An autonomous vehicle using Arduino

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***Abstract*– This paper suggests a self-driving car model that is similar to a real self-driving automobile but is a more cost-efficient alternative. This model will assist students in comprehending how an actual autonomous vehicle operates. Some difficulties in the actual world can also be resolved using this technique. This model's logic and algorithm can be used to any other vehicle, such as a wheelchair, to make it autonomous and enable its user to control it independently. Additionally, a hardware architecture that can be modified depending on the situation is given.**

***Key Words*: Arduino, self-driving car,ultrasonic sensor, motor, batteries, object detection, obstacledetection**.

I. INTRODUCTION

Since recently, every automaker has been working to develop its own autonomous vehicle concept. Many have been successful in achieving some levels of autonomy and are planning to begin producing autonomous vehicles in a few years, which has attracted a lot of attention and discussion. Even if people are unsure about the autonomous concept and still feel a combination of enthusiasm and unease about it, they will either accept it or reject it based on how autonomous vehicles will affect things like safety and other factors. Both academics and analysts from many institutions and businesses around the world have already begun to think about the effects of driverless cars on carbon emissions, the number of cars per person, the safety of the passengers in the car, etc. and are offering their perspectives on the concept of driverless cars. To gain a bigger consumer base, self-driving cars will need to exceed current driving technologies. It will undoubtedly have a significant impact on transportation's timetable and entirely alter how people see emerging technologies.

II. LITERATURE SURVEY

The invention of autopilot aero planes was a significant stride in the history of humanity towards the automation of all types of vehicles[1]. This innovation has laid the groundwork for the development of self-driving car technology. Researchers have been trying to find a solution to the problem of creating driverless autonomous autos since 1920. Lihirrican Wonder employed radio antennas in 1926 to send radio impulses that were then picked up by the antennae. The antennae transmit the signal to the circuit breakers, which in turn drive the tiny electric motors that control the car's movement at every turn. This marked the beginning of the development of autonomous vehicles. Currently, Tesla has successfully put the idea of driverless cars into practice.
The paper [2]"Self-driving car to demonstrate real time obstacles & object detection." by Mayur Bhangale, Gaurav Dabhade, Akshay Khairnar, and Mamta Bhagat suggests a concept of an autonomous vehicle that uses an Arduino coupled with a Rasberry pi for processing. They used a camera with real-time image processing to find pathways, and an ultrasonic sensor to find obstructions.

Jianfeng Zhao, Bodong Liang, and Qiuxia Chen analyze the key technology of the self-driving car and highlight the state-of-the-art in their work titled "The key technology towards the self-driving car.[3]"
The author of the study "Autonomous Vehicles: Levels, Technologies, Impacts and Concerns" by Mohsin Raza has shown the many technologies that can be used in self-driving cars. Levels of IOT are used to categories these technologies. The author has also described the numerous effects and issues with self-driving cars.

In the paper [4]“Self-Driving and Driver Relaxing Vehicle” by Qudsia Memon, Muzamil Ahmed, Shahzeb Ali,Azam Rafique Memon, Wajiha Shah. This paper states a model of self driving car which uses a GPS module along with a GSM module. This model analyses another car in front of itself and analyses it’s movements. So it keeps following the another car with the help of ultrasonic sensor.
Type of a Bluetooth Enabled automaton Application for a Microcontroller Driven mechanism by Vito M. Guardi, (May 2014).[6]the aim of this project is to create a voice-controlled robot car. A Bluetooth module, motor drivers, and an Arduino microcontroller are used in the operation. Open-source hardware called Arduino (single-board microcontrollers and kits) is used to construct digital gadgets. The plan is to initially design the Robot Car's hardware before using our prior programming experience to develop the entire system. The software (IDE) will then simulate the code before allowing it to connect with the hardware.

III.COMPONENTS AND DESIGN

Arduino Uno:

This particular microcontroller is compatible with the ATmega328P. It is utilized to process the sensor data and send precise commands to the actuators based on the input it receives.

