# Automatic and Controlled Robot with Obstacle Detection

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***Abstract*: This paper mainly concentrates on the control operations of the robot-like forward, backward, left and right movement of the robot and there is even an ultrasonic sensor attached to a servo motor and also a Bluetooth module. It consists of a microcontroller to process the data, and Ultrasonic sensors to detect the obstacles on its path which can automatically sense and overcome obstacles on its path. The robot has a Bluetooth receiver unit which receives the commands and gives it to the microcontroller circuit to control the motors. The microcontroller then transmits the signal to the motor driver IC's to operate the motors. When it detects any obstacle, the robot changes its direction by calculating the distance and displays the distance of the obstacle in radar screen. The project aims at the development of robotics field in the military areas by which the human loss can be reduced for a more extent. Here there is a specific switch on robot. When the switch is in ON state it is controlled by a Bluetooth module. Where the robot receives the commands through voice and performs its control operations like forward, backward, left, right and stop. When the switch is in OFF state it is controlled autonomously. If any obstacle is in front of the robot vehicle, then it will automatically change its direction.**

***Index Terms*: Automatic Robot, Obstacle detection.**

## I. INTRODUCTION

Embedded systems are self-contained programs that are embedded within a piece of hardware. Whereas a regular computer has many different applications embedded systems are electronic devices that incorporate microprocessors with in their implementations. The main purposes of the microprocessors are to simplify the system design and provide flexibility. Having a microprocessor in the device helps in removing the bugs, making modifications, or addin3g new features are only matter of rewriting the software that controls the device. Or in other words embedded computer systems are electronic systems that include a microcomputer to perform a specific dedicated application. The computer is hidden inside these products. Embedded systems are ubiquitous. Every week millions of tiny computer chips come pouring out of factories finding their way into our everyday products. In this paper the application of embedded systems to prepare automatic and controlled robot to detect obstacle is highlighted.

## II. METHODOLOGY

The block diagram of the proposed system is shown in the following figure. The robot should navigate safely by avoiding obstacles comes overhead. It should move by detecting the exact path by checking the sensor readings in different angles. It should send status of the robot movement (using IR REMOTE Control Receiver) when the robot is in automatic mode. It should navigate in manual mode by receiving signals from the remote.

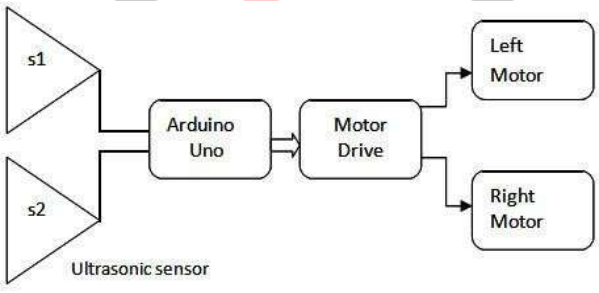


Fig.1: Block diagram of the proposed system.

**Description of Hardware Components for the implementation:**

**ARDUINO UNO**

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.

Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can communicate with software running on your computer (e.g. Flash, Processing, and MaxMSP). The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free. The Arduino programming language is an implementation of Wiring, a similar physical

computing platform, which is based on the Processing multimedia programming environment. There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Net media's BX-24, Phi gets, MIT's Handy board, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:
Inexpensive - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50.

Cross-platform - The Arduino software runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows. Simple, clear programming environment - The Arduino programming environment is easy to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with the look and feel of Arduino.

