reviewed paper

Integrated Transportation Planning and Information with PTV Vision Technology

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1 INTRODUCTION

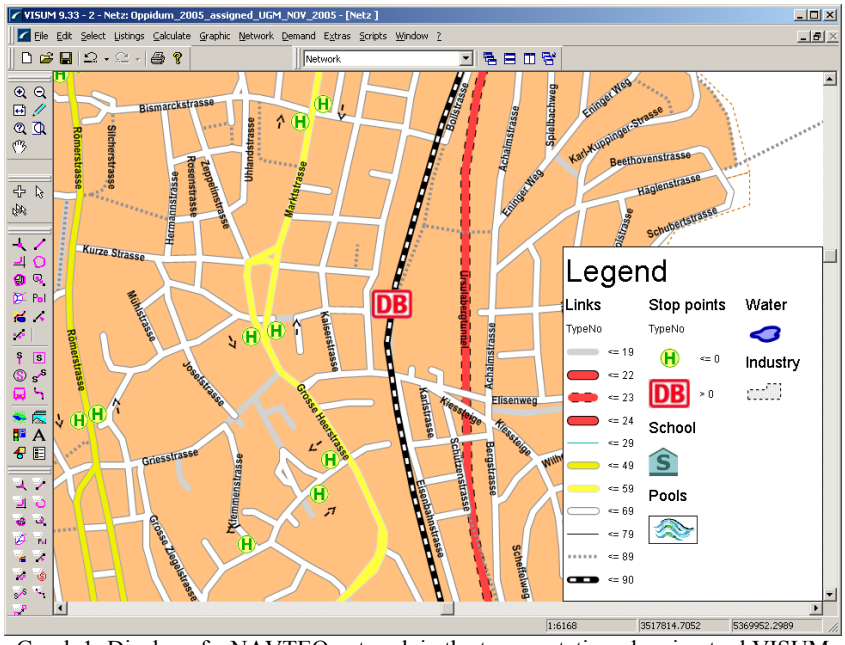
The availability of data has improved tremendously through the introduction of IT tools in the last decade leading us into an information society. The main goal in the growing amount of information is to find a common base and reference system for the data collection and to provide an adequate communication channel to the user of the processed information.

Integrated transportation planning – understood not as a secluded science for experts, but as a service to the public – can profit from the new possibilities in an information society twice. While building up the transportation model supply and demand data can be obtained and integrated in a very efficient way. The application of the results from the planning process – information on the current or predicted traffic situation – can be extended into new public services.

2 GEOINFORMATION IN TRANSPORTATION PLANNING

The base of each transportation model is the traffic supply and demand. For both existing data from systems can be utilized.

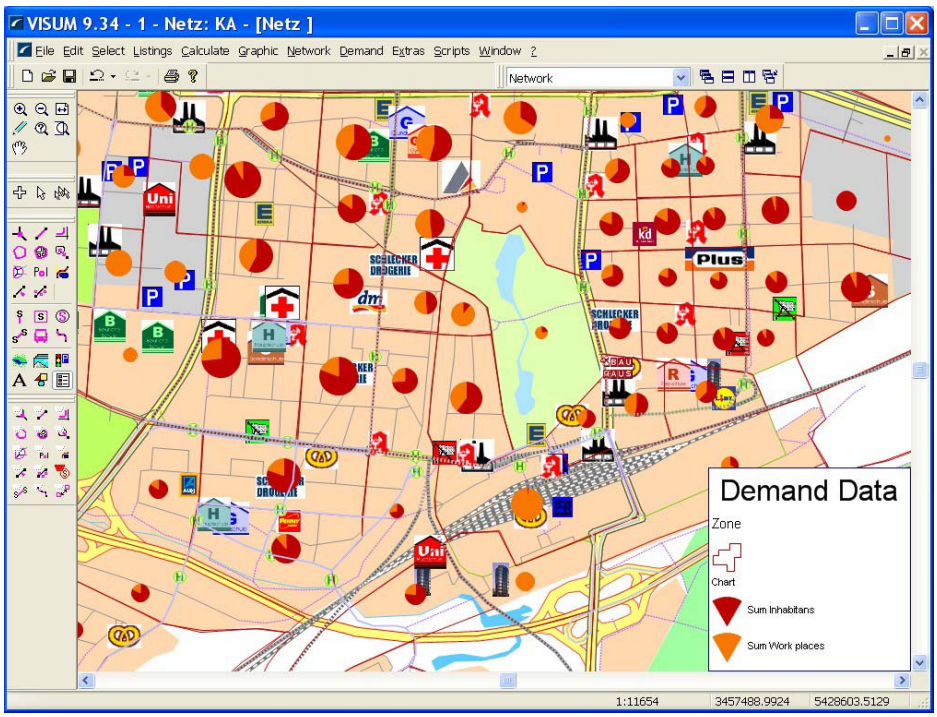
The network can be based on a completely new data source: car navigation. In this rapidly growing market providers make a great effort in the digital data collection. Already today there is a large coverage of Europe, the US and the middle east with highly detailed car navigation networks by the major providers NAVTEQ and Tele Atlas. The advantages are the detailed topology, the continuous updates and good coverage of attributes, which contain all necessary information that is needed to start a macroscopic simulation (linktype, free flow speed and capacity). The accuracy and attributes also allow a display which is comparable to city maps.



