

# WIRELESS SURVEILLANCE ROBOT

*Submitted in partial fulfillment of the requirement for the degree of*

**BACHELOR OF TECHNOLOGY**

**IN**

**ELECTRONICS AND COMMUNICATION ENGINEERING**

By

Bhavya Chadha (161075)

Under the Guidance of

**Dr. Shweta Pandit**

**Assistant Professor (Senior Grade)**



**JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT,  
SOLAN**

**March 2020**

## Table of Content

<b>Content</b>	<b>Pg. No</b>
Declaration by the scholar	6
Supervisor's Certificate	7
Acknowledgement	8
Abstract	9
<b>Chapter 1</b>	10-28
1.1 Project Introduction	
1.2 Arduino Uno	
1.3 Bluetooth Module	
1.4 Ultrasonic Sensor	
1.5 Motor Driver Shield	
1.6 GSM Module	
1.7 Gas Sensor	
<b>Chapter 2</b>	29-44
Literature Survey	
2.1 Design and Working of Arduino Uno	
2.2 Design of Bluetooth Module HC-05	
2.3 L293D Motor Driver	
2.4 Ultrasonic Sensor HC-SR04	
2.5 Gas Detector Sensor	

**Chapter 3** 45-53

3.1 Work done till date

3.1.1 Outlay of project

3.2 Future Vision

3.2.1 Implementation of Motion Planning

3.2.2 Mobile Robot Model

3.2.3 Path planning algorithm

3.2.4 Proposed flowchart

3.2.5 Methods to connect

**Appendix** 54-62

Arduino Motor Shield Code

Arduino Bluetooth HC-05 Code

Arduino Ultrasonic Sensor Sr-04 Code

Pathfinder code

**REFERENCES** 63

## LIST OF FIGURES

Figure number	Caption	Page No.
1.1	Block Diagram of Wireless Surveillance Robot	12
1.2	Pin Description of Arduino Uno	15
1.3	Bluetooth Outlay	17
1.4	Connection Diagram	19
1.5	Bluetooth Pin Diagram	19
1.6	Pin Diagram of Ultrasonic Sensor	21
1.7	Switch diagram of H-Bridge	23
1.8	Diagram of Motor Sensor Sheild	24
1.9	Diagram of GSM Module	25
1.10	Pin Diagram of GSM Module	26
1.11	MQ2 Gas Sensor	28
2.1	Arduino Uno Pinout	31
2.2	Bluetooth Module	34
2.3	Motor Driver module	37
2.4	Ultrasonic Sensor	40
2.5	Pin Diagram of MQ2 Gas Sensor Module	44
3.1	Project picture	45
3.2	Patrolling path	46
3.3	Geometrical representation of movement	49
3.4	Algorithm diagram	50

## LIST OF TABLES

Table number	Caption	Page No.
1.1	Bluetooth Description	20
1.2	Motor Shield Description	24
1.3	GSM Module Description	27
2.1	Specification Sheet of Arduino	31
2.2	Specification Sheet of Motor Driver	38
2.3	Specification Sheet of Ultrasonic sensor	41

## **DECLARATION BY THE SCHOLAR**

I therefore proclaim that the work introduced in this report entitled “**Wireless Surveillance Robot**” submitted at **Jaypee University of Information Technology, Wagnaghat, India**, is a valid record of my work completed under the supervision of **Dr. Shweta Pandit** (Assistant Professor, Electronics and Communication Engineering Deptt.). I have not presented this work somewhere else for some other degree or confirmation.



Bhavya Chadha

(161075)

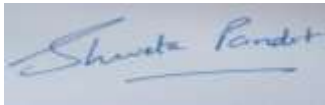
Department of Electronics and Communication Engineering

Jaypee University of Information and Technology

Date: 28.5.2020

## **SUPERVISOR CERTIFICATE**

This is to certify that the work reportable within the B-Tech report entitled “Wireless Surveillance Robot”, submitted by Bhavya Chadha at Jaypee University of Information Technology, Waknaghat, India, could be a bonafide record of his original work carried out underneath my direction. This work has not been submitted elsewhere for the other degree or certificate.

A rectangular box containing a handwritten signature in blue ink that reads "Shweta Pandit".

Dr. Shweta Pandit

Affiliation: Asst. Professor

Date:28.5.2020

## **ACKNOWLEDGEMENT**

I have put lot of hardwork and efforts in this project, and it would not have been possible without the possible support along with guidance of my guide and mentor Dr. Shweta Pandit. I am extremely indebted to her for her steerage and constant management as for providing necessary data concerning the project and additionally for her support in finishing the project. I would additionally prefer to give greetings to alternative college members of Electronics and Communication department for constant support.

I would also like to give regards to Prof. Dr. M. J. Nigam for guiding us through the project in the 8th semester and helping us at the initial stages. Finally, I would like to give my regards to Ashish Kumar and Mukul Gupta who were involved in depth to the project.



## **ABSTRACT**

Security is essential worry for everybody. This Project depicts a structure of successful security reconnaissance framework that can screen an industry with various sensors. Unapproved access and Gas spillage can be observed by the status of every individual sensor. Versatile robots possess ability in going to their condition and are temporarily in one physical area. A case of a versatile robot that has been used regularly nowadays is Automated Guided Vehicle (AGV). An AGV is a portable robot that goes along markers and wires placed along the floor or utilizes lasers and visions. Portable robots have been also seen in industry, resistance or security conditions. So keeping their huge use in the present period and in future I am persuaded to work toward this path.

A robot has been created in this task which can be utilized for multipurpose application identified with reconnaissance and security frameworks. The task incorporates structuring and building up a remarkable independent security robot which can and should be used in family unit or office use. The thought comprises of four primary components: Multiple sensor exhibit, communicating framework (Bluetooth with GSM), movement arranging (independent watching) and programming application for versatile interface. This report depicts the techniques and extents of the previously mentioned robot. With the assistance of GSM module we will have the option to transmit instant messages with caution notice. This undertaking will likewise help distinguish the gas spills with the assistance of gas identifier appended to it.

# CHAPTER-1

## INTRODUCTION

### 1.1 INTRODUCTION

Remote framework has been underneath enormous improvement in earlier years. Communication without wiring makes a control framework horrendously solid and being compact to use. The key component of this innovation is that it peruses a sign (Transmitting/Encoding Circuit) and procedures it into a wave (low recurrence) kind that is then imparted into a fixed sign recipient (Receiver/Decoding) that at that point unscrambles the sign into the prior transmitted sign prompting a blasting remote electronic communication.

With propels in innovation throughout the years, nonetheless, it's feasible to watch zones of significance remotely by exploitation robots instead of human. With the exception of the obvious preferred position not losing any hands, physical and ethereal robots will discover refined parts that aren't clear to people. By outfitting the robots with camera sensor and other entirely unexpected sensors, it is feasible to accomplish data in regards to the genuine location. Satellite communicating data helps to liberate methodically with the robots and thus get period various media input. In this way, lately, observation innovation has become an area of decent investigation premium.

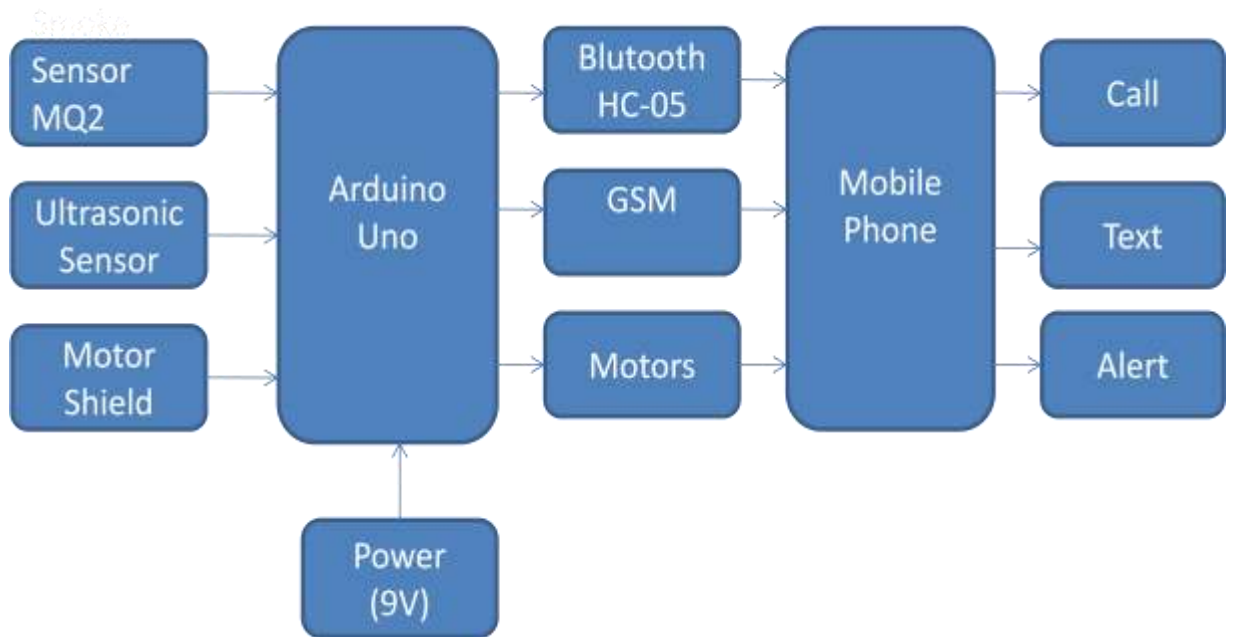
The main security observation robot was put forward by D.W Gage and H. Everett, 1999 in "Portable Detection. Evaluation and Response System (MDARS)" [1]. From that point, forward safety robots are becoming developing enthusiasm with expanding improvements in research field. Yoichi Shimosasa et al., joining safety observation and administration framework together, built up a self-ruling gatekeeper robot which will direct guests in daytime light and watch at night. A group of savvy portable safety robots watches various floors on the structure. Ongoing event of a strange occasion, the portable robot delivers the

