NETWORK MANAGEMENT NOTES

Real Time Traffic Information Systems

Motorway variable message sign providing driver information to improve road safety.

What are they?

On–line information can be provided either before or during the journey. The main forms of information are:

(i) Public Information Services: for example in house, in office or in hotel information is provided via radio and television bulletins or via a terminal (either computer or television screen) using radio, TV, telephone or the Internet to provide the communications link. Examples of information provided to the TV screen are Teletext, cable TV and Prestel. Rail (via Railtrack), London Underground and road traffic is currently available via teletext. In France, the Minitel system provides on–line travel information for all modes to a special small computer unit. In Great Britain and the Netherlands, on–line travel information for all modes of transport is provided via a phone–in system (see also Advice Note: Public Transport Passenger Information). In London the ROUTES on–line information system provides information about all underground trains and buses while the Railtrack information system provides train information via (a) telephone (b) cable television and (c) local radio.

(ii) Pre–trip information in public places. This can be provided:

❍ by the use of information kiosks, placed in airports, rail stations, bus stations and other interchange points and also in offices (to encourage employees to travel on public transport), hotel foyers and at strategic places on streets. They consist of a computer with a touch screen interface linked to information sources via telephone and, in future, via the Internet. These are already in use in Birmingham, Southampton, and several other cities.

❍ by the use of Personal Digital Assistants – hand held computers with on–line access to a variety of travel information sources. These are currently under development – eg, the PROMISE system, as part of a Fourth Framework, (European–Funded) R&D project project.

❍ by traffic speed monitoring and display systems, (eg the *Trafficmaster* system). Large screen versions are increasingly being used in motorway service stations, airports, hotels and offices to give pre–trip or on–trip information. The system employs a screen with a diagram of the motorway networks, different sections of which can be displayed at will. On–line information about traffic conditions on the UK motorways, together with a growing number of trunk and urban strategic roads, is accessed via a network of speed monitoring points.

❍ variable message signs (VMS) in airports, train, underground and bus stations and at bus stops. Increasingly, these signs are being used to give information about traffic delays, arrivals and departures, including any delays, or incidents which may cause congestion. They have had a good reception from customers when introduced on the London Underground some years ago, and at bus shelters in schemes implemented in London and Southampton.

(iii) On–trip information

❍ *Dynamic Information Systems*

Variable Message Signs (VMS) are employed by highway operators in order to enable important information to be disseminated to roads users during their journey. Types of VMS are many and varied, using fairly basic electromechanical plates, which rotate in order to alter the information presented to drivers, through to fully–variable text message signs which can display information about current road, weather or congestion conditions ahead. Electromechanical Plate Signs are often employed in place of a fixed direction or route information sign, eg, for describing the status of car parks or directing traffic to a particular area of a city.

By Susan Harvey, Secretary General, ITS Focus

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ITS Focus is a not for profit public/private partnership dedicated to promoting (i): the use of ITS as an integral part of transport policy, and (ii): the interests of UK companies in the emerging world market for ITS.

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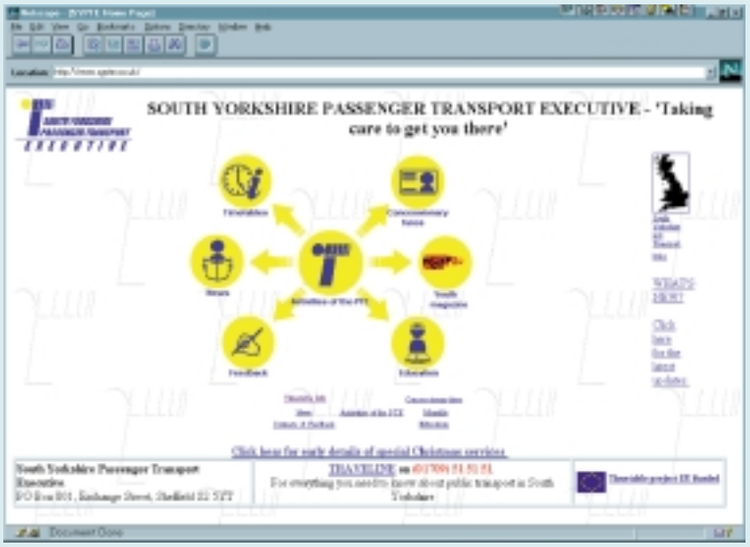

