Advanced Programming in Artificial Intelligence

APAI Race

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artificial intelligence research group

Context

- Practical case
- 50% of the total grade (Covid-19 modifications)
- Minimum of 3 (over 10)
- In groups of 2 students (exceptionally 3)
- Design and development of a Complete Solver for SAT + presentation of a research paper
- Final deadline (not the race): June 5th
- No participant in the race: Maximum grade of 7

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The APAI Race²: Submission

- Deadline: May 28th, 12:00 AM (GMT +2)
- Submission
  - Participants: Names of the group members
  - Solver: Name of the solver
    - Sent to the activity of the race in the Virtual Campus (with the names of the members of the group)
  - Benchmarks: 5 instances to upload into your shared space in the Virtual Campus (zip/tgz file)
    - File names: {id_group}_{id_instance}.cnf
    - Max size per instance: 100KB
    - Will be requested during the race

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The APAI Race²: Rules

- Benchmarks
  - Files in CNF format (explained in class)
  - Generated with the rnd-cnf-gen.py and rnd-graph-gen.py
- Solver
  - Programming language: Python (lab version)
  - Running parameters
    - $ ./solver_name <input_cnf_formula>
  - Output format
    - Comments (will be ignored): c comment
    - Solution: s SATISFIABLE / s UNSATISFIABLE
    - Values to variables: v -1 2 3 -4 5 -6 -7 -8 0

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The APAI Race²: Rules

- Benchmarks

```
c Random formula
p cnf 3 4
1 -2 3 0
2 3 -1 0
-1 -2 3 0
2 -3 0
```

- Solver output (the 'v' line can be another solution)

```
c Solver Name
s SATISFIABLE
v -1 2 3 0
```

```
c Solver Name
s UNSATISFIABLE
```

(in case the problem has no solution)

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The APAI Race²: Resources

- Computational resources
  - Time: 10 seconds per instance (CPU time)
  - Memory: system limit
    - Be careful with swapping
- Penalization
  - Timeout: 20 seconds
  - Bug: 10000 seconds

The APAI Race²: Results

- Results
  - Total time
    - CPU time for each solved/unsat instance
    - 20 seconds for each timeout instance
    - 10000 seconds for each buggy solution
- Classification
  - Rank solvers by total time
    - Less (time) is better

The APAI Race: Environment

- Race environment
  - race-complete.py: $ ./race.py <benchmark-folder> <solver>
    - Runs every .cnf file in the benchmark folder with the solver
    - Sets the CPU time limit for each run
    - For each run outputs the CPU time or the penalization
    - At the end outputs the total time (score used to rank the solver)

After the Race

- If there is enough time...
  - Each group will explain the techniques and heuristics used in the solver
- Evaluation
  - Better solver → better grade for the practical case
  - The source code will be revised
    - May decrease the grade

Complete SAT Research Paper

- Presentation of a research paper
  - 35% APAI race[2]
  - 15% Presentation of a research paper
  - Read and understand a research paper about complete SAT solvers
  - Make some slides explaining the paper
  - Make a 10-15 minutes presentation of the paper
  - In English
  - Revise you presentation before sending it...

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