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IMPLEMENTATION OF IoT BASED AUTONOMOUS CAR

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ABSTRACT

An autonomous car/driverless car can also be automatically called a robotic car, operates itself without the help of any driver. This car senses a traffic-like environment, weather, surface conditions, road infrastructure ,adjacent cars, maps, indicator board etc. Use of cameras, radar, lidar, GPS and navigation paths. Advantages of autonomous cars- less traffic collisions than normal cars, increased reliability, increased safety, decrease of accidents, increased efficiency, safe human life, etc. The main disadvantages are, these are issues of cyber security, software malfunction, damage liability and driver loss related jobs. This article provides information on working with autonomous cars and the various sensors used to control it.

Keywords: Arduino Uno, Ultrasonic Sensor, IR Sensor, GPS module.

1. INTRODUCTION

In the last few years, the number of vehicles has been increased and some levels of inadvertent collision with drivers. To avoid this, the proposed system introduces an autonomous car, which restricts it to slow driving. The proposed system automatically moves to the destination without any human assistance and has functions such as lane-finding, disruption detection and traffic signal analysis. These functions help the vehicle to move to the specified location, avoiding accidents, providing a real-world view with the help of a camera attached to the top of the target system, and detect traffic signals and strictly obey them. This will ensure safer and more convenient mobility. Hence, we are moving towards autonomous car drive technology to limit such problems.

2 . BLOCK DIAGRAM

As indicated in the block diagram, our suggested system is made up of seven primary blocks. Two peripherals provide input to the MCU: firstly the images from sensor and next the input from distance sensor. The image , which consist of a pixel array, is fed as input to the MCU using an inbuilt comparator, which replaces pixels that were previously represented in pixels with bits only. The binary representation from the distance sensor is sufficient input from the distance sensor to be turned into an 8 bit value with the MCU's internal ADC because our autonomous car is supposed to detect the images of a road. This value which we calculated can be transferred to actual distance, where this is not programmed in the software.

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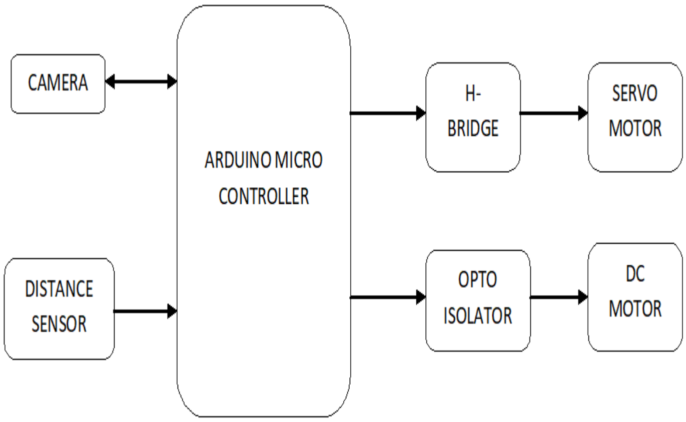

Fig 2: Block diagram of Suggested system

We decided that just the car would travel forward, thus no H-bridge circuit was necessary to operate the DC motor, which had to be driven in only one direction. Multiple power sources were required, to power all of our hardware. The MCU's target board requires a 9 volt battery to function properly. This, together with the on-board 5 volt regulator, gives the MCU a consistent 5 volt VCC. The camera is fed by 5volt supply on the MCU, which causes no problems with the system because it required a small amount of current. The distance sensor is powered by a separate source battery, a battery pack consisting of 3 batteries. The rest of the circuitry is appropriately segregated from the MCU and runs on a car battery configuration with five 1.5 volt batteries for a total supply of 7.5 volts. For H-bridge circuits, which require less voltage, this was too high. Instead of using extra battery sources, diodes were added in series between the positive terminal and the H-bridge VCC pin to lower the voltage. The analog comparator voltage threshold had to be changed to a value appropriate for a certain road line color, which we choose black. The MCU processes image input from the camera to produce a signal. That controls the servo motor in the RC car at the same time, allowing it to move.