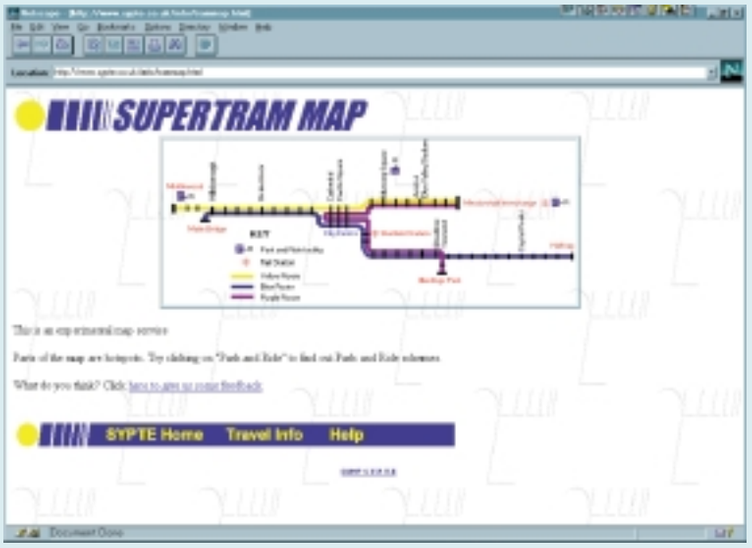

Three pages from SYPTE's website.

The messages displayed on VMS are also subject to DOT regulations[1]. The messages must conform to a specific range of schedules, or be authorised by the Secretary of State – via the Highways Agency, (in the case of trunk roads), or the relevant Government Regional Office.

VMS can be regulatory (eg, lane control, or access restriction, information, providing information about roadworks, traffic incidents and estimated travel time, or used as warning signs (eg severe weather warnings, notices about long vehicles or low bridges)[2].

❍ *Variable Text Message Signs*

This type of sign is employed wherever textual information can be used to provide guidance to the road user. The UK has, in many ways, led the way in creating wide area strategic signing systems. Early in the 1990s, the Scottish Office specified and procured a systems (FEDICS), which makes use of multiple line character based Variable Message Signs placed at strategic nodes within the road network. Particular information is displayed which enables drivers to make a choice as to which route to take when there is likely to be network congestion or

link journey delays. This strategy has been repeated by the Highways Agency in a message signing system which operates in an area from London to Birmingham and Nottingham (the Midlands Envelope Scheme). The Highways Agency has also purchased several hundreds of text message signs which are being installed for use at points throughout the road network.

❍ *Lane Control Signs*

Lane Control Signs, as the name implies, are used on expressways and are situated above each running lane of the carriageway. In their most primitive form, the sign provides a limited number of displays which are used to advise drivers that they should expect to change lane, leave the expressway or reduce their speed. More advanced Lane Control Signs are capable of displaying an enforceable speed restriction and, by being linked to enforcement cameras, are able to regulate the flow of traffic on particular areas of carriageway. This enables a greater number of vehicles to be carried on the network, reducing congestion and preventing flow breakdown.

Lane control signs on the M25, showing enforceable speed limits under high–flow conditions.

❍ *City Information Systems*

One example of an integrated approach to variable signing and live information is provided by the Hampshire CC Road Management System for Europe (ROMANSE) Project. This system, which has at its heart an Urban Traffic Control system, takes information from a number of sources and makes it available to all categories of road user. Variable Message Signs are used to provide information about the number of car park spaces available in the city, traffic flow and congestion on major routes into, out of and around the city and real time passenger information at bus terminals and bus stops.

