



Green Adaptive Control for Future
Interconnected Vehicles

G-Active

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Reducing emissions of road vehicles: the G-Active project

EPSRC

Engineering and Physical Sciences
Research Council

UNIVERSITY OF
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Why should we reduce vehicle emissions ?

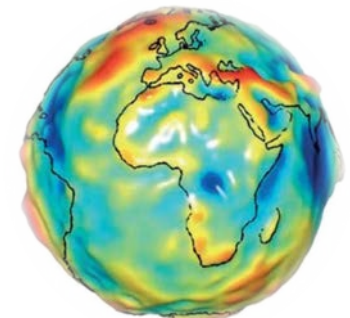
- Vehicle Emissions:
 - exhaust
 - brake and tyre wear



- Vehicle emissions have negative impact on health e.g. increase risk of developing asthma, bronchitis, chronic obstructive pulmonary disease, pneumonia and upper respiratory tract infection (Buckeridge et al., 2002)



- CO₂ emissions cause global warming, 8% of worlds total CO₂ emissions is the result of personal transportation (Barkenbus, 2010)



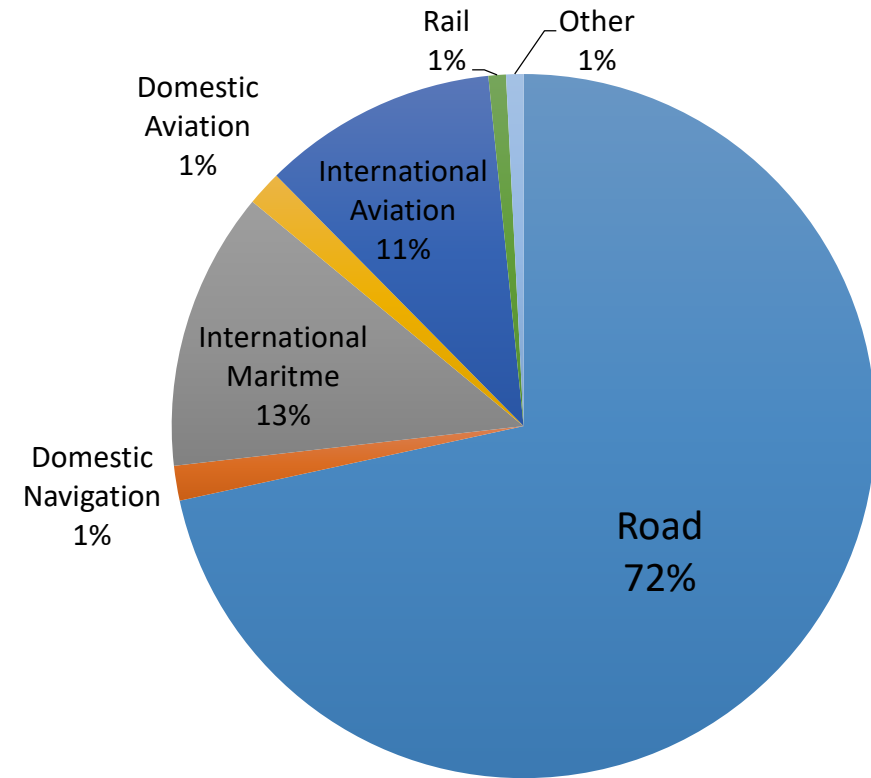
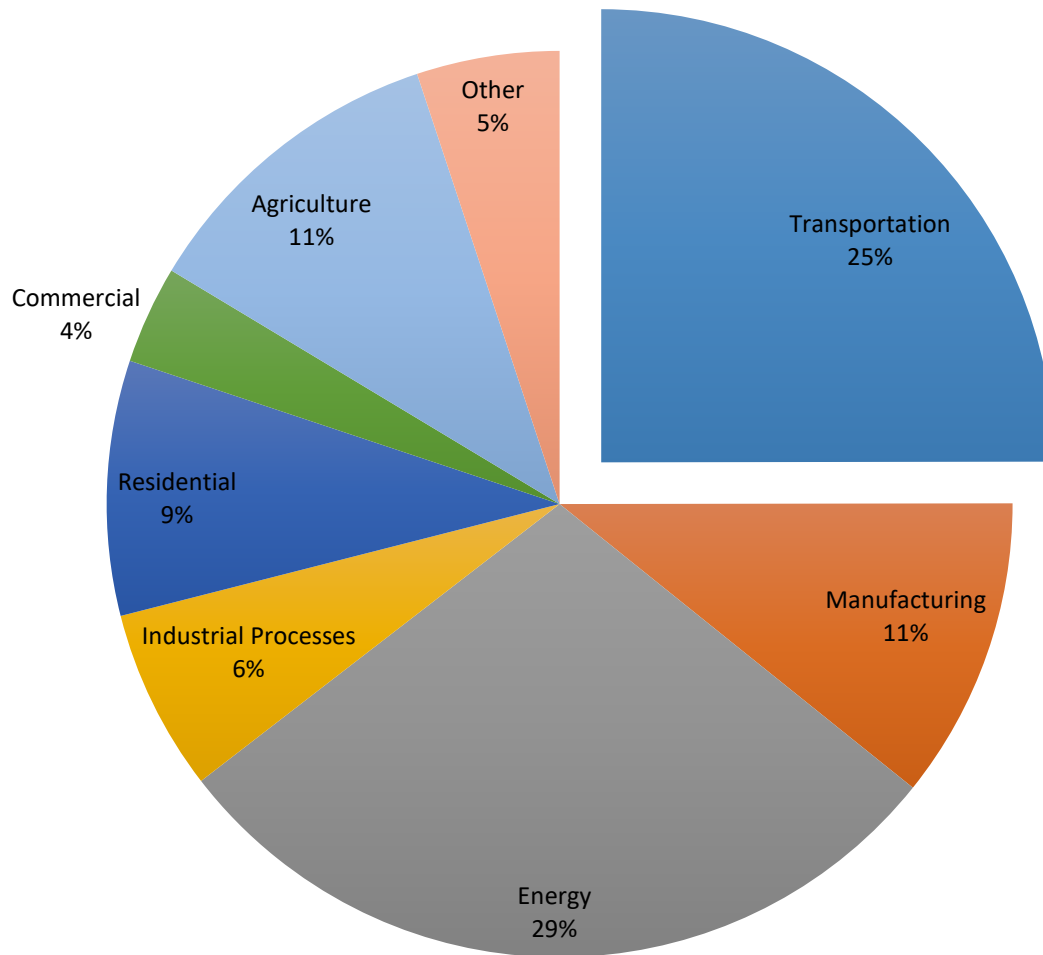
- Social Cost of Carbon (SSC) is estimated between \$38 (US government) and \$220 (Moore, 2015) per tonne CO₂





