



Oxford University

Future Infrastructure Forum Team

Structures / dynamics

Geotechnics



Tony
Blakeborough



Martin
Williams



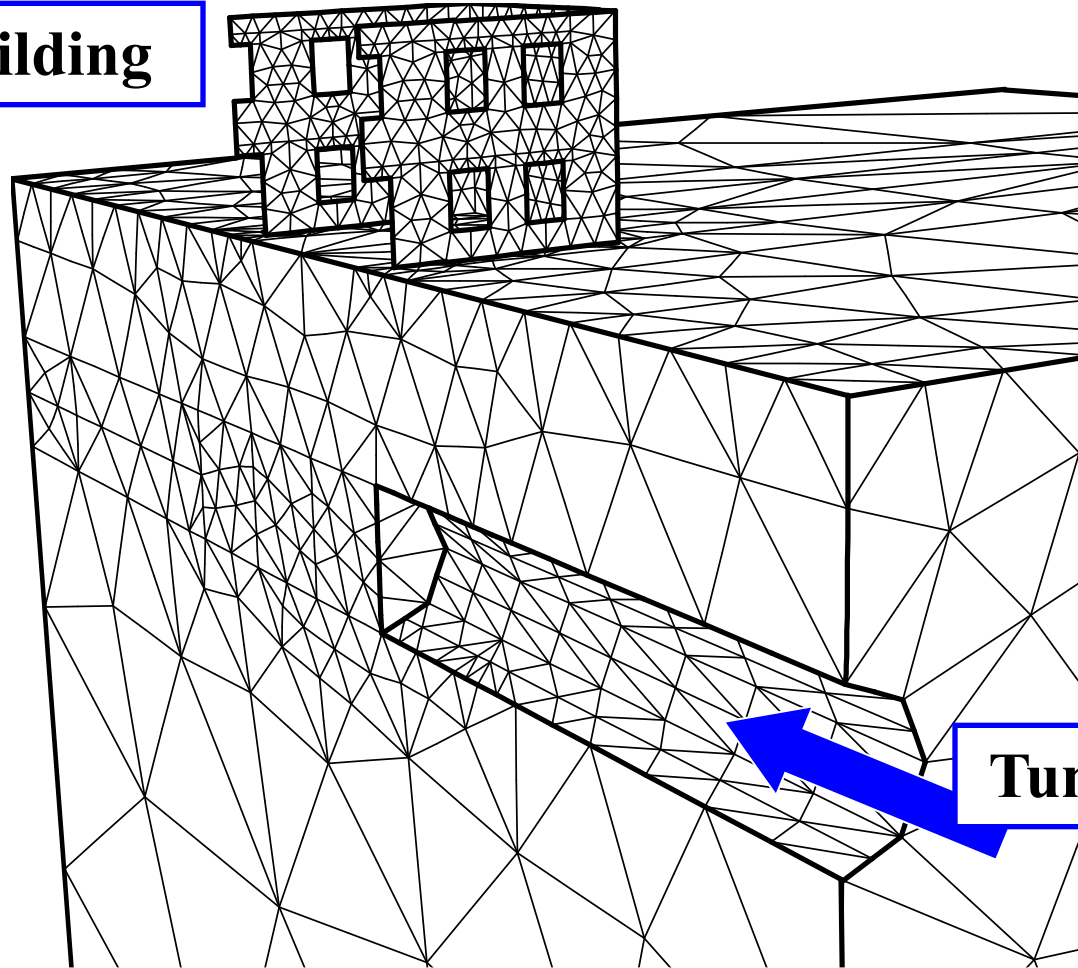
Harvey Burd



Byron Byrne

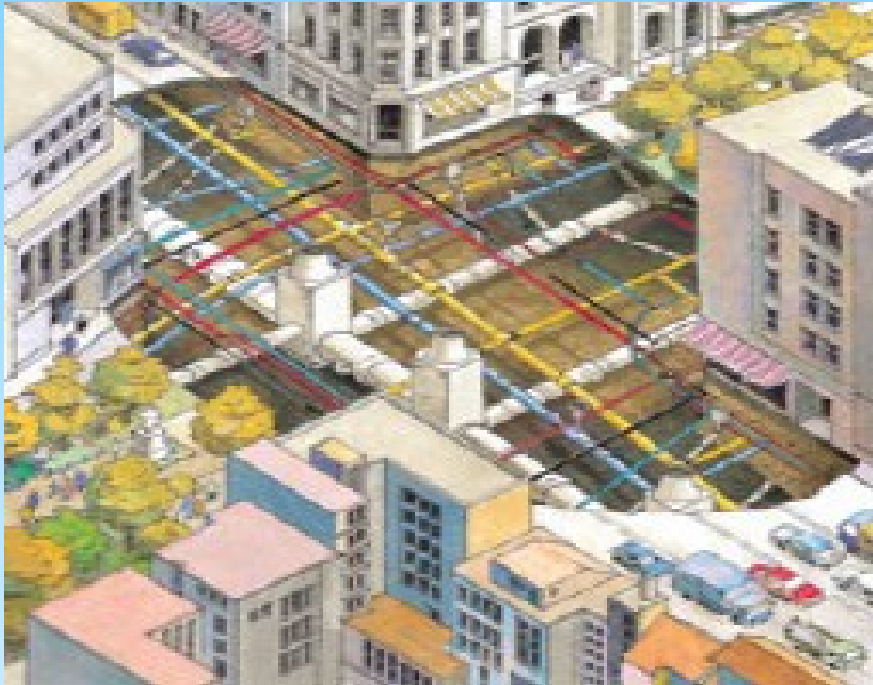
Incremental tunnel construction

Building



Tunnel

2.0 Electromagnetic detection of buried pipes

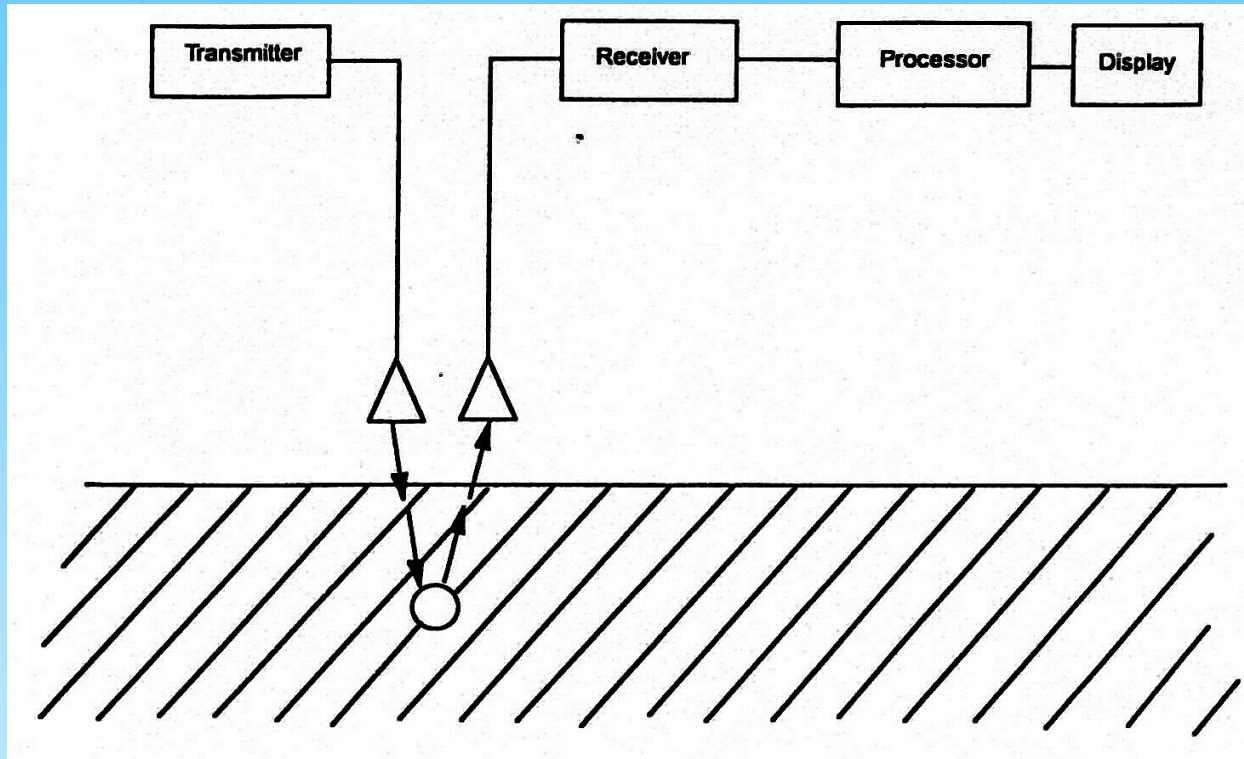


The Problem



©Simon Hickinbotham

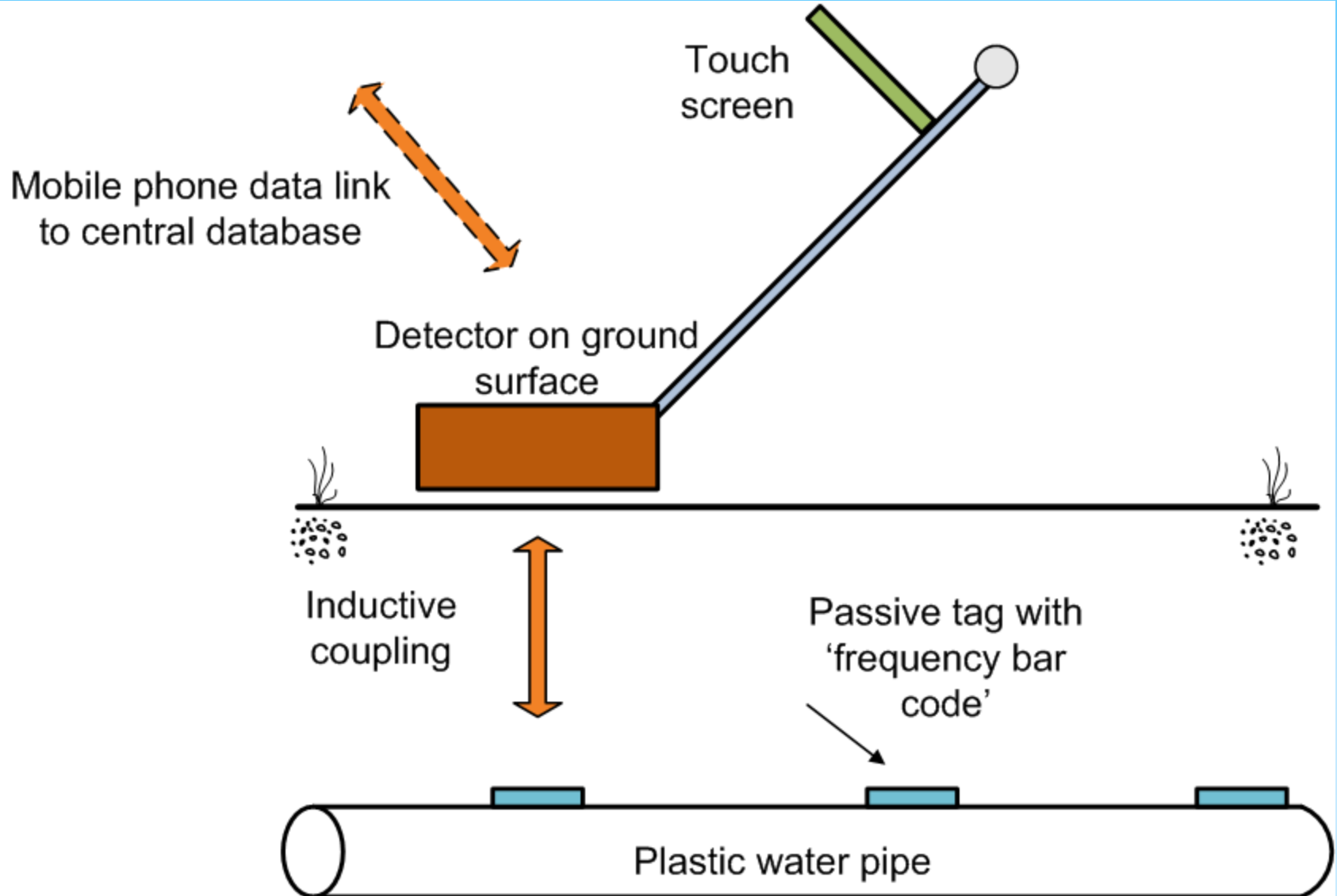
Ground Penetrating Radar system



Problems:

- a) Lack of contrast
- b) Inability to identify the type of the assets
- c) Invisibility of certain types of pipe

The Solution



Early Fieldwork





Oxford Electromagnetic Solutions

Oxford Electromagnetic
Solutions Limited
Building B1 (Room 12)
Martlesham
Innovation Centre
Adastral Park
Ipswich IP5 3RE
+44 (0)1473 559 050
