Combinatorial Optimization

B4M35KO+BE4M35KO

Grading system

To get an assessment, the following requirements have to be met:

- obtain at least 25 from 50 points.
- successfully solve all homework assignments.

How to get points:

- 7 points for each test I,II (written at lectures).
- 10 points for practical test (written at the lecture).
- 16 points for semester project.
- 10 points for homework assignments No. 1-5
  (2 points for each assignment if successfully submitted before the deadline).

For more information, please check course website:

https://cw.fel.cvut.cz/b202/courses/ko/start

Homeworks

- homeworks can be coded in Python, C++ or Java.
- each homework (the source code) must be handed in to BRUTE (https://cw.felk.cvut.cz/brute) with a hard deadline, specified in BRUTE.
- homeworks are graded automatically by the BRUTE.
- there is 1 penalty point for each commenced week until the homework is uploaded successfully (max. -2 points penalty).
- check **https://cw.fel.cvut.cz/b202/courses/ko/upload_system** for technical requirements on the submitted source code.

Semester project

- each student chooses from the following two options:
  a. Cocontest.
     Students participating in the contest implement a solver for one specific combinatorial optimization problem.
  b. Research on chosen topic.
     A student chooses a non-trivial problem from the combinatorial optimization area on which he/she will work during the semester. The topic must be approved by the lab teacher!
- if student wishes to choose Research on chosen topic, he/she will email his/her lab teacher with the selected topic by strict deadline of 6. 3. 2021

Combinatorial Optimization Contest
Cocontest 2021

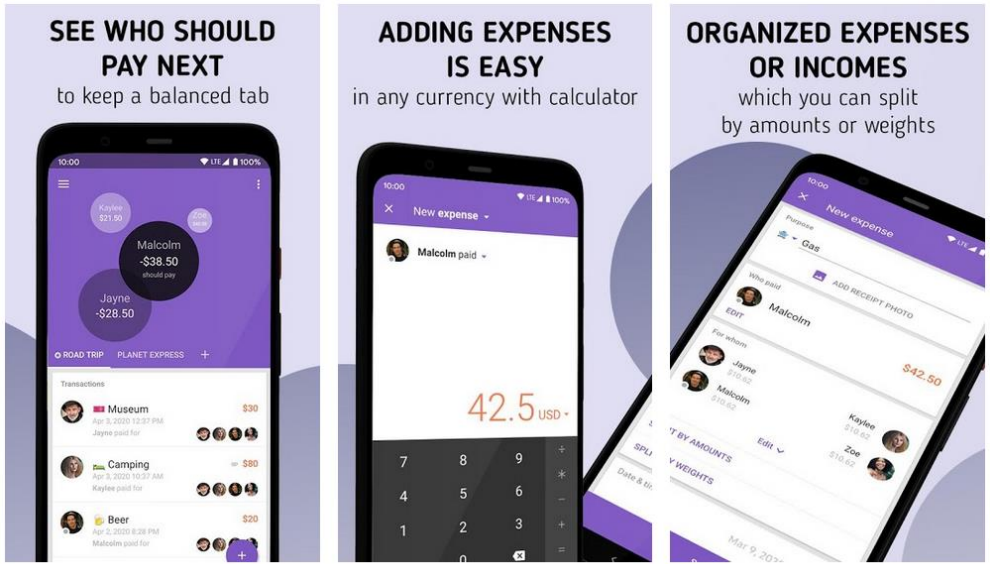
- Optimization competition
  - single real-life optimization problem.
  - the assignment is to implement the solver, no report needed.
  - solutions are evaluated by BRUTE.
  - grading comprises both the ability to solve given instances well enough and the rating among the other students.
  - computation time given for the solver is bounded.
- Past contests
  - 2020: **Bureau** (winner Václav Voráček)
    https://cw.fel.cvut.cz/b192/_media/courses/ko/semester_project_cocontest_2020.pdf
  - 2019: **Sewer Design Problem** (winner Pavel Gramovich)
    https://cw.fel.cvut.cz/b182/_media/courses/ko/semester_project_cocontest_2019.pdf
  - 2018: **Air Tickets TSP** (winner Lukáš Hejl)
    https://cw.fel.cvut.cz/b172/_media/courses/ko/semester_project_cocontes_2018.pdf
  - 2017: **Settle-up Problem** "dlužníček" (winner Ondřej Benedikt)
    http://rtime.felk.cvut.cz/~novakan9/cocontest2017/semester_project_cocontest.pdf
  - 2016: **The Capacitated Facility Location Problem** (winner Vladimír Kunc)
    http://rtime.felk.cvut.cz/~novakan9/cocontest2016/contest2016.pdf

