INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact Factor: 6.078
(Volume 7, Issue 3 - V7I3-1607)
Available online at: https://www.ijariit.com

Autonomous car using ultrasonic sensor, Arduino controller

Kaushal Darji
kaushaldarji7182@gmail.com
Thakur Polytechnic,
Mumbai, Maharashtra

Abdur Razzaq Qureshi
qureshiabdurrazzaq2002@gmail.com
Thakur Polytechnic,
Mumbai, Maharashtra

Vinit Bhosale
vinitbhosale1092002@gmail.com
Thakur Polytechnic,
Mumbai, Maharashtra

Harshit Dubey
harshitdubey320@gmail.com
Thakur Polytechnic,
Mumbai, Maharashtra

Manish Salvi
manish.co@tpoly.in
Thakur Polytechnic,
Mumbai, Maharashtr

ABSTRACT

This project is will provide information about An Autonomous Car which is developed by using Arduino Uno Micro Controller with Ultra Sound technology supported with a servo motor. This robot will be able to move on its own and can turn left and right if it detects an object in front of it. The robot and its components get commands from a program written in C++ language. The robot is initially at rest and sends ultrasonic sounds from its sensor and receives it and returns the distance it founds in front of it. If the distance is not enough or it's is very less the robot moves a little back and then the servo motor rotates the ultrasonic senor first to the right of the robot and then the ultrasonic sensor calculates the distance of the right. Then servo motor again gains its original position the turns left. The ultrasonic sensor again calculates the left distance and returns both left and right distance. then the robot to direction in which it gets maximum distance.

Keywords: *Microcontroller , Ultrasonic sensor , Arduino, Encoder*

1. INTRODUCTION

The Autonomous Car is an Automated Car Which Is driven by using an Arduino, a 9V battery to power the Arduino circuit, A pair of Stepper motor, a 12V rechargeable battery, an Ultrasonic Sensor, a servo motor and a motor driver. This robot is fully automated and very efficient in doing its job. Since the world is getting with automation this model is really a very good and necessary in one's daily routine. Cause it's up of Arduino and ultrasonic sensors. it's very much efficient because it has no effect to the nature and surrounding. Also, the ultrasound produced by the ultrasonic sensors has no effect to any living being as well as the nature. This robot is very much fast and compatible to all the other automated robot which is strong and also necessary. This robot can drive itself and automatically, it can look left and right by itself, it can move left and right, front and back by itself and also it can read the distance from the front, right, left all by itself. This Fully automated robot is easy to use, code and understand the working of all its components thus making it very much reliable rather than any other vehicle. The following is a basic block diagram of Autonomous Car

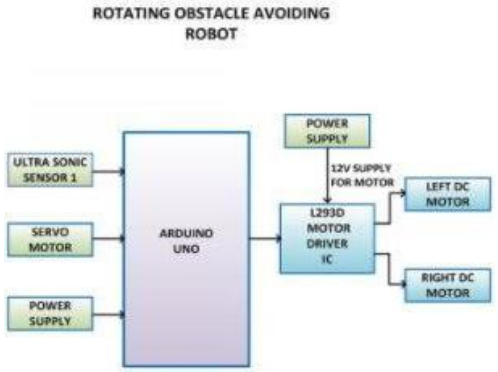

Fig 1: Basic Block diagram

2. SYSTEM DESIGN

The robot continues to move in its forward direction unless and until it encounters an objects in the front. the robot is able to detect the object with the use of ultrasonic sensors. As the sound is a very fast source the robot emits sounds periodically and multiple times in a very less amount of time i.e., less than a second technically a millisecond or a nanosecond. these rays are bounced and deviated to the sensor if an object is encountered in its front and sends the robot a message to stop the robot then has a servo motor just right underneath it. it moves the ultrasonic sensor the right and left to get the distance the motors underneath the chassis rotates in a way that makes the robot moves and turn left and right.

