Line Planning in Public Transportation: State-of-the-art and recent trends

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Part 1 gives an oerview on models and algorithms for line planning: Given an existing public transportation network with its stops (or stations) and direct connections, the first step in the strategic planning of a transport system is to define lines and their frequencies. A line is a path in the public transportation network along which regular service is offered. We discuss various optimization models minimizing either the costs of the lines or maximizing the convenience for the passengers.

Although the line planning problem as discussed in Part 1 can be solved more or less efficiently, the algorithms and approaches are still not suitable for solving real-world problems. A first problem concerns the decision of the passengers. It is usually assumed that it is known how the passengers travel, i.e., a passenger's weight is assumed to be known for every edge in the network. This is an unrealistic assumption since the route choice of the passengers depends on the lines. We discuss how the passengers' decisions may be integrated into the optimization process.

Secondly, designing a good transportation system does not only include line planning but also other planning phases such as timetabling or vehicle scheduling. Algorithms for every single planning phase are known. However, the best line plan is not helpful if it only allows bad timetables and costly vehicle schedules. Hence, some effort should be made to find integrated solutions. Using our toolbox LinTim we illustrate how decisions made in line planning can influence the subsequent planning phases and we present first approaches on how line planning can be integrated in timetabling and vehicle scheduling.