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Obstacle Avoiding Car

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Abstract: ***This research discusses an ultrasonic sensor-controlled robot vehicle that can avoid obstacles. The robot is constructed with an ultrasonic sensor, and an Arduino microcontroller is used to operate it. Ultrasonic sensor mounted on the robot vehicle's front end. Through sensors that are attached on the robot, the sensor receives data from its surroundings. The sensor detects the obstruction and changes its course to choose a path devoid of obstacles. The sensor will be send the data to the controller is compared with controller to decide the movement of the robot Wheel. The robot wheel's movement and direction will depend on the wheel encoder and an ultrasonic sensor for sensing. This vehicle is employed for obstacle detection and collision avoidance. We have programmed the controller to be used with ARDUINO SOFTWARE***
Keywords: Arduino UNO, Motor Shield, ATMEGA 328P-PU, Motor Driver Module, Ultrasonic Sensor, Servo Motor.

I. INTRODUCTION

The goal of the project is to create a robotic vehicle that can avoid obstacles by employing ultrasonic sensors to guide it. In order to carry out the requested operation, an Arduino Uno is used. A machine that can complete tasks autonomously is a robot. Robotics is generally a combination of computational intelligence and physical machines (motors).Computational intelligence involves the programmed instructions. The idea suggests creating a robotic vehicle with built-in intelligence that can self-direct when an obstacle is in its path. An Arduino Uno is used to construct this robotic car. Any obstruction in front of it is detected by an ultrasonic sensor, which then instructs the Arduino. Robotics is a rapidly expanding and fascinating field today. Robots are intelligent enough to occupy the most space possible. Robots that are autonomous and intelligent can do desired tasks in unstructured conditions without constant human supervision. The fundamental requirement for this autonomous robot is obstacle detection. Through mounted sensors, the robot gathers information about its surroundings.

II. LITERATURE SURVEY

Following are some facts that are based on a thought analysis of various authors' works and are revealed in this area of the literature study.

1) He Kezhong in 1996, An autonomous Robot was developed in house for outdoor applications and demonstrated on road-following with obstacle avoidance task at an average speed of 3m/s. Here the computer vision ie. Ultra sonic sensor are used in the robot of road following and obstacle avoiding

2) Gopalkrishnan in 2004 have developed Methodology for design and development of an Autonomous Robot for implementing intelligent behaviours, with the help of microcontroller interfaced & Sensor. The component of robot were microcontroller, control software, Sensors & Actuators. The controller is generally based on microcontroller or personal computer .

3) Jang ping sheu in 2005 have proposed a sensor network consisting of both static and mobile nodes in a distributed network system. They have design a smart Robot and implemented it for nodes replacement task in distributed network

4) IoanDoroftei in 2007 have proposed some information about conventional and special wheel called Mecanum Design. One of the primary requirements of an autonomous robot is its capacity to navigate the working environment while dodging obstacles and moving on to the next site.

5) Kunhsiangwu in 1999 have proposed path of planning method using fuzzy logic control with potential field approach for Automatic Guided Vehicle design and implementation with image processing technique.

III. OBSTACLE AVOIDANCE SYSTEM

Obstacle avoidance in robotics is the process of achieving a control goal while adhering to nonintersection or non-collision position limitations. It is a popular issue in unmanned aerial vehicles. The growing demand for the employment of unmanned aerial vehicles in urban environments, particularly for military applications where they can be very helpful in city conflicts, is what is crucial about the obstacle avoidance concept in this field. Obstacle avoidance is typically thought of as being distinct from route planning because the former typically entails the pre-computation of an obstacle-free path that a controller will later use to direct a robot along.

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A good and reliable obstacle avoidance function of a driverless platform is also necessary to have a robust obstacle detection module given recent advancements in the autonomous vehicle sector.

A. Overall Details about Main Parts

1) Arduino Uno

It is the microcontroller board based on ATmega328 Arduino projects can be stand- alone or they can communicate with software on running on a compute.

