NOVATEUR PUBLICATIONS
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN No: 2581 - 4230
VOLUME 10, ISSUE 5, May - 2024

KIT4 CURIOUS ULTRASONIC BASED OBSTACLE AVOIDING ROBOT

Mr. Pramod Basavraj Birajdar
Project Guide: Ashwini A. Dhavale
Student's, Department of Electrical Engineering
V.V.P. Institute Engineering college, Solapur, INDIA

ABSTRACT
This project involves the design and implementation of an intelligent obstacle-avoiding robot car. The objective of this project is to implement a robot car, which while moving should have the ability to detect obstacles in its path and change direction where obstacles are present without any form of external influence. The new direction to be taken to avoid collision is the direction that has the most distance between the obstacle and the sensor and this is determined by the robot based on sensor inputs. This implementation was done using an ultrasonic wave sensor, which measures distance by sending pulses. Also, the movement of the servo motor (for sensor movement) and the DC motors (for wheel movement) are controlled by the motor driver shield in order to enable the obstacle avoidance function. The commands are sent to the Arduino microcontroller chip which serves as the main control of the robot car, as it controls the sensor and car movement. The implemented robot car was able to successfully detect and avoid obstacles within the line of sight of the Ultrasonic sensor used.

1. INTRODUCTION

In our world today, ROBOTICS is a very interesting research area, which is fast growing as it is the simplest way for modifying modern day technology. Robotics plays a major role in technology advancement, which is why I decided to work on the robotics field and design something intelligent to make human life simpler. An autonomous robot is one which can move without any external interference in an environment which is unstructured and unknown to the robot. The robot is able to do this because of the software intelligence embedded inside it in order for it to be able to sense the environment, detect any obstacle which is in its path and move round the environment by avoiding these obstacles [1]. In the designing of an autonomous robot, there are many robotic designs that can be used. To make a selection of the design to be used, the main factor to be put into consideration is the physical environment in which the robot will be operated. Examples of autonomous robots: walking robots, drones, robotic cars, and snake robots. The obstacle avoiding robot has enough intelligence in order for it to cover the maximum area of the space provided and it has an ultrasound sensor which is used to detect any obstacles in the path of the robot, after which it will move in a direction to avoid the obstacle. The main aim of such technology is that it can play a huge role in today's transportation as it can be used to avoid accidents, which generally happen on congested roads by applying emergency brake. If this technology is used in a car, it will automatically sense any objects (living things or objects) in the path of the car and automatically apply breaks or take a side to the available free space where necessary.

2. Methodology of Project

The robot uses the Ultrasonic sensor to measure the distance in front of it then it moves. As the distance reduces, the robot interprets it as the presence of an bstacle. As soon as the robot detects the obstacle, it stops and moves back a few cm then looks left and right before moving to a free path.

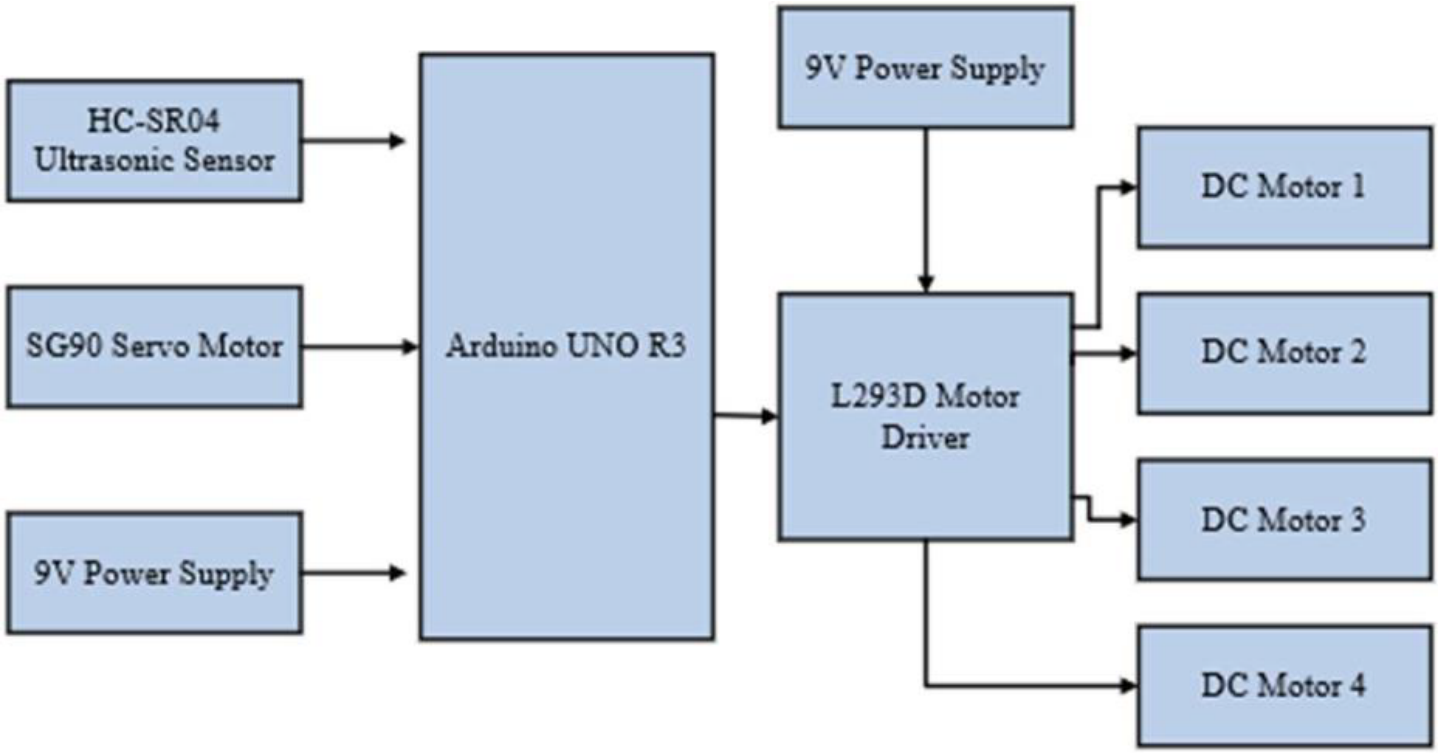
3. Objective of the Project:

