Imagine how intelligent your vehicle could become...
how can we make technology work for everyone?
Intelligent Vehicles

Intelligent Vehicles, or Autonomous and Connected Vehicles, are moving out of the realm of science fiction and into reality. The cars on our roads already have a basic level of intelligence, but for our cars to do more, so that we can do more, the technology needs to continue improving.

In the last decade there has already been an increase in vehicle intelligence, but what do we mean by intelligent? How can we understand it and what are the benefits?

A fully autonomous car would be capable of carrying out all the operational functions of a traditional car, without a human operator. A truly connected car would connect to devices within the car as well as external networks such as the internet. This could provide system diagnostics to your garage, direct you to the nearest available parking, or instigate an immediate roadside assistance response.

Benefits and opportunities

- Improvements in road safety, with the potential for crash elimination. It’s predicted that over 2,500 lives could be saved by 2030, with 25,000 serious accidents avoided.
- Greater energy efficiency and reduced carbon emissions as a result of automated driving rather than variable human driver behaviour.
- Increased time for work or leisure. The average driver spends 235 hours in the car each year. Imagine if they could use that time more productively.
- Independence for those unwilling, or unable to drive; for example those with disabilities, or those currently priced out of the market by high insurance costs.
- New opportunities for OEMs, suppliers, and small businesses afforded by the new technologies. A survey by the SMMT has predicted the creation of 320,000 new jobs in the UK as a result of these developments.

Challenges to implementation

The move towards fully autonomous vehicles is happening in recognised stages, starting with driver assistance. Currently only the early levels (partial automation) are fully available to the public, requiring an active driver to be monitoring at all times.

Before we can realise full vehicle automation and connectivity, a number of challenges must be overcome:

- **Technology**: It needs to be both dependable and secure, but also affordable.
- **Understanding customer usage**: In order to develop the right technology, we need to understand how the customer will use it, including their behaviours and preferences.
- **Legal and ethical frameworks**: In the event of an accident, who is liable? Is it the driver, manufacturer, or software creator? The law requires that a human be in control of his/her vehicle at all times. How will this need to change before autonomous vehicles can be accepted?
- **Public trust**: Ultimately, full vehicle automation will be achieved, but will not be accepted if the public fail to trust it.

Levels of vehicle automation

0: No automation
   - The driver completely controls the vehicle at all times.

1: Driver assistance
   - (e.g. ABS, lane keep assist, cruise control)
   - Individual vehicle controls are automated, either lateral (steering) or longitudinal (breaking/acceleration) control of vehicle.

2: Partial automation
   - (e.g. super cruise park assist)
   - At least two controls can be automated in unison (lateral and longitudinal control, but driver permanently monitors road.

3: High automation
   - (e.g. highway pilot, self-parking)
   - The driver can fully control all safety-critical functions in critical conditions, but must take over control if requested.

4: Full automation
   - (e.g. fully automated, self-driving vehicle)
   - The vehicle performs all safety-critical functions, with the driver not expected to control the vehicle at any time.

How are we addressing this challenge?

At WMG we’re working to make intelligent vehicles as affordable and usable as the cars we drive today, creating a new driving experience that all of us can enjoy. Our research will enable technology breakthroughs to happen more quickly, with increased confidence.

WMG’s 3xD Simulator for Intelligent Vehicles is the only simulator of its kind designed specifically to test the real-world robustness and usability of smart, connected and autonomous vehicle technology. Our research vision is to recreate the world for an intelligent vehicle within the 3xD simulator, replicating complex driving scenarios, changing lighting conditions, communications interference or unexpected events, all in a safe and repeatable environment.

Using our unique signal emulation capability we aim to create our own ‘wireless world’, allowing us to develop next generation communication protocols. This includes the capability to replicate GPS or 4G signal loss, or even simulate a cyber-attack. We will also develop approaches to validate sensing technologies like Radar, LiDAR, cameras and ultra-sonics. Using 3D miles of photorealistic, real world driving routes presented via 360 degree high definition visuals, accompanied by 3D surround sound and real vehicle motion, we deliver an immersive experience for driver-in-the-loop technology evaluations.

National Automotive Innovation Centre

Opening on the Warwick campus in 2017, the National Automotive Innovation Centre will provide a critical mass of international research capability, in which we will play a major part. Working together in state of the art facilities, academic and industrial R&D teams will develop the breakthrough designs, technologies and processes needed for the future of the automotive industry.

The Centre is a long term commitment between Jaguar Land Rover, Tata Motors European Technical Centre, and WMG, to enhance the UK’s capacity and capability in key areas of automotive research.

It will address the shortage of skilled R&D staff across the automotive supply chain, developing the talent required for the demands of emerging technologies and engaging future generations of engineers.

“our focus is on making the new technology work on real cars, with real people, in real time”

Professor Paul Jennings, Professor of Experimental Engineering and Head of Energy and Electrical Systems
Working with us will enable innovative companies to quickly learn about the ‘real’ capabilities of their technology and gain a better understanding of how users interact and respond. Policy makers will be provided with early evidence against which to make informed decisions and set future standards. All this leads to reduced risk and accelerated development towards real world trials and, ultimately, the implementation of intelligent vehicles and technology.

Our world leading applied research, combined with our approach to working with industry, makes WMG the best partner to develop Intelligent Vehicle technology.

As an example, we are currently working on the Research for Advanced Platform Development (RACeD) programme with Jaguar Land Rover. A group of five Engineering Doctorate projects, RACeD is addressing a collection of specific challenges, which will collectively advance JLR’s pathway to building up autonomous technology capability. These include next generation HMI, the self-learning car, on-and-off board data platforms, and the connected car.

A partnership with one of the UK’s only manufacturers of autonomous vehicles, RDM, the Innovative Testing of Autonomous Control Techniques (INTACT) project is funded by Innovate UK. Together we will develop and apply novel simulation concepts to enable fast, safe, and repeatable testing to optimise the evaluation and development of autonomous technology.

Automated Verification Process for Vehicle-in-the-Loop simulators (VVIL) is a feasibility study funded by Innovate UK and in partnership with Vertizan, an SME working in automotive software testing. The VVIL project is exploring the feasibility of an automated process of verifying a complex autonomous driving system of systems through intelligent automated test input generation.

We also transfer practical skills and the latest thinking to engineering, business, and cyber security students, as well as automotive industry professionals. From one-day workshops right up to doctoral degrees, our education programmes cater for every level in a practical and engaging way.

How are we working with industry?

Getting in touch
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