connection area (floor number) of the occasion to the administered PC. A programmed watching vehicle goes about as a safety car in the security framework, which will screen those no man's lands of the customary fixed reconnaissance framework. The remote checking abilities can likewise be upgraded by utilizing the remote system and the face identification framework is adjusted to record and break down the trespassers . Endless applications today are utilizing portable help security robots, including self-governing route, security watching, housework, search-and salvage activities, material taking care of, fabricating, and robotized transportation frameworks. Despite the application, a versatile robot must utilize a strong self-governing route framework.

Self-sufficient route still stays the essential difficulties in portable robotic industry; many control calculations and methods had been as of late built up that intend to conquer this test . A safety robot dependent on UWB innovation for inside situating of obscure territories. It will be utilized in dangerous situations, as unsafe gas spills, where utilization of work force is hazardous . The security watch robot will use a few sensors and engines so as to explore inside in self-ruling mode. It will likewise have the option to convey and be controlled by means of Wi-Fi nowadays, safety robots are being promoted monetarily.

Knightscope's robot safety monitors, a progressed physical safety robotic which will watch waiting areas, workplaces and also outside. Additionally, rising friendly robots like Riley and Aido, Personal Robot, likewise includes house safety watching. With a few researching and usage of safety robots are accessible, innovation utilized in safety robots diminishes it's reasonableness. To take care of the issue, the research thesis "Surveillance robot Using Multi Sensor Network" [3] proposes an ease independent versatile security robot dependent on a multi sensor framework that is easy to use and is likewise moderate. The insightful security watch robot is executed utilizing versatile application. The robot is mobile and provides completely self-ruling watching in an ideoined area. It has a multi sensory observing framework with 6 sensors. This additionally makes the robot

adaptable, with the end goal that it tends to be utilized for both watching and furthermore for alarms relying upon client decision while a significant number of the gadgets fill just one need. It likewise gives 4 sorts of disturbing frameworks by means of which warning of security infringement is sent.



**Figure 1.1:** Block Diagram of Wireless Surveillance Robot.

## 1.2 ARDUINO UNO

Arduino Uno is a microcontroller board created by Arduino.cc that is an ASCII content record physical science stage in the primary bolstered micro controller Atmega328. Introductory Arduino venture had been started in cooperation Style foundation Ivrea happening in 2003 by Massimo Banzi and David Cuartielles of the aim of providing a reasonable and flexible thing to studies and abilities of prevailing assortment of instruments inside the universe. The current setup of Arduino Uno has an USB interface, six simple information pins, fourteen I/O advanced ports that region unit acclimated related with the outer circuits which is appeared in Fig. 1.2. Out of fourteen I/O ports, six pins are used for PWM outcome. It allows the fashioners to oversee and catch the outer electronic instruments inside this present scenario.

This board has all of the alternatives expected to control the controller and may be straightforwardly related with pc through USB link which is familiar with move the coding to controller with DE (Integrated Development Environment) programming bundle, in the principle created to program Arduino. DE is similarly perfect with UNIX Systems, MAC or Windows as it may, Windows are liked to utilize. Programming techniques like C++ and C region units used in DE. Besides USB, AC to DC or battery new parent will be acclimated to power the board. Arduino Uno things zone unit practically like elective sheets in Arduino family as far as use and common sense, notwithstanding, things don't go with FTDI USB to Serial drive chip. A few renditions of Uno things are available, notwithstanding, Arduino Uno and Arduino Nano V3 is an important authority parts that go with AVR Atmel microcontroller any place RAM space is 32KB. When common sense and nature of the assignment go confused, small card is more inside the part to frame them allocate significantly more data.

### **1.2.1 FEATURES:**

- It is the open supply policy wherever any individual can optimize and change board supported the amount of location and task that require to realize.
- The board possess an inbuilt guide include that holds the power in line once the gadget is related with the outside instrument.
- 13KB of non-unpredictable capacity is utilized to allocate the amount of headings inside the code.
- 5V is expected to show the board switch on, which might be accomplished legitimately exploitation USB thiong and outer new parent, be that as it may, it will increment external supply upto 12V which might be directed and cutoff to 5V or 3.3 V upheld the need of the task.

### **1.2.2 COMMUNICATION AND PROCEDURE**

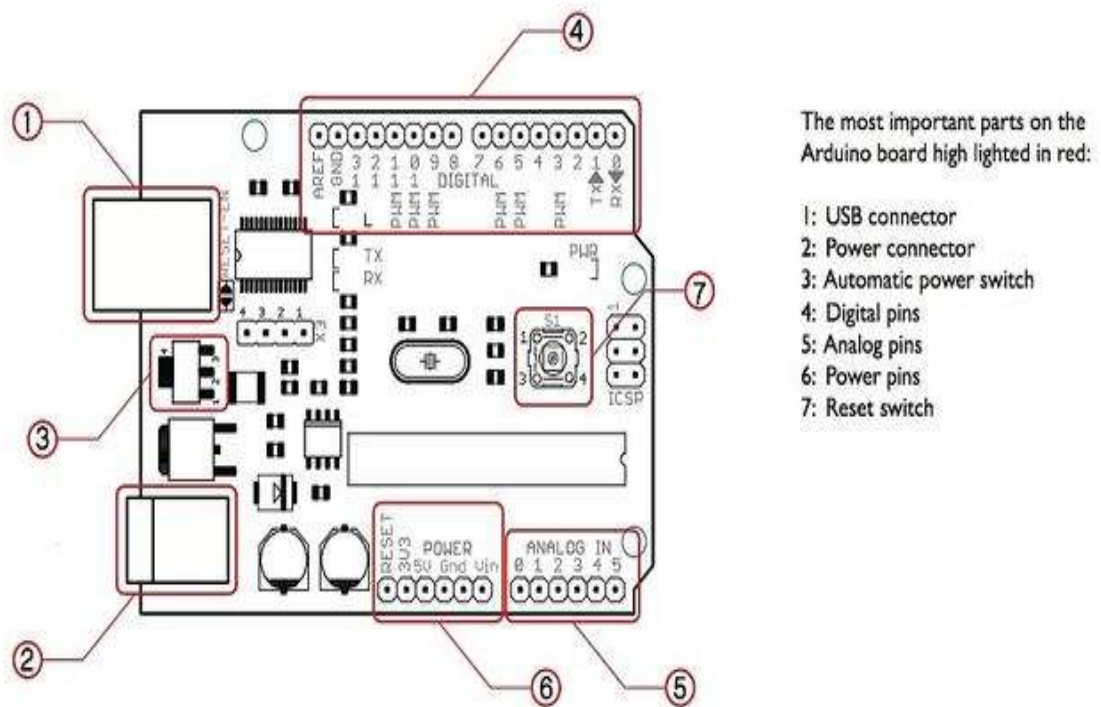
Arduino Uno posses an ability of relating with elective Arduino sheets, pc and micro controllers. The Atmega328 placed on board provides likewise correspondence exploitation pins like Rx and Tx.

The Atmega16U2 placed on board provides pathway to similar correspondence exploitation USB ports. Sequence mirror is provided on the DE programme bundle that is used to transmit or recieve data from the board. On and off chance LEDs put on the Rx and Tx pins streak, it demonstrate the transmission of data.

