

ITS Radar Helpdesk Query: Vehicle Occupancy Detection

Query no:	1	Query initiator	John Slip (Highways Agency)
Date:	19 th September 2005	Compiled by:	John Paddington
Query topic areas:	Vehicle Occupancy Detection / Enforcement		
Categories and level of relevance :	Monitoring	Some Relevance	
	Enforcement	Very Relevant	
	Traffic Management Technology	Some Relevance	
	Technology Solutions	Some Relevance	
	Pilots	Very Relevant	
	Tolling	Some Relevance	
Transferability to Highways Agency :	Meets Policy Objectives	Yes	
	Cost/Benefits Information	Not available	
	Development status	Pilot	
	Innovative	Yes	
	UK legal issues	Possible Privacy Issues	
Summary:	<p>An extensive literature review carried out for the Canadian Ministry of Transport concludes that Occupancy Detection external to the vehicle is currently difficult.</p> <p>A trial that is currently taking place in Leeds UK using infrared and visible light cameras is believed to have shown some positive results.</p>		

Introduction

This document is provided in response to the above query regarding the potential for automated vehicle occupancy detection. The following sections provide information on the latest research findings in this area and pilot studies in progress:

Canadian Ministry of Transport Study on Automated High Occupancy Detection – December 2004

A study was carried out by McCormick Rankin Corporation in 2004 for the Ministry of Transport in Ontario, Canada. This study reviewed the state of the art in Automated High Occupancy Detection.⁽¹⁾ This report documents the study and includes commentary on the technologies available and views of stakeholders such as Highway Authorities, States, Enforcement Agencies and Vehicle Manufacturers.

The report considers trials of automated systems that have already taken place and concludes that detection systems external to the vehicle do not currently provide a feasible method for enforcement. The report does however suggest that the trial currently taking place in Leeds, may produce a feasible method of enforcement in the future. The Leeds trial is discussed later.

The Canadian report then goes on to consider in-vehicle detection and enforcement options in detail, considering a wide range of technologies available and the issues with each type of technology. The technologies considered are:

- Mechanical systems;
- Photography / video;
- LED imaging;
- Thermal / infrared imaging;
- Weight sensors;
- Ultrasonic / Radar;

- Capacitive Sensor;
- Heartbeat / Breathing monitors;
- Fingerprint and Biometric information; and
- Smart cards and readers.

The report also considers how the costs of in-vehicle occupancy detection could be reduced by introducing such a system as part of systems already under development, such as security / safety systems. The report then presents a business case on the likely costs and benefits of using in-vehicle monitoring units.

Leeds Trial (HOVMON) – Ongoing

The Leeds trial (HOVMON project) is funded by DfT/EPSRC and involves Golden River Traffic Ltd, Laser Optical Engineering Ltd, Leeds City Council, Photonics Consultancy, and the University of Sussex. Photonics Consultancy reports⁽²⁾ that the system uses both an infra-red camera and a visible light camera, as using only an infra-red camera would require expensive laser diodes to allow the system to function in low natural light. However, Photonics expect that the cost of laser diodes will fall over time and then remove the need for the second camera.

The trial system works because infrared light with a wavelength of approximately 1.5 microns can pass through the heat resistant layers on car windscreens and at this wavelength, human skin is very absorbing of this type of infrared, although hair and clothing reflect the light quite strongly. This means that human faces appear black whilst surroundings appear grey and white in images from this camera.

This trial is starting to appear in the press, and The Times⁽³⁾ reports that an infrared camera is being trialled on the A647 in Leeds as a means of enforcing the High Occupancy Vehicle lane. This camera, developed by Laser Optical Engineering⁽⁴⁾ uses a combination of infrared and visible images, which are digitally processed to distinguish between skin and background.

The camera technical specification⁽⁵⁾ describes the trials conducted so far and claims that occupants can be detected in the rain at 50mph and the latest windscreens with infrared filters do not cause any significant drop in contrast. However, the technical specification does indicate that the camera requires sufficient lighting to function and may require street lighting. The company Vehicle Occupancy Limited⁽⁶⁾ appears to have been set up by Laser Optical Engineering to market this product and their web site talks in more detail regarding installation issues.

The Department for Transport website has a project summary on the project and details of a report published by the University of Sussex⁽⁷⁾.

Key Contact:	Leeds HOVMON trial Dr J Brocklehurst, Photonics Consultancy. Tel. 01462 742856 Email. jrb@photonicsconsultancy.co.uk
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Reason Foundation Newsletter – April 2005

The April 2005 Reason Foundation Newsletter⁽⁸⁾ provides a commentary on issues of High Occupancy Vehicle Lane Enforcement. This article provides a commentary on the Canadian Study, and does not provide any more detail, however it does neatly summarise the issues involved with occupancy detection.

References

1. “Automated Vehicle Occupancy Monitoring Systems for HOV/HOT Facilities”, McCormick Rankin Corporation, December 2004:
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2. “High Occupancy Vehicle Monitoring (HOVMON)”, Photonics Consultancy
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3. “Cameras to police car-share lanes”, the Times Online, 17 July 2005:
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4. “HOVMON - High Occupancy Vehicle Monitoring”, Laser Optical Engineering Ltd:
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5. “VOM-10 Vehicle Occupancy Monitor Technical Specification”, Laser Optical Engineering Ltd:
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6. Vehicle Occupancy Limited Website:
<http://www.vehicleoccupancy.com/installation.htm>
7. DfT Research Database: Monitoring of High Occupancy Vehicles
<http://www.rmd.dft.gov.uk/project.asp?intProjectID=10039>
8. “Automated HOV Enforcement? Don’t hold your breath”
<http://www.reason.org/surfacetransportation22.shtml#feature3>