The Aim of this project is to design and implement a robot car that is able to move round an unknown environment without running into obstacles in its path.

The Objectives of the project are as follows:

- The robot car should have the capacity to detect obstacles in its path based on a predetermined threshold distance.
- After detection of an obstacle, the robot should be able to change its direction to a relatively open path by making an autonomous decision.
- The robot car should not require any external control during its operation. The robot car should be able to measure distance between itself and an obstacle in real time. •
- The robot car should be able to operate effectively in an environment which is unknown to it.

4. Block Diagram:

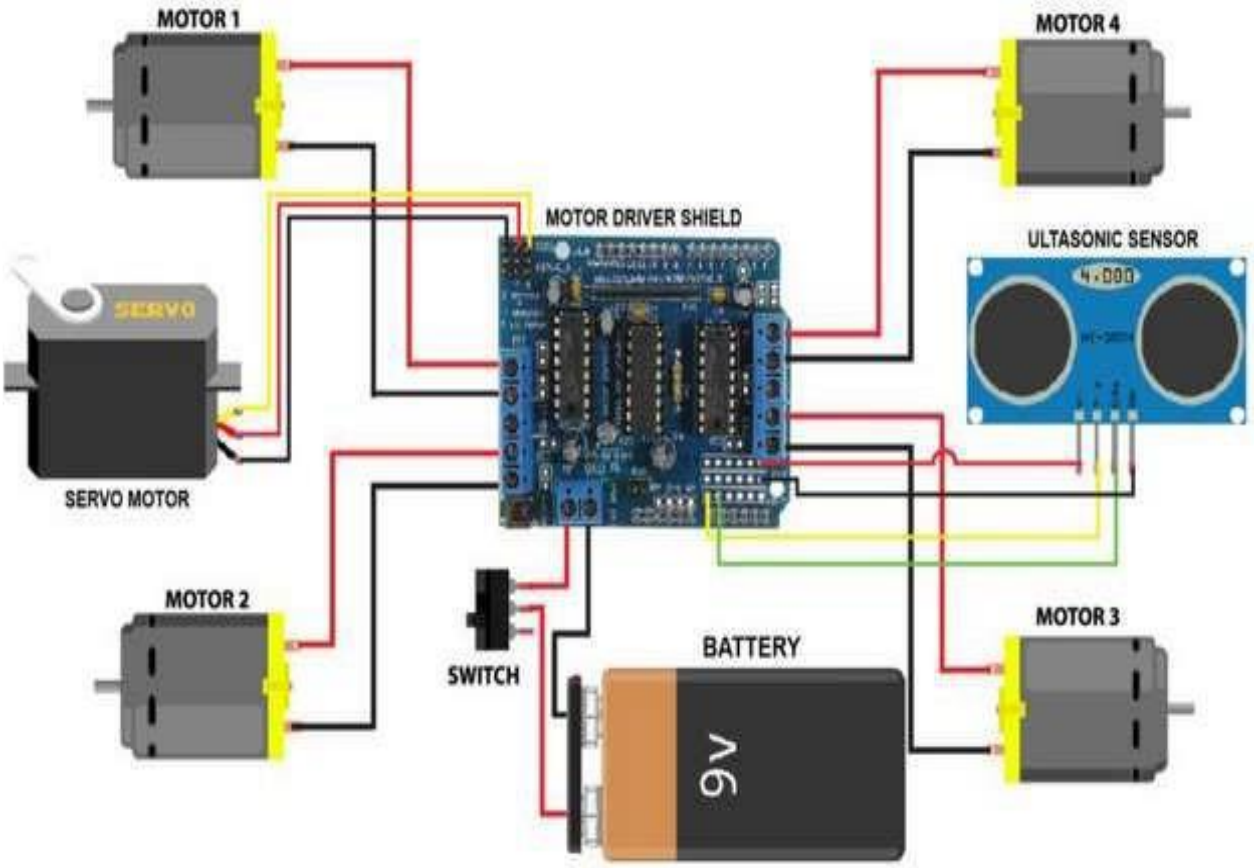


5. Working:-

At first, the robot is given a forward direction to move and the input is set to low for Trigger pin as well as the Echo pin of the ultrasonic sensor. When the ultrasonic sensor detects the reflected waves, the object is said to be in front of the robot and the echo pin goes high. Instantly after the echo pin goes high

the timer starts and will stop when the echo pin goes low. The sensor will give the output in milliseconds and the distance between the barrier and the robot is calculated. Depending on the distance, the direction of the motor is determined. If the distance is not too small, then the robot will turn left as default if there is no barrier or obstruction in the left direction. If the distance is small the speed of the robot will decrease, eventually, it moves in the backward direction and turns left/right depending on whether the barrier or obstruction is present on the left. Actuators are responsible for changing the direction of the robot, to which the power is given by the driver module through Arduino microcontroller using different combinations of input for each direction into a set of four pins.

6. CIRCUIT DIAGRAM



7. Heart of Project :

7.1. Arduino UNO

Arduino UNO is a microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

7.2. Specifications:

Microcontroller	Atmel ATmega168 or ATmega328
Operating Voltage (logic level)	5 V