3. SENSORS USED IN AUTONOMOUS VEHICLE SYSTEM

A vehicle requires a variety of sensors and computer systems to replicate the traditional women process of understanding how to safely navigate its current location, desired location and routes and hazards. Of the currently available sensors, no single component is capable of interrupting its environment in such a way as to provide sufficient information for autonomous driving. Instead, engineers design a system that combines a set of sensors that strategically control the specific capabilities of a system, but adjust its shortcomings through the use of others.

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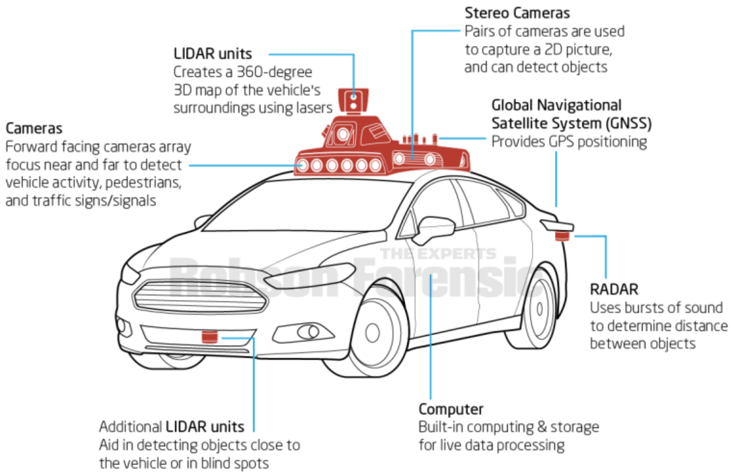

Fig 3. Various sensors used in Autonomous car

3.1. RADAR

It is a sensor used to detect hazardous materials in the path of vehicles more than 100 meters away, and works well with metal detectors. Automotive radar is commonly found in two forms: 77GHz and 24GHz where 24GHz is used for low range applications 77GHz for long-range sensing it can see 100 yards and choose the speed of all the objects perceives. It is now exactly as you tell computers to be a cyclist, but you should be able to track the fact that you are moving with the speed and direction that helps you drive the car. The radio waves emitted by the radar moves at a speed of light and returns to the device when it detects an object in its path. Depending on how long the radio waves detects the object and how long the wave takes to return, the radar device can detect the distance between vehicles and object encounters.

3.2. Video Cameras

The camera is a passive sensor that is used to obtain information about the surroundings. It is mounted next to a rear-view mirror and creates a real-time 3D image of the road that identifies hazards such as pedestrians and animals. It is also used to identify roadways and traffic signals.

Fig 3.2. Video Camera

3.3 Ultrasonic Range sensor

This sensor uses sound transmission to detect objects. Ultrasonic sensor on the rear wheels helps track the movement of the car. It calculates the number of wheel rotations with the help of GPS and GOOGLE MAP to determine the exact location of the car. It warns the car about the obstacles in the rear. Cars offering automatic 'Reverse Park assist' technology use such sensors to help the car navigate to tight reverse parking spots. Typically, these sensors are activated when the car is involved in reverse motion.

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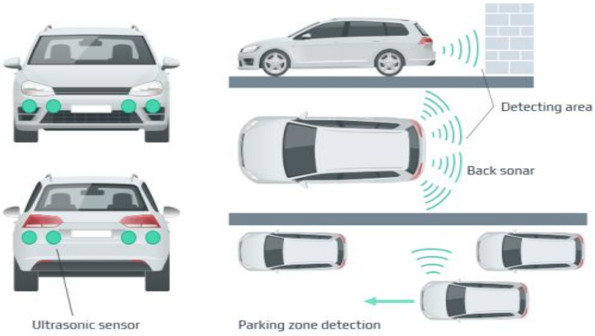


Fig 3.3. Ultrasonic sensor

3.4 GPS

It puts the car on its intended route with the accuracy of 30cm. With GPS, which includes the car macro locations, the smallest cameras on the deck can detect small details such as red light, stop signals and construction zones. Data has been received from several GPS satellites to calculate longitude, latitude, speed of the course to help the car navigate. After receiving information, specify your location using a process called GPS receiver pin-fraternalization.