Graph 1: Display of a NAVTEQ network in the transportation planning tool VISUM

The data model for the public transportation in the PTV Vision products has been extended to a level of detail which corresponds with the operational systems. The entire timetable can therefore be easily exchanged between the planning tools and the travel information systems.

For the demand model the major source are statistical data, like inhabitants or work places per traffic zone. But the model can be lifted to a new level of accuracy if not only average values per geographical unit, but also singular traffic attractors like schools or shopping possibilities are introduced to the model as points of interest (POI).



Graph 2: Display of demand data in the transportation planning tool VISUM

A transportation model is gathering a lot of information as input data, but the transportation planning process also produces valuable results for other applications. The most common output of a traffic simulation are:

The origin and destination matrix expressing the transportation demand.

The utilized paths through the network to travel from A to B, which result in the turning volumes at each intersection.

The number of vehicles using a certain road expressed as the link volumes (Veh/hour).

Saturation of links and intersections calculated as the volume capacity ratio.

As a result of congestion a predicted time loss for travel time according to the saturation.

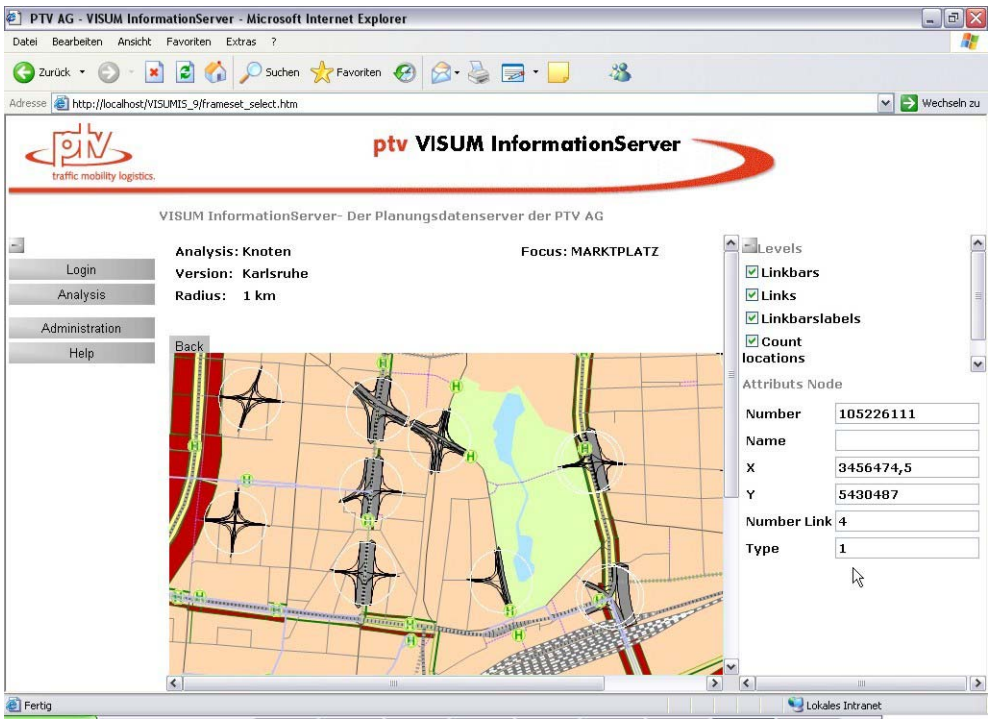
All this information can not only be used for planning new transportation infrastructure but is also useful for the analysis of accessibility, route guidance and traffic information.

