Web-based Timetable Information System for Public Transport

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Abstract — Web-based timetable information system for public transport has been created in Tver region, Russia, aimed to serve as a communication system for passengers and offering the opportunity for Internet search for path between any stops of any modes of transport in the region. Moreover the system is adjusted for traffic schedules and transport schedule information receiving at any stop of the travel line and timetable for any route. Information updating is provided by the carriers. The system is implemented on Microsoft technologies base.

Keywords - timetable information system; PTV Vision VISUM; public transport; shortest path.

I. INTRODUCTION

Web-based timetable information systems for public transport are still at the initial stage of development. The most common systems are DELFI [1], EFA [2], EU-Spirit [3] и HAFAS [4].

The bottleneck issue of all the systems is the the multiple transfer path and intermodal path (the path with multiple modes of transport) search. Also, all the systems have inconvenient user dialog. While developing web-based timetable information systems for public transport in Tver region, Russia, with Internet address: http://map.l-star.ru (in Russian) all the drawbacks were supposed to be eliminated.

Web-based timetable information system for public transport of Tver region is aimed to solving two problems – to optimize traffic management and to provide the public with timely information on all routes, schedules and modes of transport of Tver region.

It could find the shortest path between any stops of any modes of transport of Tver region, having up to 10 transfers. The system was developed upon Tver region executive office request.

The Tver region has an area of 84.2 thousand km^2, the population of 1 million 620 thousand people, including 36 districts and 12 cities. It stretches from west to east for 450 km, from north to south for 350 km. The main modes of transport are electric trains and buses. There are also trams, trolley-buses and fixed-run taxis. The total number of different routes is about 1000.

The carriers are responsible for information updating, introducing the rerouting information data. They need the data for route reporting to state bodies and for route planning – the system allows to find out the transport-related rate in different localities of the Tver region.

The system offers to the public the possibility to receive the traffic schedule at any stop, to get the travel line and timetable for each route, as well as the shortest path between stops considering the traffic timetable.

The information system is implemented using the Microsoft asp.net technologies (programming language Visual C#) and database server MS SQL 2008 R2 (Microsoft Corp).

The Google Maps API (Google Inc) technology is used to visualize the routes and stops. PTV Vision VISUM (A+S Consult GmbH) traffic planning system is used to search for the shortest path. Figure 1 presents information system use case diagram.

II. SEARCH FOR THE SHORTEST PATH

The shortest path can be routed between any of two stops with transfers (up to 10) or without transfers if such path exists. In order to do this, it is necessary to select the stop from a drop-down list that appears when you type the first few letters of the stop's name or select them on the map (there could be from 2 up to 4 stops), specify the modes of transport (all at once is possible) and the time of your motion start. The developed path is drawn on the map and the relevant basic information is reflected in the table.
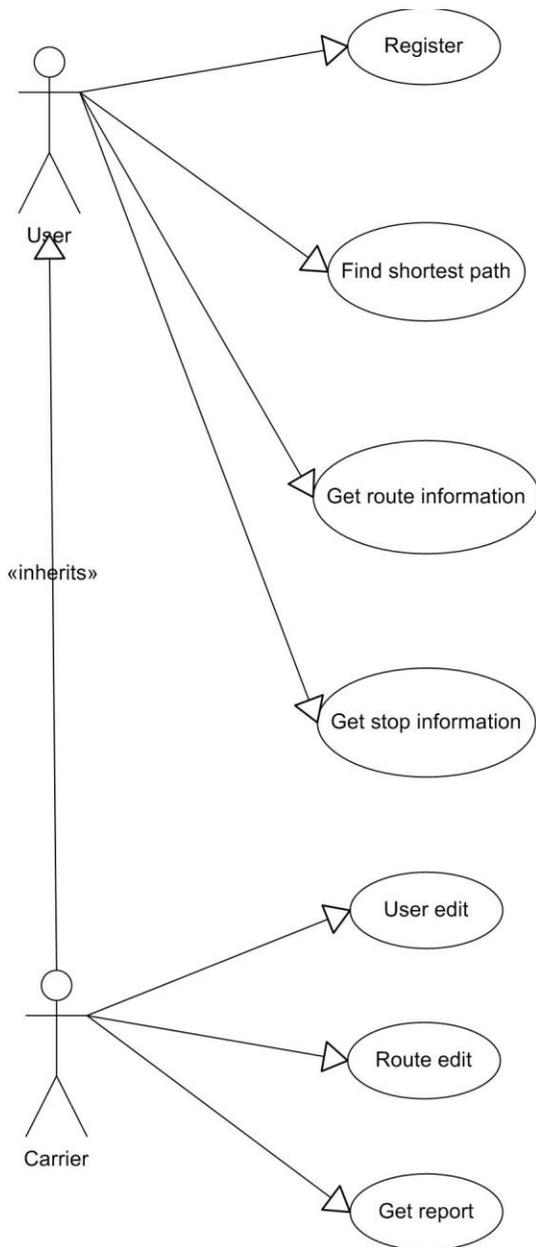
Figure 1. Use case diagram.