Arduino Uno can be customized exploitation Arduino Software bundle that possibly cross-stage application known as DE handwritten with Java. The microcontroller Atmega328 organized out of the base accompanies worked in boot loader that liberates you from utilizing a different burner to move the program on the board.

Arduino Uno provides a large variety of applications. Following area units are some main applications of the board:

- Embedded Systems
- Security and defense system
- Digital physical science and artificial intelligence
- Traffic light-weight count timer



**Figure 1.2:** Pin Description of Arduino Uno

## **1.3 BLUETOOTH MODULE**

### **1.3.1 DEFINITION**

A Bluetooth revolution could be a rapid below steam-controlled remote revolution connect that is supposed to join phones or option moveable instrumentality along. It's a determination (IEEE 802.15.1) of use of low level radio correspondences to connect elective system gadgets, PCs and telephones on short distances while not wires. Remote signs can be transmitted with Bluetooth over short separations, for the most part up to thirty feet (10 meters).

### **1.3.2 HC-05 BLUETOOTH MODULE**

HC-05 Bluetooth model is direct to use Bluetooth Serial Port Protocol module, meant to clear remote controlled affiliation arrangement. Its communication is through serial correspondence that makes clear connect to pair with controller and PC. HC-05 Bluetooth model provides different modes comprizing slave and ace mode which infers it prepared to use neither getting sending information.

#### Hardware Features

- -80dBm sensitivity.
- Upto +4dBm RF transmitting power.
- 3.3 to 5 V /O.
- PIO control over things.
- UART relation with changeable baud rate.
- With integrated antenna.
- With edge connection.

#### Software Features

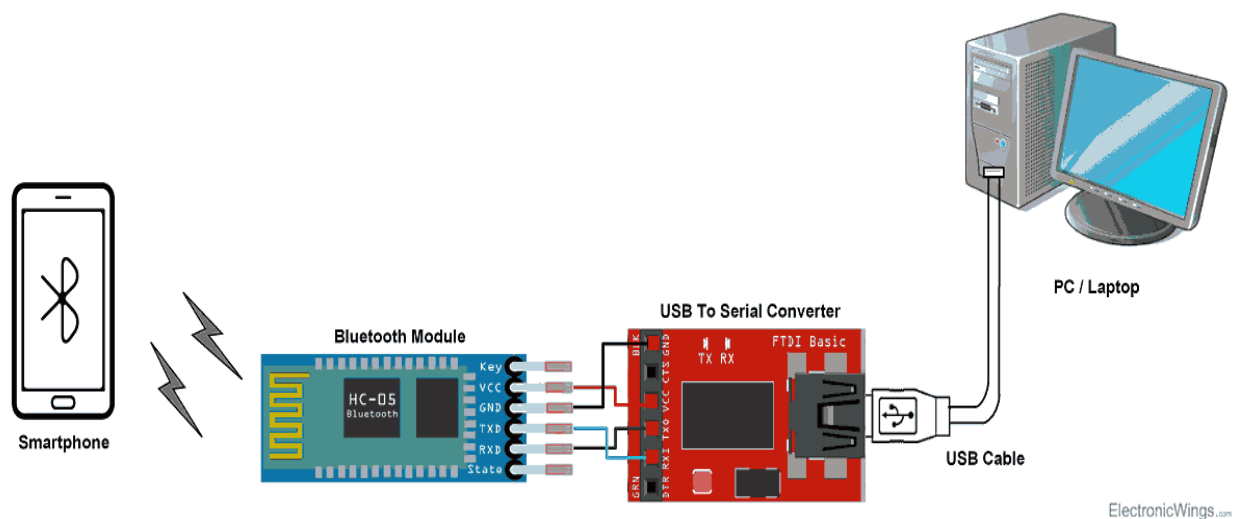
- Slave specific Baud rate upto 9600, Stop bit:1, Data bits: 8.
- Auto connects to the previous device on power.
- Allows pairing device to connect as default.
- Auto pairing PINCODE:"1234" as default.



## Bluetooth transmission among Devices

For Example, transmit data via cell phone thing to HC-05 Bluetooth model and view the information on computer sequential screen and contrariwise.

To convey cell phone with HC-05 Bluetooth model, cell phone needs Bluetooth extreme application for sending and accepting information. We can understand Bluetooth extreme applications to humanoid and of windows in a few application store.



**Figure 1.3:** Bluetooth outlay

Along these lines, when we need to convey through cell phone with HC-05 model, pair this HC-05 model to the PC by means of sequential to USB conversion.

Before building up correspondence between couple of Bluetooth gadgets, firstly we have to combine HC-05 module to cell phone for transmission.

Pair HC-05 and cell phone:

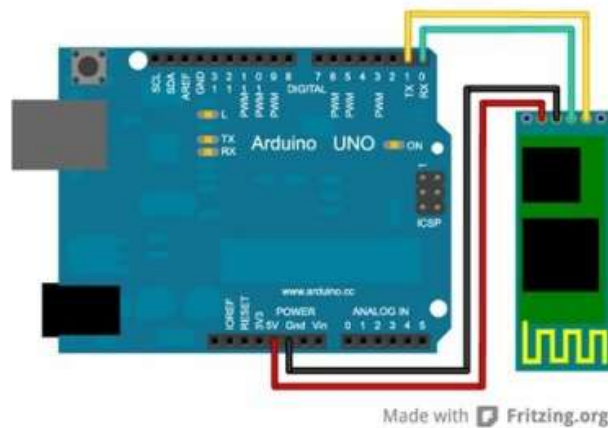
1. Look for Bluetooth device from the phone. We will see Bluetooth device with “HC-05” name.
2. Click on connect device option; default pin for HC-05 is 0000 or 1234.
3. Henceforth pairing couple of Bluetooth devices, open extreme software (e.g. Realterm, Teraterm, etc.) in PC, choose the port where we have tapped USB to serial mode. Select default baud rate of upto 9600 bps.
4. In cell phone, search Bluetooth extreme application and click on paired device HC-05.
5. It is easy to communicate; we just have to type in the Bluetooth extreme app of cell phone. Letters will get transmitted wirelessly to Bluetooth module HC-05. Bluetooth will automatically transmit it line wise to the PC, that should appear on screen. Same way we can transmit data from computer to phone.

## Command Mode

- If we want to alter setting of Bluetooth model as in change password for connection, Bluetooth device’s name, baud rate etc.
- To perform this task, HC-05 has been given AT commands.
- To utilize Bluetooth model in the AT command mode, connect “Key” pin to High (VCC).
- Original Baud rate of HC-05 model in command mode is 38400bps.

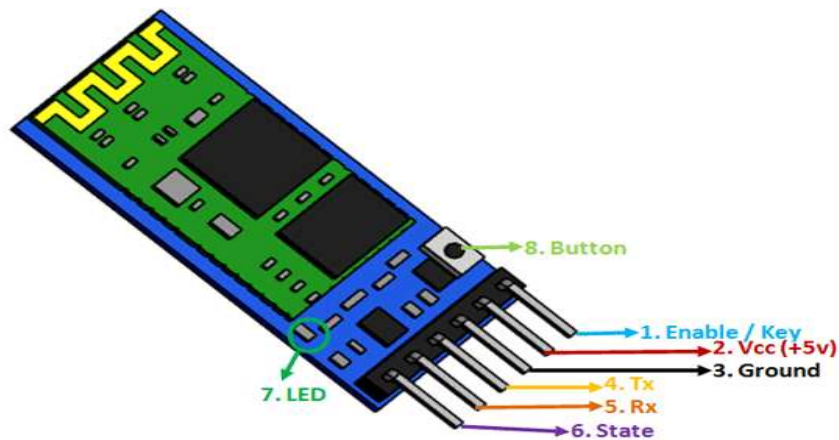
## Hardware Connections

As we see that Vcc and Ground of module moves to Vcc and Ground of Arduino. The Transmit pin goes to Receiver pin of Arduino and Receiver pin goes to Transmit pin of Arduino i.e(digital pin 0 and 1).The person can utilize the on board LED. Withstand here LED is attached with digital pin 12 from outside for good result of the process.



**Figure 1.4:** Connection Diagram. [11]

### 1.3.2.1 PIN DESCRIPTION



**Figure 1.5:** Bluetooth Pin Diagram. [11]

**Table 1.1 : Bluetooth Description**

PIN	DESCRIPTION	FUNCTION
VCC	+5V	Attach to +5V
GND	Ground	Attach to Ground
TX	Bluetooth serial signal sending PIN, UART_TXD	Attach along the MCU's (Microcontroller and etc) RXD PIN.
RX	Bluetooth serial signal receiving PIN, UART_RXD	Connect with the MCU's (Microcontroller and etc)

## 1.4 ULTRASONIC SENSOR

The indiscernible gadget has partner instrument which quantifies the space to relate things exploitation indistinct noise waves.

