White Paper
Making driving as safe as flying in an autonomous world
Introduction

We are on the cusp of a truly revolutionary transformation in transportation. If the UK government’s vision becomes a reality, we will see the introduction of autonomous vehicles on UK roads within the next three years, changing the ways in which people, goods and services move from A to B for good.

The public, however, is uneasy about this prospect of driverless cars on UK roads in 2021. Our recent research reveals that just 16% of the UK public would feel safe riding in a self-driving car. In comparison, 65% say they feel safe when flying on-board an aeroplane. So it begs us to ask the question, can we ever make driving feel as safe as flying in an autonomous world?

Addressing concerns over safety are a must if the government is to achieve its vision and reap the socio and economic benefits autonomous vehicles offer. The Society of Motor Manufacturers and Traders, for example, indicates that connected and autonomous vehicles (CAVs) offer. The recent introduction of CAVs could boost the UK economy by around £5 billion per year by 2030, indicating that connected and autonomous vehicles (CAVs) offer.

Addressing concerns over safety are a must if the government is to achieve its vision and reap the socio and economic benefits autonomous vehicles offer. The Society of Motor Manufacturers and Traders, for example, indicates that connected and autonomous vehicles (CAVs) could boost the UK economy by around £5 billion per year by 2030, and the market could create an additional 320,000 UK jobs in the next 11 years. Furthermore, it’s been reported that the introduction of CAVs will cut traffic congestion and reduce the number of road accidents, ultimately saving more lives.

With this at front of mind, the UK government is making significant investments in developing the technology, enthusiastically pushing forward with its vision of being “at the forefront” of self-driving cars. However, the technology will only take off if consumers back it and trust that it is indisputably safe.

In this report, we evaluate attitudes of the UK public towards CAVs and assess how industry and government can address consumer concerns, by ensuring these innovative systems are 100% safe. We take a look at how we can draw inspiration from other industries such as aerospace, using simulation technology to put AVs through rigorous testing to certify they are safe for the public to use. We also discuss how to address security concerns, looking into how industry can secure the systems and protect the vast amounts of data they produce – a concern for a significant percentage of population in the ever-more connected world. Lastly, we consider the reality of a world with autonomous planes and trains – where safety, once again, becomes a critical consideration in the transport revolution.

We recently conducted consumer research which revealed the attitudes of the UK public towards driverless cars. Fear, uncertainty and doubt were common feelings, with the majority of the UK public (57%) admitting they would not feel safe riding in a self-driving car. Nearly a quarter of respondents in our research (23%) said they feel apprehensive about the prospect of autonomous vehicles being on UK roads in the next three years. In addition, one in five (20%) said they are fearful or nervous when asked about their biggest fears towards self-driving vehicles, the UK public was, interestingly, most concerned about the safety of pedestrians (56%). This was closely followed by a fear over the safety of passengers within the car (51%) and a rise in potentially fatal, accidents (49%).

The issue around pedestrian safety is, arguably, one of the biggest challenges for self-driving cars. We know, pedestrians can be unpredictable and erratic. They do not necessarily always follow the rules of the road; moving in any direction, at any time, usually with very little warning.

While the UK public is worried about the safety of driverless cars at present, we can say with certainty that no government would certify autonomous vehicles for everyday road use without a mountain of evidence to show that they are unquestionably predictable and safe, even during a highly implausible sequence of adverse events. This is where the testing comes in.

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A question of confidence

For consumer confidence to be high, there needs to be a high level of trust. We recently conducted consumer research which revealed the attitudes of the UK public towards driverless cars. Fear, uncertainty and doubt were common feelings, with the majority of the UK public (57%) admitting they would not feel safe riding in a self-driving car. Nearly a quarter of respondents in our research (23%) said they feel apprehensive about the prospect of autonomous vehicles being on UK roads in the next three years. In addition, one in five (20%) said they are fearful or nervous.

In fact, just 12% of the UK public expressed feelings of excitement or optimism about the prospect of self-driving cars being on the roads in 2021 – a feeling most likely to be shared by the younger generation compared to older respondents.

Tried and tested

Since Philip Hammond’s 2017 Budget speech, whereby he formally announced the UK government’s objective to have “fully driverless cars” in use by 2021, several trials have been taking place – with companies such as Waymo, Mercedes-Benz, Uber and many others, conducting on-road autonomous vehicle (AV) testing.

