Real-time Passenger Information - A New Way to Promote Public Transport

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BACKGROUND

Real-time public transport passenger information has been brought up as a new feature to increase the attractiveness and usefulness of public transport. The other features as more comfortable vehicles, low ticket prices, shorter journey times and punctuality of timetables has been widely used. However, during the last decade the real time public transport information systems have strongly promoted public transport in the competition with the daily using of private cars. There are at least 150 public transport information systems based on traffic telematics currently in use in Europe. Besides this there is also more than 300 internet web sites to give information for public transport users. Both figures are constantly growing

REAL TIME PASSENGER INFORMATION

The real time passenger information scopes according to INFOPOLIS-2 (project supported by the European Commission Telematic Application Program, Transport Sector) specifications are:

* Public Interactive Terminals are located near public transport network facilities as terminals or stations. They are intended to help passengers to plan their journeys as to select the bus line and to find the arrival and departure times.

* Dynamic Bus Stop Displays are often the most prominent equipment of passenger information systems. They will give passengers the real-time information of the next bus arrival. This service will highly improve the conditions of the journey because it will decrease the uncertainty and discomfort of the waiting for the bus and minimize the waiting time by enabling some last minute shopping without fear to lose the bus.

* On-board Information will help passengers to have the information of the next bus stop to be served. Besides this it may include information of the destination and possible connections to other bus lines. On-board information will decrease the stress to lose the right bus stop of those passengers who are not every-day users of that specific bus line.

* Information at Home/Office is mainly pre-trip information about routes, connections, fares and time-tables. Some real-time information as the next bus arrival time at a chosen bus stop can be found. Enquiry office terminals are only for information personnel from transport companies. Their main purpose is to help personnel to answer user requests.

* Portable information equipment as mobile telephones or hand-held terminals are new instruments to give information for passengers before or during the journey This area is developing very fast e.g. with WAP based communication. It will give in future all kind of possibilities for a user to specify the information he or she actually needs.

PASSENGER INFORMATION IN HELSINKI

The real time passenger information system is dominant part of the HELMI Public Transport Telematic System used in Helsinki since the year 1999. It comprises now 4 tram lines (3,4,7,10) and 3 bus lines (16,62,23), but it

will be enlarged rapidly to all nine tram lines and several bus lines in the centre of Helsinki. The total number of vehicles in the final stage will be 300 buses and trams. The number of daily passengers on the tram line 4 is 37 000 and on the bus line 23 is 5 000. When the system will cover all the tram lines and centre area bus lines, it will be available for 250 000 daily passengers.

The real time passenger information system used in Helsinki includes or it will include in the future four of the five categories specified by the project INFOPOLIS-2. These are:

* Dynamic visual displays at bus and tram stops
* On-board displays and audible information on buses and trams
* Information at home/office via Internet
* Portable information using mobile telephones

The last one is not yet available. Also the information at home/office includes only static time-tables and route information. The real-time information about bus and tram arrive times at stops is available only for the staff of the City of Helsinki via the city Intranet.

Automatic Vehicle Location (AVL) is the corner stone of the passenger information

The passenger information relies on the Automatic Vehicle Location (AVL) system using GPS-satellite navigation and the odometer of the bus. The bus location is specified with a three step procedure (look at the box on the right).

Each bus is polled by the central equipment every tenth second. The central computer has continuously the data of the exact position of each bus along the route. This enables the central system to forecast next bus arrival times to all the bus stops. This data is used to update the real-time database of bus arrival times at each bus stop. This data is also sent directly to all bus stop display equipment

Real time visual displays show the next bus arrival

Existing bus stop displays provide real-time information of the arrival of the next bus. The ontent used in Helsinki is:

1. Route number of the bus or tram
2. Destination of the arriving vehicle
3. Waiting time in minutes

The waiting time of the next bus is shown with one minute accuracy. The figure counts down until it reaches zero. Then it starts flashing, which makes it more visible than the steady figure. Besides messages on service disruptions can be sent from the bus fleet control room to the displays if needed. This option, however, is not yet used.

The bus stop display is situated some 5 to 10 meters from the bus shelter in the direction of the arriving bus. The visual appearance of the display is like the bus shelter, all the colours and shapes are the same. The vertical position is 250 cm above ground. The text of the display is shown with LCD (Liquid Crystal Display) in both sides of the display. The text colour is yellow and the text height is 4 cm. All the displays have been protected against vandalism somehow; with strong metal cases, poly-carbonate fronts and anti-graffiti coatings. No audio information of the arriving bus is available at bus stops.