Input Voltage (recommended)	7-12 V
Input Voltage (limits)	6-20 V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	8
DC Current per I/O Pin	40 mA
Flash Memory	16 KB (ATmega168) or 32 KB (ATmega328) of which 2 KB used by bootloader
SRAM	1 KB (ATmega168) or 2 KB (ATmega328)
EEPROM	512 bytes (ATmega168) or 1 KB (ATmega328)
Clock Speed	16 MHz
Dimensions	0.73" x 1.70"
Length	45 mm
Width	18 mm

8. Future Scope:

This project can be enhanced with the use of a more specialized development board. A camera can replace the ultrasonic sensor for better accuracy and precision. Even the structure can be replaced to further improve mobility. The basic principles of the project can also be applied to Unmanned Aerial Vehicles which can then be used for surveillance and military applications.

9. Conclusion:

The obstruction avoiding robot has the ability to detect obstructions and avoid obstacles and barriers. The robot is built using the Arduino UNO development board and its IDE which helped communicate with the robot. The obstruction avoider uses an ultrasonic sensor seated on a servo motor to get a wider field of view. The Arduino helps achieve the autonomous navigation of the robot.

References

1. Crisp, J. (2004). Introduction to Microprocessors and Microcontrollers. Oxford: Newnes.
2. Hall, D. (2005). Microprocessors and Interfacing. New york: Tata McGraw Hill Education Private Limited.
3. M. Saravanan, N. S. (2010). Microprocessors and Microcontrollers. Oxford: Oxford University Press.
4. Monk, S. (2017). Electronics Cookbook. California: O'Reilly Media, Inc.
5. Murphy, R. R. (2000). Introduction to AI Robotics. Massachusetts: MIT Press.
6. Paul, O. (2019). Robotics. Retrieved from https://www.sciencedirect.com/topics/engineering/robotics.
7. What is robotics? (2019). Retrieved from https://builtin.com/robotics.

8. Adam, A. (2019). Robotics. Retrieved from https://www.britannica.com/technology/robotics.
9. Artificial Intelligence. (2018). Retrieved from https://builtin.com/artificial-intelligence.
10. Rouse, M. (2020). What techtarget is artificial intelligence. Retrieved from https://searchenterpriseai.com/definition/AI-Artificial-Intelligence.