42886 Optimisation of Operational Transport Systems

Project 2 - Dynamic Dial A Ride

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October 5, 2016

1 The Context

You are employed in a company specialising in routing vehicles, and your company has been hired by the municipality of the Danish city of Odense. The city is considering offering a Dial A Ride service for the elderly and the handicapped, and they want an analysis of how the service should be set up, and ultimately how the vehicles should be routed.

You have been privy to a discussion between three stakeholders: *the municipality*, *the elderly* and your own colleagues in *the routing company*. Based on this you have gained an insight into the (sometimes) conflicting demands and objectives the Dial A Ride service will be subject to.

2 Existing Framework

Your company has previously used a framework to solve a dynamic vehicle routing problem. You quickly realise that some of the code can be reused and that the major changes needed are:

- Events now reveals both a pickup, delivery and a demand.
- There are additional feasibility checks that needs to be done mainly in the file representing a route.
- The check for solution feasibility at the end of the planning must be updated.
- New instances will have to be configured.

Some of the code has been updated, and some functions have been marked with *TODO*. Contrary to the previous project, changing files beyond the solver will be required.

3 Tasks

These tasks should be covered somewhere in your report. The order and how you do it, is up to you. While all tasks should be covered, there is some degree of freedom in the weight you put on each task.

Analysis of the problem, and the context of it.

- Describe the problem in your own words.

- List the relevant KPIs, order them (roughly) by importance and comment on potential conflicts.

- Select a subset of the KPIs and use them to construct an evaluation function. Argue for your choice, potentially indicating what would be added next if the set of objectives was extended.

- Create a model/definition of the problem, and describe the assumptions you make: How many vehicles are available? How many of the requests are dynamic[1], and how many known in advance? What are the distributions of the requests? Is there a difference between distribution of pickups and deliveries and to what extend are these time dependent?

Implementation of a prototype solver for the problem.

- Implement at least one construction heuristic for the problem.

- Implement at least one local search algorithm for the problem. This includes defining at least one neighbourhood operator.

- Comment on the choice of local search over exact methods.

Validation and tests of the solution.

- Compare (at least) two different configurations of your solver statistically.

- Discuss to what extent you believe you solution would be applicable to a real life problem. What are the strong sides, what is more loosely modelled.

4 Help

You may pose questions about the project during scheduled lectures and by scheduling meetings with Rune in between these. If there is an area you feel you lack skills or information in, you may also suggest a mini lecture on the topic.

[1] You must have some dynamic requests

5 Formalia

Your project must be done in a group of 2 unless otherwise agreed, and must be handed in no later than *1/11 - 2016* on CampusNet. You must hand in a zip containing the entire project as an attachment to your report. The report may be no longer than 16 pages excluding visualisations, tables, front page etc. Do however limit the use of visualizations to a sensible amount.