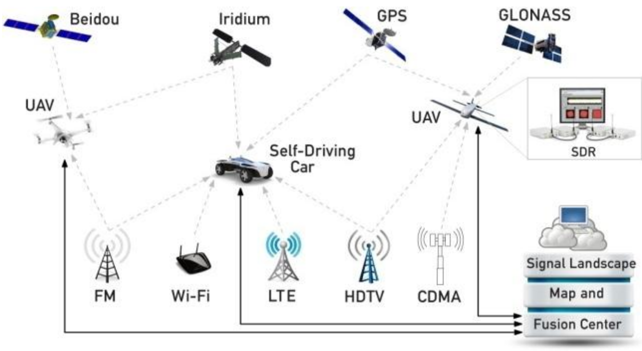
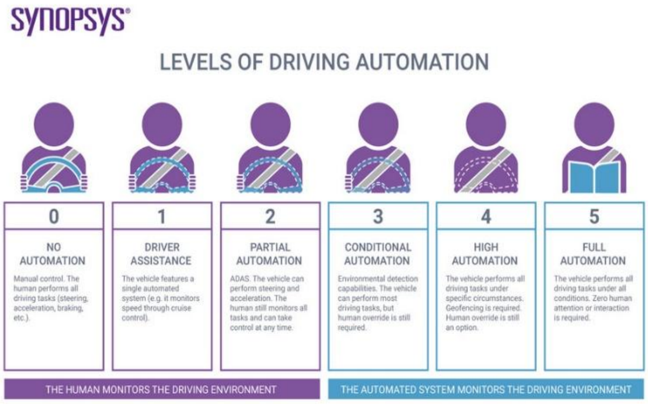


Fig 3.4. Tracking of GPS

4. Levels of driving Automation



5. Working of Autonomous vehicle

Self-driving cars employ a variety of technologies to safely navigate our roadways, including radar, cameras, ultrasound, and radio antennae. These are employed in modern autonomous cars, as they each add a layer of autonomy to the system, making it more dependable. For example, Tesla's "Autopilot" car has eight cameras to give 360-degree sight, as well as 12 ultrasonic sensors and front-facing radars to identify adjacent dangers.

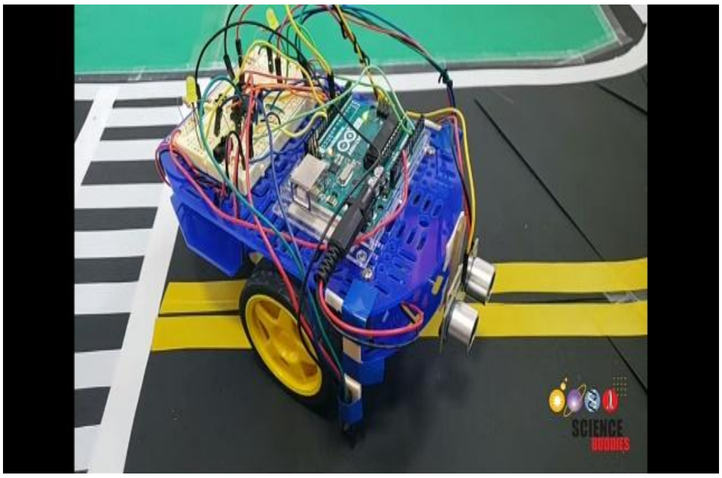


Fig 5: Working of Autonomous vehicle

5G is a sort of mobile broadband that permits the wireless transport of data from one device to another at a significantly quicker pace than the 4G LTE connections we're used to on our smart phones. 5G claims to be about 1000 times faster than 4G LTE at peak throughput, making issues like excessive latency and slow response a thing of the past. 5G networks, when combined with self-driving cars, will enable smooth car-to-car communication, but that's not all. Everything, from motorised cars to traffic lights, will be connected to some form of high-speed network, enabling all kinds of new and fascinating capabilities**.**