Research on Chosen Topic

- students can solve a problem for some company, project, diploma thesis etc.
- the assignment has two parts: written report and implementation.
- submission is divided into 3 parts constrained by deadlines.
  - 1 penalty point for the late delivery (for each part)
- written document is between 4 and 8 pages.
- the evaluation is performed by the student's lab teacher, it considers fulfillment of formal requirements and the work quality.

Past successful topics

Settle Up



By David Vávra

https://control.fel.cvut.cz/vodafone-ocenil-studentskou-praci
https://grow.google/intl/cz/story/settle-up-sd%C3%ADlen%C3%AD-spole%C4%8Dn%C3%BDch[…]aj%C5%AF-na-cest%C3%A1ch-nikdy-nebylo-jednodu%C5%A1%C5%A1%C3%AD

Past successful topics

Branch-and-Bound Algorithm for the Combinatorial Routing Problems

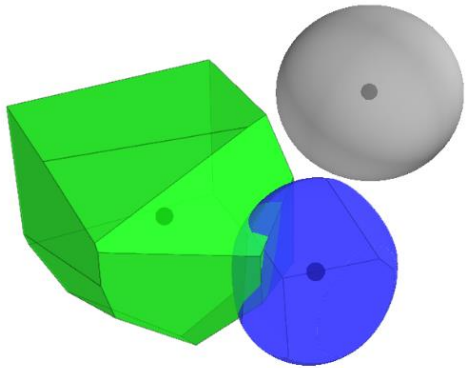


Fig. 1. Detail of a neighborhood set consisting of three neighborhoods: polyhedron (green), ellipsoid (gray), and hybrid (blue).

