Experience with Implementation of Transportation Control

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Every time a new theoretical strategy for signal control in urban transportation network is being implemented in practice, the implementing team faces many challenges of both administrative and technical nature. Using our transportation control system HRSD as an example, we will overview all the main phases of the design and implementation process and mention several important points that have been overlooked in the initial proposal.

We will concentrate on several topics:

HRSD design, development, and simulation. The transportation control system is based on the set of discrete models [2, 3] based on the vehicle conservation law [4]. The model provides queue length estimates, and the control block attempts to minimise the queue lengths over the controlled network using linear programming approach. Prior to field-testing the system, the whole system had to be simulated and evaluated. For this purpose a new set of interface libraries for Aimsun traffic micro-simulator [1] has been developed. The final tests took part in May 2009 and provided data for the administrative evaluation of the system.

Administrative evaluation. The field test of HRDS had to be approved by all local authorities in charge of any affected part of the transportation system. In our case our proposal was evaluated by the Municipal Department of Transport (ODMHMP), the Prague Public Transit Company (DPP), the municipal road administration agency (TSK Praha) and the Directorate of Transport Police of the Czech Republic. Given that every state body has a legal limit of 30 days to respond, the administrative procedures caused significant delay the whole implementation process.

Detectors. A new set of strategic detectors is required by the HRSD algorithm. As we could not afford to place another inductive loops in the road network, cheaper (but also not so reliable) variant using external video-detectors has been chosen. The detectors communicate over wireless link to their particular intersection controllers. Their measurements are collected and transferred to HRSD, they have no direct influence on the local controller.

Control and communication hardware. HRSD interfaces to the controlled system over an SQL database that mimics the database used by traffic control centre computers. The data from controllers is collected using a custom-made interface boards converting the controller bus to Ethernet with ability to interpret appropriate commands that would normally come from the traffic control centre. xDSL is used for communication between the controllers. Externeal connectivity is realised over GPRS connection using a modem borrowed from another project. Unfortunately, this severely limits the connection speed and allows just for monitoring the state of the HRSD system, starting it up and shutting it down. All other data (logs, surveillance pictures) have to be downloaded manually on-site.

Computer hardware. The whole testing system consists of four computers that have to fit into very confined space inside the intersection controller case. Ideally industrial-grade PCs would have been used – they are small and reliable, but unfortunately also very expensive. Hence, the actual hardware is a mix of notebooks and recycled low-power mini PCs that survived from different other projects.

References

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