Fig :1. Arduino Uno Board

DC Motor:

The most typical kind of motor is a DC motor, or direct current motor. Typically, DC motors only have two leads: a positive lead and a negative lead. The motor will turn if you connect these two lines straight to a battery. The motor will turn in the opposite direction if the leads are switched. Since a DC motor needs more current than an Arduino pin can provide (40mA), we use a motor driver. It functions similarly to a current amplifier, driving the motor in response to signals from the Arduino.

Fig 2: DC Motor

Ultrasonic Sensor:

An ultrasonic sensor is a sensing device that uses ultrasonic waves to estimate the distance of an item around it.

Fig : 3 : Ultrasonic Sensor

IR Sensor

The heat and motion of a target can also be detected or measured using these sensors.

When an object passes in front of the IR sensor, it outputs an electrical signal. The Arduino can determine whether or not there is an obstruction by using the electrical signal being emitted.

Fig 4: IR Sensor

IV.METHODOLOGY

The primary requirement for the vehicle movement, as shown in the diagram in fig. 5, will be distance, which will be determined with the aid of an ultrasonic sensor.

In order to determine whether it will travel forward, backward, left, right, or halt, it will specify the distance. Since the ultrasonic sensor is connected to Arduino Uno, this increases the degree of freedom of the ultrasonic sensor. As a result, the ultrasonic sensor

will adjust its course in accordance with the distance to its left and right. The Ultrasonic Sensor the detects the object and it gives the intimation to the Arduino Uno and it also calculates the distance of the object and sends the result to the Arduino Uno and intern gives the signal to the buzzer.
The IR sensor is been used to detect whether the person is been present in the vehicle or not and intimates the user.
The DC motor is been connected to the H-Bridge which is in turn used to connect the two front wheels and the two back wheels which are used for the movement of the vehicle and the motor is used to rotation of the wheels. The motor is connected to the Arduino board and when the signals are been passed from the board the motor accordingly makes the movement of the wheels.

The vehicle is been connected to the users handset or the mobile through the Bluetooth where the Arduino is been connected through it and when the vehicle starts first the IR sensor senses for the any person who are been placed in the driving seat and if found it will detect and sends the message to the phone through the phone and if it does not detect any person then it will send a message as the driver not detected.

Once the IR sensor sends its intimation then the dc motor will start its work and then when the instruction is been given by the user through the phone according to that instruction the motor starts to rotate the wheels. The user can give left, right, front, back and stop instructions through the phone and it works accordingly. If the IR sensor which is placed in front and the back of the vehicle as shown in the vehicle if it detects any obstacles it stops the wheels from the movement and then gives the buzzer sound and stops the vehicle until the next instruction is been given.

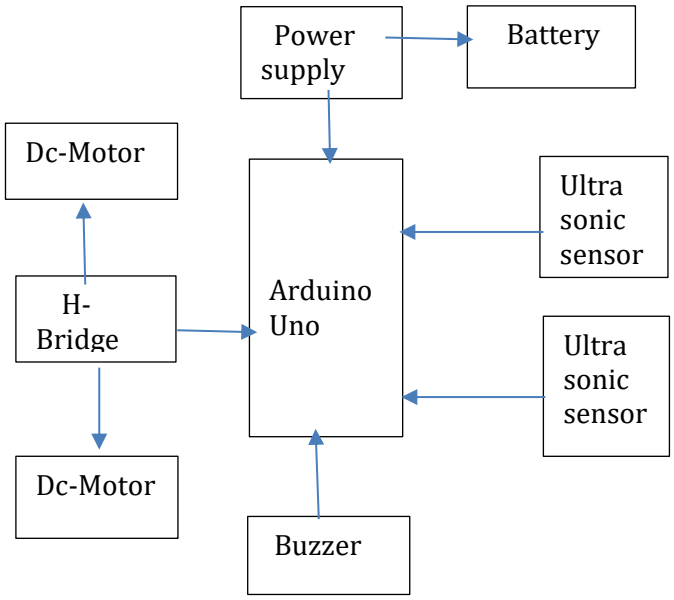

Fig 5 : Block diagram of autonomous vehicle

As shown the block diagram the components are been attached as shown in figure 5 and where all the components are been connected to the Arduino Uno board and the connection as shown.