5.1. VEHICLE TO VEHICLE (V2V)

The advantages like quick, high-speed network is the ability of self driving automobiles to interact with each other, as previously indicated. Autonomous automobiles would be able to transmit information about their present location, ways, and road dangers via this sort of seamless communication. For example,the two vehicles are travelling on the same lane on a highway and the one of the car which is travelling in front detects a dangerous road condition using its sensors, the information may be sent on to the car behind. So he may begin braking and adjusting his course. Furthermore, with a network of networked cars, traffic congestion can be alleviated since each vehicle will be able to make intelligent judgments regarding its present path in order to maintain a constant pace of vehicle movement**.**

5.2. VEHICLE TO INFRASTRUCTURE (V2I)

In addition to communication with other vehicles self-driving cars will also have the ability to communicate with the various infrastructure elements. For example, in parking space the autonomous vehicle does not know the way how and where to park, with cars coming and going continuously,it is imperative that self-driving vehicles are able to plan their route in advance to maintain full efficiency. Therefore, the information about the parking spaces can be transmitted to a self-driving vehicle in the air to sensors that monitors about the parking space. Once the vehicle receives information that space can be reserved for the specific car, and this reservation can be transmitted to the cloud so that multiple driverless cars will not fight for the same parking space. It is even more important that vehicles are fully aware of pedestrians and their exact locations. As they may not be able to eliminate all these phenomena significantly it will reduce the number of deaths at some points in the future. Without smart phones or some kind of internet devices almost all of us never leave the house ,that means we always have access to the internet in some form or the other.

5.3. VEHICLE TO PEDESTRIAN(V2P)

Interestingly, many of these devices, have the ability to use global positioning system to determine the exact location of the person using the device. So that the information can be immediately sent to an autonomous vehicle travelling nearby with a 5 G network, making it aware of pedestrians at all times. By this, driverless vehicles will be able to dynamically react to the situation of pedestrians with accident prevention measures such as braking, automatic steering, which in turn make our roads much safer to travel on foot.

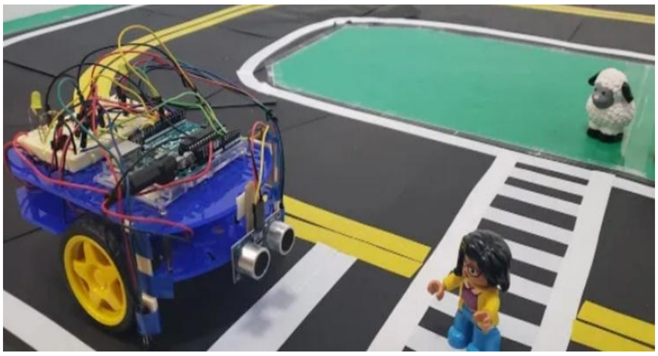


Fig 5.3. Vehicle to pedestrian(V2P)

6. ADVANTAGES

1. Self-driving cars follow traffic rules.
2. Improvement in mobility for people who can't drive.
3. Savings on fuel.
4. Robots are able to constantly focus.

7. CONCLUSION

Autonomous car will surely prove to be boon in the automation industry and many conventional cars will be preferred. They can be used for patrolling and capturing images in positions of criminals. Since they will not require any driver, accidents due to carelessness of goods carrier vehicles can be reduced and better logistic flow will be ensured. Buses for public transport will be more regulated due to minimum errors therefore due to more autonomous nature and efficiency, an autonomous car of this nature can be practical and highly beneficial for better regulation in the moving class of goods and people.

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