User perspectives in public transport timetable optimisation - DTU Orbit (06/12/2018)

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The present paper deals with timetable optimisation from the perspective of minimising the waiting time experienced by passengers when transferring either to or from a bus. Due to its inherent complexity, this bi-level minimisation problem is extremely difficult to solve mathematically, since timetable optimisation is a non-linear non-convex mixed integer problem, with passenger flows defined by the route choice model, whereas the route choice model is a non-linear non-continuous mapping of the timetable. Therefore, a heuristic solution approach is developed in this paper, based on the idea of varying and optimising the offset of the bus lines. Varying the offset for a bus line impacts the waiting time passengers experience at any transfer stop on the bus line. In the bi-level timetable optimisation problem, the lower level is a transit assignment calculation yielding passengers’ route choice. This is used as weight when minimising waiting time by applying a Tabu Search algorithm to adapt the offset values for bus lines. The updated timetable then serves as input in the following transit assignment calculation.

The process continues until convergence.

The heuristic solution approach was applied on the large-scale public transport network in Denmark. The timetable optimisation approach yielded a yearly reduction in weighted waiting time equivalent to approximately 45 million Danish kroner (9 million USD).