An indiscernible gadget utilizes an electrical gadget to send partner get unintelligible pulse that take-off previous data with respect to an item's vicinity.

Soaring frequency noise waves repeat from boundaries to give particular reverberation pattern.

Ultrasound is related with any lighting environmental factors and can be used outdoor and indoor. Imperceptible sensors will take care of the impact avoiding for the framework, and getting influenced generally, as far in light of the fact that it isn't excessively speedy.

Ultrasonics zone unit in this manner wide utilized, they'll be loyally related with grain container detecting applications, ramble applications, water level detecting and detecting vehicles at your nearby drive-through structure or bank.

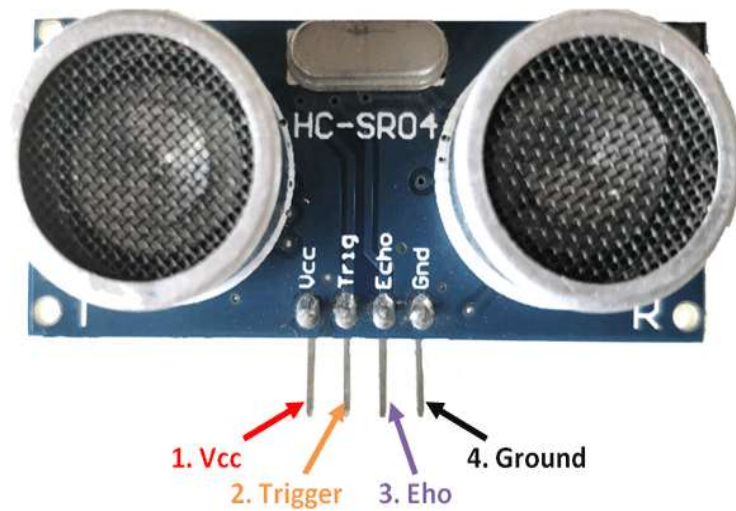
Ultrasonic range detector area unit ordinarily used as devices to notice a collision.

**Ultrasonic Sensors are used in detection of:**

- Existence
- Leveling
- Positioning
- Distancing

**Ultrasonics are liberated of:**

- Light
- Smoke
- Dust
- Color



**Figure 1.6:** Pin Diagram of Ultrasonic Sensor

## **1.5 MOTOR DRIVER SHIELD**

The Motor Shield perhaps a driving model for motor that allows us to use Arduino in managing with the work velocity and course with the shield. Upheld the duplicate Full-Bridge Chip L298, it is prepared to drive couple of DC engines or a stage motor.

This is an augmentation shield which will drive four servos, two DC engines and one stepper motor. We'd like attachment the task into the Uno or Mega2560 board. It's stream-fueled by 2 sources – when associated with an impact board, it's steam-controlled by the yield of the board; to drive an enormous momentum motor, we can interface an outside supply for the Motor Driver ensure and the control board. There's a pointer light discharging diode on the task. When it isn't being used, we can control off by the switch and it won't impact the work of the control board. The working voltage is 6.5V-12V.

### **1.5.1 H-Bridge Circuit**

H bridge basically is computerized circuit that permits a power to be applicable over a heap toward any path. H bridge circuitry is as often as possible utilized in apply autonomy and numerous different process to permit DC motors move front and in reverse. The motor can control circuitry and are for the most part utilized in various converters like AC-AC, DC-AC, DC-DC converters and numerous different sorts of intensity computerized converters. In explicit, a two way stepper motor is constantly determined by a motor which is controlled by having two H bridges.

H bridge is manufactured with four switches same as S1, S2, S3 and S4 as demonstrated in Fig.1.7. At certain scenario when the S4 and S1 switches are shut, at that point a plus voltage will be applied on the part. By switching on the switches S4 and S1 and shutting the switches S3 and S2, the voltage is transformed, permitting alter activity of the motor.

The Motor module is a drive model for motor which licenses us to utilize Arduino to manage the work velocity and bearing of motor. Upheld the duo Full-Bridge Chip L298, which is prepared to move two DC motors or a stage engine.

This is an expansion shield which will drive four servos, two DC engines and one stepper engine. We'd like fitting the undertaking into the Uno or Mega2560 board. It's stream-fueled by 2 sources – when associated with an impact board, it's steam-controlled by the yield of the board; to drive an enormous ebb and flow engine, we can interface an outside gracefully for the Motor Driver ensure and the control board. There's a marker light discharging diode on the venture. When it isn't being used, we can control off by the switch and it won't impact the work of the control board. The working voltage is 6.5V-12V.

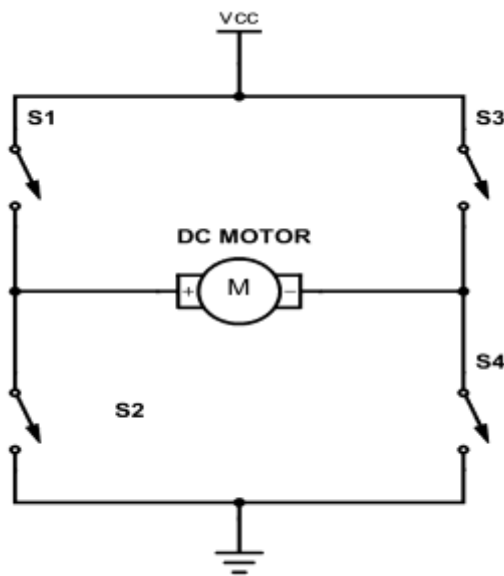
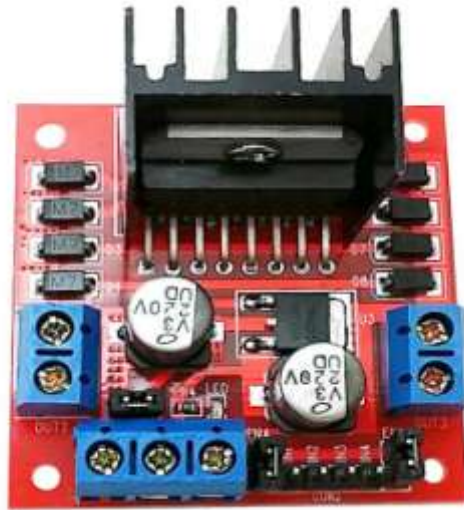


Figure 1.7: Switch diagram of H-Bridge. [9]

### 1.5.1 Specification

**Table 1.2:** Motor Shield Description

SPEC	VALUE
Employ voltage	5V
Exterior Power	6-15Watt
Output Current	2.0A Max on individual channel
Output	2 Channel, 4 Ports



---

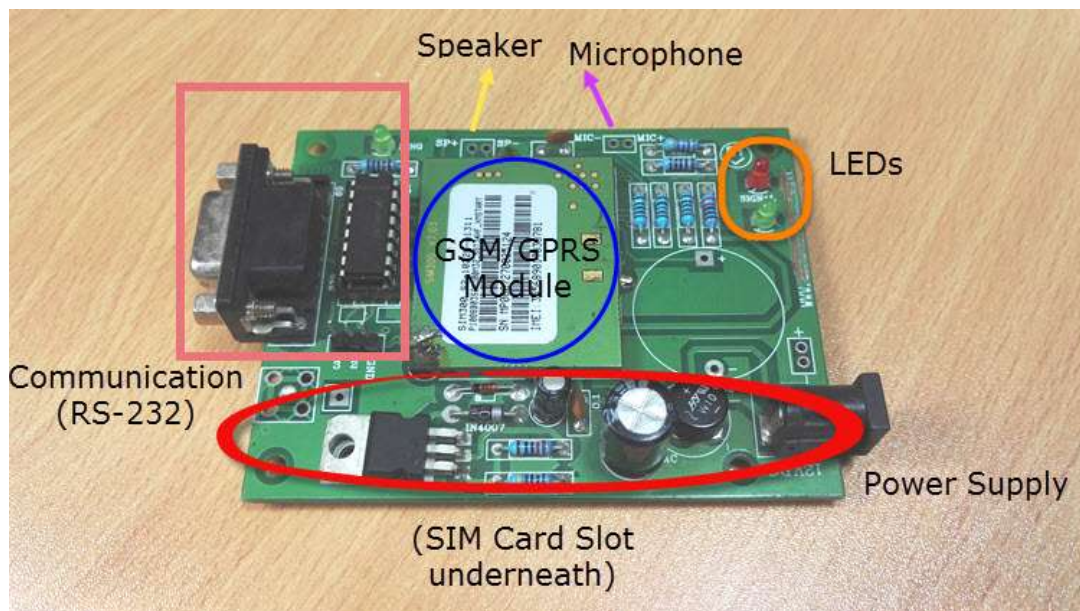
**Figure 1.8:** Diagram of Motor Sensor Shield



## 1.6 GSM Module

A GPRS or GSM Module has been a partner IC or chip that interfaces with GSM Network utilizing a Subscriber Identity Module and with Radio frequencies. The original radio frequencies inside which an average GSM Module works is, 900MHz, 1900MHz, 850MHz and 1800MHz.

