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IOT-ENABLED AUTONOMOUS VEHICLE DESIGN: HARNESSING COMPUTER VISION FOR INTELLIGENT NAVIGATION

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ABSTRACT: This project shows a vehicle design that can be controlled over the web and mostly runs itself. It talks about how to make a car that can be directed from anywhere in the world using the Internet and a reliable server. In addition, this car will have high-tech features like technologies for avoiding obstacles and finding its way, which will let it work on its own if the power goes out. The self-governing vehicle's path and speed are controlled by a beat width modification in the engine driver circuit. To get around barriers, the ultrasonic sensor is used. What's going on with the car is sent to the cloud by the IoT module, and the instruments are managed by Arduino. The self-sufficient can also be controlled through the Internet of Things. Voice management over Bluetooth can also be used to limit the device. In this case, the main goal is to lower the risk to human life and make sure that driving a car is as safe as possible. At the same time, the car will provide comfort and luxury to the driver. In a simulated situation, a small car with the above features did very well.

KEYWORDS: IoT (Internet of Things), Computer Vision, Sensors

1.INTRODUCTION

The Internet of Things, or IoT, is a network of physical items that are linked to the internet through software, sensors, actuators, and circuitry. For example, cars and buildings are examples. This makes it easier for the devices to share and collect info. A group called the IoT-GSI came up with the phrase "the framework of the data society" to describe the Internet of Things in 2013. The Internet of Things (IoT) and network infrastructure that are already in place make it possible to control and find objects from afar. Better speed, accuracy, and money-making are all possible because this makes it easier to connect computer systems to the real world. Adding motors and sensors to the Internet of Things has made it a cyberphysical system by definition. This group includes, among other technology advances, smart grids, smart homes, smart transit, and smart cities. The processing unit built into the system can instantly recognize things and works with the Internet infrastructure that is already in place. The Internet of Things is expected to connect fifty billion things by 2020, according to experts. As technology improves, people are eagerly looking for new ways to use computers in a wide range of situations. Drivers from all over the world who want the best in safety and comfort are interested in the current trend of self-driving cars. The main thing that worries most people today is traffic crashes. It changed into something strange and unclear. Drivers who don't follow the rules are mostly to blame for accidents that happen on public roads. When drivers are tired or busy, they often hit things that are in their way. A lot less human mistake could happen if computer vision and trained sensors were used to control the mobility process. In some cases, getting closer to the car from a distance is better than avoiding problems. Because of this, it would be very helpful if the car could be controlled from afar using the console and be able to talk to the computer. Playing video games on your PC is one possible option. The Internet of Things and

computer vision, which are essential to our business, allow us to control how our cars and robots are used while they are moving. Because they have sensors on them, these things or devices can talk to the system and send data from the ground. They have actuators inside that let devices outside the earth watch it and talk to it. They could be similar versions of popular products that you already know and like, or they could be completely new, custom-built gadgets that can be used in ways you can't even imagine. Things that you carry with you or keep at home may be on this list. They could also be used in the creation of one's home or the tools used in the production process. All of these can turn large amounts of real-world data into digital data, which lets you learn more about how people use your apps, services, and goods. The Internet of Things (IoT) lets people, animals, and things talk to each other over a network by giving them unique identifiers and getting rid of the need for real connections between computers and people. An Internet of Things board has a driver that turns all UART data into GPRS-based online data and a SIM900 GPRS modem built in for connecting to the internet. A specific website or social media tool may be used to share information that is meant for clients.

2. LITERATURE SURVEY

The following tasks have been done by different people in the past. The goal of Gurjashan Singh Pannu, Mohammad Dawud, and Pritha Gupta's 2015 paper "Design and Implementation of Autonomous Car using Raspberry Pi" is to make a prototype of an autonomous car using a Raspberry Pi as its processor and a single camera. A sonar sensor and an HD camera work together to give the car important information about the outside world. Since the vehicle can safely and intelligently get to the designated place, it is unlikely that a person will make a mistake. Combining a number of modern algorithms, such as those made for detecting obstacles and lane marking, gives the vehicle the amount of control it needs. Sumit Garethiya1, Lohit Ujjainiya, and Vaidehi Dudhwadkar wrote a paper in 2015 called "predictive vehicle collision avoidance system using Raspberry Pi." It shows a useful way for a car's collision avoidance system to find something in its blind spot and in front of the car. When the distance between the car and the obstacle gets smaller, an alarm and an LED light let the driver know. This information can be seen on the display board. According to Arjun K1, Prithviraj, and AshwithaA 528, the ultrasonic sensor can tell the difference between things that are moving and things that are not moving in relation to the car. This technology can pick out people on foot, horses, bikes, and cars that are going next to a moving car. The 2014 book "Design and Development of Accelerometer-Based System for Driver Safety" by V. Sagar Reddy, Dr. L. PadmaSree, and V. Naveen Kumar. The current study comes up with a new idea for a low-cost, low-power hardware device that can pinpoint the exact position of an accident caused by a driver's distraction and warn the driver to be more careful while driving. An accelerometer picks up events, and the Raspberry Pi (ARM11) makes handling easier. Should the right person be told about an event so that they can act quickly to stop it from getting worse and save lives? "Vehicle Accident Prevention System Embedded with Alcohol Detector" was written by M.H. Mohamad, Mohd Amin Bin Hasanuddin, and Mohd Hafizzie Bin Ramli (2013) said that an alcohol detector could be a good way to stop car crashes. With an LCD screen, this device can let the driver know how drunk they are. It also sounds an alarm with a buzzer to let the driver and anyone else nearby know what's going on. The most important safety feature of the system is that it disables the starting mechanism, making it impossible for a driver who is very drunk to operate the car.

