

Self-driving cars idea exploration

In modern days we have been more and more surrounded by computers, smartphones, and other electrical devices. We got used to it. However, even though people are already taking artificial agents like Siri or Alice for granted, they are still thrilled about self-driving cars. The purpose of this essay is to explore the idea behind automated cars, and all the new technologies that are used for implementation into reality. Autonomous vehicles, also known as self-driving cars or autonomous vehicles, are vehicles that can independently perform all or most functions without human intervention. These vehicles use various combinations of GPS navigation, vision systems and other sensors to identify their surroundings and act upon them in order to achieve a goal such as a meeting place or destination. Autonomous vehicle technology is being developed by a number of organizations around the world including many large automotive manufacturers. The benefits that autonomous vehicles could bring are numerous; they could reduce traffic congestion, improve road safety and make transportation more efficient.

The first idea of a self-driving car was actually made a long time before the first one was created. The idea belongs to Leonardo da Vinci. In the 1500s he created a self-propelled cart that could move without being pushed (*Reiser, 2022*). It is possible to consider this invention as the first autonomous type of vehicle. However, next few hundred years' people did not succeed with automation till the 20th century, when the first real cars appeared. In 1925, first radio-controlled car was presented by Francis Houdina, his car could move through New York streets without a driver. The radio could start the engine, sound the horn, and shift gears. Unfortunately, this project was shut down due failure of the operator that twice lost control of the car. About 14 years passed, until in 1939 General

Motors created the first automated car model. The vehicle was electric and guided by a radio electromagnetic field. In 1958 the car prototype was turned into a real one. The car had sensors and could detect the current flowing through a wire embedded in the road (*Reiser, 2022*). The next decade was focused on implementing cameras in autonomous vehicles. And by 1990, Carnegie Mellon University started building self-driving cars and using neural networks for image processing and steering control. Since the 2000s the self-driving car industry has been growing, and a lot of new technologies are used.

The most recent stack of technologies, used in creating self-driving cars, includes artificial intelligence. AI powers autonomous car systems. Developers use image recognition, machine learning, and neural networks. These networks can identify pattern in the data that then goes to the machine learning algorithms that allows making split-second decisions. Basic layers of an autonomous car are sensor, infrastructure, compute and network, hardware and software interfaces and applications (*Kumar, 2021*). Each company can make own decision about layers functionality. Besides these main layers, there are crucial technologies that enable the autonomous driving value chain, such as security, AI, and simulation. Hardware layers are created with sensors, infrastructure, and computing, while networks create a connectivity layer that interfacing with sensor fusion and maps to pre-process data, allowing applications to analyze and finally make decisions (*Kumar, 2021*). The foundation of a stack are sensors, they allow “seeing” surrounding and understand it. The network stack is more standardized and they need to have an interface with external infrastructure like cellular technologies. Each country has its own standards, so manufacturers of Japan cars will need to work with V2X, rather than DSRC which is used mostly in the US. Compute requirements depend on the real-time processing needed to analyze and process surroundings. It also depends on type of workloads – video processing and Ai decisions. Operating System is one of the important parts of the software ecosystem of cars, and each manufacturer has their own choice of implementing OS. But in the end, the user will interact with it, and it has a big impact on user experience.

The idea of self-driving cars is encouraged in the US, but it still needs to be regulated. So, governments of a few states passed some legislation that help to regulate this area. For example, California, Florida, Michigan, and Nevada passed a law that allows the testing of a self-driving car in their states, however, the vehicle should be registered, insured, and has certificates from the DMV. Different states provide their own legislation about this matter. Although in Europe comprehensive regulations are still lacking.

Even though people and lawmakers like the idea of self-driving cars, there are also some concerns regarding the moral side of this matter. In 2020 the US faced about 35,766 fatal motor vehicle crashes. And the leading cause was human error (*Joshi, 2022*). However, even studies show that 99.9% of accidents that happen with self-driving cars are caused by human error, such as pedestrians or the driver of a second car. (*Wodecki, 2021*). Autonomous cars can be a good solution for decreasing crashes on roads because they are programmed to follow a particular set of rules. But even though they are so "obedient" to the law, there are enough moral dilemmas around them, such as who to blame for an accident. Driver, manufacturer, or the victim. Or the dilemma in a case of choice, what decision the car should make selecting between crashing into a baby or a group of criminals. Another thought to consider is a cyberattack and a gap in security.

In general, self-driving car will be adopted by society because it is efficient and very useful. A lot of professions and businesses can benefit from it. But on the other side, some occupations will change or extinct. Instead of taxi drivers, people will have operators that can make sure everything is working well. Definitely, autonomous cars are the future. But there are still some areas where developers can make improvements and work on the moral side of the matter. Some regulation needs to be adapted too. But for now, self-driving cars slowly coming into modern people's lives in the US, even though other parts of the world didn't fully embrace this technology.

Work cited

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