IT Technologies

Autonomous vehicles

Autonomous vehicles are essentially driverless cars; in summation, these vehicles can completely and safely navigate their way around the environment with little to no human input.

The concept of self-driving cars is simple; however, the complex technologies, potential safety issues, and ethical concerns are what is stopping it from becoming a mainstream technology in the present state. For Australia's current technological climate, our latest road vehicles have automated features, such as self-parking, lane-keep assistance, and distance assist; however, this only aids with driving. A licensed human still needs to have full control over the car. It is estimated that over the next 20 years[1]. vehicles in Australia will not need human drivers at all while vehicles increasingly become fully automated.

Regulations play a massive part in the complete autonomation of vehicles. There are 5 vehicle automation levels following the United Nations Economic Commission for Europe (UNECE) World Forum for Harmonization of Vehicle Regulations[2]. Level 1 is the current driver-assist features, as mentioned earlier. Level 2 is Tesla's Autopilot system, where drivers are expected to keep attention on traffic. Level 3, the driver can do other various things such as use phones and watch movies. Level 4 is the stage where drivers no longer have to be ready to intervene if necessary, and Level 5 is complete automation.

Sensor technology is an integral system in autonomous vehicle development. These essentially allow the vehicle to see the environment around them, such as surrounding vehicles, pedestrians, weather, and other general traffic hazards. One such sensor technology system that has already been developed is called 'Advanced Driver Assistance Systems' [3], which are commonly implemented in most modern car's safety systems. For the modern car, these are not operable directly by the driver but assist in crash prevention and parking. By and large, visual sensors are the predominant technology implemented by ADAS, in addition to lidar (light detection and ranging) and radar (radio detection and ranging). The hardware and software of ADAS used in modern cars are now being targeted towards autonomous vehicles and the future of driverless cars, becoming one of the many parts that make up an autonomous vehicle. The growth in this field of technology will help fast track the implementation of automated services.

Another area of technological advancements required for autonomous vehicles is machine learning. Autonomous vehicles will use both AI and Machine learning to process data collected from its sensors and then decide what it will do with the information from there[4].Machine Learning will calculate algorithms to identify certain objects and hazards that the sensors detect to determine what course of action the vehicle needs to take moving forward. Machine learning by its very design improves reactions and the decision making of autonomous vehicles with every additional set of data; this allows the 'car' to make decisions and perform actions that are far safer and quicker than the everyday human can react. Furthermore, machine learning technology[5] will identify risks, human error, and potential hazards on the road from subtle signs most humans will not notice. This allows the machine learning system to 'learn,' collect data and share this data with all other autonomous cars in the system. As technology progresses, machine learning will make autonomous vehicles more efficient than a human driver can.

This development's obvious impact allows road users to spend more time doing things they would rather be doing within their vehicle's confines, such as playing with their phones, watching movies, studying, or even catching up on sleep. If automation technology is perfected, it also eliminates human error in car accidents, making it a very effective safety measure. According to the Pennsylvania Department of Transportation, driver actions account for over 90% of motor vehicle accidents in the United States of America. Eliminating human error will result in a significant decline in crashes and fatalities. Not only does this have a significant impact on safety concerns, but many positive environmental factors come into play with self-driving vehicles. It is predicted that eventually, automated driving efficiency will reduce road traffic, leading to reduced fuel consumption and, in turn, reduce Carbon dioxide emissions. According to placesjounal.org, "analysts predict that by 2050 self-driving cars will save 59,000 lives and 250 million commuting hours annually and support a new "passenger economy" worth USD 7 trillion."[6]

While this does have a significant positive impression on daily commuters, it severely impacts our transport industries, such as Taxis, Uber, Bus companies, and government-funded rail networks, while also affecting the logistical networks like Truck drivers and Couriers. Without human drivers, businesses can potentially save hundreds of thousands in staff salaries by automating vehicle services. In the mining and agriculture industries, we have already seen how automated machines can eliminate the need for human operation and have made operating roles redundant. Mining Company Roy Hill, which is majority-owned by mining magnate Gina Rinehart's company Hancock Prospecting has agreed to convert 77 of their haul trucks from manned to completely autonomous by 2021[6], effectively putting 77 truck drivers out of a job. This is following the lead of other mining giants such as Rio Tinto and BHP. This will leave a huge footprint on the mining industry, no longer needing to hire people in this position ever again whilst beneficially lining the investors' pockets. According to the Australia Taxi Industry Association[7], as of December 2014, there were 21,344 total Taxis owned and operated in Australia. Not if, but when self-driving vehicles come into full automation, one would surmise this will conclusively lead to an end to the need for human-operated Taxi's, thus putting 21,344 Australians in the search for other jobs.

For me, personally, this has a significant positive effect on my life. As a Welder for V/Line, I am required to drive a truck for the daily purposes within my job description - however, it is not the sole reason I am employed as the duties of working as a welder fulfill my primary role. If truck automation became a mainstay, it would allow so much extra time to cover other daily tasks such as paperwork and organizing orders, optimizing the time it takes traveling to and from job sites while still performing my primary welding task. On the contrary, my father is a locomotive driver with V/Line. Although it is not car automation, Australia's train driving industry's growing concern is complete train automation, which would render his employment redundant. Australian federal parliamentary research into automated trains showed increases in efficiency, reliability, and safety while significantly saving labour costs. There are currently 42 cities worldwide[8] that enjoy the reliable service of automated public railway transport, with more than an outstanding 50 percent of them belonging to Asia. While this is extremely positive for traffic reduction, pollution, and cost-effectiveness, the repercussions are that it puts hundreds of thousands out of employment worldwide, including locomotive drivers, conductors, engineers, and potentially other railway staff well. Although this is not exactly car autonomation, there are many resembling characteristics between self-driving trains, self-driving cars, self-driving trucks, and so on, these making up the category of autonomous vehicles.

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