Juuso Kummala: Matkapuhelimia hyödyntävä matka-aikapalvelu. [Travel time service utilising mobile phones]. Helsinki 2002. Finnish Road Administration. Finnra Reports 55/2002. 67 p. + app. 13 p. ISSN 1459-1553, ISBN 951-726-960-9, TIEH 3200787-v.

Keywords: Traffic management, traffic monitoring, travel time

SUMMARY

Finnra and the Finnish mobile operator Radiolinja Ltd. implemented a traffic monitoring system based on mobile phones and the cellular network on Ring Road I and Highway 4 in spring 2002. The travel time service measures travel times based on communication data in the cellular network in a certain area, at predetermined observation points. Operation of the system is based on the fact that a mobile phone travelling on a certain route always changes the base station at almost exactly the same place. The monitoring method was assessed by the Regulatory Framework support project of NAVI programme of the Ministry of Transport and Communications. This assessment showed that the system does not threaten the privacy of mobile phone users.

The purpose of this research was to study the technical performance of this travel time service. The pilot system was implemented on two road sections that already had a monitoring system based on automatic license plate recognition. The study concentrates mainly on comparison of travel time data measured by these two systems.

For the most part, the system functioned well during the test period. Only calibrations and updatings of the system caused a few brief gaps in data collection. Comparison of the travel times showed that the travel time service could be used for traffic monitoring. The observed differences in measured travel times are mostly attributable to the differences in location of the parallel systems. Had the sections been identical the achieved results would have been better. The results might also have been better if the observation points would have been determined based on the structure of the cellular network. In the pilot study, the observation points had to be artificially “forced” close to the monitoring points of the license plate recognition system.

The pilot study showed both the advantages and disadvantages of the system. One significant advantage is the capability to produce travel time observations regardless of the predominant traffic situation or the environmental circumstances. Because of the large amount of observations, the traffic situation could be interpreted easily and statistical variances and parameters based on travel times calculated and estimated reliably. Major disadvantages of the system relate to travel time observations that do not come from the monitoring road or come from the same vehicle. Observations from parallel roads, public transport, bicycles or pedestrians can affect the calculated statistical parameters.

The pilot study also revealed possible technical problems. The structure of the cellular network might cause incorrect observations on some links. In view of these possibilities the cellular based systems should always be tested and calibrated against another reliable monitoring method. However, if observations from parallel roads can be sorted out, this feature would be a clear asset to the travel time service, enabling cost-effective simultaneous monitoring of parallel roads and for example the development of a route-guidance service.

The possibilities to extend the system to cover the whole trunk road network can not be clearly estimated. In principle, the system could be used wherever the cellular network exists. However, the present location of the base

stations is not always optimal for traffic monitoring purposes. In some locations, because of the structure of the cellular network, it might be necessary to cut the accuracy demands or change the optimal length of observation links or even modify the cellular network. However, the independence of the road infrastructure allows the road authority to expand and/or move the observation link easily. The travel time service could possibly be used also for network monitoring. This could enable the monitoring of roads as a network, not only as links e.g. tracking merging and exiting vehicles.

The pilot study showed that from the technical standpoint, expanding the system is reasonable, depending of course on the pricing of the production version. Possible new monitoring links must be planned based on the structure of the cellular network and traffic monitoring purposes. It seems that the system is well suited for traffic monitoring of long observation links (≈10 km) on which vehicles leaving or merging with the link or stopping on the link are rare. On such links travel time observations represent the traffic flow well, and the calculated parameters are reliable. Also in urban settings the system can operate well and results can be satisfying, as the pilot on Ring Road I showed. The advantage of the system in urban areas is the large amount of observations, but on the other hand, observations not belonging to the monitored road increase. The tested method allows observation links of at least approximately 2-3 kilometres in urban areas.

As follow-up it would be important to test and estimate the performance of the system on short observation links. It would also be interesting to study whether the travel time service could be used for traffic forecast purposes, or if the observations at the base station could be used as input for prediction models. The possibilities of selecting observations coming from parallel roads or from public transport should also be studied. Sorting would make the calculated parameters more reliable. Public transport operators might also be interested in getting information on location, travel time or travel speed of public transport vehicles.

The project has been granted European Community financial support in the field of Trans-European Networks - Transport.