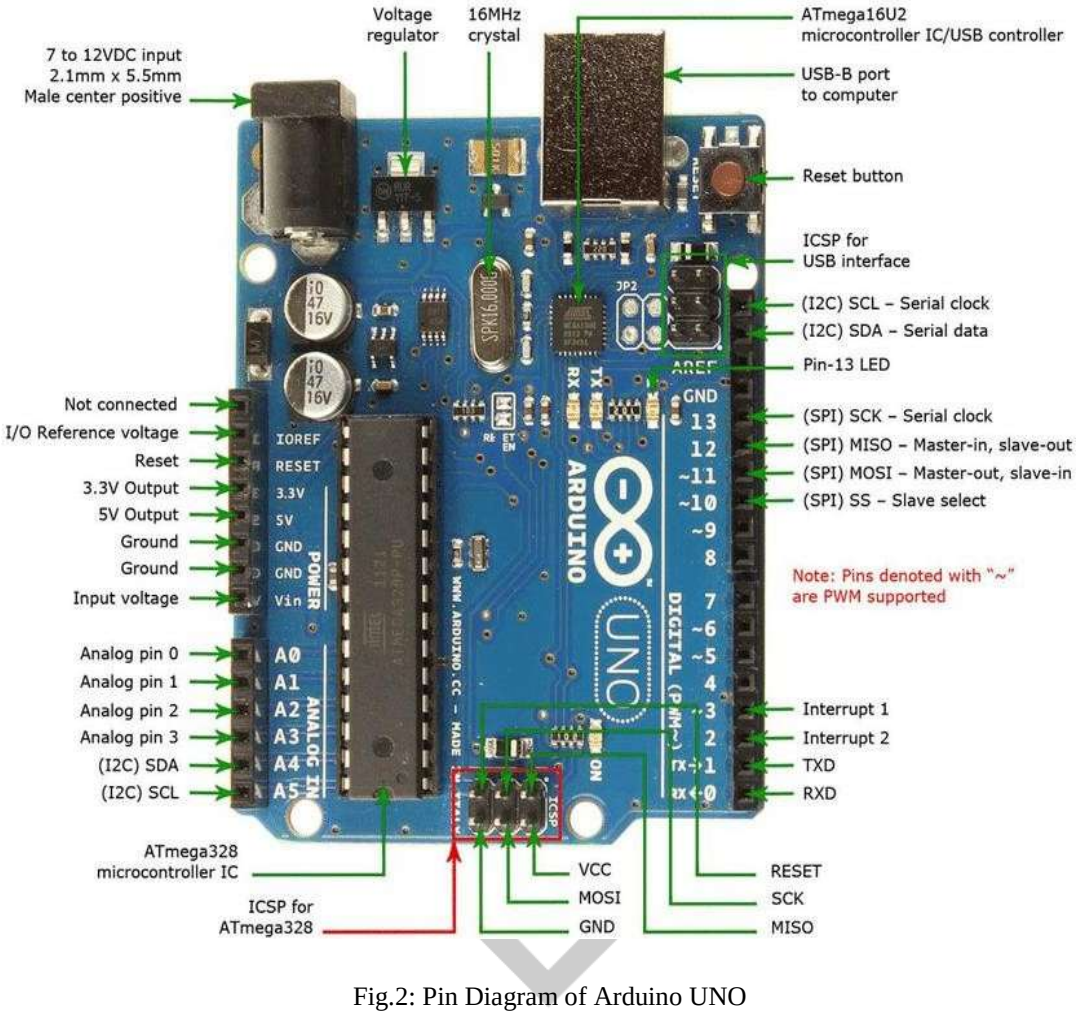


Fig.2: Pin Diagram of Arduino UNO

**Features**

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz

**Microcontroller ATMEGA328**:
The name says it all on this one. An ATmega328 in DIP package, pre-loaded with the Arduino Optiboot (UNO 16MHz) Boot loader. This will allow you to use Arduino code in your custom embedded project without having to use an actual Arduino board. To get this chip working with Arduino IDE, you will need an external 16MHz crystal or resonator, a 5V supply, and a serial connection. If you are Not comfortable doing this, we recommend purchasing the Arduino UNO board that has all of these built into the board. Atmel's ATMega328 8-Bit Processor in 28 pin DIP packages. It's like the ATmega168, with double the flash space. 32K of program space. 23 I/O lines, 6 of which are channels for the 10-bit ADC. Runs up to 20MHz with external crystal. Package can be programmed in circuit. 1.8V to 5V operating voltage.