3. ELECTRICAL CIRCUIT DESCRIPTION

The circuit consist of an arduino uno, an ultrasonic sensor, a servo motor, a pair of stepper motor, a motor driver (for stepper motor), and a 12v and 9v battery. the arduino has pins number which eventually decides whether a component is an

input or an output. The robot works with the commands provided by the circuit which is programmed in computer using C++ language and its Libraries. Since C++ is a very fast programming language a well compatible by the arduino board the robot doesn't needs much time to follow these commands.

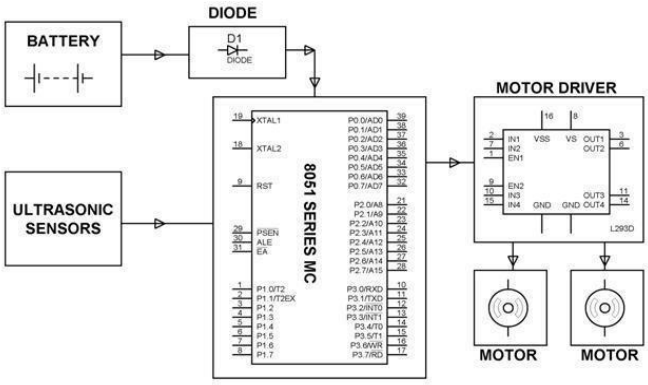

Fig. 2: Circuit Diagram for autonomous car

3.1. Arduino Uno

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

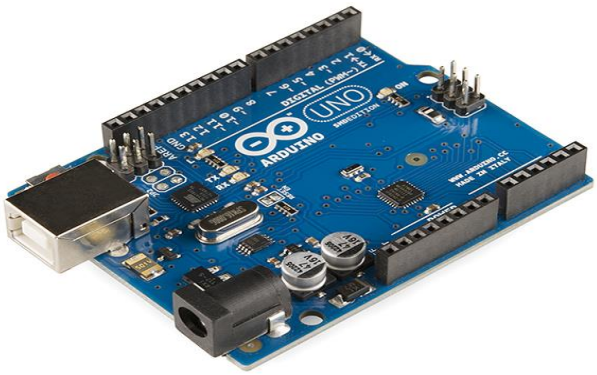

Fig. 3: Arduino Uno R3

3.2. Ultrasonic Sensor

The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar. It's ideal for any robotics projects you have which require you to avoid objects, by detecting how close they are you can steer away from them! The HC-SR04 uses non-contact ultrasound sonar to measure the distance to an object, and consists of two ultrasonic transmitters (basically speakers), a receiver, and a control circuit. The transmitters emit a high frequency ultrasonic sound, which bounce off any nearby solid objects, and the receiver listens for any return echo. That echo is then processed by the control circuit to calculate the time difference between the signal being transmitted and received. This time can subsequently be used, along with some clever math, to calculate the distance between the sensor and the reflecting object!

Fig-4 Ultrasonic Sensor HC-SR04

3.3. SERVO MOTOR

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

The motor is paired with some type of position encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

Fig-5 Servo Motor

3.4. L293D MOTOR DRIVER MODULE

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC

motors. Given below is the pin diagram of a L293D motor controller.

There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

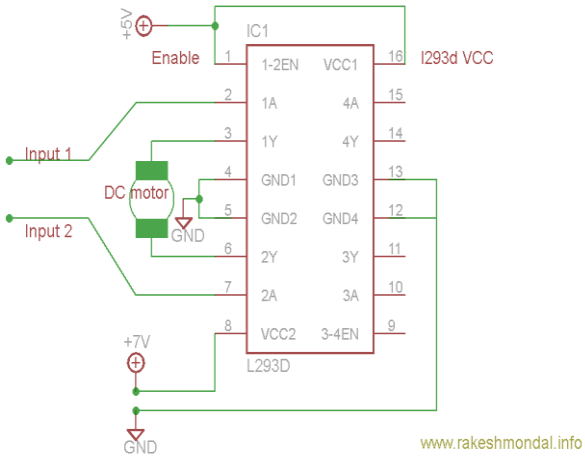

Fig-6 L293D Motor Driver

3.5. Atmega 328P Module

ATmega328P is a very advance and feature rich microcontroller. It is one of a famous microcontrollers of Atmel because of its use in arduino UNO board. It is a microcontroller from the Atmel's megaMVR microcontrollers family (Later in 2016 the Atmel is obtained by Microchip Technology Inc, the microcontrollers manufactured in megaMVR family are designed for handling larger program memories and each microcontroller in this family contains different amount of ROM, RAM, I/O pins and other features and also, they are manufactured in different output pins which are from 8 pins to hundreds of pins.

