Traffic model for disability groups based on telematic investigation

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Abstract

This paper describes the development of a traffic model for replication and prediction of desired walking and navigation routes of people with different mobility restrictions on roads and footpaths in existing urban environments. An extensive data collection is carried out and the gathered data pool of anonymized routes is assessed and used for the model development. The survey is conducted in Vienna with special handheld devices that save GPS locations, points of interests, barriers and other locations. The model is calibrated and used for simulation of showcase infrastructure improvements and removal of common barriers. The model can be used as an assessment tool for the existing infrastructure in relation to the circumstances and needs of different disability groups and is also capable for assessment of traffic infrastructure upgrades on a broader scale. The model can be fitted to simulate persons with certain types of mobility constraints and can be applied to different sized cities or regions. Based on already known and newly identified barriers and resistance factors it helps to identify and predict best fitting routes and the maximum efficiency of investments.

Keywords

traffic model, handicaps, mobility restrictions, investment assessment, barriers

Introduction

The traffic behaviour of people with mobility restrictions - especially in urban environments - is not known adequately enough at present. The majority of planning studies focus on general dimensioning guidelines or mandatory installations for example at intersections or traffic signals. Public entities try to improve the quality of daily routes for people with mobility restrictions but often are not able to prioritise investments due to missing assessment tools. Specific data about traffic volumes, preferred route choice, barriers and resistance factors also regarding the choice of public transportation for different types of mobility restrictions is missing. Furthermore existing traffic modelling tools can only consider these people to a limited extend only.

Project Details

In cooperation with the Department for spatial development, infrastructure and environmental planning of the Technical University of Vienna the project "Step by Step" is carried out from 2010 to 2012 which is financed within the framework of the 2nd tender of the program ways2go of the research and technology program iv2splus.

Focus of the project is the development of an add-on module for existing traffic modelling software tools for replication and prediction of desired walking and navigation routes of people with different mobility restrictions that can be used as an assessment tool for the existing infrastructure in relation to the circumstances and needs of these people. It is capable for assessment of traffic infrastructure upgrades on a broader scale and can be used at different planning levels.

Survey and corresponding interviews

The research project includes the conduction of a broad scale survey of daily routes in the city of Vienna. The survey takes place in Vienna in 2011 during summer and winter. Four different groups of people with mobility restrictions are asked for support during the survey: blind, visually impaired, persons in wheel chairs and persons with moving constraints. They are equipped with special handheld devices that save GPS locations, points of interests, barriers and other locations. These devices can be managed without any technical knowledge and confirm actions and loggings by sound and vibration which is a benefit for blind and visually impaired.

With this technology individual paths are recorded and processed in real time. These paths are then imported and visualized for follow up in-depth interviews that are also carried out as part of the project. Focus of these interviews is the investigation of needs and motivations for certain route choice, the definition and comparison of barriers and resistance factors.

Figure - Screenshot of a recorded route and certain points of interest (anonymized)

Survey results

According to the survey and the literature review people with different mobility restrictions have different needs and requirements upon the existing road infrastructure and street furniture. Consequently some issues that might have a major effect on one type of mobility restrictions can not be applied in common for different types of mobility restrictions.

The results of the survey are analysed with standardised statistics and highlight the most severe problem areas for each of the four groups. For blind for example areas with limited orientation points as well as inadequate clearance heights are mentioned the most. For visually impaired obstacles and missing contrasts are mentioned. For persons with wheel chairs and persons with moving constraints limited access to public transport vehicles as well as missing ramps are being identified as main barriers.

These results underline the importance of the assessment of priorities for investment into road infrastructure and furniture because the best possible outcome should be achieved for all different types of mobility restrictions.

Model development

Based on the extensive survey data from the GPS handheld devices and the processed interview results relevant parameters are identified for route decision modelling with common modelling tools.

A text-based module is created that is capable of interacting with existing transport modelling software through definition of nodes, links and neighbouring connections. The identified parameters are programmed and automatically affect the individual resistance factors for all connections and relations. For each type of mobility restriction these resistance factors are set and imported into the model application. Furthermore the origin-destinations from the field surveys are also imported into the model.

