© 2016 IJSRSET | Volume 2 | Issue 2 | Print ISSN : 2395-1990 | Online ISSN : 2394-4099
Themed Section: Engineering and Technology

Google Driverless Car

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ABSTRACT

This paper explores the impact that has been working towards the goal of vehicles that can shoulder the entire burden of driving. Google driverless cars are designed to operate safely and autonomously without requiring human intervention. They won't have a steering wheel, accelerator or a brake pedal because they don't need them, software and sensors do all the work. It takes you where you want to go at the push of a button. This Technology step towards improving road safety and transforming mobility for millions of people.
Keywords : Artificial Intelligence, Hardware Sensors, Google Maps, and Google Driverless Car.

I. INTRODUCTION

It wasn't that long ago when road maps may become extremely valuable as Antiques. A couple of months ago a Google CEO Larry Page drives in a car around to pick up a friend of his. This car has one special feature; there is no driver at all. The car drove Larry's friend twenty miles to Google without a driver. We will dream this about decades. Already we have seen a host of advancements to make safer drive like Lane assists, parking assists or even collision prevention assistance. With more advance technologies that finds greater emergence, future road ways and become a mesh network along autonomous vehicles. They share information with each other and large network speed, breaking and other variables and move in a coordinated formation. Here we are talking about Google driverless car. A world with increasingly connected climate, cars take over, where humans are out of equation.

II. METHODS AND MATERIAL

A. Autonomous Vehicle

An Autonomous vehicle (sometimes referred as automated car or self-driving car) is a robotic vehicle that is designed to fulfilling the transportation capabilities without a human operator. Qualifying to it as fully autonomous, vehicle must be able to navigate without human input to the destination that is predetermined over UN adapted roads and is capable to sense the environment. Audi, BMW, Google, Ford are some of the companies developing and testing these vehicles. Technologies making a system fully autonomous are Anti-Lock Brakes (ABS), Electronic Stability Control (ESC), Cruise control, Lane Departure Warning System, Self-Parking, Sensors, and Automated Guided Vehicle Systems.

B. Google Driverless Car explained

Only with occasional human Interventions, Google's fleet of robotic Toyota Cruises has logged more than 190,000 miles (approx. about 300,000 Km), driving in busy highways, in city traffic and mountainous roads. In a near future their driverless car technology could change the transportation. Director of The Stanford Artificial Intelligence Laboratory, Sebastian Thrun guides the project of Google Driverless Car's with elucidations:

- Steering can be done by itself, while looking out for obstacles.
- For corrections of speed limit, it can accelerate by itself.
- On any traffic condition it can GO or STOP by itself.

Figure 1: Google Driverless Car

C. Under the BONET

It integrates three constituents:

- Google Maps
- Hardware Sensors
- Artificial Intelligence

D. Google Maps

A self- driving computerized car has unveiled by Google; which has no wheel for steering, brake or accelerator, just has buttons to start, stop, pullover and a computer screen to show the route. Through GPS and Google maps to navigate. A Google map provides the car with information of road and interacts with GPS to act like a database.

E. Hardware Sensors

Real time and dynamic Environmental conditions (properties) attained by the car. To need real time results, sensors are attempted to create fully observable environment. These hardware sensors are LIDAR, VEDIO CAMERA, POSITION ESTIMATOR, DISTANCE SENSOR, AERIAL and COMPUTER.

F. LIDAR

(Light Detection And Ranging also LADAR) is an optical remote sensing technology which is used to measure the distance of target with illumination to light in the form of pulsed laser. It is a laser range finder also known as "heart of system", mounted on the top of the spoiler. A detailed #-D map of the environment is generated by the deviceVELODYNE 64- beam Laser (for autonomous ground vehicles and marine vessels, a sensor named HDL-64E LIDAR is designed for obstacle detection and navigation. Its scanning distance is of 60 meters (~ 197 feet). For 3D mobile data collection and mapping application this sensor becomes ideal for most demandingperceptions due to its durability, very high data rates and 360 degree field of view. One piece design patented the HDL-64E's uses 64 mounted lasers that are fixed and each of it is mounted to a specific vertical angle mechanically with the entire spinning unit, to measure the environment surroundings. Reliability, field of view and point cloud density is dramatically increased by using this approach.) High resolution maps of the world are combined by the car laser measurement to produce different types of data models that allows it to drive itself, avoiding obstacles and respecting traffic laws. A LIDAR instrument consists of a Laser, Scanner and a specialized GPS receiver, principally.