3.SYSTEM ANALYSIS

EXISTING SYSTEM

Geographic Source Routing (GSR), the most common protocol, sends data to nearby nodes. This makes the execution time longer and makes sure that information is always available. Therefore, it is important to find a way to cut down on delays and raise the number of items that

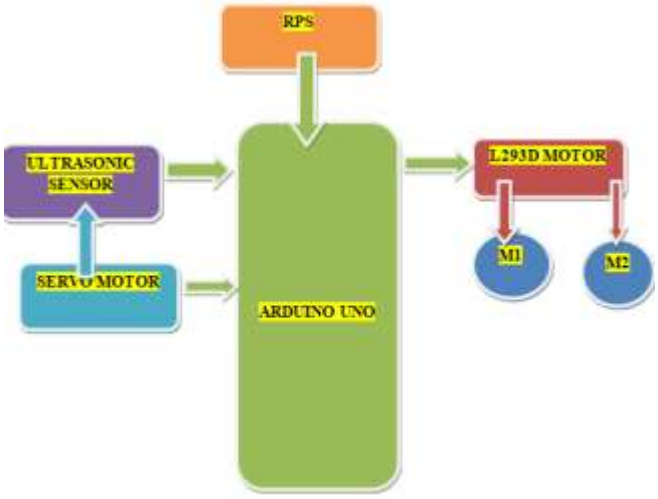
are delivered. A car monitoring system uses software to keep track of where all the vehicles in the fleet are at all times, as well as the GPS locations of each vehicle. GPS and GLONASS are the most common ways for car tracking systems to find vehicles right now, but there are other customizable vehicle area technologies that can be used as well. With the right tools, you can get information about vehicles from the Internet or computer maps. Experts in open travel in cities will always prefer car tracking technologies, especially in big cities.

PROPOSED SYSTEM

This design calls for an Arduino Mega pi as the microprocessor. It also calls for actuators, an infrared sensor, and a Pi camera. It is possible to direct the robot through the app, and the Arduino Mega Pi is always online. We are going to look at how an autonomous car is right now.

The robot will get Haggle wheels that are connected to an engine. We might use a mobile app to keep an eye on engine growth. There will also be a choice for how the video should progress in each part of the portable program. The switches will let you choose between "forward," "left," "right," and "stop." This means that hitting a certain button on the automaton will make it move. One camera and three IR sensors will be on the front of the robot. To record movies, a Pi Cam will be hooked up to the Raspberry Pi. After that, I'll put the movie on my web server. Two of the three infrared cameras on the back of the car will keep an eye on the race, and the third will be used to avoid obstacles. The engine driver circuit manages the self-governing vehicle's path and speed by adjusting pulse widths. The ultrasonic scanner helps the robot avoid obstacles. The devices are controlled by an Arduino MEGA, and an IoT module sends information about the vehicle's current state to the cloud. One more way that the Internet of Things is used is to handle systems that can work on their own. Voice orders sent over Bluetooth and server control can be used to limit the device. The C Standards Council put together Embedded C, a set of language extensions for the computer language C, to fix problems that can happen when using C extensions with different kinds of embedded systems. For embedded C programs to do important things like I/O, memory banks, and manipulating fixed-point numbers, they often need to use nonstandard C language features.

BLOCK DIAGRAM



4.HARDWARE TOOLS

- ARDUINO UNO
- ULTRASONIC SENSOR
- SERVO MOTOR
- L293D MOTOR
- RPS

ARDUINO UNO:

The Uno is the Arduino version that is used the most. Most of the time, when people say "Arduino," they mean this board. The Arduino Uno board is a popular choice among users and a great choice for people who are just starting out. There are a few different kinds of Arduino Uno. This paper shows the most recent version, which is often called Rev3 or R3.

This picture shows the Arduino Uno microprocessor module. The ATmega328 is the hardware that holds everything together. Outputs for PWM can be set up on six of the fourteen digital input/output lines. It also comes with an ICSP header, a reset button, a USB socket, a power port, a 16 MHz ceramic resonator, and six analog inputs. Each part works to help the computer do its job. It can be charged through a battery, a USB port on a computer, or an AC-to-DC charger.

