Reducing passengers’ travel time by optimising stopping patterns in a large-scale network: A case-study in the Copenhagen Region - DTU Orbit (04/08/2019)

Optimising stopping patterns in railway schedules is a cost-effective way to reduce passengers’ generalised travel costs without increasing train operators’ costs. The challenge consists in striking a balance between an increase in waiting time for passengers at skipped stations and a decrease in travel time for through-going passengers, with possible consequent changes in the passenger demand and route choices. This study presents the formulation of the skip-stop problem as a bi-level optimisation problem where the lower level is a schedule-based transit assignment model that delivers passengers’ route choices to the skip-stop optimisation model at the upper level, and where the upper level in return provides an improved timetable to the lower level. A heuristic method for large-scale urban networks is presented to solve this extremely complex bi-level problem, where the skip-stop optimisation is a mixed-integer problem, whereas the route choice model is a non-linear non-continuous mapping of the timetable. The method was tested on the suburban railway network in the Greater Copenhagen Region (Denmark): the reduction in railway passengers’ in-vehicle travel time was 5.5%, the reduction in passengers’ generalised travel cost was 3.2% and, at the system level, the yearly consumer surplus amounted at 76.7 million DKK (about 10.3 million EUR or 12.7 million USD) when compared to the existing stopping patterns.

General information
Publication status: Published
Organisations: Department of Management Engineering, Transport DTU, Transport Modelling, University of Queensland
Contributors: Parbo, J., Nielsen, O. A., Prato, C. G.
Number of pages: 16
Pages: 197-212
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Transportation Research. Part A: Policy & Practice
Volume: 113
ISSN (Print): 0965-8564
Ratings:
BFI (2018): BFI-level 2
Scopus rating (2018): CiteScore 4.98 SJR 2.036 SNIP 2.269
Web of Science (2018): Impact factor 3.693
Web of Science (2018): Indexed yes
Original language: English
Keywords: Large-scale networks, Public transport optimisation, Public transport passengers’ behaviour, Railway timetabling, Stopping patterns
DOIs: 10.1016/j.tra.2018.04.012
Source: FindIt
Source-ID: 2434593919
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review