Once all the required data is defined and resistance factors are processed the model application is able to find individual ways with the lowest resistance for each different type of mobility restriction. This does not have to be the quickest route. Based on the survey data differences in replicated and recorded routes are identified, assessed and the model is calibrated. This control cycle is applied to the process and routes for all four types of mobility restrictions.

Results are calculated for walking/wheeling routes only as well as for routes in conjunction with the use of different modes of public transports. An extensive amount of time is spent for programming and modifying the parameters and time restrictions values.

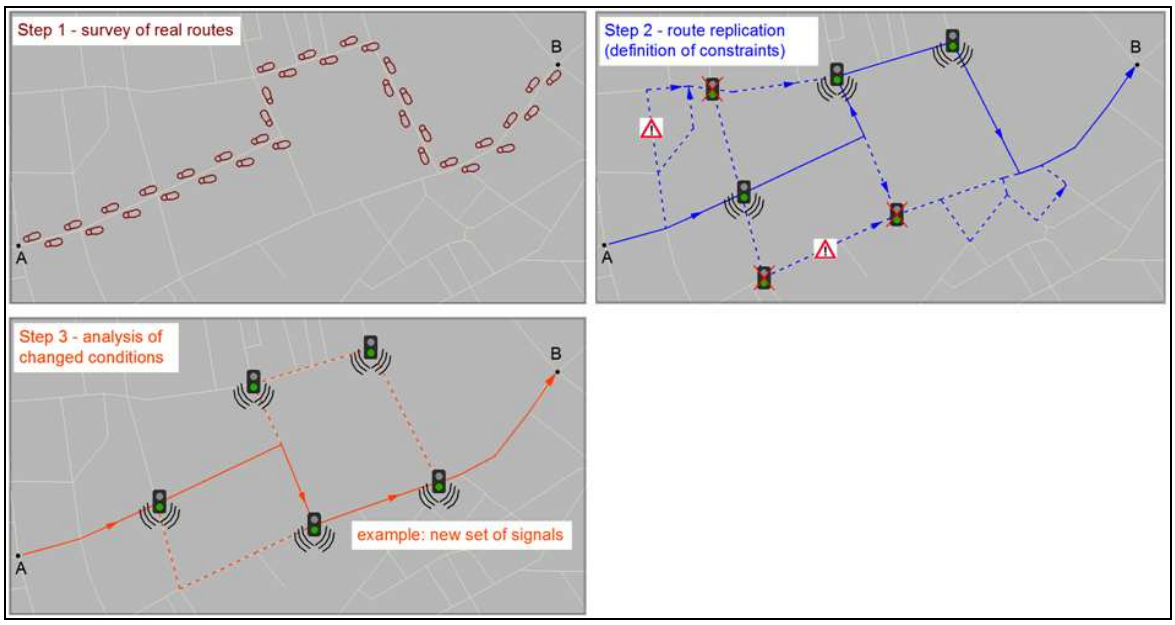

Figure - Example for modelling analysis

Conclusion

The add-on module can be used as an extension to conventional traffic models for spatial and traffic analysis and provides a behaviour-oriented technique for route estimation and prediction. Individual resistance factors can be implied for different types of mobility restrictions.

The model can be used as an assessment tool for the existing infrastructure in relation to the circumstances and needs of these groups. Different use cases can be analysed as well as showcase infrastructure improvements. The model can be fitted to simulate additional mobility types and can be applied to different sized cities or regions.

Based on already known and newly identified barriers and resistance parameters the application can be used as assistance tool for identification and prediction of routes with the lowest resistance factors and helps during evaluation procedures relating the maximum efficiency of investments. The provided module in line with a traffic modelling system supports during essential traffic planning steps.

The module is an innovation for the provision and understanding of needs and barriers of challenged people in existing situations as well as during planning exercises. Black spots and corresponding detours can be identified in existing street environments. Instead of focusing on certain location based investments the required improvements can be seen from a wider perspective and the quality and safety of daily routes for people with different types of mobility restrictions are increased.

References

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