Driverless cars are forcing cities to become smart

April 24 2018, by Saber Fallah

Driverless cars will transform the transportation industry. Credit: daxis/flickr, CC BY-SA

Autonomous vehicles are coming and they have the potential to radically better our lives. But to reap the rewards of this new technology, we first have to adapt the world to its requirements. This means preparing the way for massive engineering projects that will introduce the latest generation of mobile networks into our cities. As future autonomous vehicles become safer and more efficient, they will rely on high-bandwidth mobile networks to wirelessly share and receive data from each other.

Self-driving vehicles currently work by collecting data from an array of sensors, which is then interpreted by various algorithms. These algorithms tell the vehicle where to drive, at what speed and when to stop.

But the data that these sensors collect is inherently limited. The vehicle cannot see any vehicles outside of its field of vision, nor can it be aware of traffic occurring ten miles further down the road. To overcome this, future autonomous vehicles will be constantly accessing and interpreting data collected by thousands of surrounding vehicles, and roadside units (computing devices that provide connectivity support to passing vehicles). Huge swathes of additional information will be provided to the vehicle about road surface, weather, traffic conditions, other vehicle information and intended control actions.

We expect that driverless cars will be commercially available by 2025 and the whole UK transportation system will be fully automated by 2070. When this happens, these vehicles will sometimes be controlled by a traffic management system, which could activate useful manoeuvres such as platooning, when automated vehicles travel very closely together at very high speeds, and intersection management. These connected autonomous vehicles (CAV) will create a completely different transportation network for future generations and one that is safer, faster, more efficient, more environmentally friendly and more

productive. As we rapidly approach the point at which CAVs are ready for the streets, we have to make sure that our streets are ready for them.

Transforming infrastructure

With so much data needing to be shared, having a high bandwidth and fast wireless communication technology is essential. The next generation of wireless communication systems, based on the faster 5G technology, can potentially provide the required bandwidth. But to achieve this, we need to begin drastically increasing the number of radio antennas and roadside units in cities.

Even the most recent networks (4G LTE) that exist today simply aren't up to the task and will have to be upgraded. 5G networks will demand faster and more flexible infrastructure that can adapt to unexpected problems. Countries across the world will also have to invest heavily in new roadside units' that can help reduce any data delays and minimise the reliance on network data centres, by acting as alternative data sources. At the same time, the security of these networks have to be considered, ensuring the safety and privacy of all communication over them.

The slowly turning gears of policymakers are currently lagging behind the astronomical progress of connected autonomous vehicles. The Netherlands is currently the country furthest ahead in preparation, thanks mainly to its excellent road infrastructure. Singapore's decision to allow self-driving cars to be tested on public roads mean that it is quickly also becoming a world leader in this field. Both the United States and Sweden are also beginning to prepare for this future.

Across the world, many governments are coming to realise the necessity of infrastructure change. For example, the UK government recently announced its goal of becoming a global leader in autonomous vehicles,

with new development and testing areas to be championed. Indeed, several UK-based projects are attempting to lead the country onwards. UK CITE is equipping 40 miles of urban roads, dual-carriageways and motorways within Coventry and Warwickshire with extremely fast data networks required by CAVs. Another project, E-CAVE, is adapting Ordnance Survey digital data to help the development of CAVs. The data, which is used to create a local map of the environment, enhances the perception of CAVs and allows them drive more safely.

Even with the vast technological challenges and regulatory hurdles currently encompassing the deployment of autonomous vehicles, it's not a question of "if", but rather "when" they will be prevalent on the roads. Now is the time to have a conversation over developing the correct urban infrastructure for this new age.

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