3 INFORMATION PLATFORMS

The software products for transportation planning are very powerful tools combining mapping and GIS functionality, complex mathematical algorithms for traffic simulation and a sound data model (was ist das?) to manage a seemless data flow. These applications are expert systems and even sophisticated user interfaces will not abolish the need for a training to apply the software. Therefore other channels and information platforms have to be used.

3.1 Information flow for professionals

To share the information among a group of professionals, e.g. different departments of a regional administration, the web-based application VISUM InformationServer is appropriate. Its simple user interface allows the access to all results of the transportation model without deeper knowledge of the modelling software. A client can request a user defined evaluation, specifying the geometrical extension. The results are produced on the server on demand and displayed in the browser as a listing or a vector graphic. SVG (Scalabale vector graphic) does not only enable zooming and layer control, but also gives the possibility to display detailed information for each object in the graphic interactively. E.g. by clicking on a node the corresponding attributes like node ID, node type and coordinates are displayed. Furthermore, detailed model results like turning volumes can be accessed by the user of the internet tool.



Graph 3: Example of display of turning volumes in the VISUM InformationServer

An administration interface to define the different evaluation types and control the access to certain data sets for the individual user is a standard feature of the VISUM InformationServer.

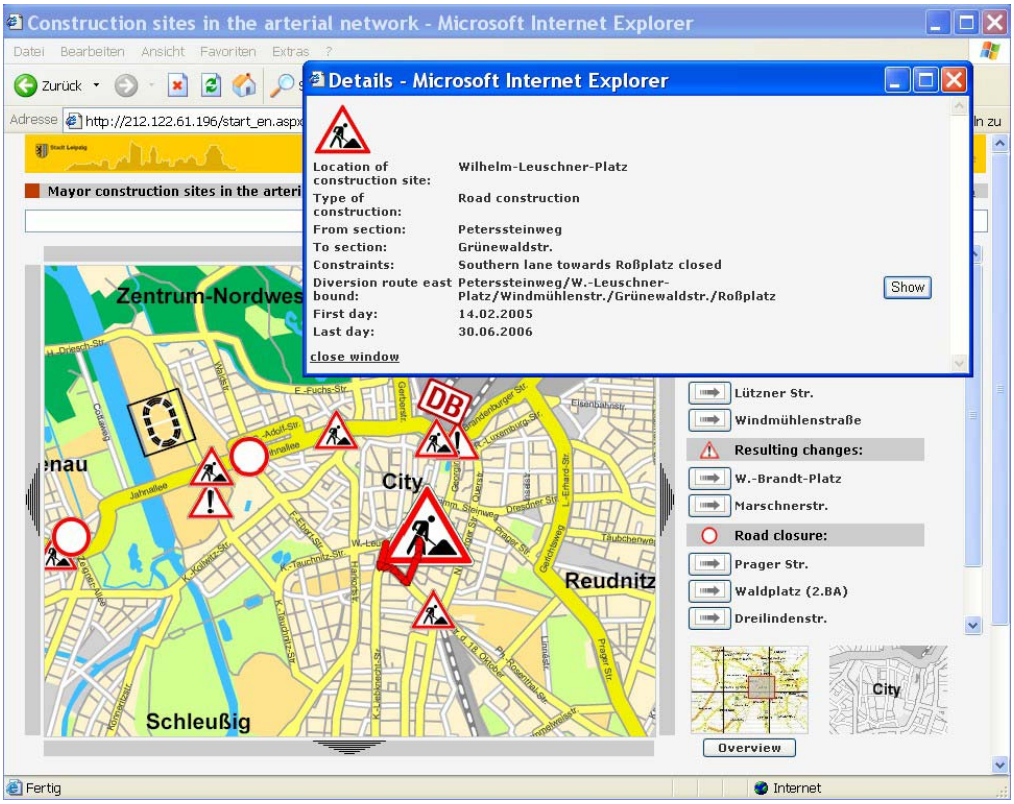
3.2 Information for the public

When providing information to the broad public the most important requirements for internet applications are quick response times and an intuitive user interface.

An example of truly integrated transportation planning is the PTV Vision model which was developed by Dr. Auspurg in the City of Leipzig in the year 1993. Leipzig has undergone a massive structural change in the past decades and the transportation model was updated and extended accordingly.

After the emphasis on transportation planning with long and short term prognosis, the task in the recent years focused on the analysis of complex road work situations. This included the macroscopic simulation of the effects of the urban network, the planning of deviations, the analysis of current road works and timing of different construction stages to minimize the obstruction. For complex intersections additional microscopic simulations were conducted, to prove the performance.

With the preparation for FIFA world cup 2006 and the Confederations Cup in 2005, the idea was born to use this existing data platform for the information of the citizens and tourists via the internet and linking it to www.leipzig.de.



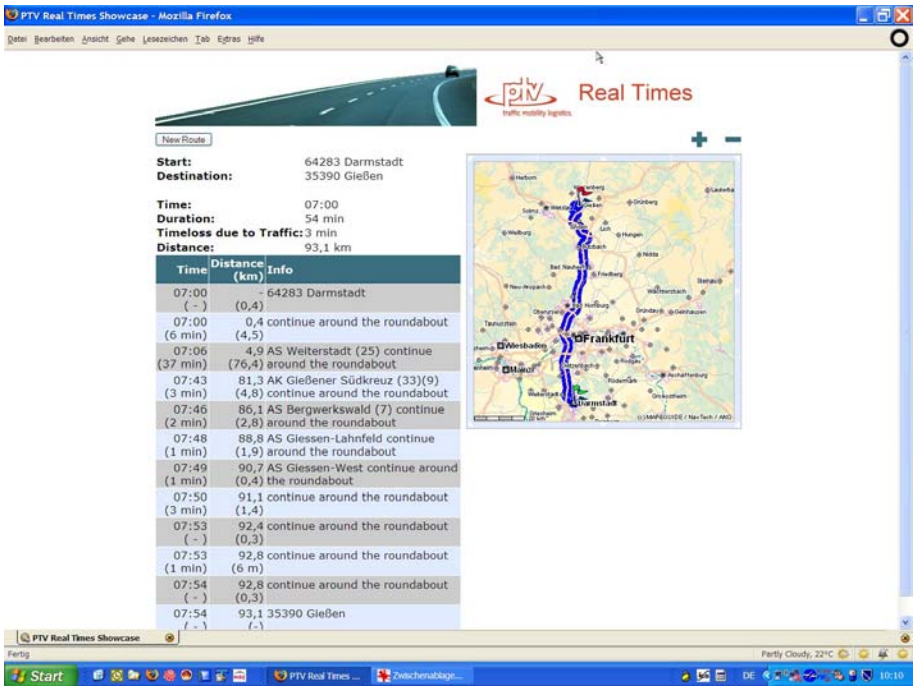
Graph 4: Roadwork information system in Leipzig

This internet site informs citizens and tourists about the current road work situation in the arterial network. All the data is directly exported from the transportaion model and is regularly updated, at least once a week and on a daily base during major events.