info@oxems.com
www.oxems.com

Spin-Out



Passive tag

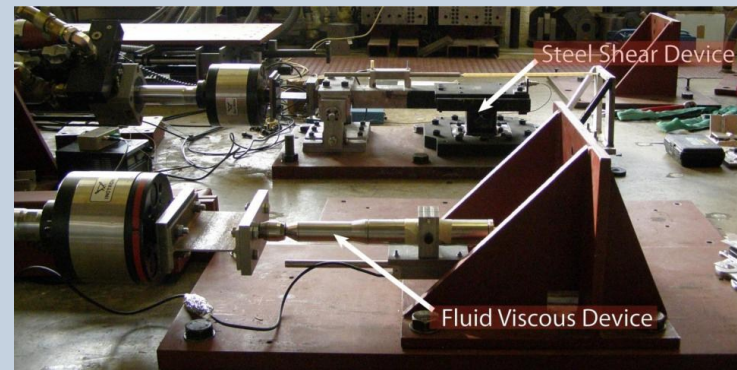
Offshore Wind Research – Byron Byrne

- Greater than 10 years research into foundations for offshore wind farms including:
 - Gravity base, suction caissons, monopiles, multi-footing piles, as well as other more innovative ideas
 - Installation response
 - Static and cyclic loading response (FLS, SLS and ULS conditions)
 - Laboratory scale, field scale, and full-scale monitoring
- Development of various design frameworks and calculation methodologies – openly available in PhD theses and papers
- 2011 *Géotechnique* Lecture emphasised full scale monitoring for closing the design loop and for life extension exercises.

Hybrid Testing

Tony Blakeborough and Martin Williams

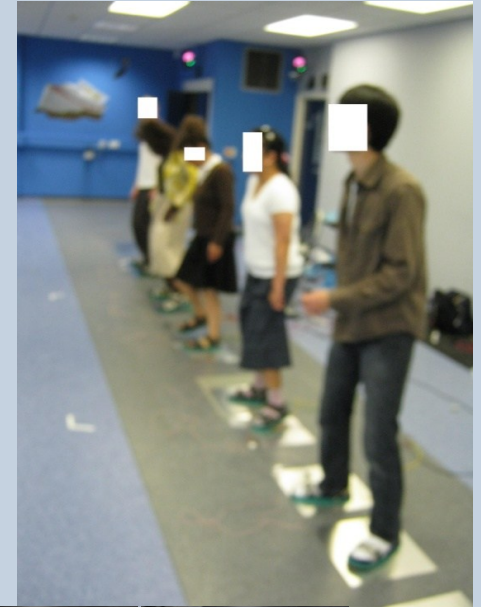
- 15 years development of hybrid testing method:
 - Pseudo-dynamic tests
 - Real-time (no scaling of time) tests
 - Remote testing
 - Laboratory scale testing of real components at realistic rates in simulated structural environment



Human generated loads

Tony Blakeborough

- Modelling spectator loading
 - Impulse model of jumping spectators
 - Timing model
 - Crowd loading
- Lateral motion of pedestrian footbridges
 - Short pedestrian footbridge
 - Measure footfall timing
 - Response modelling



EPSRC Ground and Structural Engineering Research Challenge

Real time road condition monitoring and assessment using vehicle-mounted systems

Oxford University

Tony Blakeborough

Harvey Burd

Byron Byrne

Martin Williams

Ingmar Posner

Cambridge University

Ioannis Brilakis

David Cebon

TRL

Richard Abell, Paul Copping,

Iwan Parry, Helen Viner,

Alex Wright.