ULTRASONIC SENSOR:

An ultrasonic monitor can be used to find out how far away an item is from a sound wave. A sound wave at a certain frequency is sent out and then waited for to return in order to figure out far away something is. It is possible to figure out how far away an item is from a sonar sensor by timing the time between sending and receiving sound waves.

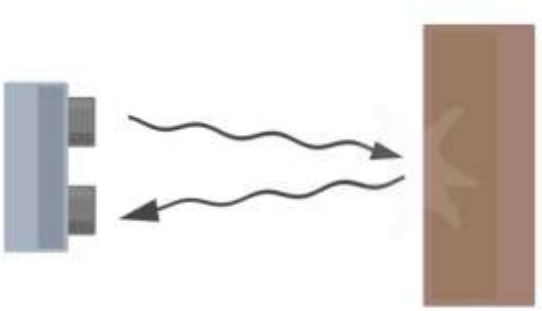


Diagram of the basic ultrasonic sensor operation

SERVO MOTOR:

You can tell a servo motor from any other type of motor by how precisely it can turn. One thing that this kind of motor usually has is a control system that tells you where the shaft is at all times. The servo motors can turn with amazing accuracy thanks to this input. This is used to move something a certain distance or angle. There is only a simple engine that works through a servo mechanism. One type of motor that works with DC power is the DC servo motor. An ASB motor is a type of servo motor that is powered by alternating current. DC servo motors will be the only thing that is talked about in this lesson. Additionally, there are many more types of servo motors than just these basic ones. These can be told apart by how their gears are set up and how they work. Because they use different combinations of gears, servo motors can make motors with very high power that are small and light. Toy cars, robotics, RC vehicles and airplanes, and other uses are all good for these parts because they have these qualities. The values for servo motors are given in kilograms per centimeter (kg/cm). 3 kg/cm, 6 kg/cm, and 12 kg/cm are the three most frequent loads that are put on toy servo motors. The measure of kg/cm shows how much weight the servo motor can carry over a certain distance. Hold a weight 1 cm above the servo motor's shaft to see if it can lift 6 kg. If it can, the motor is strong enough to handle 6 kg. As you move farther away from the engine, its load ability goes down. A servo motor's electronics are next to the motor. An electric pulse tells the electronics which way to move the motor.

Servo Motor Working Mechanism

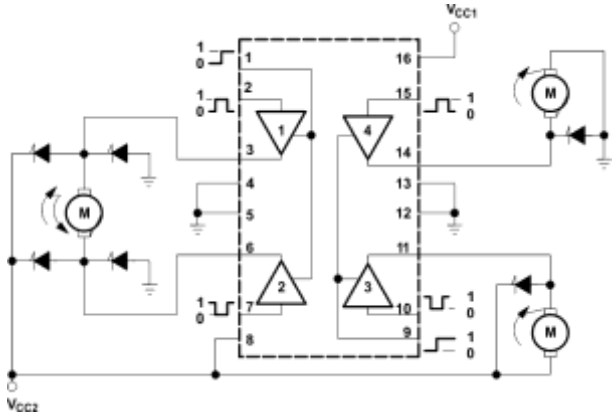
It consists of three parts:

1. Controlled device
2. Output sensor
3. Feedback system

For both motion and the final position of the shaft, a positive feedback system with a closed loop is used. In this case, the device is controlled by a signal that is made when the output signal is compared to a reference input signal. What the feedback system does is compare the input and reference signals to make the third signal. With this third signal, the computer is told how to handle an input signal. This signal will always be there as long as the feedback signal is present or as long as the reference input signal is different from the reference output signal. So, the main job of a servomechanism is to keep the system output at the right amount even when something goes wrong.

L293D MOTOR:

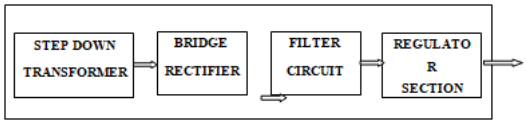
It is based on the idea of an H-bridge. H-bridge circuits let electricity flow in both directions. As you know, the motor can only turn clockwise or counterclockwise if the voltage changes way. Because of this, H-bridge ICs are perfect for powering a DC motor.



One H-bridge circuit is inside each L293D chip, and they can each turn a DC motor on their own. Due to its small size, it is widely used to power DC motors in robots. Here is a picture of how the pins on an L293D motor driver are set up.

POWER SUPPLY:

A regulated power source is needed for every digital circuit to work. In this lesson, we'll learn how to get a controlled positive supply from the mains supply.



5.CONCLUSION

A functional prototype was made that lets people use their smartphones to watch and change an automobile's settings and to drive it from a distance. The "THINGSPEAK" IoT platform was used to make configuration changes happen all the time. It's an IoT platform that lets Internet of Things apps grow and be tested without having to know how to code. This idea can move forward now that Google Maps shows the closest gas stop.

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