Drag-and-Drop technology is used on the map, allowing to move the stops' markers. As a result, a new route will be built.

Stops and routes in the table are in the form of the links. If clicked, the stop-related schedule details of routes or route information appear.

Calculation and development of the shortest path are implemented using the technology of Microsoft AJAX. The shortest path is developed using the PTV Vision VISUM transport planning system.

The quality of the developed paths is good, while the system has a drawback-relatively long search. While searching for the path via 4 stops the search time could reach 10-15 seconds. Therefore, the development of some in-house program for search of the shortest path is under way in the nearest future.

Google Maps API technology has yielded good results – user-friendly dialog had been created with ample opportunities to search the stops and to view the selected path.

III. ROUTE SCHEDULES AT THE STOPS

This service is designed to view the list of transit routes through some selected stop and the detailed characteristics of each of them. After selecting the stop and pressing the "Find" button (or pressing the stop-related link), the panel appears containing the basic stop-related information (geographical coordinates, the number of transit routes and modes of transport) and a table with a list of routes passing through a stop.

If some row of the table is chosen the selected route is drawn on the map and the second table is displayed containing the timetable at the stop for selected route (arrival and departure times, days of route).

Selecting a row in the second table leads to display of the third table containing selected route-related information – a stop, arrival and departure time, travel time and the distance covered from the initial stop.

Stops and routes in the tables are links similar to the search of the shortest path.

The tables' formation is implemented using the Microsoft AJAX technology and Web services. While clicking the "Find" button or selecting a row in the tables, from javascript code a Web service is being opened that reads out the required information from database and generates an HTML-code, that is displayed on the site. The method works very fast: the table usually appears on a web page within 1 second.

IV. SEARCH FOR A ROUTE

The route selection is done from the list containing the route list for the selected mode of transport. When and if required, a route number or the route first letters additional filter can be installed. It is also selected by clicking the route-link in a table. Selected route is immediately displayed on the map with the route-related panel (a carrier and a mode of transport) and a table containing the list of stops: its characteristics, (geographical coordinates, the path length from the initial stop, the number of transit routes and availability of bus shelter).

While selecting the row in the table, the second table is displayed – this is the timetable at the stop for selected route. The table with a relevant route information (a stop, arrival and departure time, travel time and distance covered from the initial stop) will be displayed while selecting the route.

The panel is implemented similar to the timetable-related panel at the stop.

V. THE ADMINISTRATIVE PART.

The administrative part foresees information about users and routes editing and required from the carriers by the state bodies route reporting.

The role is defined for each user - editor, operator, manager, administrator and super administrator. An editor edits his routes and sends the changes for coordination. An operator coordinates the changes for further approval by the manager. After approval the changes will be introduced in database main tables for shortest path formation, route-related information and reporting.

Each user belongs to a certain group with assigned routes and carriers. An editor, operator and manager can only operate the routes attributed to their group. An administrator can only edit the users of his group. They are supposed to be the workers of a certain carrier. Super administrator has any rights, creating new groups and its users.

Route reporting is complicated enough, its samples were given as MS Word documents. They are completed partly manually, partly using database information, containing outlines to be drawn programmatically.

Such kinds of reporting could be made by many ways, the most preferential are two of them - via InfoPath program and common asp.net pages. The second option had been chosen - it is simpler and does not require additional software support of users' computers. The quality of typed reports is similar to those made in MS Word.

VI. CONCLUSION

Web-based timetable information system for public transport had been created offering detailed information about stops and traffic routes in the Tver region, Russia, and building a path with transfers between any stopping points of the region, all modes of transport considering the traffic schedules.

The carriers and Tver region executive office are responsible for updating the provided information.

REFERENCES

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[4] HAFAS. A timetable information system by HaCon Ingenieurgesellschaft GmbH, Hannover, Germany. http://www.hacon.de/hafas.

AUTHORS PROFILE

Mr. A. Makarovskiy was born in Novosibirsk, Russia on May 8, 1966. Now he lives in Moscow. In 1986 he graduated from the Moscow Institute of Transport Engineers. Since 2011 he studies at the postgraduate course (computer science) in Moscow State Institute of Electronics and Mathematics (Technical University).