The Netherlands Research School for Transport, Infrastructure and Logistics

TRAIL

Designing Robust Road Networks

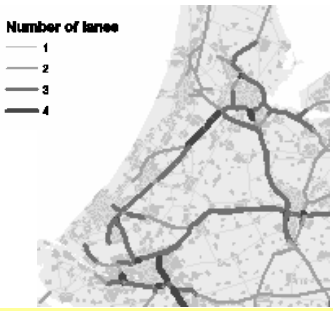
Designing road networks is a difficult task for infrastructure authorities. This is because of the fact that there are many possibilities for constructing new roads or improving existing roads and because of the fact that there are many stakeholders involved who all have different, often contradicting, objectives. This projects aims add building a model that helps the authorities in designing robust road networks.

Keywords: network design problem, robustness, reliability

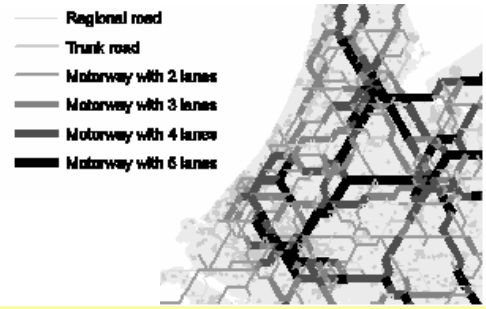
Start date: 01-08-2005
Expected end date: 01-08-2009

Background and problem definition

Designing road networks has been recognized as one of the most difficult problems in transport. This is because there are many possibilities for constructing new roads or improving existing roads and because there are many stakeholders involved who all have different, often contradicting, objectives. This research addresses the problem of designing road networks by taking into account all these objectives and, especially, by taking into account the robustness of the network.



'Existing motorways around Rotterdam and Amsterdam in 2001'



'Possible Redesign of the road network around Rotterdam and Amsterdam'

Methodological approach

A first step is to define and quantify the objective of all stakeholders of a road network. Secondly, a model will be build by which these objectives can be optimized. The model will start with the existing road network, which will be combined with a detailed grid network that covers the Netherlands completely. An optimization algorithm determines the optimal link and node characteristics of each link and node in the existing and in the grid network and gives a prioritisation of adjustments to the existing network.

Expected practical and scientific results

This project is expected to result in a model, which is capable of indicating where new roads should be constructed and of which roads the capacity is to be extended. The model can be relevant to all traffic infrastructure authorities for making investment decisions.

Scientific and societal relevance

This project contributes to the development of a sustainable transport system for the Netherlands, where the accessibility of all regions is on an acceptable level and where the travel times are reliable. All road users benefit from this. The development of suitable objective functions and of an efficient algorithm for solving the Network Design Problem for large networks by taking into account the objectives of the different stakeholders is still a great challenge to international research.

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