The Netherlands Research School for Transport, Infrastructure and Logistics

TRAIL

Multi-objective optimization of multimodal transport networks

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The expected activity densities for 2040 and thus traffic flows in the Randstad area are too high to just rely on expansion of passenger car use, even if the environmental performance of cars will improve dramatically. On the other hand, the present public transport system does not appear to provide a sufficiently attractive alternative to many people.

Purpose

The purpose of the project is to design a multimodal transport network that will be optimal for the Randstad area in 2040. We start from the current network and take multiple sustainability objectives (such as accessibility, environmental impact and livability) into account. Therefore, we define a mathematical optimization problem.

Decision variables

The development of new transfer facilities (P+R interchanges, stations) and service lines (new infrastructure, new connections, Intercity status of stations) are the decision variables.

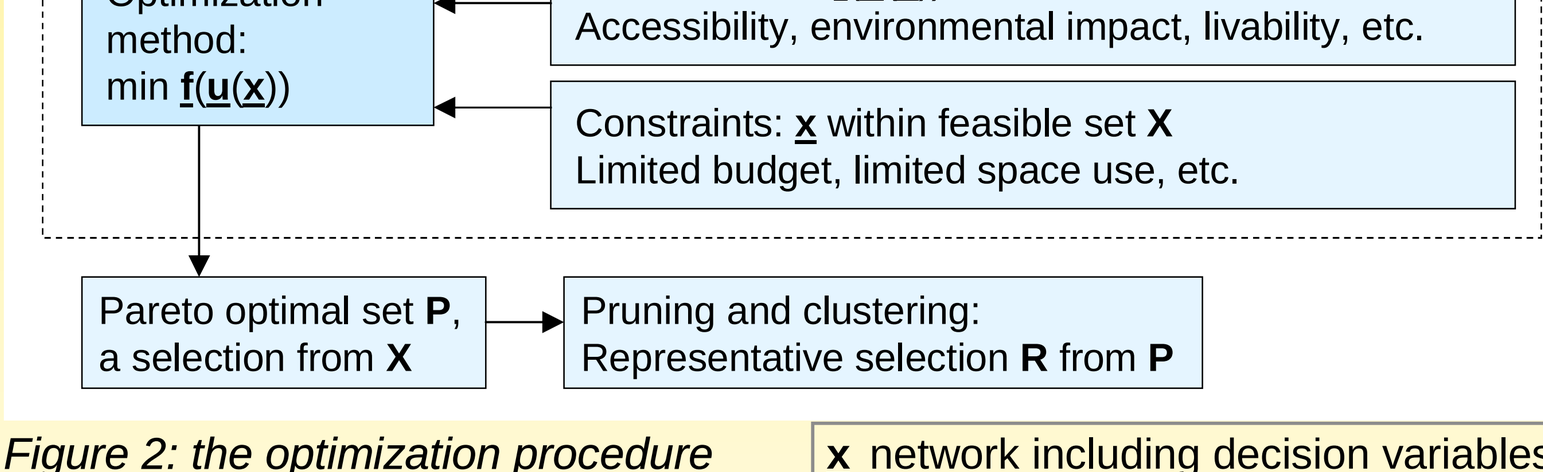

Figure 2: the optimization procedure

Multimodal network

During the optimization process, we view the transportation system as an integrated system of modes, such as trains, cars, buses and bicycles *(fig. 1)*.