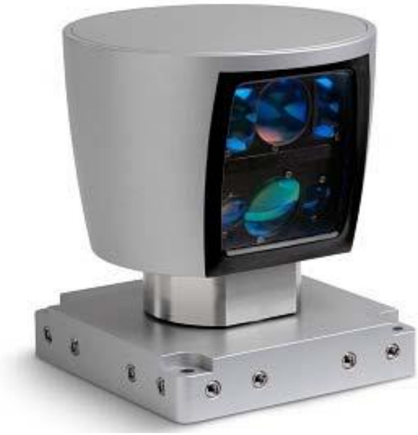

Figure 2 : HDL-64E Lidar

G. How is LIDAR Data Collected?

A beam of light is reflected by the surface when it encounter with the Laser that is pointed at the target area .To measure the range, this reflected light is recorded by a sensor. An orientation data that is generated from integrated GPS and Inertial Measurement Unit System scan angles and calibration with position. The result obtained is a dense, and "point cloud" (A detail rich group of elevation points consists of 3D spatial coordinates i.e. Latitude, Longitude and Height).

H. Video Camera

A sensor that is positioned near to the rear-view mirror that detects the upcoming traffic light. It performs the same function as the mildly interested human motorist performs. It reads the read signs and keeps an eye out for cyclists, other motorists and for pedestrians.

I. Position Estimator

An ultrasonic sensor also known as(Wheel Encoder) mounted on the rear wheels of vehicle, determines the location and keep track of its movements .By using this information it automatically update the position of vehicle on Google Map.

J. Distance Sensor (RADAR)

Other sensors which include: four radars, mounted on both front and rear bumpers are also carried by this autonomous vehicle that allows the car to "see" far enough to detect nearly or upcoming cars or obstacles and deal with fast traffic on freeways.

K. AERIAL

A highly accurate positioning data is demanded by a self-navigating car. Readings from the car's onboard instruments (i.e. Altimeters, Tachometers and Gyroscopes) are combined with information received from GPS satellites to make sure the car knows exactly where it is.

L. Computer

Car's central computer holds all the information that is fed from various sensors so to analyze the data, steering and acceleration and brakes are adjusted accordingly. Not only traffic laws, but also the unspoken assumption of road users is needed to understand by the computer.

M. Artificial Intelligence

Artificial Intelligence provides the autonomous car with real time decisions. Data obtained from the Hardware Sensors and Google Maps are sent to A.I for determining the acceleration i.e. how fast it is; when to slow down/stop and to steer the wheel. The main goal of A.I is to drive the passenger safely and legally to his destination.

N. Working Of Google Car

- Destination is set by "The Driver "and software of car calculates a route and starts on its way.
- LIDAR, a rotating, roof mounted sensor monitors and scanners a range of 60- meters around the surroundings of car and creates rudimentary detailed 3-D map of immediate area.
- An ultrasonic sensor mounted on left rear wheel monitors movements to detect position of the car relative to 3-D map.
- DISTANCE SENSORS mounted on front and rear bumpers calculate distances to obstacles.
- All the sensors are connected to Artificial intelligence software in the car and has input from Google
- VIDEO CAMERAS and street view.
- Artificial Intelligence stimulates the real time decisions and human perceptions control actions such as acceleration, steering and brakes.
- The surface installed in the car consults with Google Maps for advance notification of things like landmarks, traffic signals and lights.
- To take control of the vehicle by human is also allowed by override function.

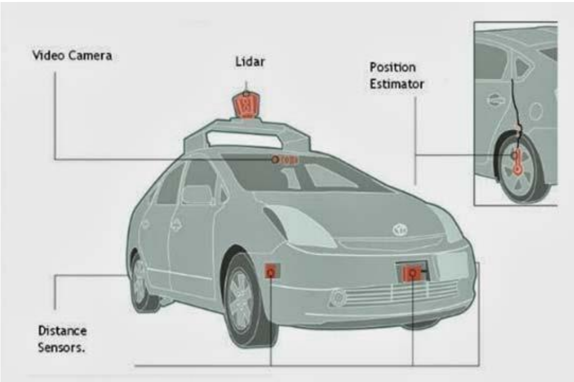

Figure 3: How it Works

O. An End To Traffic Jamsforever

Autonomous cars will be able to "talk" to each other and navigate safely by knowing where they are, by using RADAR, CAMERAS, GPS, SENSORS and Wireless Technology in relation to other vehicles and by means with connectivity they can communicate with obstacle like traffic signals. As a result traffic flowbecomes smoother; an end to traffic jams and greater safety would be achieved by illuminating the frustration and dangerous driving that's often triggered by sitting in heavy congestion for ages. When it comes to sustainability, the self-driving car also holds great promise by figuring out the most –direct, least traffic jammed route by driving without quickly accelerating or breaking too hard, all which leads tsaving on fuel consumption.

Figure 4: Going Driverless on road

P. Trials and Tribulations

We seldom think about , what needs to be happen behind the scenes to bring this potentially life-changing technology to the market , while it's easy to get lost into it. Ahead of the Law is the major problem to this technology, as Lawmakers have a huge impact on innovation. In the US most federal and state automobile Laws assume a human operator. Before the technology can be commercialized these need to be repealed. To legalize the operation of autonomous cars on the roads, Nevada became the first state in 2012. An attempt to gain state support for similar changes in Law, Lobbyists from Google have been travelling around other states and targeting Insurance companies as well. The technology also poses serious Puzzle to Insurance in terms of Regulatory issues and Liability.

