LIDAR Based Self Driving Car

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Abstract: Many characteristics must be considered while creating an autonomous vehicle (self-driving vehicle), such as obstacle avoidance, obstacle ranging, traffic signals, vehicle classification, tracking, and parking. Finding and ranging barriers is one of the most crucial features of an autonomous vehicle. A number of autonomous vehicle technologies have been demonstrated in recent years. LIDAR sensors (Light Imaging Detection and Ranging) are one of the most widely used stereo vision technologies. LIDAR is a laser-based detection and ranging technology with radar likes feature. In order to determine and distance obstacles, LIDAR is used, whereas radar is used to park the car. To boost recognition of this technology, it become determined to awareness on LIDAR, which has played an important role in the development of self-driving cars.

Keywords: Ranging, Detection, Automatic vehicle, LIDAR

1 Introduction

- The biggest issue of transportation today is the growing population. As a result, there is a created automated driving system that automatically drives the car.
- By fundamentally altering car use, the idea is to prevent traffic accidents and save people's time. The technology that has been created for automobiles that allows them to drive themselves.
- The purpose of the automated vehicle's design is to provide a human driver with an automated driving experience. Without any human input, the car can sense its surroundings, navigate, and fulfil human transportation needs. LIDAR is a sensor that detects the presence of objects in the environment.
- It constantly monitors its surroundings, and if an obstruction is identified, the car detects it and travels around to avoid it. Fewer traffic collisions, improved reliability,

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more route capacity, and reduced traffic congestion are all advantages of autonomous vehicles.

- It is expected that, once the existing difficulties are overcome, the autonomous automobile will become a reality and a requirement of existence, as human life requires secure and safe, efficient, cost-effective, and comfortable modes of transportation.

2 Problem Statement

Self-driving automobiles will benefit society by increasing safety and decreasing traffic congestion. These self driving vehicles provide a plethora of advantages. They will, above all, make driving on the roadways safer. Radar, LIDAR, sonar, GPS, odometer, and inertial measurement devices are among the sensors that autonomous vehicles use to measure their environment. Sensory data is interpreted by advanced control systems to determine acceptable navigation courses, as well as obstacles and necessary signage.

3 Components

The following components make up the hardware of the proposed system:

A. Node MCU

B. LIDAR Sensor

C. Motor Drive

D. Rectifier

E. Regulator

F. Servo Motor

G. DC Motor

A. Node MCU

The Node MCU platform is a completely free and open source LIDAR platform. It comes with firmware for the ESP8266 Wi-Fi SoC from Expressive Systems and hardware for the ESP12 module. The phrase "node MCU" is basically used to describe firmware, not development kits. The firmware uses Lua as its scripting language. It is based on the Personal Data project and developed with the Espress if NonOS SDK for ESP8266.Spiffs is one of the most popular open source projects. The Expressive ESP8622 WiFi SoC interactive software comes with an open

source hardware board, unlike the $3 ESP8266 WiFi module with a CP2102 TTLtoUSB chip for programming and debugging, is breadboard compatible, and can only be powered from the via the micro USB port.

B. LIDAR Sensor

LiDAR, or light detection and ranging, is a widely used remote sensing technique for detecting an object's
distance on the earth's surface. Despite the fact that it was originally employed in the 1960s when laser scanners were put on planes, LiDAR did not gain widespread acceptance until twenty years later. Only after the introduction of GPS in the 1980s did it become a common tool for determining precise geographical measures. More LiDAR mapping technology and its application has increased to a wide variety of sectors now that its reach has spread across several fields.

C. Motor Drive

In robotics, different types of motors are employed, such as DC motors, Servo motors, and stepper motor.
application will determine the motor you use, and there are various methods to use it. Some motors can be operated directly using a variety of methods, such as connecting them to the power supply and turning it on. But what if we want to use other controllers, such as wireless systems, microcontrollers, and so on. Motor drivers are used to connect motors with control circuits. The controller circuit works with low- current signals, but the motor requires a lot of current. Motor drivers are used to convert a low-modern manage sign right into a higher-modern sign which could force a motor.

D. Rectifier

A rectifier is a tool that converts bidirectional alternating cutting-edge (AC) into unidirectional direct cutting-edge (DC).A half wave rectifier is the simplest rectifier. It works by removing one side of the AC and passing current in only one direction.

E. Regulator

A voltage regulator is a device that maintains a steady voltage automatically. Negative feedback or a basic
forward architecture can be used in a voltage regulator. An electromechanical mechanism or electrical components could be used. It may be used to regulate one or more AC or DC voltages,

depending on the design. Voltage regulators are divided into two categories: linear and switching. Both regulate the voltage of a system, however linear regulators have a low efficiency whereas switching regulators have a high efficiency.