The internal circuitry of ATmega328P is designed with low current consumption features. The chip contains 32 kilobytes of internal flash memory, 1 kilobytes of EEPROM and 2 kilobytes of SRAM. The EEPROM and the flash memory are the memories which saves information and that information still exits the power is disconnected or off but the SRAM is a memory which only saves the information until the power is supplied and when the power is disconnected all the information saved in SRAM will be erased.

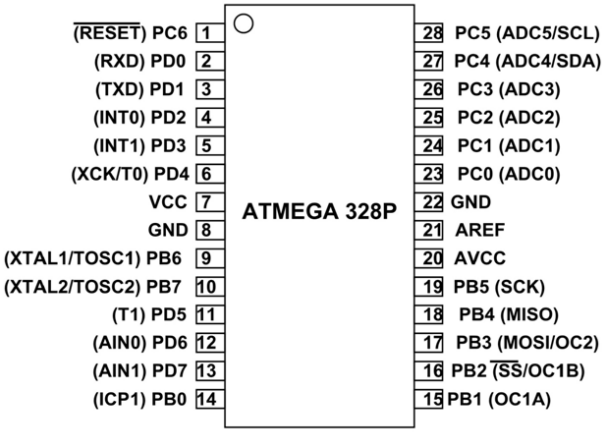

Fig. 7: Atmega 328P IC

4. WORKING PRINCIPLE

This project works on the principle of ultrasonic sounds. Whenever the robot encounters an object in front of it the ultrasonic sounds detect the obstacle and sends signal to the circuit. This signal is then pushed to the Arduino. the Arduino then search for the solution that we have created in our program and burnt in the Arduino. the Arduino then signals the stepper motor to look first at the right side at an angle 'a'. As soon as the motor turn and completes its 'a' angle the Arduino signals the ultrasonic sensors to trigger the waves and record the distance. the Arduino signals the servo motor come back at initial position. Then The Arduino signals the servo motor to look at left position at an angle of a. As soon as the servo reaches at a, Arduino triggers the ultrasound to again send the waves and calculate distance. When the Arduino gains the distance of the left and right direction the Arduino calculates the maximum length of both directions. if Arduino gets the left direction length as maximum the Arduino will trigger the right motor to move back and left motor to move front and vice versa. This process will keep on going forever which eventually make the robot move and work.

5. APPLICATION

- Obstacle Avoidance
- Autonomous Car

6. CONCLUSION

Thus, we made a project which runs automatically detects an object in front of it looks left and right and calculate their distance. then runs in which it gets the maximum distance. The project also gave us information about coding in C++, building algorithms and flowchart which eventually made our project working better and fine.

7. REFERENCES

[1] Autonomous car. (n.d.). Retrieved April 19, 2016, from https://en.wikipedia.org/wiki/Autonomous_car#cite_note-4

[2] Computer History. (2016, February 19). Behind Google's Self-Driving Car Project. [Video File]. Retrieved from https://www.youtube.com/watch?v=GCg4VWU2pE0

[3] Davies, A. (2016, February 29). Google's self-driving car caused its first crash. Retrieved April 19, 2016, from http://www.wired.com/2016/02/googles-self-driving-car-may-caused-first-crash/

[4] Fung, B. (2014, May 28). The future of Google's driverless car is old people. Retrieved April 19, 2016, from https://www.washingtonpost.com/news/the-switch/wp/2014/05/28/the-future-of-googles-driverless-car-is-old-people/