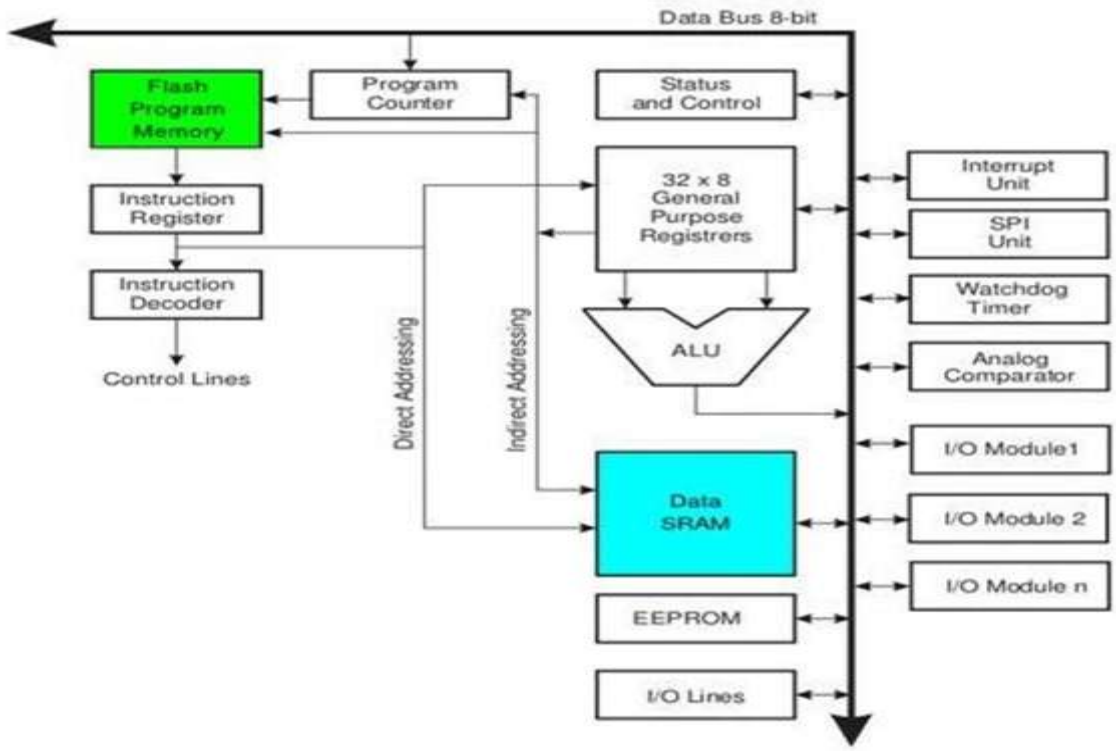


Fig 3: Architecture of ATmega328

**Parameters of ATmega328:**

- Flash (Kbytes): 32 Kbytes
- Pin Count:28
- Max. Operating Frequency (MHz):20 MHz
- CPU: 8-bit AVR
- NO. of Touch Channels: 16
- Hardware Touch Acquisition NO Max I/O Pins: 23
- Ext Interrupts: 24

The complete schmatic for the implementation shown in the following figure.

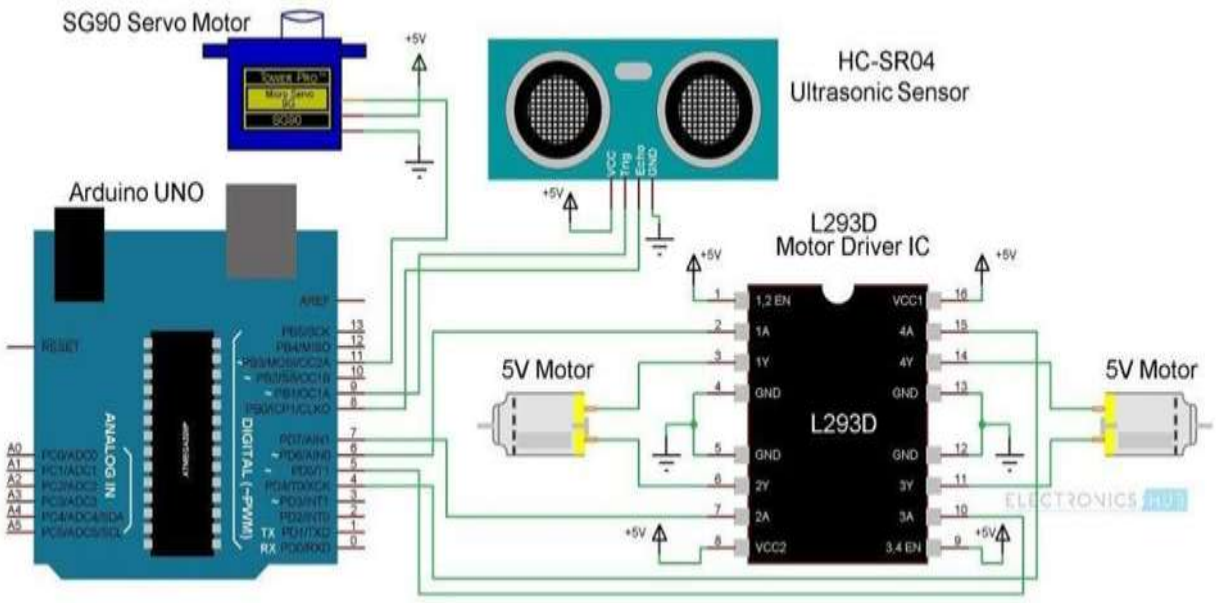


Fig.4: Circuit Diagram of Autonomous Robot

**Circuit Operation:**

Designing mechanism helps to build a robot that automatically detects the obstacle on its path and guides itself whenever an obstacle comes ahead of it. This robotic vehicle is built, using Arduino. An ultrasonic sensor is used to detect any obstacle ahead of it. A motor driver IC and 2 DC motors are used for controlling the movement of the robot. A servo motor is then mounted on the servo and by rotating is also used in this model. The ultrasonic sensor is then mounted on the servo and by rotating the servo to different angles we will obtain the readings from the ultrasonic sensor in those angles. This will help the controller to detect the exact path to navigate. All the connections are made as per the circuit diagram.