As it's out of reach to interface a GSM/GPRS Module on to relate outer gadget kind of a microcontroller, we'd like an arrangement like appeared inside the accompanying Fig.1.9.

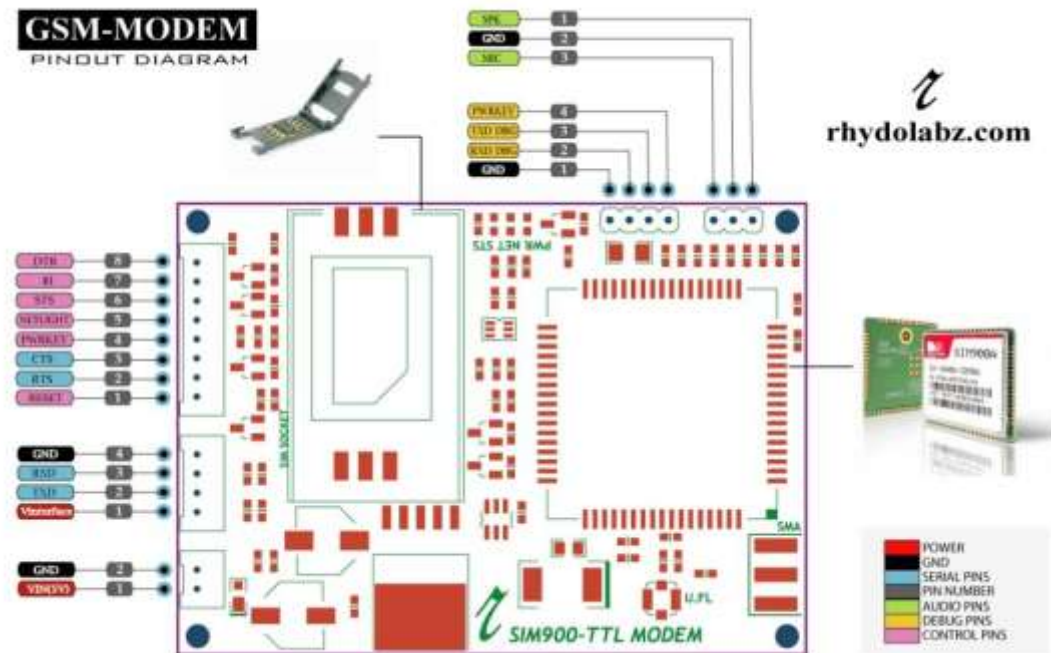


**Figure 1.9:** Diagram of GSM Module

It comprises of the GPRS and GSM Module, opening with embeddings a SIM, RS-232 relation for associating with microcontroller or a computer, signal standing precious stone reflector, power give and an arrangement to interfacing speaker and mice.

Each GPRS and GSM Module is selected and might be separated by the MEI run. MEI or International Mobile Equipment Identity range could be a fifteen digit unmistakable range identified via vagrant, satellite telephones and distinctive other Network gadgets.

**Pin Diagram of GSM Module:**



**Figure 1.10:** Pin Diagram of GSM Module. [10]

Along with this GPRS and GSM Module, we can do following things.

- Do, reject or receive voice calls
- Delete, receive or Send messages in SIM
- Search, read, Add the contacts in SIM
- Receive and transmit data through the GPRS and GSM Network through GPRS

The task told above can be performed by the help of Attention codes or AT Codes. AT Code are a part of Hayes Command Set, that is toled originally for a modem. GSM Networking also performs a same AT like commands for its GSM Modules.

**Table 1.3:** GSM Module Description

GSM Module	SIM900A
Frequency	900MHz/1800MHz
Modem Interface	RS232 Serial Interface
Power Required	4.5V to 12V
Current Required	<590mA
Sim900A Temperature	-40°C to +85°C
Weight	40g

Baud Rate	9600bps
-----------	---------

## 1.7 Gas Sensor

Sensors are the computerized instruments utilized to communicate to external condition. There are different sorts of detecting device accessible which can distinguish light, commotion, fog, closeness and so on. With the approach in innovation, these are accessible as both simple and advanced structures. Other than shaping a communication with the external condition, sensors are additionally a urgent piece of security frameworks. Hot sensors are utilized for distinguish the fire henceforth play it safe on schedule. To smoothen the working for control frameworks with delicate gadgets, moistness detectors are utilized for keeping up dampness in the unit. This one sensor utilized in security frameworks to recognize unsafe gases is MQ2 Gas detector.



**Figure 1.11:** MQ2 Gas Sensor Module

## CHAPTER -2

### LITERATURE SURVEY

#### **Research and concept**

[3] K. Pooventhan, R. Achuthaperumal and C. Manoj Balajee, "Surveillance Robot Using Multi Sensor Network", *International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control*, vol. 3,no. 2, pp. 113-115, 2015.

- Examined the research paper and got the idea of Surveillance Robot Functioning. This kind of robot can perform troublesome and dangerous work of people. It might have an unsafe activity and such risky occupation should be valid by using a little covert agent robot. Be that as it may, it is severe to look at and see the places where perilous to the people. At the point when the client controls by remote controller, the government agent robot will move to wanted goal and spy pictures around the robot. The client can check and suggest from PC with the remote controller.

[4] J. Garcia, A. Alsuwaylih and S. Tosunoglu, "Security Patrolling Autonomous Robot", in *Florida Conference on Recent Advances in Robotics*, 14-15 May 2015.

- Researched about how to make a self moved Robot. The Robot can be effectively interfaced utilizing Mobile Phones. Its multisensors can give a capable method of security and freedom.

## 2.1 Design and Working of Arduino Uno

It should be widely utilized openly supply micro controller helped instrumentally on ATmega328P micro controller and progressed by Arduino. The board will be given social affair of cutting edge and direct data input output pin that will be related to fluctuated development sheets and elective circuitory. The instrument has fourteen computerized pins along with six simple pins. It's changeable with the Arduino Integrated Development Environment via a structure B USB line.

This will be normally controlled by USB interfacing or by partner degree outer 9V battery, despite the fact that it sees voltages in center of seven and twenty volts. This is regularly all in all sensibly simply similar as Arduino Nano with originator. The instrument reference vogue is circulated underneath a naive house traits Share-A like 2.5 empower and is out there with Arduino site. Mastermind and creation data for a few forms of the instrument square measure gettable. "UNO" signifies same Italian and is picked to stamp the release of Arduino programming (IDE) 1.0. The Uno panel and with form 1 to Arduino code (IDE) with reference styles of Arduino, by and by advanced to additionally advance discharges. The Uno panel began inside the settlement of USB Arduino thing, and what is more the substitute seen for the Arduino stage. The Atmega328 alongwith Arduino Uno stresses a prearranging with a boot loader that permits to move new code there to while not the usage of the outer equipment technologist. It conveys using the underlying STK500 rule. The Uno does not utilize the FTDI USB-to-sequential chips since it all in all fluctuates among every single past board. Or on the other hand possibly, it decisions the Atmega16U2 (Atmega8U2 up to modification R2) changed as a USB-sequential changer. The Arduino UNO can for the most part thought of the principal straightforward and popular board.

