

How driverless cars see the world

Facing the revolution of self-driving cars, it is important to think about how these four-wheeled projectiles see their surroundings. They need to be able to measure distances and velocities to foresee the motion of people and objects in order to avoid collisions. Many companies have therefore started to investigate Light Detection and Ranging as the eyes through which driverless cars see the world. Light Detection and Ranging is a method for measuring distance and velocity using light.

Let us start by imaging a regular car driving on the highway moving in 110 km/h. Then suddenly a deer jumps onto the road ahead. The driver slams the brakes and the car, luckily, stops in front of the wild animal. This is an event that could very well happen in real life. However, what is left out is that from the time that the driver notices the car, up until the car fully stop, the car has moved almost 100 m. This distance is how far the car moves until completely still and involves the driver having to react, deciding how to act and finally slam the brakes.

A driverless car, on the other hand, is not relying on the reaction and decision-making from the human. Instead the car is limited by how fast and precise it can obtain information from the environment. By enhancing this from of information to the vehicle, the navigation on our road can be made much safer than before. This is where Light Detection and Ranging comes into play.

The goal of this project is to get a better understanding of how Light Detection and Ranging works in practice. This will be done by designing a system that uses the method and can measure distances in real life. In theory, Light Detection and Ranging sends out light which bounces on the surface of the objects in the surroundings, figure 1. The light then returns to a receiver which quickly calculates the distance and velocity of the objects. The reason for using light is that it, obviously, travels with the speed of light and thus makes the time it takes for it to come back to the receiver much faster than other methods. The faster the information can get to the car, the faster the car can make the decision to brake and hence more easily it can avoid a deer jumping onto the road.

Sending out light to detect objects and measure distances and velocities is not a new idea but because of the high-tech advantages that are happening in our society, limitation have been pushed further than ever before. The real question now becomes how well can we actually make the cars see and is it enough for society to fully accept driverless cars on our roads?



Figure 1: Visualization of how a car sends out and receives light to gather information about its surroundings

(<https://www.gpsworld.com/autonomous-vehicles-can-reduce-road-fatalities/>).