Q. How Safe is IT?

The new car is the next evolution of Google's self-driving car. While the new frame is untested, the company's previous versions have clocked up over 700,000 miles of testing on public roads, mainly around California, including over 1,000 miles of driving in the most complex situations and cities like San Francisco's hills and busy streets. The car itself is limited to 25 mph, which restricts it to certain roads, but also minimizes the kinetic energy it could carry into a crash if one should happen. The front of the car is also made to be as kind to pedestrians as possible with a foam bumper and a flexible windscreen that is designed to absorb energy from an impact with a person's body. Seat belts are also provided – a safety requirement for vehicles on the road – while the car has redundant systems, a "fault-tolerant architecture" as Google calls it, for both steering and braking, should the primary systems fails; plus that emergency stop button that passengers can hit at any time.Google has also taken the data and behaviours it learned from its previous vehicles to create a defensive, considerate driving style that is meant to protect both the passengers and other road users. For instance, the car will wait a second after the traffic lights turn green before it moves off, although this could incur the anger of drivers stuck behind it.Google also says that making it drive in a natural and predictable way has been one of the key goals, so that it behaves in a familiar way on the road for other drivers. A laser sensor on the roof constantly scans the surroundings.

III. RESULTS AND DISCUSSION

Artificial Network Networks Characteristics:

- A distributed representation of the information: The information is stored in a distributed network (in the network's weights), which means that any inputs and outputs depend on all weights from the neural network.
- The ability of generalization from some training data to some unknown situations. This feature depends on the number of weights and the topology, for example the size of the neural network. It is found that increasing of the neural network size leads to better memorizing the training data but to lower performance on test data, which means that ANN has lost the ability to generalize. Determining the optimal number of perceptron's from the hidden layers is a key step in designing an ANN. It can be done by choosing different topologies of the Artificial Neural Networks until it begins to decrease performance on the test set.
- Tolerance to noise: an ANN can be trained, even if the data are affected by noise, - obviously decreasing its performance.
- Resistance to partial destruction: because the representation of the information is distributed through the entire neural network, it can still operate even if a small part of the network was destroyed.
- Fast calculus: learning an Artificial Neural Network using a training data it's time consuming, but once trained it will quickly calculate the network output for a given input(test). Anyone can train an ANN in order to perform/approximate a particular function by adjusting the values of the connections (weights)

between elements. The ANN is usually adjusted (trained) so that a signal at the entrance to involve a certain output (target). The network is adjusted on the basis of comparison with the target response, until the network output matches the target. Because the learning algorithm of this neural network is supervised I need to give it several pairs input / output.

IV. CONCLUSION

This paper explained about the Google Driverless car revolution which aims at the development of autonomous vehicles for easy transportation without a driver. For the economy, society and individual business this autonomous technology has brought many broad implications. Cars that drive themselves will improve read safety, fuel efficiency, increase productivity and accessibility; the driverless car technology helps to minimize loss of control by improving vehicle's stability as these are designed to minimize accidents by addressing one of the main causes of collisions: Driving error, distraction and drowsiness. But still these cars have a lot of hurdles to go through before they became everyday technology.

V. REFERENCES

[1] www.theneweconomy.com/insight/googledriverless-cars

[2] JaeminByun, Ki-InNa, Myungchan Noh, Joo Chan Sohn and Sunghoon Kim; ESTRO: Design and Development of Intelligent Autonomous Vehicle for Shuttle Service in the ESTRI.

[3] J. Markoff. (2010, October) Google cars drive themselves, in traffic. Online.The New York Times.

[4] KPMG (2012), Self-Driving Cars: The Next Revolution, KMPG and The Center for Automotive Research; at www.Kpmg.com/ca/en/Isuues-And Insight/ArticlesPublications/Documents/SelfDriving- Cars-next -revolution.pdf.

[5] Stephen E. Reutebuch, Hans-Erik Andersen, and Robert J.McGaughey; Light Detection and Ranging (LIDAR): An Emerging tool for Multiple Resource Inventory.

[6] bgr.com/2013/01/27/googledriverless- car-anaysis-306756/

[7] Spectrum.ieee.org/automation/robotics / artificial-intelligence/how-google-selfdriving- car-works.

[8] Luis Araujo, Katy Mason and Martin Spring; Self-Driving Cars: a case study in making new markets.

[9] Q. Zhang and R. Pless, "Extrinsic Calibration of a Camera and Laser Range Finder", in Proc. IEEE/RST Int.conf. Intelligent Robots and Systems, Sendai, Japan, 2004.

[10] www.dezeen.com/2014/05/28/public-test-drivefirst-driverless-cars-bygoogle/

[11] Todd Litman, Victoria Transport Policy Institute; Autonomous Vehicle Implementation Predictions.