The Sentient Van

Intelligent Transportation Systems Research

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Infrastructure

The sentient van project has created a vehicular platform into which many different sensors and applications are integrated, allowing research into Intelligent Transportation Systems (ITS), network connectivity on the move, and congestion charging.

Figure 1: *The van itself*

Figure 2: *Computing infrastructure onboard the van*

Equipment onboard includes:

- Trimble GPS receiver
- Two dashboard touchscreens
- 3G/GPRS data card
- 802.11a/b/g wireless LAN
- Sensor-dedicated CAN bus
- RFID card reader
- OBD-II engine diagnostics

Customisation of existing user interface controls (such as buttons on the steering column, and the audio system) has also been carried out.

Communications

Every time the van is started, the onboard computing infrastructure begins collecting data from the various sensors. An example application is the collection of wireless coverage data, which can then be used to draw approximate coverage maps, used in work on heterogeneous network handovers to determine handoff locations. (Figure 3).

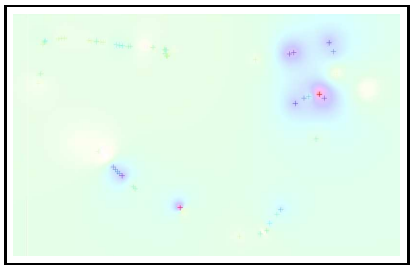

Figure 3: *3G cellular coverage*

Work has also been carried out investigating the performance of 802.11b WiFi technology in urban environments.

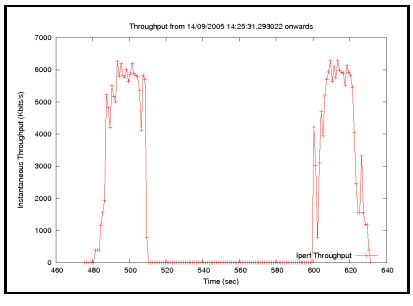

Figure 4: *802.11b Performance at 40 m.p.h.*

Ranges achieved have been approximately 300 m from the access point using an 8 dBi antenna, on a variety of streets (Figure 4).

GPS Tracking

GPS readings are uploaded at regular intervals over the cellular network from the van, to allow semi-real time tracking, as shown in Figure 5. Other data can easily be added to the stream (Figure 6).

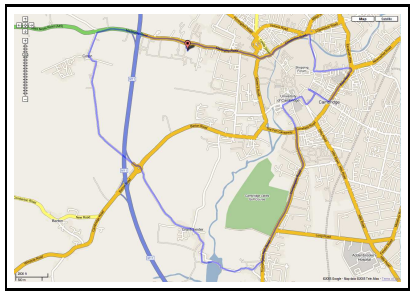

Figure 5: *GPS Trace of a typical journey*

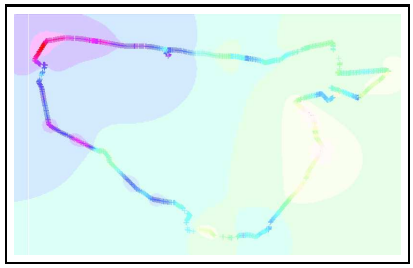

Figure 6: *Variation in altitude over a journey*

Current Work

Congestion charging is another important ITS application that is being researched, including the possibility of using onboard cameras in each vehicle [2]. We have also investigated using vehicles as mobile congestion "sensors" in simulations [1].

Papers

[1] D. N. Cottingham, J. J. Davies and A. R. Beresford. Congestion-Aware Vehicular Traffic Routing Using WiFi Hotspots. In *Proceedings of Communications Innovation Institute Workshop*, pages 4–6. CMI, April 2005.

[2] R. K. Harle and A. R. Beresford. Keeping Big Brother off the Road. In *IEE Review*. IEE, October 2005.