1.0 Background

Monitoring the network

- Assessing condition in relation to
 - Visual condition
 - Ride quality
 - Construction
 - Structure
 - Friction
 - Condition of drains and structures
 -



Slide supplied by Alex Wright, Technology Development, TRL

Road surface condition assessment



Multifunction devices (HARRIS and TRACS)

- These condition assessment tools build on the latest technology to measure
 - The environment surrounding the vehicle
 - Pavement shape
 - Pavement texture
 - Imaging
 - GPR
- At high speed to an enhanced level of detail, coverage, and accuracy
- HARRIS2

Shortcomings of current survey systems

Cost

This limits the amount of data that can be collected

Weather conditions

Optical methods behave poorly on damp surfaces

Accuracy

Issues with accuracy, repeatability and location referencing



Safety issues

Laser systems

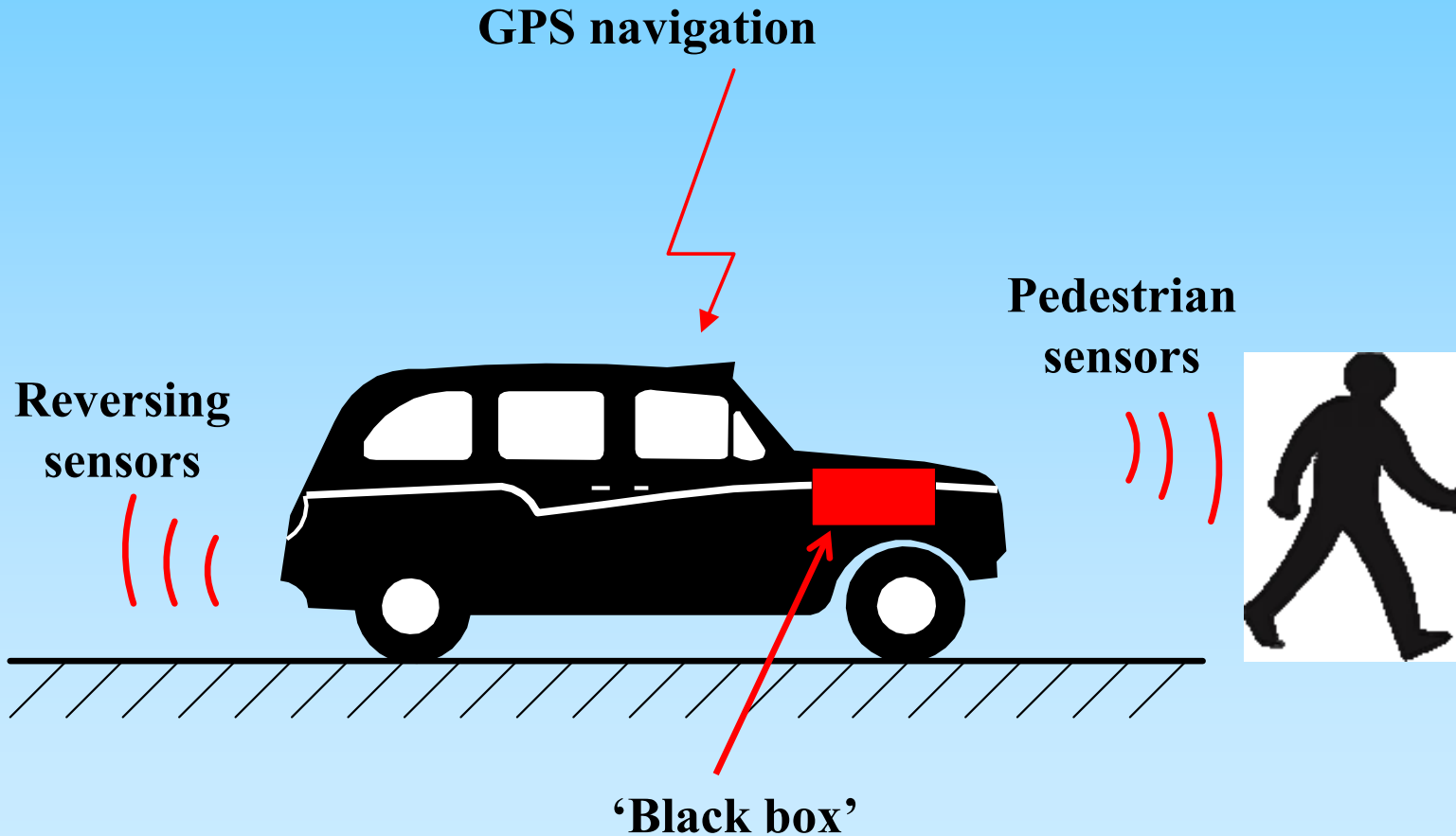
Financial Matters

(Data supplied by Richard Abell, TRL)

- Highways Agency spends about £800m per year on maintenance (£180m on pavement renewals, £100m on other roads renewals, £200m on structures renewals, about £50m on technology and about £270m on routine maintenance).
- Routine TRACS (trunk roads) and SCANNER (local roads) surveys cost approx. £20/km but manual visual surveys can range from £20-£80/km depending on the site. Traffic management can add significantly to the cost.