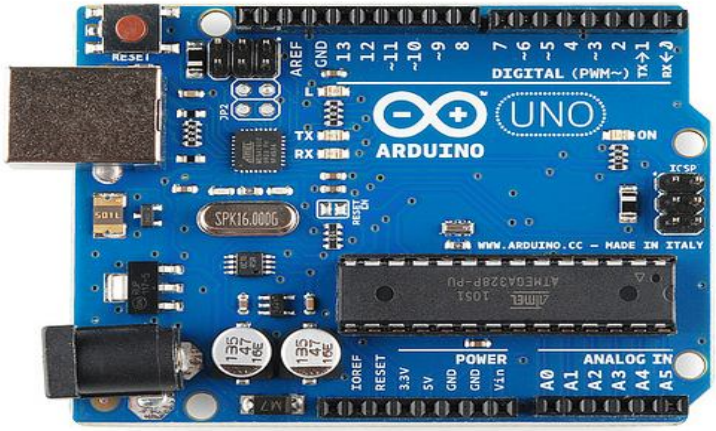


Fig.1- Arduino Uno

2) 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 popular Arduino development platform, specifically the Arduino UNO or Arduino Nano model, is where this is most frequently implemented.

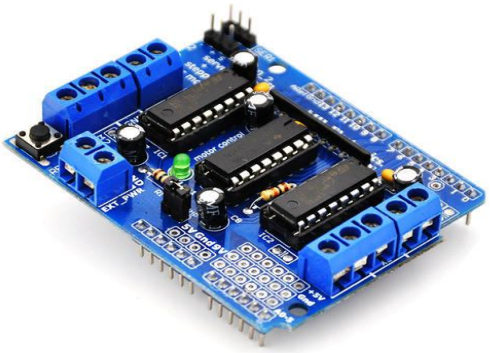


Fig.2- ATMEGA 328P-PU

3) Motor Driver Module

You can use the L293D H-bridge module with motors that have a voltage of 5 to 35 volts direct current. The module used in this article has an additional onboard 5V regulator, allowing you to obtain 5V from the board if your supply voltage is up to 12V.

4) Ultrasonic Sensor

The ultrasonic sensor is used for obstacle detection. Using its sensor head to transmit ultrasonic waves, an ultrasonic sensor then receives the reflected ultrasonic waves from an object. Ultrasonic sensors are used in many different applications, such as automatic door openers and instruction alarm systems. The ultrasonic sensor is relatively small and quite effective.

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Fig.3- Ultrasonic Sensor

5) Servo Motor

Micro Servo is a tiny and lightweight server motor with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos.



Fig.4- Servo Motor

IV. CONCLUSION

Following study on the aforementioned Arduino controller and ultrasonic sensor, the HC-SR04 ultrasonic sensor was selected because its control outcomes are suitable for usage in the recently developed vehicle prototype system. It was used to recognise barriers and avoid them.

By writing the method in Python, the obstacle avoidance algorithm was effectively implemented and carried out with little to no error. The use of obstacle avoidance in vehicles can greatly reduce the likelihood of accidents and fatalities. As they design, build, and programme an autonomous robot, students will gain interest in and excitement for the subjects of engineering, mechatronics, and software development.

Today, we live in a robotics-based environment. Whether we are aware of it or not, we use a variety of robots in our daily lives. The thesis seeks to assess the lessons that students can take away from designing, building, and programming an autonomous robot in the areas of engineering, mechatronics, and software development.

The purpose of this is to serve as a guide for students who are new to the Arduino community and to teach them about embedded systems, IR sensors, microcontrollers, and how to build robots using Arduino.

The purpose of this experiment was to manipulate various robot components to control how they responded. The overall end objective was to make the robot avoid obstacle by programming it to use the sensors attached to it.

