

Obstacle Avoidance Robot using Ultrasonic Sensors

Lalit Rana¹ Arun Rati² Manish Kumar³ R.K. Chauhan⁴

^{1,2,3}Student ⁴Professor

^{1,2,3,4}IMS Engineering College, Ghaziabad India

Abstract— This paper is all about an obstacle avoidance robot that is controlled by ultrasonic sensor. The robot uses ultrasonic sensor and it is controlled by Arduino microcontroller. The Arduino board was selected as the microcontroller platform and its software counterpart, arduino software, was used to carry out the programming. Ultrasonic sensor fixed in front of the robot. The sensor gets the data from surrounding area through sensors fixed on the robot. The sensor senses the obstacle and gets deviate its path to choose an obstacle free path. The sensor will be sending the data to the controller is compared with controller to decide the movement of the robot tires. The hardware used in this project is widely available and inexpensive which makes the robot easily replicable.

Key words: Obstacle, Microcontroller, Ultrasonic Sensor, Arduino, DC Motor

I. INTRODUCTION

This project is based upon the obstacle avoidance robot using ultrasonic sensors for its movement. An Arduino uno is used to myriad the desired operation. A robot is a machine that can be perform task automatically. Robotics is generally a computational intelligence and physical machines (motors). Computational intelligence involves the programming instructions. The project proposes robotic vehicle that had intelligence built in it such that it guides itself whenever an obstacle comes ahead of it. This robotic vehicle is built, using Arduino uno. An ultrasonic sensor is used to detect any obstacle in front of it and sends a command to the Arduino. In today's era of world robotics is a fast growing and interesting field. Robot has sufficient very high intelligence to cover the maximum area of provided space. Autonomous Intelligent Robots are robots that can be perform tasks in unstructured environments without continuous human guidance. The obstacle detection is primary requirement of autonomous robot. The robot will gets the information from surrounding area through sensors on the robot. Some sensing devices mostly used for obstacle detection like infrared sensor, ultrasonic sensor etc. Ultrasonic sensor is most suitable for obstacle detection and it is of low cost and having very high ranging capability.

II. PURPOSE

The purpose of our research is to provide simple rob computational platforms so the robot's designer can focus on their research and tests instead of sensors like ultrasonic sensors and arduino. The simpler architecture out's hardware architecture but with powerful co is also useful for educational robotics because students can build their own robots with low cost and use them as platform for experiments in several course.

The following list shows typical robot control architectures:

A. Arduino Uno

Arduino uno is a microcontroller board based on the ATmega328P (datasheet). There are 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack an ICSP header and a reset button in arduino uno.

B. Atmega 328P-PU

Atmega328 is a single chip microcontroller created by ATMEL in the mega AUR family A common alternative to the ATmega328 is the "pico power" ATmega328P. The most common implementation of this is on the popular Arduino development platform, namely the Arduino UNO or Arduino Nano models.

C. Atmega 328P pin diagram

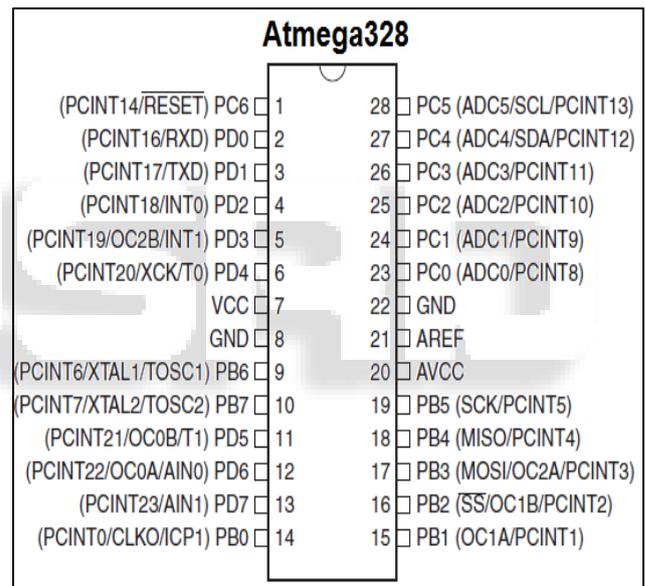


Fig. 1: Pin Diagram of ATMEGA 328P

D. Motor Drive module (L293D)

The L293N H-bridge module can be used with motors that have a voltage of between 5 and 35v dc. The module used in this project, there is also an onboard 5V regulator, so if your supply voltage is up to 12V you can also source 5V from the board.

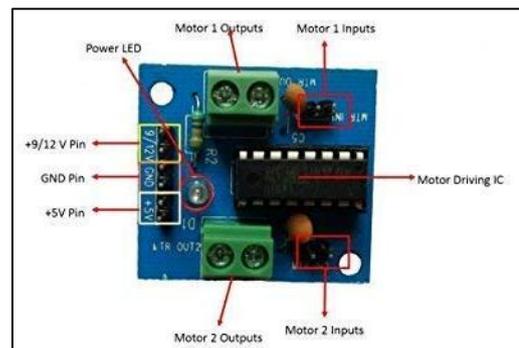


Fig. 2: Motor Drive (L293D)

E. Servomotor

A servomotor is an electrical device which can be push or rotate an object with high precision. If we want to rotate and object at some specific angles or distance, then we have to use servo motor. It is made up of simple motor which run through servo mechanism. It may be DC or AC servo motor. We will get a very high torque servo motor in a small and light weight packages. Due to these features they are being used in many robotics applications.