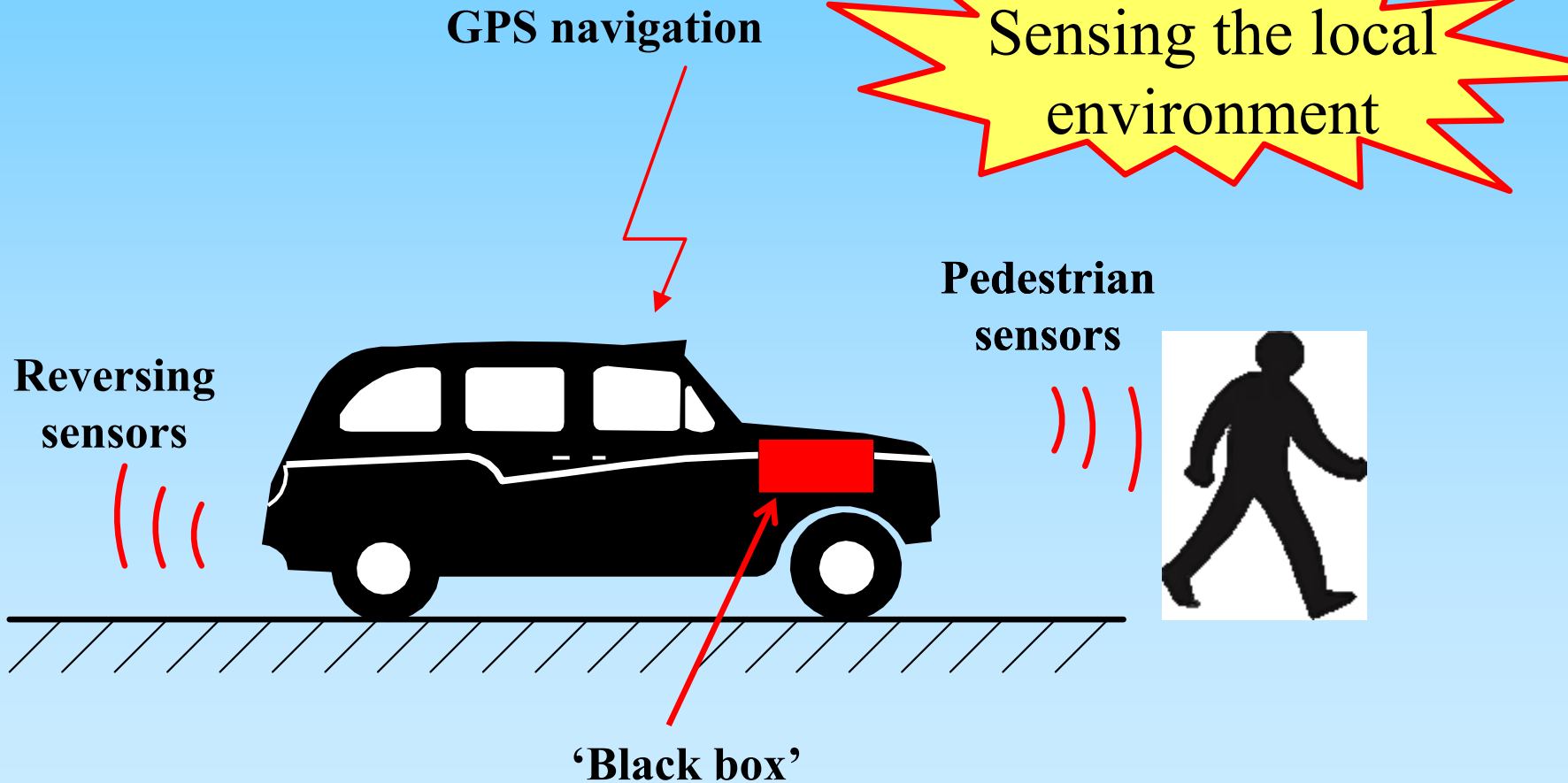
2.0 Research proposal

Intelligent Vehicles

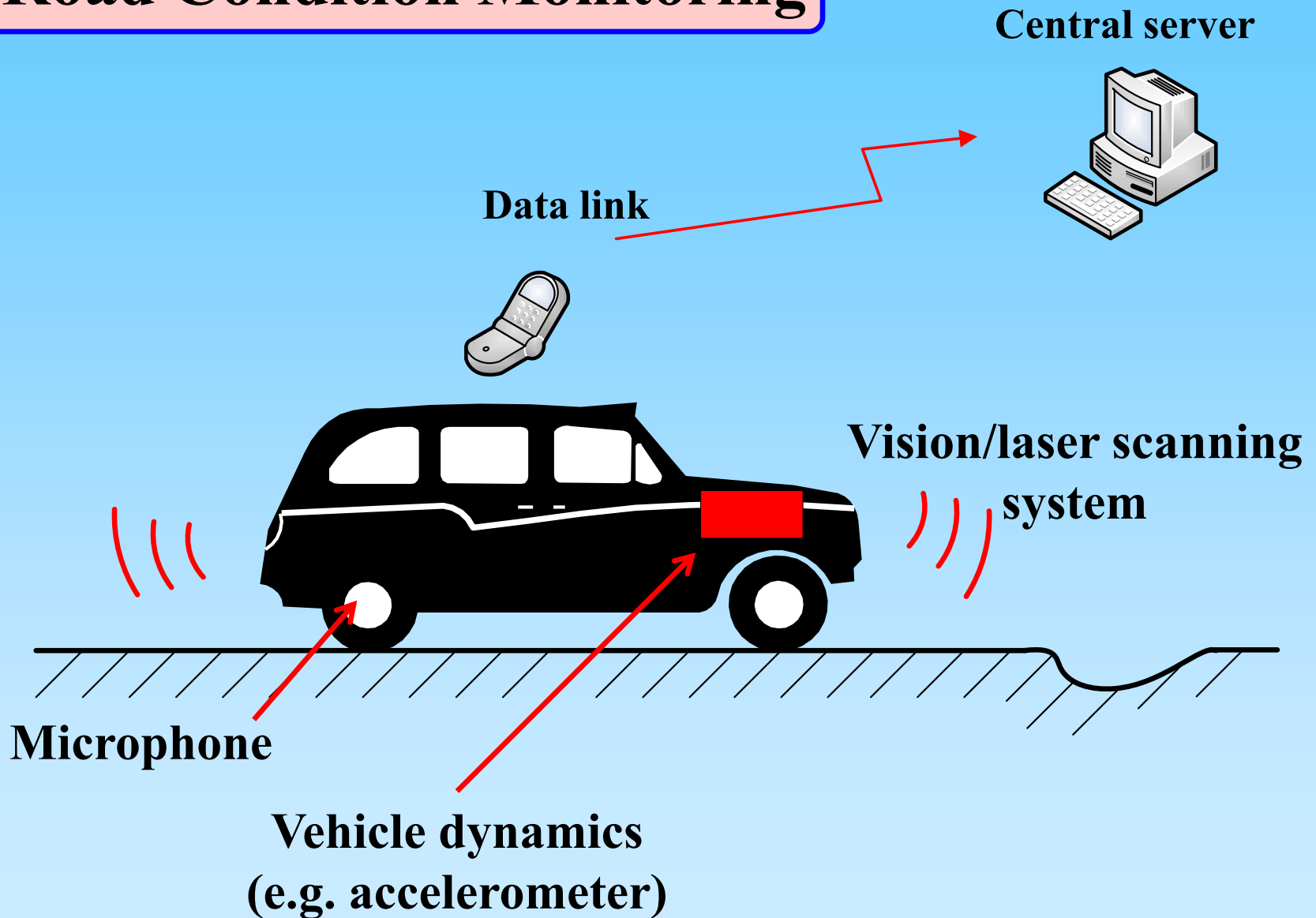


