Combinatorial Optimization
B4M35KO + BE4M35KO

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CoContest 2024
week 14
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CoContest 2024

Motivation

- ▶ a real-life issue as a combinatorial problem
- ▶ to resolve cyclic package/source code dependency in the cheapest way

The problem is known in the literature as the "minimum feedback arc set."

Instances

- ▶ complete graphs
- ▶ layered graphs ("chained" bipartite graphs)
- ▶ trees

Possible Solutions

Optimal

1. **topological sorting** with the highest sum of edge costs
2. **finding all cycles** and removing at least one edge of each of them with the lowest cumulative sum

Threshold & Ranking

1. **greedy topological sorting** in a random order of vertices
2. genetic algorithm
3. **decomposition** into strongly connected components
4. **greedy acyclic graph** from the edges with the highest weight
   ▶ in addition extended with local search procedure
      4.1 add random edges and regain acyclicity by removing the cheapest edge in each cycle
5. weight normalization by the edge degrees?

Best Student Solutions

..?

Statistics

- ▶ top 10 solutions:
  - ▶ C/C++: 9
  - ▶ Python: 1 (3rd position)
- ▶ 71 students submitted a code producing at least one valid solution

Hall of Fame 2024

1. Viacheslav Larionov (5.75)
2. Lukáš Cezner (8.00)
3. Tomáš Děd (9.13)
4. Jakub Rada (9.38)
5. David Čech (9.56)

Industrial Informatics Department

- way of cooperation:
  - semestral project
  - diploma thesis
  - part-time job
  - doctorate
- what we do:
  1. optimization algorithms
  2. machine learning (mainly for industry)
  3. scheduling
  4. planning
  5. simulations
  6. embedded systems
  7. robotics, automotive
  - both theoretical research and industry cooperation and applications

For more information about what we are doing, our projects, thesis topics, etc., please visit:

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