By Jindřiška Deckerová

https://cw.fel.cvut.cz/b202/_media/courses/ko/student_semestral_deckerova.pdf

Past successful topics

Electric Vehicle Routing Problem

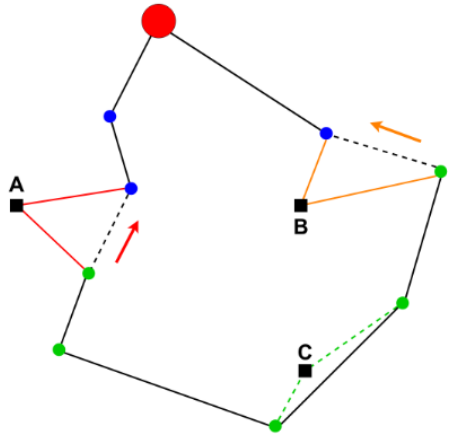


Fig. 1: AFS reallocation

By David Woller, Václav Vávra & Viktor Kozák

https://cw.fel.cvut.cz/b202/_media/courses/ko/student_semestral_evrp_kozak.pdf

Past successful topics

Scheduling in TSN networks extended for class II

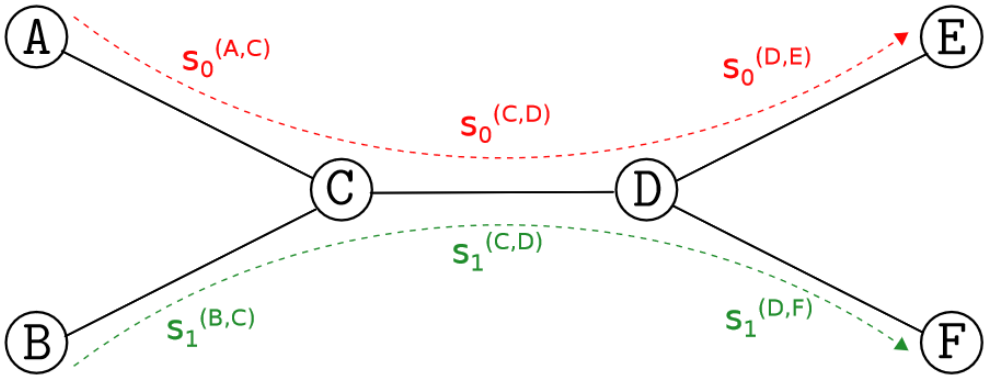


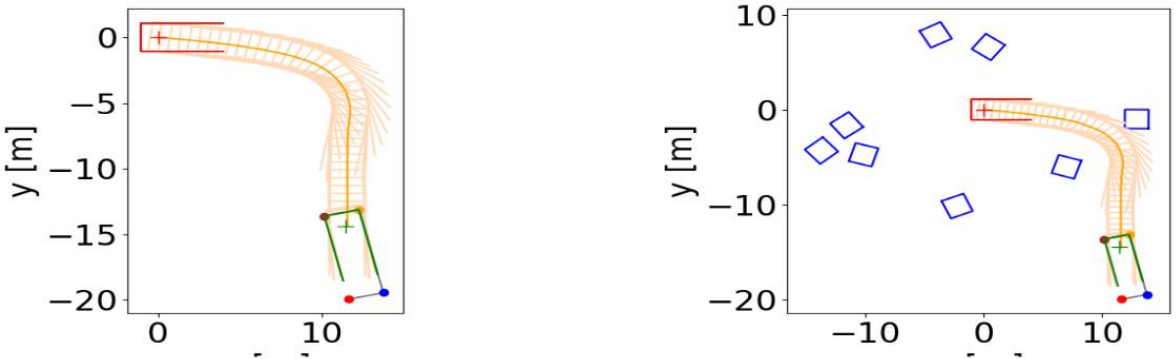
Fig. 1: Sample network with two flows of class II

By Kateřina Brejchová

https://cw.fel.cvut.cz/b202/_media/courses/ko/student_semestral_katerina.pdf

Past successful topics

Algorithm implementation of “Optimisation based path planning for car parking in narrow environments”



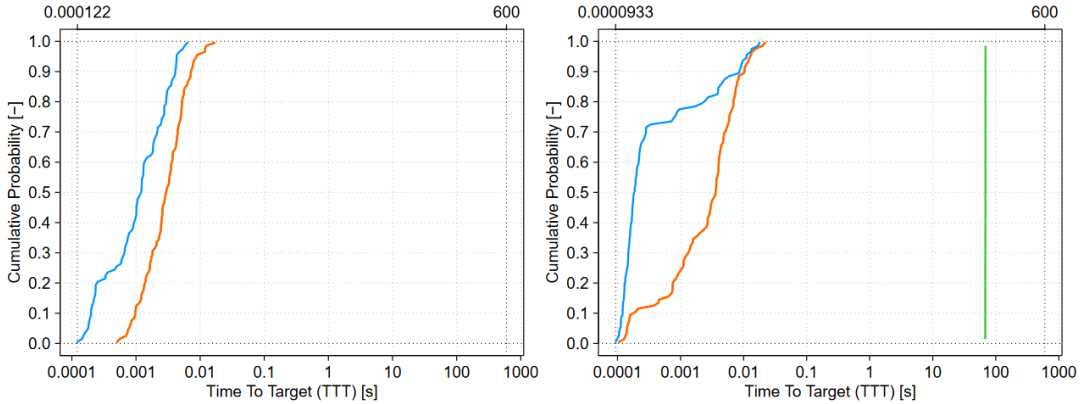
Obrázek 3: The sequence of moves in the left image for data with removed obstacles. In the right image the same data with obstacles.

By Maksym Ivashechkin

https://cw.fel.cvut.cz/b202/_media/courses/ko/student_semestral_parking.pdf

Past successful topics

The Traveling Deliveryman Problem in a specific application scenario: Meta-heuristic vs. ILP approach



(c) Size 51, inst R15.

(d) Size 51, inst R19.

Fig. 1: Examples of TTT-plots for FI+ (green), Ms-GVNS (blue), and GILS-RVND (orange) on one instance with 26 customers and three instances with 51 customers.

By Jan Mikula

https://cw.fel.cvut.cz/b202/_media/courses/ko/student_semestral_traveling_deliveryman.pdf

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

http://industrialinformatics.fel.cvut.cz/

https://www.facebook.com/IIRC.CVUT/