2.0 Research proposal

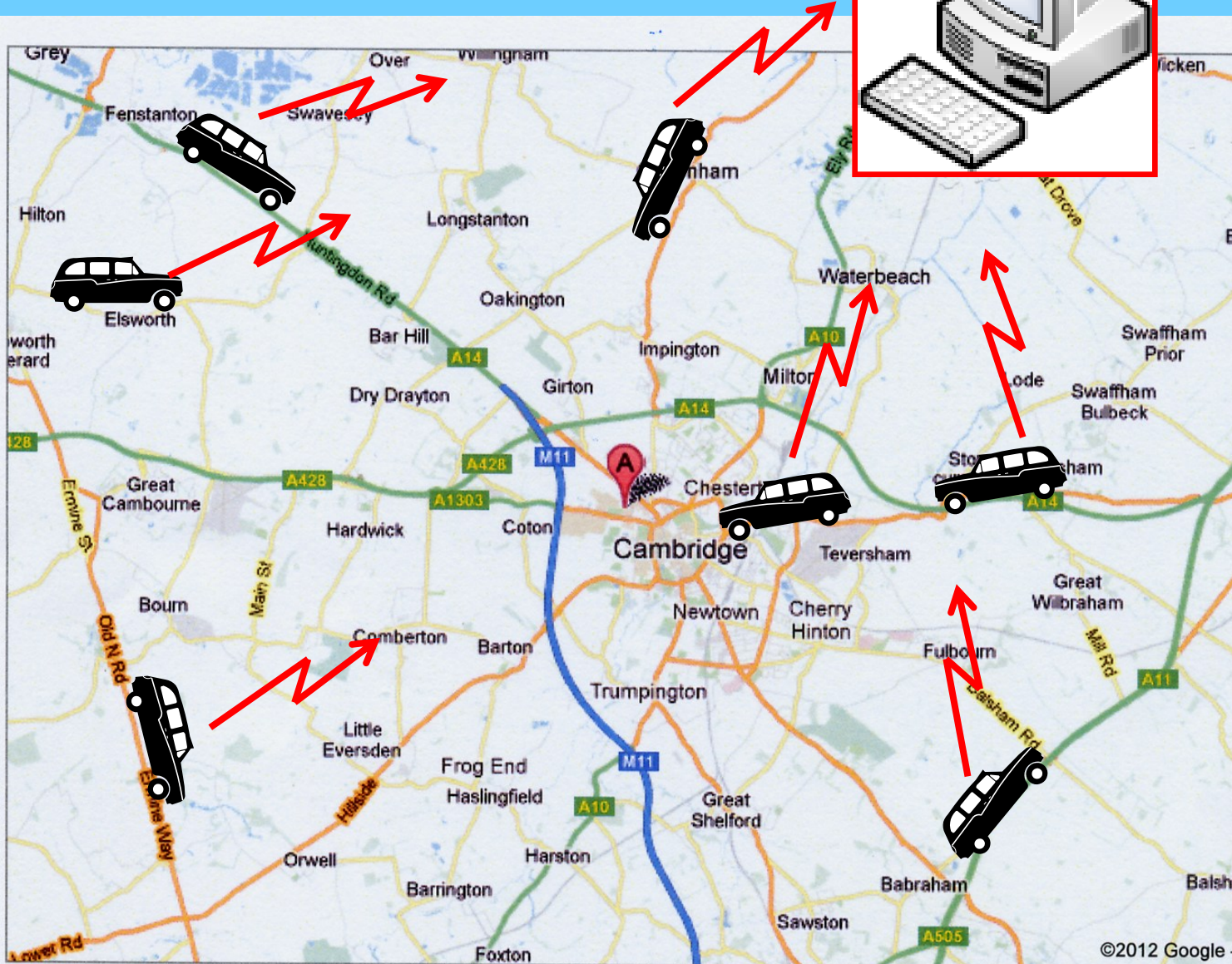
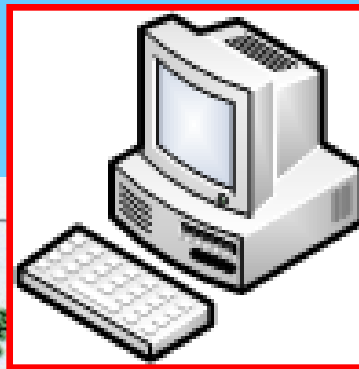
Intelligent Vehicles



