

AUTOMATED REASONING

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CLPLAB

Udine, January 2017

1 SURVEY

- CLP(SET)
- PROTEIN STRUCTURE PREDICTION
- PLANNING
- CUDA
- TO DO

2 EXAM

A brief tour on the research of CLPLAB `clp.dimi.uniud.it`

LOGIC PROGRAMMING WITH SETS (CONSTRAINTS)

- Algorithms for *unification* of terms denoting sets
- As well as hypersets, multisets, ...
- Constraint solving algorithms where terms can denote sets and built-in constraint predicate are \in, \subseteq, \dots
- The language `{log}` (setlog)
- Main papers: JLP96, FUIN98, TOPLAS00, TPLP06

PROTEIN STRUCTURE PREDICTION

- In-lattice approaches (with the FCC and a 20×20 contact energy matrix)
- Computational results on global constraints in lattice
- Off-lattice, fragment based approaches. The 5@ model.
- Main papers: BMC04, SPE07 (COLA), IJDMB10, TPLP10, JAIR13 (FIASCO)

- We have explored how to implement action description languages and planning in particular
- We have proposed and used the ASP/CP encoding seen in this course
- We have used **tabling** (e.g., for sokoban)
- We have used the new language Picat (tabling+constraints+SAT)
- Main papers: JETA109, TPLP10, FUIN10, TPLP13, FUIN13, TPLP15

- We have explored the low cost parallelism of the GPGPUs (in particular the NVIDIA cards programmed with the CUDA framework)
- First we have explored SAT solving (CUD@SAT)
- Then we moved towards constraint and ASP solving
- The constraint solver iNVIDIOSO is a work in progress (preliminary results published). It accepts flatzinc input.
- Results using LNS in previous releases are very encouraging
- Similarly the ASP solver YASMIN is under development (preliminary results published)
- Search strategy of YASMIN exploits our 2009 proposal GASP
- Main papers: FUIN09 (GASP), JETA15, ECAI15, PADL16

Plenty of things to do in the next future!

- I'll give each of you a personal assignment (no groups).
- You have to model (and solve) it using Minizinc and ASP.
- You will prepare benchmarks (I'll give some hints in each assignments) to test your models.
- Different search strategies (in Minizinc and in ASP) can be investigated. For Minizinc see the corresponding lesson. For ASP, call `clingo -help`. There is a list of options (auto—frumpy—jumpy—tweety—handy—crafty—trendy—many). Use them.
- A 6–10 pages report (including the encoding) should be prepared.
- All the codes and benchmarks must be sent to me (I'll read and check them!!!)
- Then we'll have an appointment for an oral exam on **all the course material** (definitions, proofs, etc etc)