The visual display might be integrated into the bus shelter, too. Provisionally, only separate display equipment has been used iIn Helsinki for the present. In future smaller similar displays integrated direct into the bus shelter will be used if the using of larger display is not possible because of limited space or the number and frequency of buses is small. The integration of the display in to the bus shelter may sometimes bring some problems as shown in the pictures below.

Some questions concerning the enlargement of the future passenger information have been considered already in Helsinki. Shall we equip suburban bus stops where the users do need more information of the arriving buses due to the low frequency of buses. Or shall we concentrate the equipment mostly to those bus stops where the numbers of users are highest. This question is discussed later in the section of the portable passenger information equipment.

On-board information helps first-time passengers on the route

On-board information is an important tool to decrease the passengers uncertainty to reach their destination bus stop. With the information of the next bus stop served he or she can follow the moving of the bus and prepare to leave the bus at the right bus stop. This is a great relief compared to the other possibilities as following the route on the map or to ask advice from driver or other passengers.

The on-board information in Helsinki comprises the following functions:

1. Name of the next bus stop
2. Route number of the line
3. Destination of the line

When the bus is staying on a stop or just departing the stop, the line number and the destination are shown. The destination is shown in Finnish and Swedish in rotation. When the bus has left a stop, or passed a stop without stopping on it, the name of the next bus stop is shown, rotating again the Finnish and Swedish name.

The display of the bus is situated in front of the bus just behind the driver. It can be seen clearly from most of the seats of the bus. The display uses LCD (Liquid Crystal Display) technology.The text is one row height with 16 characters (on trams) or 20 characters (on buses).

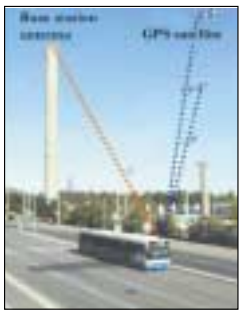
The colour of the text is yellow.

The detection system comprises on-board computers in each bus and tram which continuously are aware of the position of the vehicle. The positioning algorithm is based on a combination of GPS-navigation, door openings at bus and tram stops and odometer pulses.

All events during the bus and tram route are preprogrammed in the on-board computer. The driver only has to inform the system about the correct duty number when starting his first ride in the morning. Then the system will automatically control the next stop information, request traffic signal priority and send fleet control messages to the central computer.