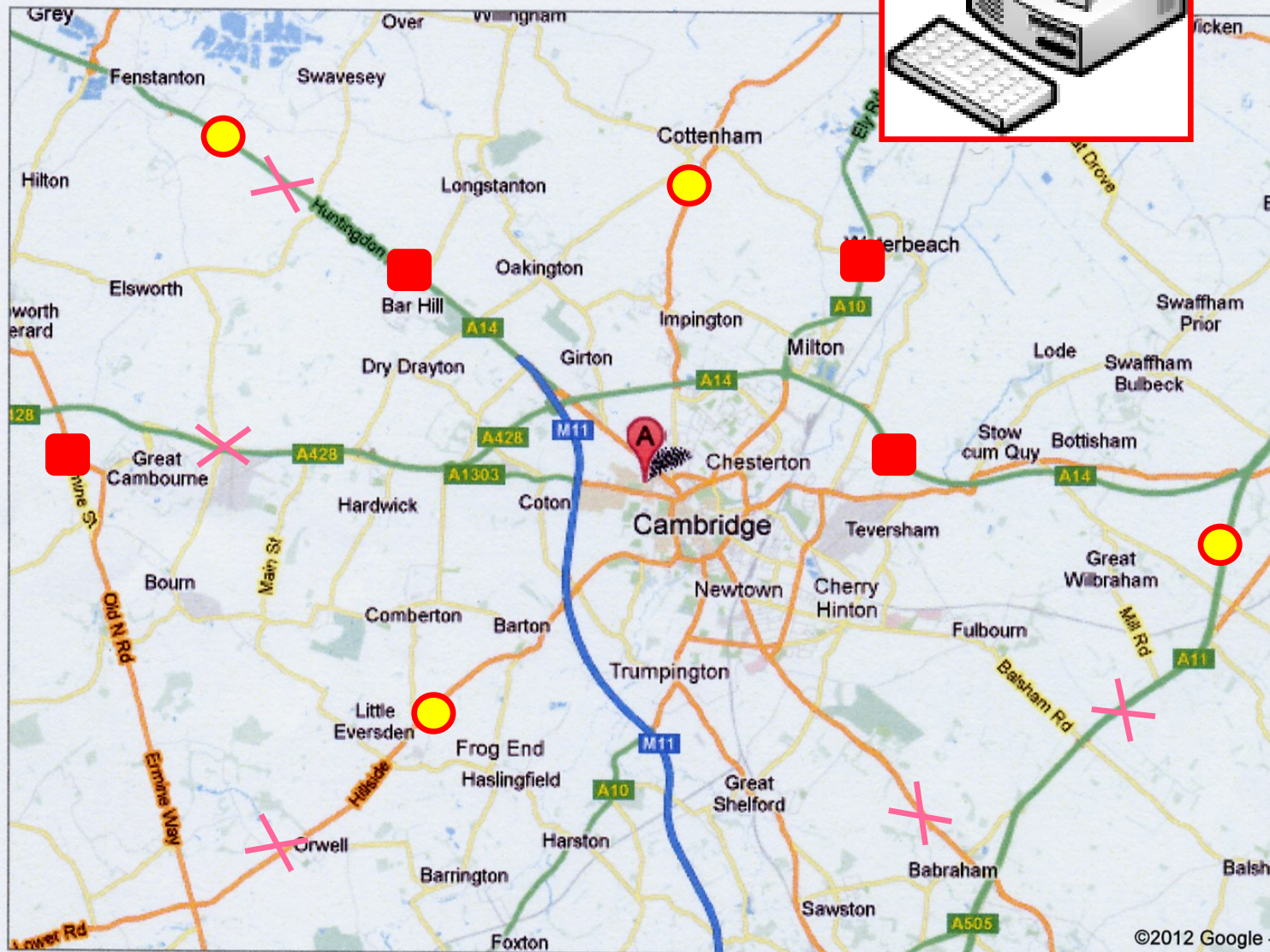
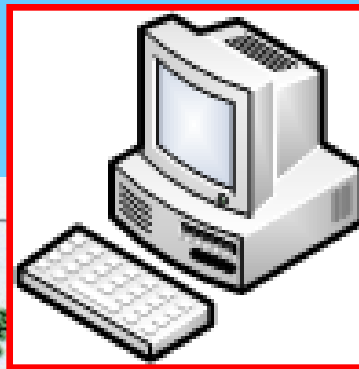
Road Condition Monitoring