V.RESULTS AND DISCUSSIONS

The project has been evaluated and is shown in figures 3, 4 to be operating without any issues. When the switch is turned on, the ultrasonic sensor begins gathering information about its surroundings and transmits it to the Arduino. The data is gathered and processed by the Arduino. Following processing, it communicates with the DC motors. In response to the commands given by the Arduino, the DC motors assist the vehicle in moving.
The closest object's distance will be first determined by the car using code. If the distance meets the criteria specified in the code, it will determine whether to shift the direction to the right or left or even inward the backward direction and sense for the objects again.

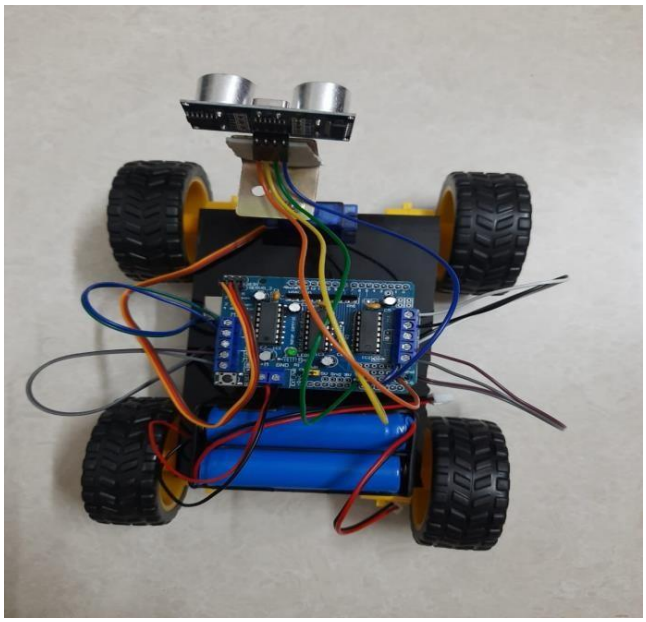

Fig 6 : Top view of the car

VI.CONCLUSIONS

According to all the results discussed in this paper, we conclude that the car uses ultrasonic sensor to calculate the distance and detect the obstacles around it and is also capable of taking it's own decisions regarding changing the directions to make a movement. The vehicle routes itself with the help of input from the ultrasonic sensor. The input from the ultrasonic sensor is passed to Arduino where it is processed and then the commands by the Arduino are passed to the motors. In this way the car operates and takes decisions to move in any of the directions.

REFERENCES:

1. Mayur Bhangale, Gaurav Dhabade, Akshay Khairnar, Mamta Bhagat "Self Driving car to demonstrate real time obstacles and object detection" International Research Journal of Engineering and Technology Volume 03 Issue: 11 Nov-2016.
2. Mohsin Raza "Autonomous Vehicles: Levels, Technologies, Impacts and Concerns" International Journal of Applied Engineering Research Volume 13, Number 16 (2018).
3. Jianfeng Zhao, Bodong Liang, Quixia Chen "The key technology towards self-driving car" IJIUS 2017.
4. Shahzeb Ali, Azam Rafique "Self-Driving and Driver Relaxing Vehicle" ICRAI November-2016
5. Shubh Srivastava, Rajanish Singh "Voice Controlled Robot Car Using Arduino" International Research Journal of Engineering and Technology Volume: 07 Issue: 05 May 2020
6. Type of a Bluetooth Enabled automaton Application for a Microcontroller Driven mechanism by Vito M. Guardi, (May 2014).
7. Automaton Controlled Mobile mechanism by Jorge KazacosWinter, (July2013).
8. Automaton based mechanism Implementation for decide and Retain of Objects By Ranjith Kumar Goud, B. Santhosh Kumar, (Oct 2014). sensible phone based robotic management for investigating applications By M.Selvam,(IJRET 2014).
9. Dominant a mechanism victimization automaton Interface and Voice by Kishan rule kilocycle per second, (2012).
10. Motion management of wheeled Mobile mechanism by GyulaMester, (SISY 2006).
11. Type of PI and inflammatory disease Controllers with Transient Performance Specification by J. C. Basilio and S. R. Matos, (IEEE 2002).
12. mechanism management vogue supported Smartphone by Xiao lutecium, Wenjun Liu, Haixia Wang, Qia Sun, IEEE, 978-1-4673-1382, pp2820-2823, Jun 2013.