Communication

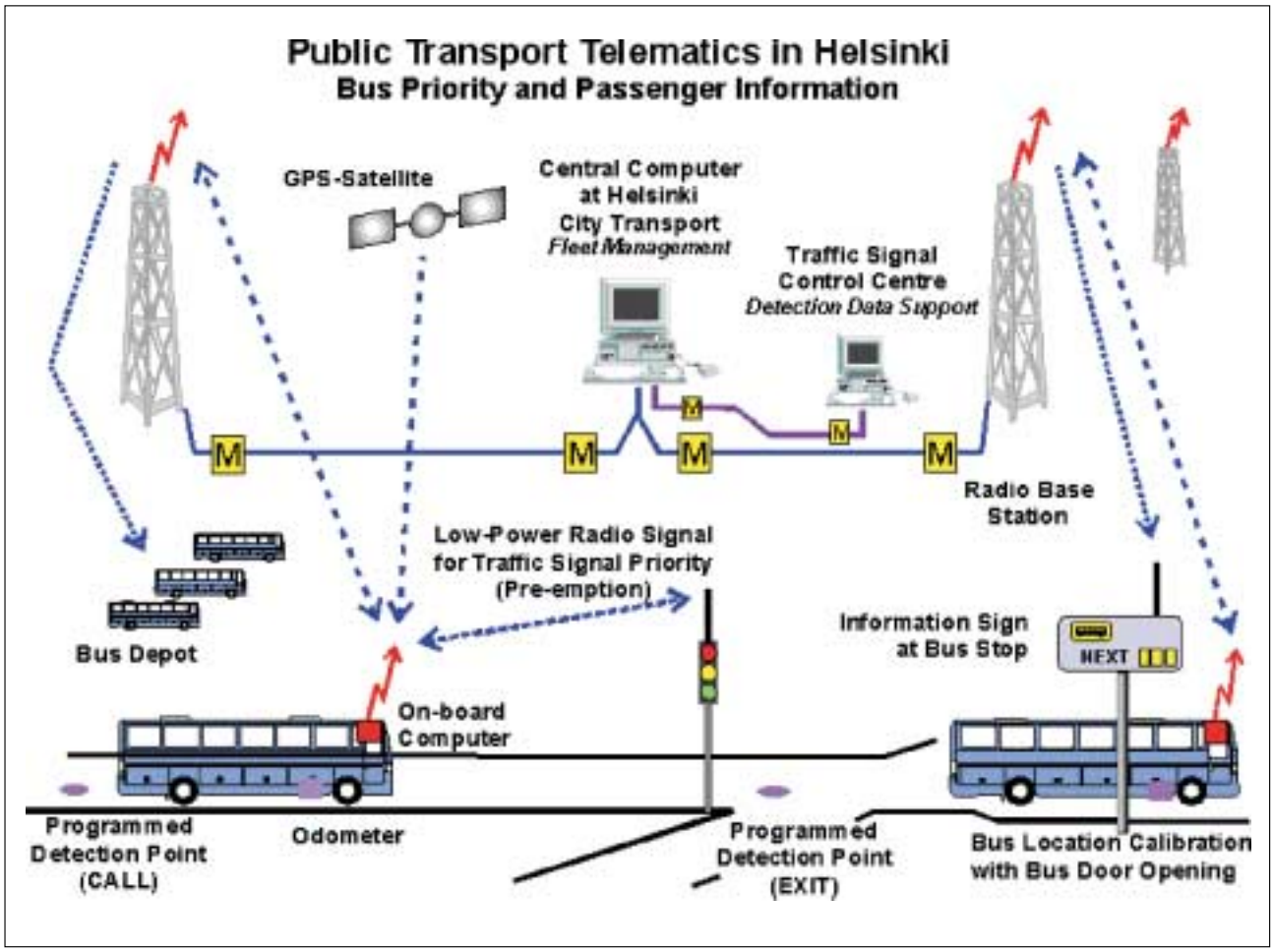
The data transmission between vehicles, traffic signal controllers, stop displays and central computer is based on radio messages.



Three base stations operating at different frequencies are handling the polling of the vehicles. The fourth base station is controlling the bus and tram stop displays.

The base stations are connected to the central computer with modem lines. A fifth frequency reserved for data support of the on-board computers is used to modify and upgrade system parameters at night at the bus and tram depots.

The traffic signal priority requests are sent over the sixth frequency direct from the vehicle to the signal controller cabinet in each junction using low power. This is essential in order to minimise the priority request transmission delay compared to the automatic vehicle location (AVL) system communication using



central computer to send messages.

All data transmission is based on open protocols. For instance the possibility for signal priority is not limited only to buses and trams of Helsinki City Transport. Any bus sending the right message on the right frequency to the traffic signal controller will get priority. This is a key point when the system will be enlarged in future.

Manufacturers and costs

Several companies have provided equipment to the system. The central system hardware and software, on-board computers, interfaces to signal controllers etc. are from Thoreb, Sweden. Bus and tram stop displays and also in-vehicle displays are from Mitron, Finland. The radio modems are from Satel, Finland.

The total costs of the Project 423 is approximately 0.8 MEcu. All this is from the city budget The share of the central equipment and radio communication is 30%, equipment to 20 buses and 20 trams 35%, displays to 25 bus and tram stops 15% and priority receivers for 48 junctions 20%. All installation costs except the costs of city staff are included in these figures.

SOME FUTURE VISIONS OF PUBLIC TRANSPORT PASSENGER INFORMATION

The modern traffic telematics will serve sophisticated possibilities in future to make the use of public transport easier and more punctual. This is the key point. The use of public transport should be an attractive alternative for the using of private cars. Then more and more people will use it. This is a positive way to save energy, decrease pollution and preserve city environment.

The use of public transport must be easy. You should be able to have the answer to the very simple question of where can I find my next bus to go. The real time passenger information available now is on the way toward this goal. It will tell us ”when does my bus come” and ”where does it go”.

The future vision for the public transport telematics based on the personal mobile telecommunication will give the answer also to the question ”where can I find my bus”. That means the system selects the right bus and also points out the way to the right bus stop. This stage may be here sooner than we can ever imagine.