Fig. 3: Servomotor

F. DC Motor

A DC motor is a class of a rotary electrical machines that will convert DC electrical energy into mechanical energy. The most common types of relay on the forces produced by magnetic fields. Nearly almost all types of direct current motors have internal mechanism, either electromechanical or electronic current flow in all part of the motor. Small motor applications includes motor used in automobiles, robots, hand power tools and food blenders.



Fig. 4: DC Motor

G. Ultra sonic sensor

Ultrasonic sensor is used at robot side. Ultrasonic transmitter continuously transmits ultrasonic rays and receiver receives the rays when wave strike on obstacle and reflect back. Ultrasonic sensor will fitted in front of robot. Robot will provide command signal to the user, when any obstacle come in between robot path, it will change its path. If any obstacle is detected then robot unit send alert signal to transmitter side through Bluetooth module.



Fig. 5 Ultrasonic Sensor

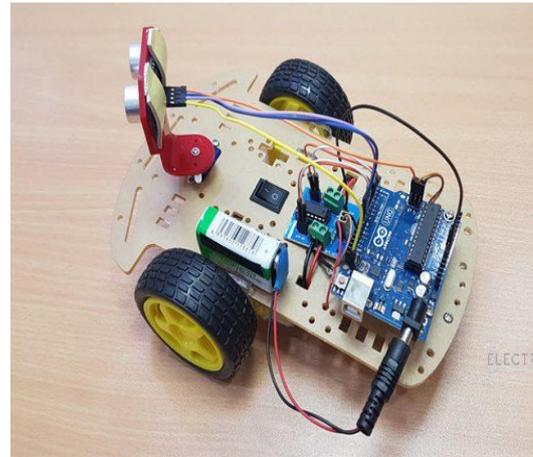


Fig. 6: Actual Robot

III. BLOCK DIAGRAM

The block diagram as shown in figure:

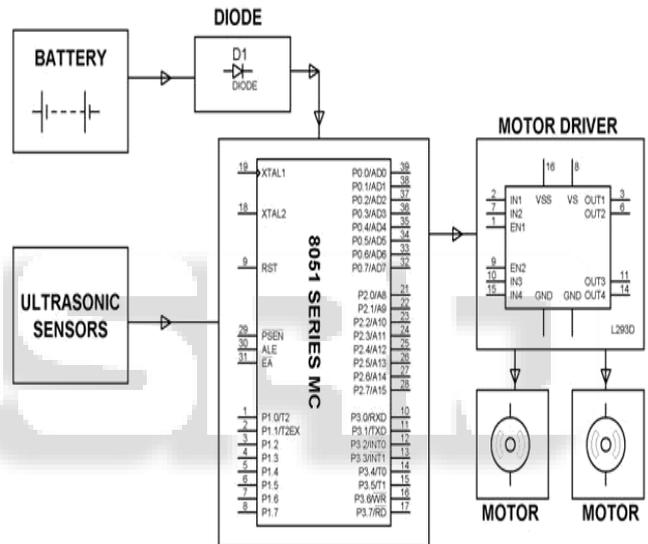


Fig. 6: Block Diagram of Robot

A. Application

- Automatic change over's of traffic signals
- Intruder alarm system
- Counting instruments access switches parking meters
- Back sonar of automobiles
- Obstacle avoiding robots can mostly use in all mobile robot navigation systems.
- They can be used for household work like automatic vacuum cleaning.
- They can also be used in dangerous environments, where human penetration could be fatal.

IV. CONCLUSION

In nowadays, world is leaned towards technology and internet and as everything is connect to internet it can be accessed by anyone on the planet at any time if he or she has valid credentials. It made it easy for person to monitor any machine, hardware or almost anything remotely which is the main advantage internet Enabled robotics as we can use in our project in near future. The Arduino controller and

ultrasonic sensor were studied and the HcSR-04 ultrasonic sensor was selected, as the controlling result is satisfying for its use in the automobile prototype system being developed. It was used to sense the obstacle and avoidance them.

REFERENCES

- [1] Johann Borenstein and Yoram Koren "Obstacle Avoidance with ultrasonic sensors" IEEE Journals of Robotics and Automation, Vol.4, No.2, April 1998.
- [2] Vaghela Ankit, Patel Jigar, Vaghela Savan "Obstacle Avoidance Robotic Vehicle Using Ultrasonic Sensor, Android And Bluetooth For Obstacle Detection" International Research Journal of Engineering and Technology (IRJET) ISSN: 2395-0056, Volume-3, Issue-2, Feb 2016.
- [3] Z. M. Liu Xuan and L. Wei, "Methods of modular robot design," in Proceedings of Second International Symposium on Intelligent Information and Technology Application, Dec 2008, pp. 663-668.
- [4] Chatelais Q., Vultur H, and Kanellis E., "Maze Solving by an Autonomous Robot", Aalborg University, 2014.
- [5] R. Vairavan , S. Ajith Kumar, L. Shabin Ashiff "Obstacle Avoidance Robot Vehicle using ultrasonic sensor and Arduino controller" International Research Journal of Engineering and Technology (IRJET) ISSN: 2395-0056, Volume-5, Issue -2 , Feb 2018.