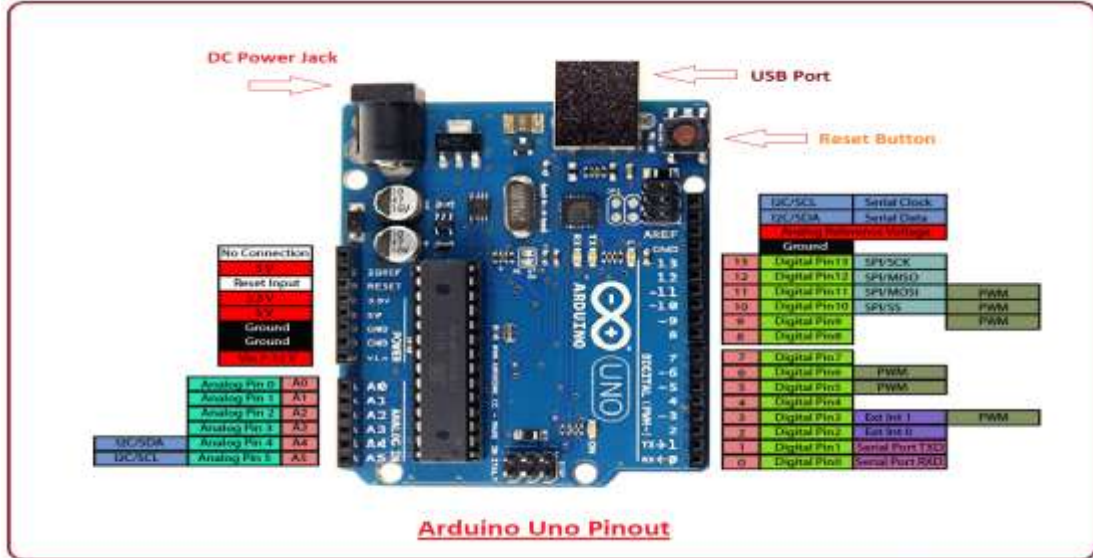


Figure 2.1: Arduino Uno Pinout. [12]

### 2.1.1 Arduino technical specifications

Table 2.1: Specification Sheet of Arduino

• Microcontroller	ATmega328P
• Employed Voltage	5V
• Input Voltage (preferred)	7-12V
• Input Voltage (limiting)	6-20 V
• Digital I/O Pins	14 (of that six offer PWM outcome)
• PWM Digital I/O Pins	6
• Analog Input Pins	6
• DC Current each I/O Pin	20mA
• DC Current for 3.3V Pin	50mA
• Flash Memory	32 KB of which 0.5 KB used by bootloader
• SRAM	2KB
• EEPROM	1KB
• Clock Speed	16MHz
• Length	68.6mm
• Width	53.4mm

### 2.1.2 Arduino Pins

- LED: An associate unalienable LED powered by future stick thirteen. When the line is HIGH power, the crystal rectifier(LED) is on, when the line is LOW, it is off.
- VIN: When the input power to the going cluster of the Arduino once it's using an outside power supply. You will get supply power via line or when getting the pow by system of the power point, using it through this line.
- 5V: When the panel has 5V directed powered then from the controller on the panel by this stick. The panel may well be over with management from ON of the DC management jack or the USB connector (5V), or the VIn line of the panel (7-20 V).
- 3V3: The emu give by the on-panel controller. Most current that is drawn is 50 mA.
- IOREF: When line is on the Arduino board provides the power thing thereupon the computerized works. Associate suitably made public defend can browse IOREF line power voltage and choose the affordable power supply or change power changed on the yields and then work with the 5V or 3.3V.
- Reset: Thing that prevent the one on the panel are reset via the pins.

### 2.1.3 Special Pins

Every fourteen propelled pins alongwith six simple lines on the uno should be used as data or outcome, utilizing digitalRead(), pinMode() limits. It runs at 5 volts.

Every line will give or take 20 mA as suggested extreme values and is provided an encased power to resistor (isolated as per normal procedure) of 20-50K ohm. A larger piece of 40 mA is the breaking point regard not to be outperformed with I/O line for avoid ceaseless mischief on the micro controller. The Uno had 6 basic data future; checked A0 till A5, every indivisual provides ten bits of assurance



(for example totally isolated characteristics). As per normal procedure it forms and measure withstand the ground upto the value 5 volts, despite of the way however is conceivable to summon the change the up end of their orange using all the AREF line with purpose and thus the analog Reference() work.

In addition, some pins have specialized functions:

- Serial: provided and attached with receiving and getting data. The usage of pins are along with the relatable values of pins of ATmega8U2 USB-to-TTL serially value data.
- Outside Interrupts: There are terms allocated often to help design and to trigger a hinder below a certain line, a rising or downgoing value, or change in data.
- SPI: The line going back the SPI values are taking use of SPI library.
- TWI: It gets the total value and help of two knots site exclusive of data using along with the wire library.

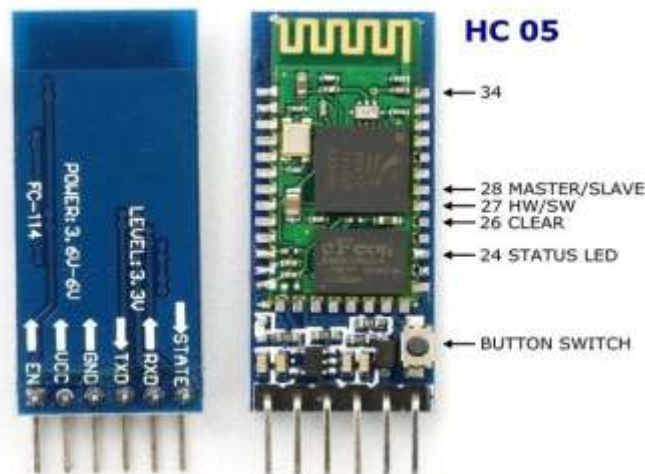
## **2.2 Design Bluetooth Module HC-05**

HC-05 is said as Bluetooth model which is utilized for personal or close by transmission. Bluetooth model will be utilized in an ace slave arrangement. It's utilized in a few applications like remote beneficiary, cordless work area, last recipient, programmed synchronization, mixed media framework move, game controllers, remote mouse, remote console and a lot of a great deal of utilizations. A Bluetooth innovative thing might be a pacy below jumped up remote innovative gadget that is intended to append telephones or elective gadgets or instrumentality along. It's IEEE 802.15.1 normalized convention. It's a detail for the usage of the low force frequency value to connect telephones, PCs and elective system gadgets over short separation while not wires. It utilizes sequential correspondence to talk with gadgets. It speaks with micro controller utilizing sequential port. Remote

signals transmitted with Bluetooth covers short separations, normally up to thirty feet (10 meters). It bolsters on the recurrence band of 2.45GHz and might support 721Kbps alongside 3 voice channel. It uses recurrence bouncing spread spectrum.

The HC-05 is a Bluetooth module which may include full duplex remote common sense. We can utilize this module to talk with 2 micro controllers like Arduino or speak with another gadget with Bluetooth common sense kind of a telephone or Laptop PC. We can utilize computerization applications to talk with micro controllers. It speaks via control and help of USART which works at 9600 baud rate and it's simpler to get along with any computer that bolsters USART.

The HC-05 Bluetooth module has 2 usable things, the one is that data mode during which it will get and recieve data from elective Bluetooth instruments and consequently the option is that the AT order mode any place the default things settings will be changed. It works utilizing the Serial port convention. Force the model to work in with +5V and associate the Rx pin which can be of the Transmitter of microcontroller and Transmitter pin of module to Rx of microcontroller.



**Figure 2.2:** Bluetooth Module

### **2.2.1 Bluetooth Module HC-05 technical specification values**

- Employed Voltage : 4V to 6V (Approx. +5V)
- Employing Current : 30 mA
- Works with Serial communication and TTL compatible
- Uses Frequency-Hopping spread spectrum
- It follows the IEEE 802.15.1 with protocol
- Operate in Slave, Master, or can be both.
- Easily used in both pc as well as laptop by Bluetooth
- Baud rate can be upto 9600

### **2.2.2 Bluetooth Module HC-05 Default Settings**

- Bluetooth Name : “HC-05”
- Password is either 1234 or 0000
- Communication through: Slave
- Mode can be: Data mode
- Data Mode Baud Rate can be upto 9600, 8, N, 1
- Commanding Mode’s Baud Rate: 38400, 8, N, 1

### **2.2.3 Bluetooth Module Pins**

- Key/EN: The accustomed bring Bluetooth model with the AT coding mode. If Key pin is about to up, then the model can add command mode. Otherwise by natural means it is preferred to be in data mode
- VCC: It connects 5V or 3.3V to the present Pin.
- GND: The ground Pin of module.
- TXD: It sends Serial data.
- RXD: It gets data linewise.
- State: It can tell accordingly whether the module is performing or no

## 2.3 L293D Motor Driver

L293D is normally a Motor drive or Motor drive IC that licenses DC motors to drive component toward any path. We've utilized 6V DC motors. L293D comprises of sixteen pins which may deal with an assortment of 4 DC motors simultaneously toward any path. We can oversee four DC motors with a Single L293D. It will drive each minuscule and enormous engines also. It takes a shot at the idea of H-Bridge.