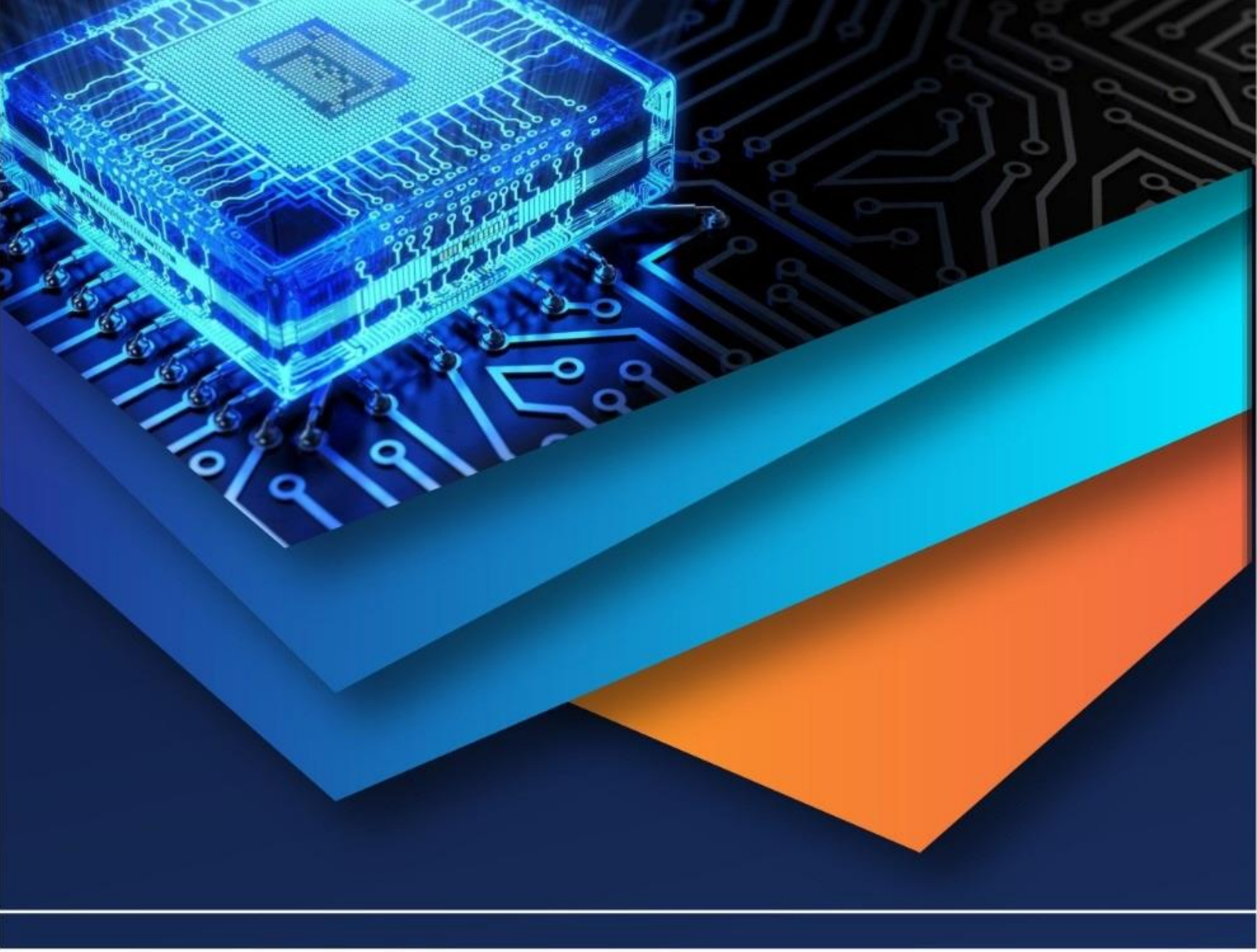
Although the thesis project has very little information regarding the use of the robot in the real world, the outcome might be very advantageous for many individuals and various sectors of the global economy depending on the sensors and features needed to meet the requirements.

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