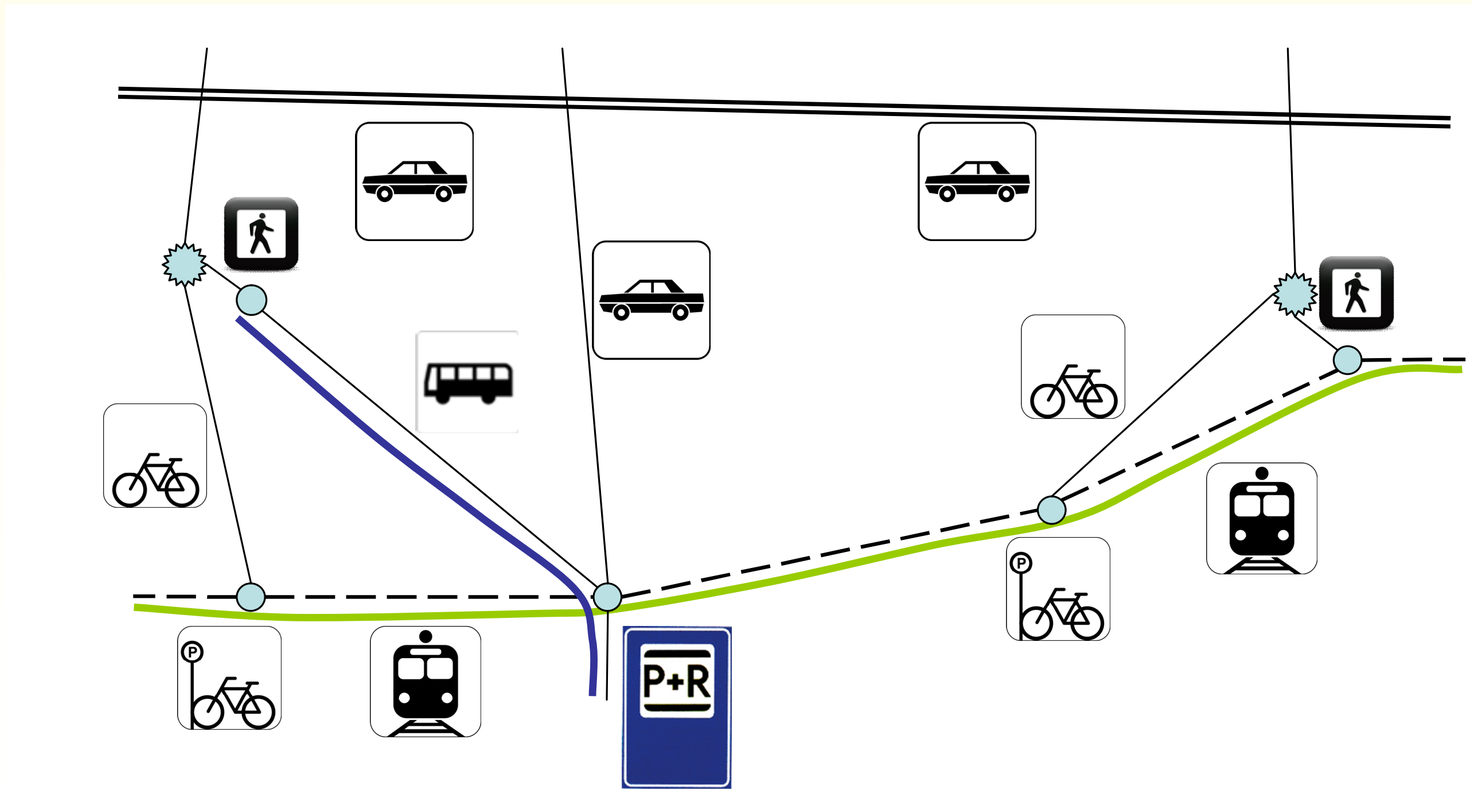

Figure 1: example of a multimodal network

x network including decision variables
u flow on the network
f objective function values
X feasible set
P Pareto-optimal set, subset of **X**
R representative subset of **P**

Multi-objective

The optimization procedure *(fig. 2)* follows a multi-objective optimization approach, including a multimodal traffic assignment model. This model views the multimodal network as an integrated supernetwork. This results in a set of Pareto-optimal solutions. Such a solution set gives insight in the interdependencies between objective functions. Applying a clustering method reduces the set to a concise overview of promising networks.

Expected results

A set of network solutions and their properties with respect to the objectives, which can be input for transport policy in the Netherlands.

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