When the robot is powered on both the motors of the robot will run normally and the robot moves forward. During this time, the ultrasonic sensor continuously calculates the distance between the robot and the reflective surface. A library called "Servo.h" is used in this program for controlling the servo. The function used is "myservo.write (angle)".

This information is processed by the Arduino. If the distance between the robot and the obstacle is less than 15cm, the robot stops and scans in left and right directions for new distance using servo motor and ultrasonic sensor. If the distance towards the left side is more than that of the right side, the robot will prepare for a left turn. But first, it backs up a little bit and then activates the left wheel motor in reversed in direction.

Similarly, if the right distance is more than that of the left distance, the robot prepares right rotation. This process continues forever and the robot keeps on moving without hitting any obstacle.

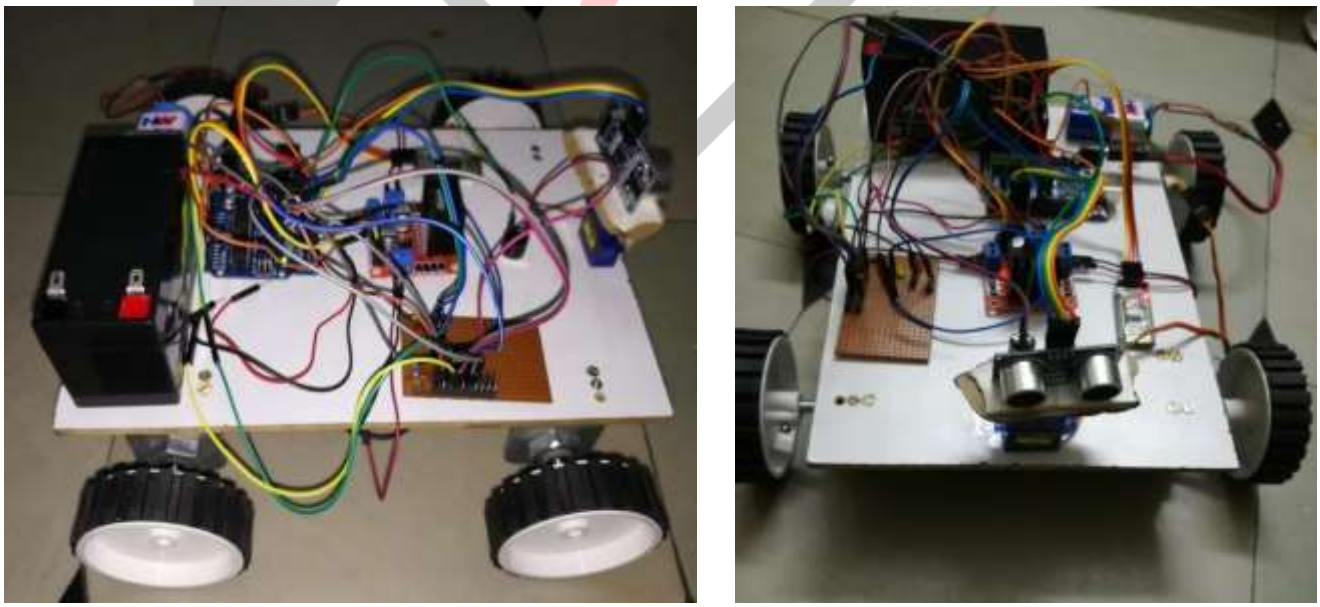

Fig.5: Practical implementation of the model.

## III. RESULTS & CONCLUSUION:

The commands to the robot are given through the hyper terminal which acts as a software interface to the IR remote control receiver. Then this robot model will move as per our input commands. It will change its path when obstacle is there. We have proposed an ISR (Intelligent Security Robot) a self- thinking robot which skillfully makes its way through the obstacles approaching its way using programmed brain without any guidance from human beings. We have used an Arduino Uno board which is easy programming thus overcoming the limitations of a microprocessor. We have also taken care of use of variable range of speed and power utilization for the functioning of the robot by using DC motor instead of AC motor. The components used for designing an ISR are cost effective, thus making it acceptable.

**Advantages of this model**

- Easy to control.
- Whenever robot senses any obstacle automatically diverts its position to leftor right.
- Controlled remotely hence no loss of life during combat.
- It is a low-cost circuit.

**Applications**

- Obstacle Detection for a Mining Vehicle.
- Obstacle detecting system for a motor vehicle.
- Autonomous cleaning robot.

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