3.3 Information through service providers

The planning authority is not necessarily the institution which will provide the information to the public. The data can also be handed to a professional service provider who will process the data further and will set up the according service platform.

One advantage of using car navigation networks for transportation planning is that the results of the modelling work can easily be fed back to the car navigation. The estimated travel time in navigation systems is usually calculated based on average speeds. But the travel time observed in reality varies significant during different times of the day. This effect is well known in transportation planning and special model runs are usually conducted for the morning and evening peek.

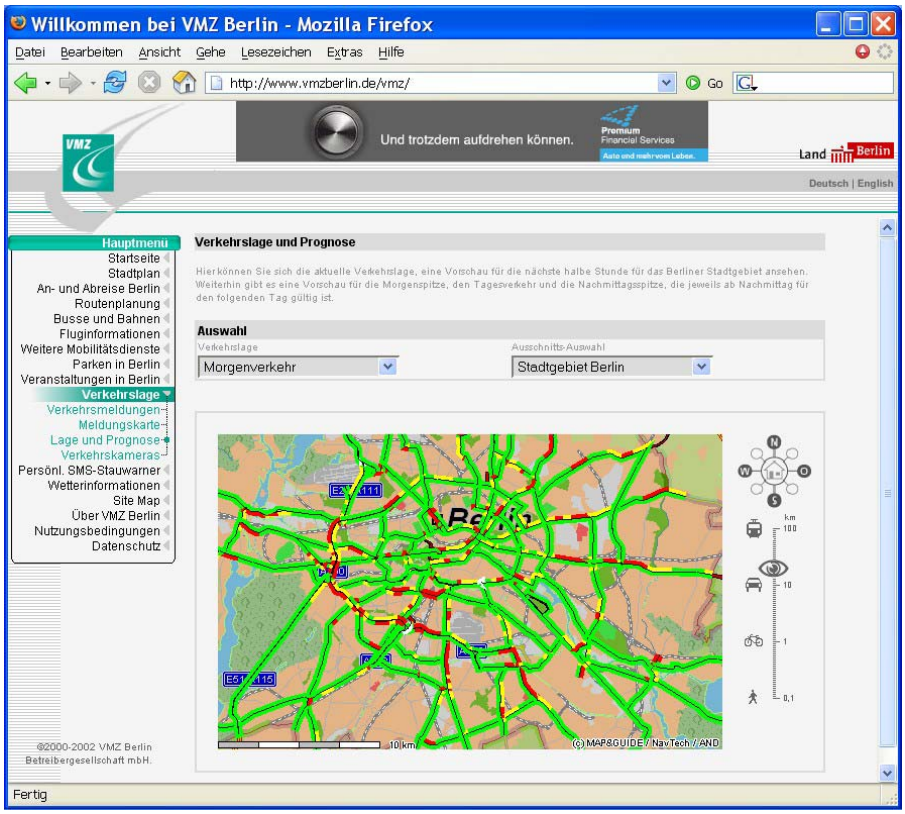


Graph 4: Showcase of route guidance based on predictive travel times

PTV has carried out a show case in the greater Frankfurt area which models the travel time on all major urban and surrounding roads for 24 hours a day and seven days a week. This predictive travel time will be integrated in a navigation prototype system in 2006.

3.4 Information traffic management

Linking the information of a transportation model to online detectors and traffic messages carries the idea of predictive travel times even further and allows to give a current level of service and a short term forecast for an entire network.



Graph 5: Propagated level of service for the urban area of Berlin

Using the origin-destination matrix and the preferred routes from the transportation model it is possible to propagate the information of the traffic detection to the entire network. In this way reliable information can be obtained even for streets that are not covered by detectors.

4 SUMMARY

Transportation planning profits from the improved GIS data availability and the technical developments for information interchange. Choosing an adequate technology (open interfaces, common reference system, web publishing) can improve the quality of the output of a transportation model and gives a much wider use to the results into the field of traffic information and traffic management (ITS). This emphasises the sustainable use of transportation models and bringing them to internet application with userfriendly interfaces meets the needs of the information society.