❍ *General*

The technology used in order to produce a variable message sign very much depends upon the type of application required. High intensity LEDs are now equal in performance to Fibre Optic signs, although some specifications still call for FO; the ultra–bright LED probably gives a more acceptable colour for the road user, as it has an offwhite/amber appearance and is less stressful to the eyes.

City information sign – here showing an advisory message to drivers approaching an event likely to cause significant queueing or congestion at peak times.

All Variable Message Signs are subject to approval (whether formal approval from a road authority, or simply acceptance by the end user). There are several manufacturers who are already able to provide signs which conform to governmental approval and to European specifications for performance and manufacturing quality.

❍ *Radio Broadcasting*

On–line information is currently provided via national and local travel news broadcasts – Digital Audio Broadcasting (DAB), and by the Radio Data System (RDS) which interrupts in–vehicle radio programmes and cassette players to bring news of roadworks, accidents, adverse weather or other incidents likely to cause delay. Currently, this system (which is now fitted in a high proportion of new car radios) exercises a "blanket" coverage of the UK – eg, the messages heard by the driver are not necessarily relevant to his area. The RDS–TMC (Radio Data System – Traffic Message Channel) – originated in the DRIVE I transport telematics programme, later continued in DRIVE II, and currently being developed in several European countries, including the UK – will enable a selective delivery of information – eg, the driver will now hear only messages relevant to his journey.

Traffic speed monitoring systems (see Section [ii]) also operate as in–car systems and are delivered either via a screen, which includes a messaging facility for the driver, or via a voice over system.

(iv) In–vehicle navigation systems

These are of two main types (although a third could be defined as combining the technologies from the two types):

❍ autonomous systems, which use digital maps and a direction finder (either by dead–reckoning or GPS) within the vehicle (CD–ROM based), to show where the vehicle is, on a small screen map display within the driver's range of vision; or

❍ dynamic systems, which comprise an in–vehicle direction finder, computer system and small–screen display, connected via a form of wire–less link (radio, digital telephone, microwave or infra–red have all been used) to a central computer system. The driver keys in his destination and is guided step–by–step to that location by means of voice–over and directional arrows on the small screen, when approaching junctions.

Experiments with both types of system have been undertaken over the past ten or more years, but large–scale deployment has been limited due to the relatively high costs associated with the in–vehicle equipment (principally the first type), the communications infrastructure (principally the second type), and the collection of good–quality, consistent and widespread "current status" data (both types).

The level of payment for these systems has been subject to much debate and has focused the traffic management community on the essential worth of "information" as a marketable commodity.

The third type of system combines digital mapping, direction arrows and voice over.

Typical rotating plate sign, in use here for car parking information.

(v) Use of existing flows of information

There are several sources of travel information which are not being used to their full potential – which is, perhaps, the key issue under–pinning the debate on the marketable value of information referred to above.

For example, the SCOOT (Split, Cycle and Offset Optimisation Technique) system for co–ordinating the timings of traffic signals across a network of junctions – probably the most successful adaptive control system in the world – uses a large amount of detailed measurements and calculations relating to the traffic flowing through the network and the junctions. This could, perhaps, be put to a wider use if it were made available to traffic information suppliers – particularly so as SCOOT systems are currently operational in over 130 cities, towns or boroughs in the UK.

Other sources of information include the ever–increasing use of light aircraft and helicopter surveillance of traffic on motorways and in cities; discrete systems which are monitoring the performance of fleets, such as buses and trucks; general detection systems on many of the motorways and urban roads in the UK; incident detection systems, using loops, image processing or overhead detectors, such as MIDAS (Motorway Incident Detection and Automatic Signalling) currently being deployed on the UK motorways.

