Autonomous Vehicles

What are they?

Autonomous vehicles, automated vehicles, self-driving cars and driverless cars are the names used to describe vehicles which have technology that allows them to move through their given environment with little, or no input by humans. Although there is debate about what the different names describe, to the general public they all mean the same thing; a car or truck which can drive itself. The SAE (Society of Automotive Engineers) has defined five different levels of vehicle automation.

1. Driver assistance for a specific function. eg. Cruise control, auto parking.
2. Partial automation. The vehicle is fully controlled by the technology, but a human driver must be ready and watching to take control immediately.
3. Conditional Automation. The vehicle is fully controlled by the technology, and the human driver doesn’t need to monitor the performance. The vehicle will notify the human driver if it needs assistance.
4. High Automation. There is no need for driver assistance at all, however the vehicle will only operate within a defined area.
5. Full Automation. There is no need for driver assistance at all and the vehicle can operate anywhere in the world that a human driver could.

Anything from level 3 and above is considered an autonomous vehicle.

Currently nearly every major technology or automotive company in the world is developing autonomous vehicles, either as part of a collaboration or individually. It is difficult to get an exact number, but collectively hundreds of billions of dollars has been invested to develop this technology. All the companies involved see this technology as the future of the automotive industry and don’t want to get left behind.

There are currently trials of automated taxi services in major cities around the world, including Shanghai in China, San Francisco, Las Vegas and Phoenix in the USA. They all allow the customer to book and pay for a trip like they would any other ride sharing service, and a trained person, known as a “safety driver”, is present in the drivers’ seat of the vehicle. However just recently the Google subsidiary, Waymo, began services in Phoenix where no safety driver is present. All the vehicles are still monitored remotely by Waymo staff, but this is the first “next step” for this industry.

These ride sharing services are likely to expand to most major cities around the world in the near future. Because the cars are prohibitively expensive for an individual person to buy and are heavily regulated, self-driving vehicles will continue to be only used for ride sharing services. Although, like any technology, this cost over time is likely to decrease allowing other uses to be implemented. Options such as companies or governments purchasing as fleet cars may become possible.

This current implementation of the technology is still only level 4 on the SAE’s classifications. All the vehicles operate in a well-defined area which is fully mapped and scanned before the vehicles can operate there. To reach level 5 vehicles need to be able to operate on any road that they need to get to their destination. A lot of work and research is going into this area, particularly in the field long distance trucking, which requires the vehicles to operate across large areas. A major area of research for automated trucking systems is what is termed as “platooning”, which is where automated systems virtually tether vehicles close together on long fast-moving roads such as freeways and motorways. While this can be achieved without full automation and is yet to be implemented beyond testing, it’s considered to be the first step towards a fully autonomous trucking industry.

The main reason there has been such a fast development of this technology over the last five to ten years is that data processing capabilities have reached a level where systems are able to process data from multiple sources and make complex decisions on that data within a fraction of a second. Without this processing speed, fully autonomous vehicles would not be possible. To accompany this there has been a lot of time and money spent to develop the monitoring devices that give the processors the data they need. These include vehicle mounted Radar, Lidar, cameras and motion sensors. Even with the development of these advanced systems vehicles still also rely on external inputs such as GPS and virtual topographical maps.

What are the likely impacts?

This technology once fully implemented will have a major impact on the way everybody lives, works and moves around. Our communities, particularly our cities and suburbs, have been designed and shaped around our use of cars and trucks. The majority of transport infrastructure built in Australia in the last 60 years has been for roads and private transportation. As a result of this people who are not car owners tend to be disadvantaged in the community.

The use of autonomous vehicles will be a major shift for the way Australians think about transport. Presently most people own their transport. It has been estimated that cars spend 95% of their time parked, so when all the costs associated with car ownership are added in, people who own cars are paying a high cost per trip. However, people are happy to pay for the convenience that this gives them. If people take up the on-demand self-driving services when they become available to them, they will be getting a similar amount of convenience at a much-reduced cost per trip. This will push people away from private vehicle ownership.

Once autonomous vehicles are in widespread use there will to be several positive impacts to the economy and society.

1. A reduction in the number of road accidents. Estimates say that 94% of traffic accidents can be attributed to human error.
2. A reduction in congestion. The vehicles will drive more safely and will communicate with each other to increase traffic flow and efficiency.
3. Increased road capacity. Because the vehicles drive more efficiently there will be a greater capacity on the current roads.
4. Space saving. The vehicles will have less need to park for long periods space will be freed up for other purposes.
5. Personal cost savings. Private car ownership will no longer be necessary so this will free up money normally used for this.
6. Increased productivity. Because of reduced transport times and the removal of the necessity to drive, people will have time freed for other purposes.
7. Reduced product costs. Because of the reduced cost and increased efficiency of the transport of goods, the cost of these goods should also reduce.

These changes will have the biggest negative impact on people who work as vehicle drivers. It is estimated that there are more than 200,000 people who work as taxi, bus or truck drivers in Australia and this technology will completely wipe out their jobs. However, it is expected that the changes will be implemented gradually so that any major disruption to the job market is diminished.

How will they affect me?

I find it hard to imagine my life where I don’t own a car or know how to drive. But for children today it may be an unusual situation and even a luxury to own your own car that you drive yourself. My children are currently 4 and 2 years old and it may be the case that they will never get to drive a car.

Like other people it is most likely to be economic considerations that will change how I use transport in the future. If it is cheaper me to use the on-demand autonomous vehicles than to own a car that may become very expensive to buy, it is a good incentive to change. I imagine that I would continue to use mass/public transport for the same reasons and occasions I do now, but for trips to locations not easily reached by public transport it would be necessary for to me to use the autonomous vehicle option.

I know a number of people who work as drivers and in the transport industry and I can see that this technology will have a big impact on their jobs. Hopefully they are able to transition to other work without too much disruption to their lives.

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