Continuous monitoring

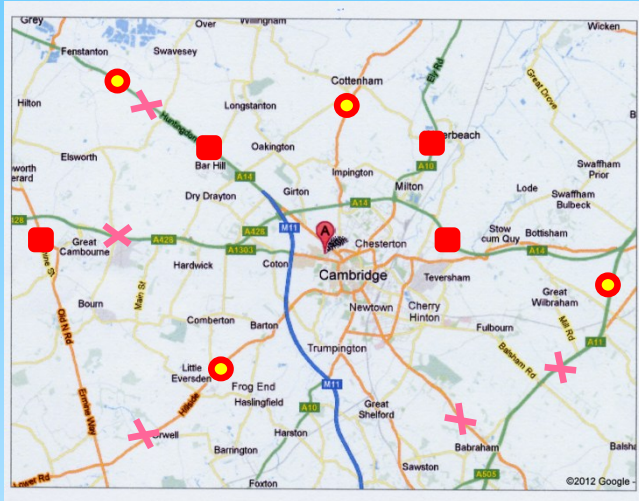


Active surface defect mapping

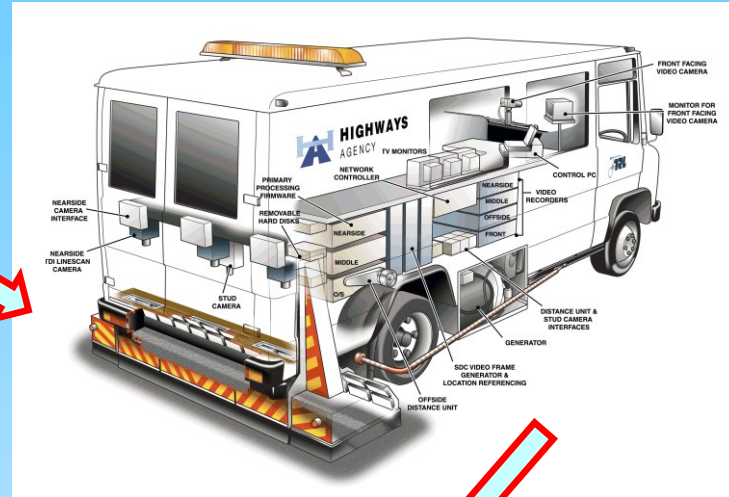


Maintenance Management

Intelligent Map

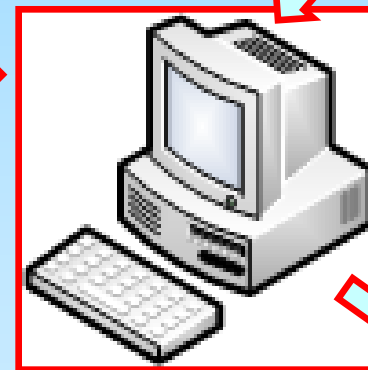
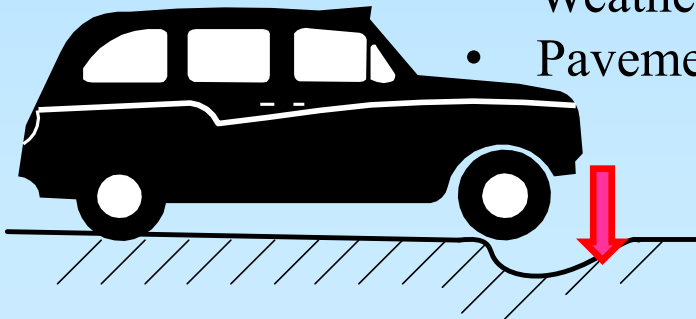


Detailed Surveys



Vehicle/pavement interaction

- Traffic volume
- Weather conditions
- Pavement design



**Management
information**

Research Capabilities

Oxford University

Autonomous car research
Geotechnical/structural
engineering
Mechanical modelling
Laser scanning/vision systems

Cambridge University

Vision
Vehicle dynamics
Maintenance management

TRL

Experience and 'know how'
Access to stakeholders
Pavement engineering
Test facilities

Research Headings

Data mining.

Interrogation and processing of existing 'Wildcat' data base

Develop a new vehicle-mounted system

- Design and test
- Multi-vehicle trial

Management information

- Damage progression modelling
- Maintenance scheduling

The future ...

Project partners

Products

Commercialisation

Venture capital

Services

Other applications

Infrastructure surveys
(Bridges, street lighting
etc..)

**Active construction
surveys**