H-Bridge has given permission for voltage to flow toward any path. Voltage got to correction its heading to pivot the engine clockwise or anticlockwise way.

In a Single L298D chip there are 2 H-bridge circuit inside the IC which may turn four DC engine severally. It's utilized in mechanical application for prevailing DC engines. It might be acclimated run 2 DC engines with identical IC. Speed and Direction the executives is possible.

The L298D comprises of 16-Pin Motor Driver IC. It's mainly acclimated drive motors. One L298D IC is gathered for powering 2 DC engines at indistinguishable time; furthermore the bearing of 2 motors will be overseen severally. It's employable voltage is littler sum than 36V and usable current is littler sum than 600 mA, It controls advanced circuits like 555 clocks, Op-Amp, computerized doors or maybe micro controllers like Arduino, ARM, PIC and so on. The Pins 1, 2, 3, 4 are acclimated change input pins for engine one and engine two. We will in general utilize every one of the engines every one of the pins are control high as a matter of course by interfacing with +5V offer. The data pins input one, two are utilized to control the engine one and information pins three, four are acclimated the board the engine two.

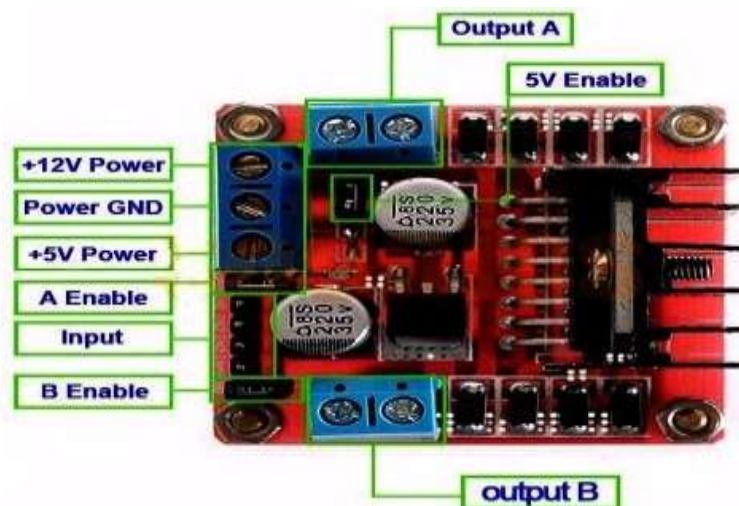
It acclimated drive high current motors exploitation Digital circuits. It also acclimated drive stepper engines. High current LED's might be driven. It also utilized in Relay Driver module.

If Input one is High (5V) and Input two is low (0V) Motor one may be rotated in clockwise direction.

If Input three is High (5V) and Input 4 is low (0V) Motor two can be rotated in clockwise direction.

If Input one is Low (0V) and Input two is High (5V) Motor one may be rotated in anticlockwise direction.

If Input three is Low (0V) and Input four is High (5V) Motor two may be rotated in anticlockwise direction.



**Figure 2.3:** Motor Driver Module

### 2.3.1 L293D Motor Driver Specifications

**Table 2.2:** Specification Sheet of Motor Driver

Motor Voltage	4.5V-36V
Peak Motor Current	1.2A
Continuous Motor Current	600mA
Supply Voltage	4.5V-7V
Changing Time	300ns
Max operating Vol	46V
Peak Output Current per Channel	2A
Min Logic Voltage	4.5V

### 2.3.2 L293D Motor Drive Pins

- Out 1: Motor A will be leading out via 1
- Out 2: Motor A will constantly leading out 2
- Out3: Motor B will be leading out 1
- Out4: Motor B will constantly lead out via 2
- GND: This is Ground
- 5V: this gives 5V Logic Input
- EnA: It Enable PWM signalling with the Motor A
- In1: Input for the Motor A will constantly lead out 1
- In2: Input for Motor A will be leading out via 2
- In3: Input for Motor B will go out via 1
- In4: Input for Motor B will go out via 2
- EnB: Enables PWM signal for Motor B

## 2.4 Ultrasonic Sensor HC-SR04

The Ultrasonic panel gives indiscernible wave, then the wave goes in air and once it gets protested by any thing it then certainly gets pushed back to the identifier this is then reflected wave and is controlled by the Ultrasonic collector module.

To calculate the distance we tend to use formula:-

$$\text{Distance} = \text{Speed} * \text{Time}$$

Ultrasonic identifier estimates separation by utilizing imperceptible waves. The identifier head discharges an indistinct wave and gets the wave reflected back from the objective. Ultrasonic Sensors quantifies the separation to the objective by ascertaining the time between the emanation and gathering.

An optical finder incorporates a transmitter and collector, while an ultrasonic sensor utilizes one ultrasonic component for every emanation and gathering. In an intelligent model quiet locator, one generator radiates and gets indiscernible waves then again. This permits contracting of the identifier head.

The Distance maybe calculated with the subsequent formula:-

$$\text{Distance } L = (\frac{1}{2}) * T * C$$

where L can be distance, T will be time between the giving and recieving and C is ofcourse the sonic speed.

The constant speed of Ultrasonic sensor wave at space conditions that is 330m/s.

The module can ascertain the time taken for the quiet finder wave to return and initiates the reverberation pin high for that exact same express amount of your time. Simply compute the space abuse microcontroller or chip. It's typically utilized on stages like Arduino, ARM, PIC and so on.

Force the detector utilizing a +5V through the VCC and ground pins of the finder. The present devoured by the locator is littler sum than 15mA and in this way

might be legitimately power-driven by giving on panel 5V pins (If accessible). The Trigger and furthermore the Echo sticks square measure each I/O pins and in this way they are connected with both pins of the microcontroller. To start the estimating, the trigger pin should be made high for  $10\mu\text{s}$  thus killed. This activity can proceed a quiet wave which will recome at 40Hz via the transmitting device and furthermore the collector can anticipate the wave to come. When the wave returns subsequent to being reflected by any item, the reverberation pin will go up for a caertain value of the time which can be taken as the time being taken by wave to come back to the finder.



**Figure 2.4:** Ultrasonic Sensor



### 2.4.1 Ultrasonic Sensor Specification

**Table 2.3:** Specification Sheet of Ultrasonic sensor

Detecting Range	3cm-4cm
Supply voltage	5V
Current Consumption	15mA
Ultrasonic freq	40KHz
Max Range	400cm
Min Range	3cm
Resolution	1cm
Ranging Accuracy	+3V

Ultrasonic transducers convert AC into ultrasound. Ultrasound may likewise be utilized to make highlight point separation estimations by transmission and accepting unmistakable eruptions of ultrasound between transducers.

It is acquainted with stay away from and discover snags with machines like biped robot, hindrances avoider machine, way discovering machine and so forth.

It will be familiar with taking the separation beneath the scope of 2 cm to 400 cm.

It will be familiar with map the articles encompassing the sensor by turning it.

It will be given and taken as along the waves will infiltrate with water.

### 2.4.2 Ultrasonic Sensor Pins

- VCC: Ultrasonic Sensor operates at 5V DC power supply.
- Ground: This pin is connected to ground.
- Trig pin: Its role is to start the procedure for giving ultrasonic waves. It will be kept up at 10 $\mu$ s for starting the procedure. These waves will travels at the speed of sound, which will then create 8 cycle power ponics outcomes that will be recieved in the Echo pin.

- Echo pin: The pin will remain at top level for a small period taken into account time taken by the ultrasonic waves to fall back to the receiver end.

## **2.5 Gas Detector Sensor**

Sensors will be computerized gadgets utilized as cooperation with the external condition. There shall be different sorts of detectors accessible that can identify light, commotion, smoke, closeness and so forth. With the approach in innovation, these are accessible as both simple and computerized structures. Other than shaping a communication with the external condition, sensors are likewise a pivotal piece of security frameworks. Fire and smoky detectors are utilized to identify the fire and play it safe on schedule. To get smootheness working with control frameworks along touchy hardware, dampness detection are utilized via keeping up stickiness for the whole procedure. Of one such detector utilized in wellbeing frameworks to distinguish hurtful gases is MQ2 Gas detector.

### **What is an MQ2 Gas Sensor?**

MQ2 gassy detector can be a computerized detection thing utilized for detecting the grouping of gases noticeable all around, for example, liquor, hydrogen, propane, smoke, LPG, methane, and carbon monoxide.