Work is also under way to develop standards for communication of data between information providers and the data sources and dissemination devices, to ensure that future developments can be incorporated easily. Some of the existing transport telematics projects are well down the road to pilot implementation of such standards and, in the background, DETR is commencing a programme of research and development leading to an Urban Traffic Management and Control (UTMC) specification (although this is unlikely to be available before 1999).

Transport operators, road authorities and traffic police should confer on the benefits of providing more sophisticated pre–trip and on–trip real time information to travellers in their area. Experimental schemes in other areas should be studied.

What can on–line information systems do?

These systems can assist travellers in a multiplicity of ways:

(i) They can relieve traffic congestion by suggesting the alternative routes and by persuading travellers to move their journey in time.

(ii) In–car systems save time for drivers either by the provision of route guidance which enables them to choose the shortest route, or by providing traffic information so that they can avoid hold–ups.

(iii) Pre–trip information helps public transport passengers to choose the fastest available or most convenient route. It also encourages the use of combined modes of transport, and helps transport operators to integrate their services.

(iv) Real time passenger information at bus stops increases the users' confidence in the service and improves comfort. The *Countdown* system in London and the *Stopwatch* system in Southampton are being trialled.

(v) Variable Message Signs can also be used to provide parking guidance so that an effective Park and Ride system can be set up, from some miles outside a city. They can also be used to inform drivers entering the city of the location of car parks and the number of spaces available.

(vi) In–vehicle information systems help freight drivers undertaking Just–in–Time deliveries: on–line traffic information, in particular, helps them to meet deadlines.

(vii) All types of systems can be used to help the emergency services improve their performance.

County and City Councils may wish to investigate the possibility of setting up a public/private partnership to initiate a multiple on–line information system in their city.

How do they work?

On–line travel information is conveyed by use of **transport telematics** – the fusion of Information Technology and Telecommunications – to enable communication between the vehicle and the environment through which it is travelling. This may be done using microwave beacons at the road or track side, communicating with tags or smartcards in the vehicle, or via satellite. So far as pre–trip information is concerned, the Internet will increasingly be used as a carrier both for in–home information and for information kiosks.

Integrating the on–line information. Attention is currently being given to the delivery of an integrated flow of information to all the access points mentioned earlier. This can be done by (a) setting up an effective server processing system at the point of origin to ensure consistently high quality information (eg police monitoring of information about traffic incidents and congestion) then, (b) setting up a computerised information server, which is programmed to select information from a variety of sources and provide a series of messages which are delivered on demand to the various access points. An example of such an information server is that developed by SCOTIA – (the Scottish Travel Information Association). This is a vitally important function (see *Implementation Issues*).

Implementation of Traffic Information Systems[2]

Key issues are:

(i) the collection of information from a variety of sources involves co–operation between a number of organisations who may not have operated in this way before – eg police, traffic managers, the motorway organisations, and the Met Office.

(ii) the **processing** of information in a coherent and consistent way in a standard form.

(iii) dissemination of information must be done as quickly and efficiently as possible, via the means described earlier.

(iv) monitoring – the information flow must be monitored continuously to ensure a uniformly high quality, and to avoid gaps in provision.

(v) institutional issues arise because of the multiplicity of information sources, and the need for a variety of public and private sector organisations to co–operate, eg the police, motoring organisations, private sector information collectors, passenger transport operators, the Department of Transport and local authority transport departments.

(vi) funding – the cost of setting up such systems will need to be assessed against "value for money" criteria plus normal local or central government spending criteria. If the private sector is to become involved, the business case must clearly identify sources of capital, anticipated revenues, risk levels and the level of public funding required. A special public/private sector association may need to be set up in order to fund the "start up" of such a multiple on–line information system in a city, for example.

City and County Councils should investigate the possibilities of using on–line information to promote the use of buses and the use of combined modes, for parking guidance and improve emergency services.

References

1 Traffic Signs Regulations and general Directions (HMG, 1994).
2 Transport in the Urban Environment (The Institution of Highways & Transportation, 1997, Chpts 15 and 18).

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