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Preferred truck routes meet navigation

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Abstract

Many routes taken by truck drivers are suggested by navigation devices. These navigation devices do not always consider the needs of trucks. This leads to substantial problems in cities, such as trucks colliding with low bridges or taking unsuitable routes via the city centre or residential areas.
This paper describes the steps required to integrate communal routing preferences and interests into navigation systems. It shows (1) which rules have to be considered when developing a concept for preferred routes and (2) what the consequences are for system design. All project stages are shown. This includes implementing the preferred truck routing concept, extracting the common construction rules for modelling preference networks, consolidating the findings from the process, and building a realistic, working navigation system that has implemented the technology.
Besides the pure feasibility aspects, the project shows strategies for integrating communal routing preferences into common navigation systems.

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1. Introduction

Routing methods in pre-trip planning tools and on-trip navigation solutions are used to find an optimal route (in terms of time and distance) from a starting point to a destination. Cost-effective routing is also possible if a vehicle profile (which specifies costs) is used with the method. The more detailed the digital base maps, the more sophisticated and complex the potential routing methods for finding the required solutions.

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Navigation solutions that take into account truck-specific attributes for route planning have only been available for few years. They take into account legal restrictions for certain classes of vehicles or hazardous goods, as well as physical restrictions like weight and height restrictions on bridges. It takes a considerable amount of time to integrate new developments such as low emission zones into navigation systems. This is partly due to technical reasons, but also due to high regional diversity in the concepts.

Since drivers today trust their navigation device more than maps, the aim is to set up a pilot project to prove the feasibility of integrating communal routing preferences into a navigation system.

An important reason why communal governments are not happy about today's navigation systems is that the aims of individual drivers and communal/social aims differ. Individuals simply want to get from A to B as quickly, easily and cheaply as possible. However, the communal interest also includes a responsibility towards all citizens; environmental impact control (pollutant and noise emission), avoiding traffic jams, providing sufficient road capacities and protecting sensitive areas like city centres. These collective traffic management goals are undermined by the use of unsuitable tools. This is the case with the majority of truck drivers, who use devices intended for use in cars. This individual practice leads to an undesirable result on a massive scale, such as trucks taking the "smart" shortcut through residential areas and city centres.

The solution is a navigation system that accounts for both individual and collective interests. Trucks are a critical group of road users regarding emissions and noise. Finding the best suited routes for trucks (safe and fast roads) involves bringing local knowledge and drivers' needs together. The aim is to avoid truck traffic in inner cities and neighbouring communities and to keep trucks on motorways or other appropriate roads for as long as possible. Routes from motorways to commercial sites should follow the most suitable roads for trucks.

2. Modelling requirements

The main goal of the project was to find out what rules should be used to design preferred truck routing networks for the Dresden test case.

The given objectives for defining routing preferences across the network are:

- Trucks should take specific roads (in the defined preferred routing network for trucks) from the motorway to the industrial areas
- Truck traffic in sensible areas like inner cities should be reduced
- Roads with higher emissions should be avoided if possible
- Routes must be time-efficient so that truck drivers will not ignore them
- Overall emissions by the use of preferred routes should not outweigh local improvements elsewhere.

Some goals are conflicting. For example, high emission roads are often also predefined preferred roads and route choice based on minimum route time & distance often conflicts with the other aims. The main difference between a printed preference map and a map in a navigation system is that digital routing models have to suit every situation (i.e. navigation from any starting point to any possible destination point) and still deliver consistent results. Printed maps, on the hand, are more suited to highlighting special situations, like leaving a motorway and industrial areas as destination.

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