The issues with on-road testing, however, have been publically voiced – namely concerns over the volume and repeatability of the tests being applied to AVs. In a well-cited report,1 researchers at the RAND Corporation have argued that even though companies and manufacturers do publicise the millions of miles driven in ‘autonomous mode’, the number of vehicle miles travelled during testing is still insufficient to provide the evidence required that demonstrates self-driving cars are unquestionably safe.

The problem is that carrying out such large-scale testing on controlled tracks or on roads presents significant cost and safety challenges, as well as the requirement to drive huge amounts of mileage. In fact, RAND calculates that five billion miles of ‘testing’ will be required to gather the evidence required that demonstrates self-driving cars are unquestionably safe.

We can, essentially, subject AVs to a much more rigorous “driving test” than we do with human drivers. If we consider the current laws and regulations around driving, the government certifies that a human being is able to drive a car after passing a driving test from the age of 17 years old. That driver is never tested again. However, with simulation technology, we can continually test an AV throughout its life span making sure it is continually safe, even in the most unusual of circumstances.

And we are doing this right now. Through our work with KPI Simulation, Latent Logic and Warwick University WMG, we are now creating highly accurate virtual reality simulation environments – including artificial intelligence (AI) trained models of pedestrians and road users – to test CAVs. Through such measures, we can ensure they behave as if they are in the real world, knowing that the self-driving car is making smart, fast and safe decisions.

Learning from other industries

The key challenge with simulation technology is ensuring that the scenarios we subject AVs to actually represent the real world, with a suitable level of accuracy.

For example, how can users be sure that the synthetic environment represents an environment whereby a pedestrian suddenly steps out into the road or extreme weather conditions cause blind spots? How can users be sure that the vehicle under test is going to behave in a similar way as if it were in the real world? To address this “reality gap”, we can turn to lessons learned from our work in the civil aviation space.

Civil flight simulators, today, are certified before they can be used for training. The devices are certified by aviation authorities against a set of objective and subjective criteria, which enables users to be comfortable conducting pilot training in simulation. As such, pilots are exposed to highly accurate scenarios, allowing them to be properly trained to make the right decisions in all kinds of conditions.

Aviation, today, has certainly set a very high bar when it comes to safety. Despite a slight increase in the number of aviation fatalities around the world in 2018, deaths from air crashes are still very rare. According to data from Aviation Safety Network, aviation deaths around the world have been falling over the last two decades. The number of fatalities on roads is much higher, the World Health Organisation states that “1.25 million people die each year on the world’s roads.”

Reports have indicated that driverless cars have the potential to prevent 25,000 road accidents, but in order for this to be realised, the public has to perceive that the technology is safe to use in the realplace – something our research has shown not to be the case at present.

Therefore, making the simulations as realistic as possible and demonstrating to the public that AVs have been subjected to scenarios that reflect the real world will be crucial to their success. It will give the public an independent validation of safety, robustness and reliability in driverless cars. The simulations we use will be fed by highly detailed scans of real roads, traffic camera data, accident data, and near-miss analyses. These inputs will be used to create a high-fidelity model of real-world roads, which will be populated with realistic artificial intelligence (AI)-based road users.

If successful, this work could lay the foundations for the development and certification of all types of unmanned vehicles – including planes and trains as well as automobiles.

Planes, trains and automobiles

We have reached a point in time where the concept of flying cars and piloted planes simply no longer resides in the pages of science fiction. We have reached a point in time where the concept of flying cars and planes, trains and automobiles

While there are many challenges to be overcome, it is clear that autonomous vehicles have the potential to revolutionise transport and travel for the better. However, it is crucial that we ensure that this technology is developed in a safe and responsible manner.

An onward journey

For the government’s 2021 vision to become a reality, autonomous cars must not only be demonstrably safe, but they must also be perceived as safe by the public. Our research has highlighted consumer concerns over the safety of passengers and pedestrians, and over data protection – concerns that need to be addressed if the UK is to reap the reward of an autonomous world promises to offer.

We argue there are ways in which the industry and government can assure and demonstrate the safety of autonomous vehicles – namely through the use of simulation for AV testing which is faster, safer, cheaper, more versatile and more repeatable than any other method. With the mountain of evidence that we can generate, we fully believe consumers can feel as safe in a driverless car as they currently do when flying. And it is our hope that such measures will make truly autonomous driverless cars – and other vehicles in the future – an achievable reality sooner, rather than later.