAMS routine (or)
  - Online using PAVER Server

- Statistics collected in trace files:
  - Model statistics
  - Non-default input options
  - Solver and solution statistics
    - Resource time
    - Iterations

Data Analysis Tools

Analysis tools which compare:

- Solver robustness
  - Optimal, feasible, unbounded, infeasible, fail

- Solver efficiency
  - Resource time

- Quality of solution
  - Objective function values

Data Visualization Tools

Performance Profiles:

- A function of τ showing probability of success given τ times minimum solver time

- Plot combines robustness and efficiency information

- Can be used online using PAVER Server

PAVER Server for Automation

- PAVER (**P**erformance **A**nalysis **A**utomation & **V**isualization for **E**ffortless **R**eproducibility)

- Online server provides tools for
  - Automatic GAMS batch file creation
  - Automatic performance analysis and visualization
  - Results available online and via e-mail

PAVER Server (cont.)

PAVER - Performance Analysis Web Submission Tool

The Performance Analysis and Visualization for Effortless Reproducability Server (PAVER) web-submission tool runs the Performance Tool pprocess.gms and returns the results as a zip file attachment via e-mail. Users can also view results online. Users input their data in the form of trace files (GAMS traceopt=3). See the Tracefile Section for details concerning the trace file format.

The PAVER performance analysis tool is GAMS independent. User who wish to use PAVER with non-GAMS solvers can do so , as long as the data files submitted are in the traceopt=3 format as described in the Tracefile Section.

If users wish to rename solvers in their trace files, they can enter a new solver name in the *Rename solver* field. This is especially useful if a single solver with several different options is analyzed. In this case all the trace files may have the same solver name. Users can rename the solver to reflect the different options used.

For more information see the PAVER - Performance Analysis Web Submission Tool information section.

Email Address (required): beck@plato.la.asu.edu

	Submit trace file:		Rename solver:
Trace 1 (required)	C:\gamsprojects\pworld\plib\sbb\ [Browse...]		CONOPT2
Trace 2 (required)	C:\gamsprojects\pworld\plib\sbb\ [Browse...]		KNITRO opt.1
Trace 3	C:\gamsprojects\pworld\plib\sbb\ [Browse...]		LOGO default
Trace 4	[Browse...]		
Trace 5	[Browse...]		
Trace 6	[Browse...]		
Trace 7	[Browse...]		
Trace 8	[Browse...]		

[Submit Trace Files] [Clear Form]

Links / Other

Performance World provides links to:

- Other model libraries
- Benchmarks performed by others
- Benchmarking references
- Related performance resources

Some Links

Benchmarks

- Benchmarks of Free and Commercial Optimization Software by Hans D. Mittelmann
- Benchmarking solver for interactive use on NEOS
- Benchmarking with performance profiles using the COPS test set

Model Collections

- COPS: Large-Scale Optimization Problems (nonlinear):
  - COPS models and benchmarking at Argonne National Laboratory
  - COPS models in GAMS (No.229-245)

- CUTEr: Constrained and Unconstrained Testing Environment, revisited:
  - CUTEr models at Rutherford Appleton Laboratory

Conclusions

Our Goals:

- Uniform access to a comprehensive set of established and new test problems

- Automation tools for collecting performance measurements

- Tools for analyzing and visualizing test results

- Enable users to reproduce performance results

- Automation via the performance analysis automation server (PAVER)