Generating Pareto Trip Plan Options According to Bus Passenger Preferences

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ABSTRACT

Almost everybody already needed to travel through public transport to another location in the same city. One may either need to arrive as early as possible not to lose an appointment, or to avoid to walk for a long distance (as for elderly people), or even try to plan a direct trip with no connection, even if it means arriving at the destination later.

Operations Research (OR) tools helps bus transit companies to reduce their operational costs, by assigning optimal timetables, and vehicle and crew schedules. Moreover, those tools are also able to increase their service level by providing accurate information for their passenger. We introduce an algorithm that computes a set of trip plan options according to user preferences.

In this work we present a multi-objective shortest path algorithm to generate trip plan options for a public transportation network. The algorithm builds the entire Pareto-optimal frontier considering all objectives. The proposed labeling setting algorithm is designed to perform in time-dependent graphs, where for each bus stop, multiple nodes are created: one for each bus route that services it. Additionally, pruning and filtering techniques are applied to improve the computational performance. In a post-processing step, Pareto solutions are ranked using predefined weights and provided as a list of traveling options.

Our experiments take place in real-world public transportation networks. We compare our algorithm with a single objective shortest path algorithm.

KEYWORDS. Multi-objective shortest-path, Public Transportation