

## Note on 2/16/18

### Breakdown of MIPLIB 2010: Contents & Summary (my opinion&questions in blue color)

#### 1. Introduction

They describes what they have done via MIPLIB 2010: provided instances, categories of instances (easy, hard, open), progress in solving MIP instances, speedup of commercial MIP solvers, how much it becomes faster to solve MIPs, breakdown of the instances

#### 2. The test sets (361 in total)

MIPLIB 2003 contains only 60 instances⇒Inadequate test sets for researchers. The authors identified “several areas” for which dedicated test sets should be made available:

- Benchmark (87): instances solvable to opt. within  $\leq 2$  hours on high-end PC
- Infeasible (20): infeasible instances (are these useful?).
- Primal (40): instances for which the solution of the root LP relaxation has the same objective value as the optimal solution (why the name “primal”?).
- XXL (11): very large instances w.r.t. #variables, #constraints, #non-zeros.
- Reoptimize (66): instances for which the reoptimization of the sub-LPs takes an unusually long time.
- Tree (52): instances that lead to large enumeration trees (how they find/measure it? solvers provide information?)
- Unstable (21): instances that have “bad”(?) numerical properties and are likely to cause numerical troubles (?) in the solver. This set is intended to test solver robustness.
- Challenge (164): compilation of hard-to-solve instances, instances that to our knowledge have not been solved to optimality. For 21 instances, no feasible solution has been found. Some of these may be infeasible.

##### (a) What are the sources of the instances?

They started a call for instances: March 2010-Oct. 2010. 1,108 instances from 57 contributors. They translated them to .MPS format. When somebody sent .AMPL model, they preserved them on MIPLIB website. And any other internet repositories: BCOL, CORL, DEIS-ORGLI, etc. Initially, the number of candidate set contained about 2,000 instances. (I think, we also need to make a call for instances to researchers. Prior to that, we need to make a “format” in which they can submit instances. The format can roughly contain: the form of SIP model, application type - energy, manufacturing, logistics, telecom, etc, #scenarios, prob. for each scenario, etc. We will provide a sample format for each family of instances so that they can refer.)

##### (b) How were the instances selected?

- Exclusion of trivial instances and (near) duplicates.
- Examination and pre-selection by eight groups.
- Final refinement of the benchmark set.

#### 3. The solution checker

##### (a) Floating-point arithmetic and tolerances

##### (b) What do MIP solvers actually try to solve?

- (c) What does the solution checker test?
- 4. How to run a test, add a solver, and what the scripts do?
- 5. Variability of MIP solver performances
  - (a) Reasons for performance variability
  - (b) Generating and measuring performance variability
  - (c) Results on performance variability
  - (d) Consequences for benchmarking
- 6. The instance catalog
- 7. State-of-the-art MIP solving
- 8. Final remarks