F. Servo Motor

A servomotor (sometimes called a servo motor) is a simple electric motor with servomechanism control.
Motor is used as a controlled device and is connected to a servomechanism, it is referred to as a DC Servo Motor. A controlled motor that is powered by AC is referred to as an AC Servo Motor. A servomotor is a linear or rotary actuator that can control position, acceleration, and velocity in linear or angular directions with pinpoint accuracy. It is made comprised of a motor. It additionally necessitates a complicated controller, that's regularly a separate module created completely for servomotors

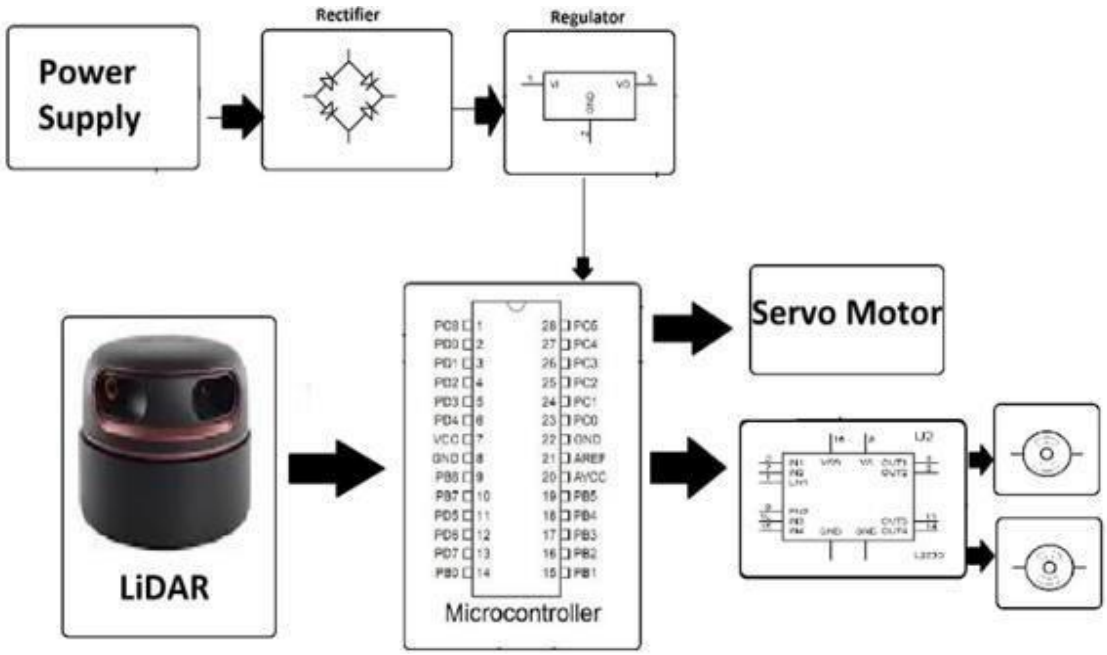
G. DC Motor

DC motors are very suitable for belt-driven applications. This constant speed motor is used in industrial and automotive applications such as machine tools and winding/unwinding machines where a great amount of torque precision is required.

4 Methodology

Lidar devices that fulfill both maintenance and notification functions. One of the stand-out characteristics of the smart car is the possibility for self-driving. The broader spread of faster cellular 5G connection, there will be a wider field for creating new automotive solutions. Safety is one of the most important matters of concern for all road users, and LIDAR in smart cars is the pathway to safer driving. The Advanced Driver-Assistance Systems (ADAS) were created on the basis of the LIDAR technologies' implementation. ADAS can manage the car and driver safety and prevent potential threats both on the road and during parking with the help of automotive radars and cameras. Many cars also have got teen safety tools

5 Block Diagram



6 Working

LIDAR devices (always rotating, using a laser beam to create a 360-degree image of the surroundings of the vehicle), cameras (detecting traffic lights and signs, assisting in recognizing moving objects), radar sensors (neighboring obstacles or vehicles), cameras (detecting traffic lights, reading road signs)), the main computer (in the trunk), and the area around the optional LIDAR device.

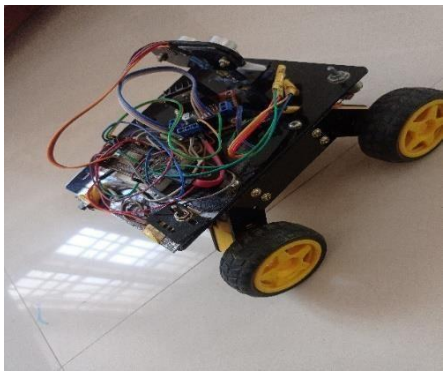
When the LIDAR produces a laser beam, it moves vertically and gives data at a distance of 4-6m, depending on the LIDAR's height and movement angle (360 degrees, vertical).To calculate the right obstacle distance, the measured vehicle dimension is combined with LIDAR data. The traffic sign and road sign are detected by a camera that is installed alongside the LIDAR.

On autonomous vehicles, a radar sensor is positioned around the vehicle to identify nearby obstacles or vehicles. Parking is problematic due to the LIDAR's ability to provide data from a specific distance from the LIDAR. Use additional LIDAR and radar devices to determine the distance of nearby objects to avoid parking difficulties.

It collects all data such as LIDAR, radar, LIDAR (optional), camera, etc. and compares it to the stored map to analyze the current state through the backbone's main computer.

In the image above, place the camera on top of the car, for example. Things such as road signs, traffic lights, and moving objects such as people can be found in the raw photos. Designers must take raw data and provide bounding boxes and labels that properly classify and identify those elements in order to exercise their identification and decision-making powers.

7 Result



8 Conclusion

The Light Detection and Ranging (LiDAR) Sensor and its Application in Autonomous Driving as a Future Road Safety Companion. If the robot advances forward and detects an impediment, it checks for other directions and moves in the forward direction where there are no obstacles. LiDAR is utilised to sense the obstacle. To lidar, the servo motor. It's a perfect building element for applications like autonomous vehicle navigation, infrastructure surveys, mapping display and retrieval, and many more 3-D data collection applications. Those of us who have worked in the ADAS and autonomous driving industries know how important LiDAR will be in future automobiles.

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