EU emissions

Transport is the second highest source of emissions in the EU (*Hill et al., 2012*)



Of which road transportation is the prime contributor!



The G-active contribution to the mitigation of the emission problem

G-Active aims at reducing CO₂ and NO_x emissions in passenger and light duty road vehicles by implementing new energy management systems

Specific objectives

- Fuel consumption minimisation
 - optimisation of the management of both powertrain and ancillary systems
 - tailoring the EM to specific powertrain architectures (traditional, HEV, PHEV, etc..)
 - Monitoring and predicting traffic conditions
- User acceptance maximisation
 - by adapting to the driver's style in real time



G-Active ideas to reduce fuel consumption

Develop new Energy Management Systems that are:

- **Global:** optimises the energy management of both the powertrain (gear, start & stop, power split) and ancillary systems (air conditioning, etc.) together
- **Predictive:** exploits driver behaviour and traffic predictions to optimise EM and driver satisfaction using a receding horizon approach.
- **Adaptive:** to the journey characteristics, vehicle state, driver style, weather, traffic conditions.
- **Scalable:** work with or without in-vehicle V2X capabilities, with different performance.



Project Organisation

1. Driver Behaviour Modelling



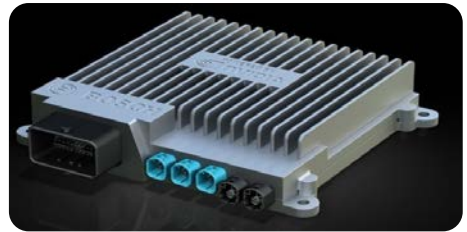
3. Vehicle Modelling



2. Traffic & Infrastructure Modelling



4. Predictive Energy Management



5. Predictive EM for Inter-connected Vehicles



6. Human Factor Assessment



7. Vehicle Tests

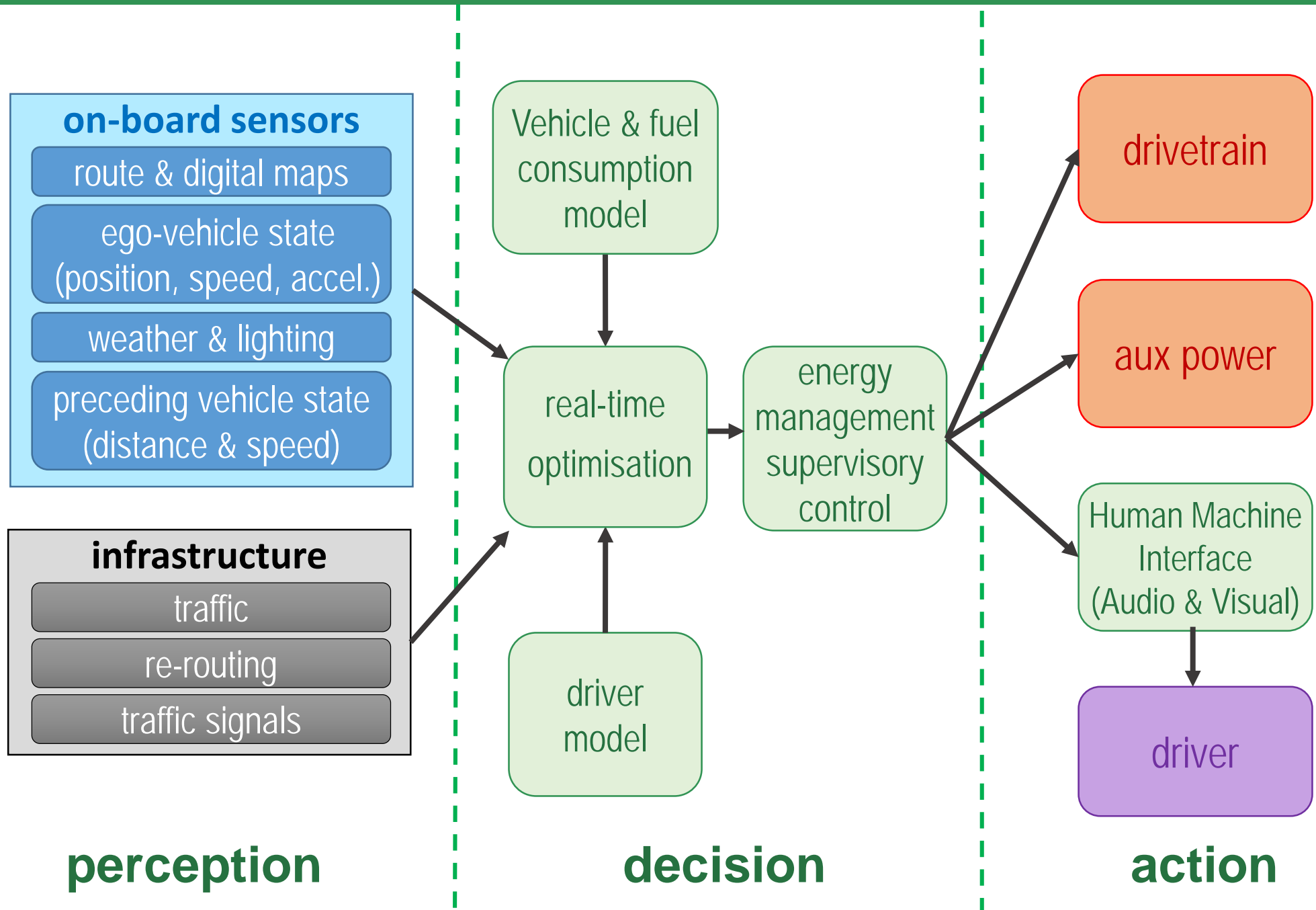


8. Network-level Effects





Energy Management System architecture





Progress so far and the way ahead

- **Reducing hybrid vehicles emissions by optimizing driving speed and power split**
Dr. Boli Chen
- **Improving driver experience by understanding and predicting driver behaviour**
Dr. James Fleming
- **Reducing emissions and improving driver experience by predicting traffic conditions**
Dr. Bani Anvari
- **Promoting Fuel Efficient Driving by applying Human Centred Design techniques**
Dr. Craig Allison

Thanks for your attention !



www.g-active.uk

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