Combinatorial Optimization

B4M35KO + BE4M35KO

Vilém Heinz, Josef Grus, Jan Pikman and Theodor Krocan

Czech Institute of Informatics, Robotics and Cybernetics
Industrial Informatics Department

CoContest 2025
week 14
19. 5. - 25. 5. 2025

CoContest 2025

Motivation

- a general packing problem with many real-life applications
- filling parcel lockers, trucks, ships
- easily extendable to 3D, adding special constraints, ...

Essentially 2D multiple knapsack problem

Instances

- 20-400 customers, 30-300 boxes
- some instances had mafiosos - customers who offered significantly larger bribes for fulfilling the entire order
- uniformly randomly generated sizes

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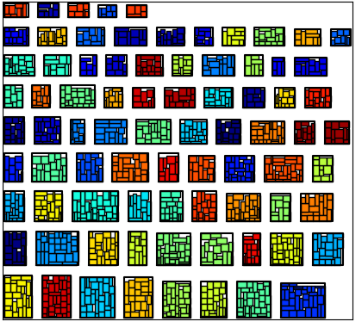

Figure: Smaller example (80 boxes)

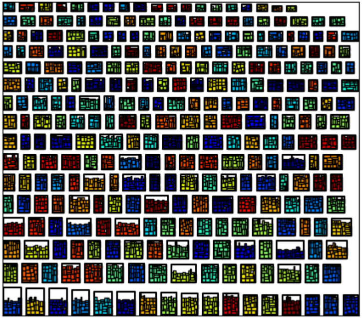

Figure: Larger example (300 boxes)

Possible Solutions

Optimal

1. **1D variant** - bin-packing formulation
2. **2D variant**
   - bin-packing + *Tiles*-like model
   - should be enough to receive 1.5 points from threshold

Threshold & Ranking

- **reference**
  1. genetic algorithm to assign boxes to customers
  2. level-based packing procedure to pack items
- better packing procedures
- other metaheuristics
- integrating ILP solver

Best Student Solutions

..?

Statistics

- top 10 solutions:
  - C/C++: 4
  - Python: 6 (1st position)
- 96 students submitted a code producing at least one valid solution

Hall of Fame 2025

1. **Jakub Kolář (2.00)**
2. Marek Jagoš (6.00)
3. Petr Netušil (8.00)
4. Jan Tychtl (8.14)
5. Rostislav Kvarda (8.79)

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

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