MQ2 detector can be otherwise called chemiresistor. The thing has a detecting material on who obstruction diversifies when it interacts with the material. This adjustment in the estimation of obstruction is utilized for the recognition of gas. MQ2 can be said as metal semiconductor type gas sensor. Convergences of gas ofcourse with the gassy element is estimated utilizing a voltage seperator organize found in the detector. The detector then takes a shot at 5V direct voltage. It can distinguish gases in the grouping of range 200 up till 10000ppm.

### **2.5.1 Working Principle**

The outcome of detector has a detecting component, basically aluminum-oxide based clay, covered by the component of tin dioxide, encased on the hardened steel work. Detecting component has six interfacing legs joined on the same. The Two legs are answerable for warming the detecting component, the remaining legs are utilized for yield signals.

Oxygen will be surrounded on the outside of detecting part of panel when it is warmed in the atmosphere at up temperature. At that point give electrons that are there in tin material are pulled in along and near to this oxygen, hence forestalling the present stream.

When diminishing suck ups are available, these O<sub>2</sub> atoms respond with help of lessening gases in this way diminishing the surface thickness of the suck up oxygen. Presently current will move through the detection, which created simple voltage esteems.

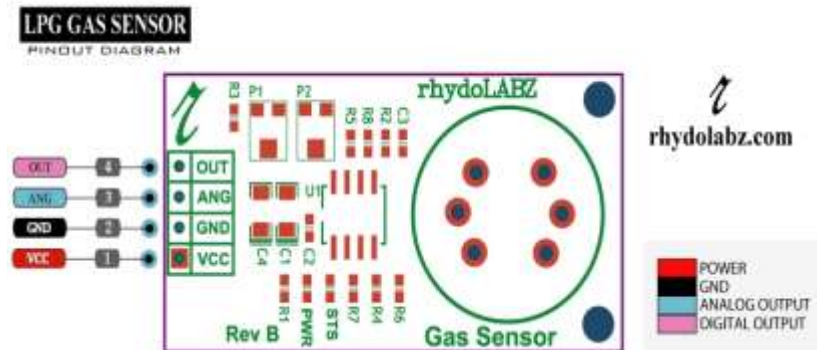
The power value esteems will get estimated to get bolstered the convergence of gas. Voltage esteems will be up when this convergence of gas is is on up.

### **2.5.2 Applications**

The detection can be utilized to identify the nearness of gases noticeable all around, for example, methane, butane, LPG and smoke yet they can't recognize gases. In this manner, they can't tell what is the gas present.

Model adaptation of the detection is utilized without getting related with any of micro controller and will be helpful when recognizing just a single specific gas. This can just recognize the gas. In any case, in the event that ppm must be determined, at that point the sensor ought to be utilized in absence of model. The detection will be likewise utilized for Air quality observing, Gas spill caution and

withstanding keeping up natural guidelines in medical clinics. In enterprises, these are utilized to identify the spillage of hurtful gases.



**Figure 2.5:** Pin diagram of MQ2 Gas Sensor

Pin description of gas sensor :

1. Vcc : This pin powers the module, typically the operating voltage is +5V.
2. Digital out: To get digital output we use this pin.
3. Analog out : This pin provides 0-5V analog voltage totally dependent on the amount of gas.
4. H-pin : Of given two H pins, one is switched to supply and the other with the ground
5. A-pin : The A pins and B pins can be switched. The pins will be tied to the Supply voltage.
6. B-pin : The A pins and B pins can be switched . One pin provides output while other is used as ground

## **CHAPTER 3**

### **Proposed System**

#### **3.1 Proposed System Model:**

In our Project we have implemented the robot car physically. The car is partially functional (moving wise) and few sensors like Bluetooth, Arduino uno, motors have been attached and are fully functional. I also studied the Motion planning concept that will set this project free from human control and would try to implement the same in the project.

##### **3.1.1 Outlay prepared which includes:**

Arduino

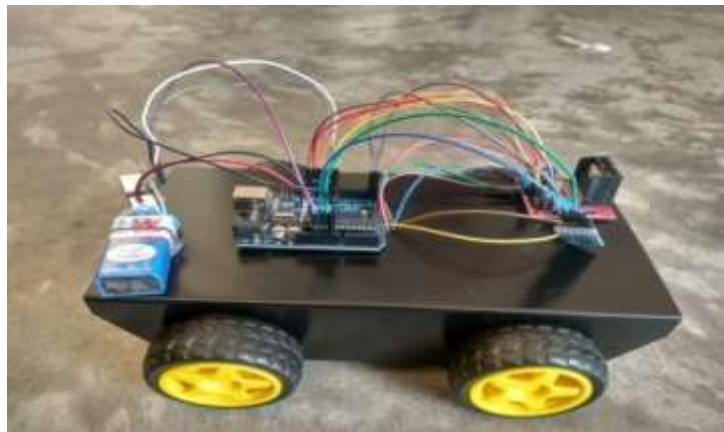
Motor Shield

Battery

Bluetooth Module

Ultrasonic Sensor

Jumper wires



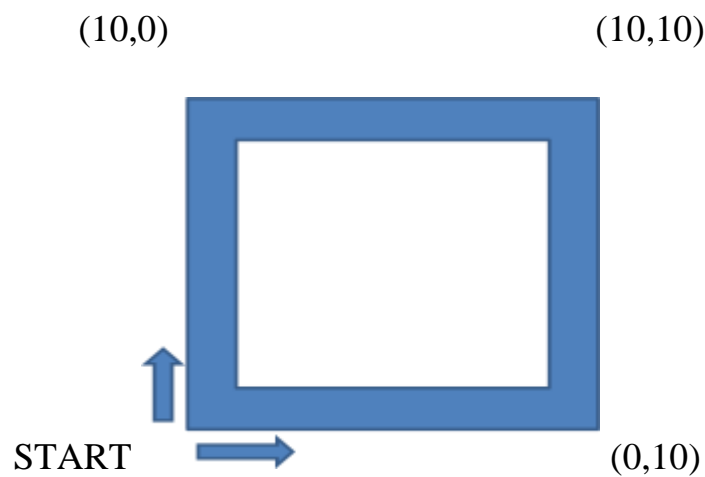
**Figure 3.1:** Project picture

## 3.2 Future vision

### 3.2.1 Implementation of Motion Planning

The Robot can be non moving as well as self-ruling. The fast and accurate movement will provide Robot to watch a specific region. Restricted algorithms are utilized to acquire the ideal area. Watch course is adjustable as indicated by the watch region – this should be possible remotely utilizing the versatile procedure. This then the robot utilizes ultrasonic separation detection for going on the set out separation. Observation courses are set out on demand of client.

For evaluation, the fig.3.2 is showing the manual contribution with separations it go edges to be watched. The bot can now compute what in total separation it has voyage utilizing wheel encoding technique. This will work on 3.3V territory. The solution are taken into account ceaselessly and prepared as needs be. The order for the separation and points to be shrouded will be providing the accompanying arrangement order = ("10cm,90\*,50cm,45\*,25cm,5\*,10cm,160\*). This naturally watches a characterized zone. A basic exhibition to get watching is shown in the fig.3.2 underneath for a separation with total 10cm and get an edge of 90 degrees.



**Figure 3.2:** Patrolling Path. [7]

These days, robots are considered as a significant component in the public eye. This is because of the substitution of people by robots in essential and risky exercises. Notwithstanding, planning a proficient route system for versatile robots and guaranteeing their protections are the most significant issues in self-ruling apply autonomy.

In this manner, the way arranging issue has been most fascinating and looked into themes. With getting point for the bot way arranging is accompanied to scan a protected way in this versatile bot. Additionally some way is needed for it to be ideal. In this scenario, a few discovered works handling the way arranging issue hasd been presented in writing. Up to this point, numerous techniques have been utilized for way arranging of portable bots. Among all these all procedures, the geometry distance strategy, for example, Vector Field Histogram, Agoraphobic Algorithm, and Artificial Potential Field. These strategies give the leading plot for staying away from deterrents.

On the opposite side, a few discovery working for following control of a tires portable bot had been picked up consideration in the writing. The nonpartying framework endures of nonstationery and vulnerability issue. In light of this vulnerability, the direction blunder for a tyred portable bot has consistently into creation and can't be wiped out. For this scene, many following techniques are propelled in the writing as Proportional (PID) controller yet this controller becomes non stable when it is influenced by the detection affectability.

The point of the created procedure is to take care of the issue when the robot s situated between two deterrents, for example, the accompanying: how the robot can recognize that the separation between the two hindrances is sufficiently sheltered to arrive at the objective without crash and how to maintain a strategic distance from obstructions and move among the couple impediments with most limited way. This might be the reason this working depends on choosing safe free portions in a domain burdened by impediments right off the bat. From that point onward, a created defining moment looking through calculation is applied to

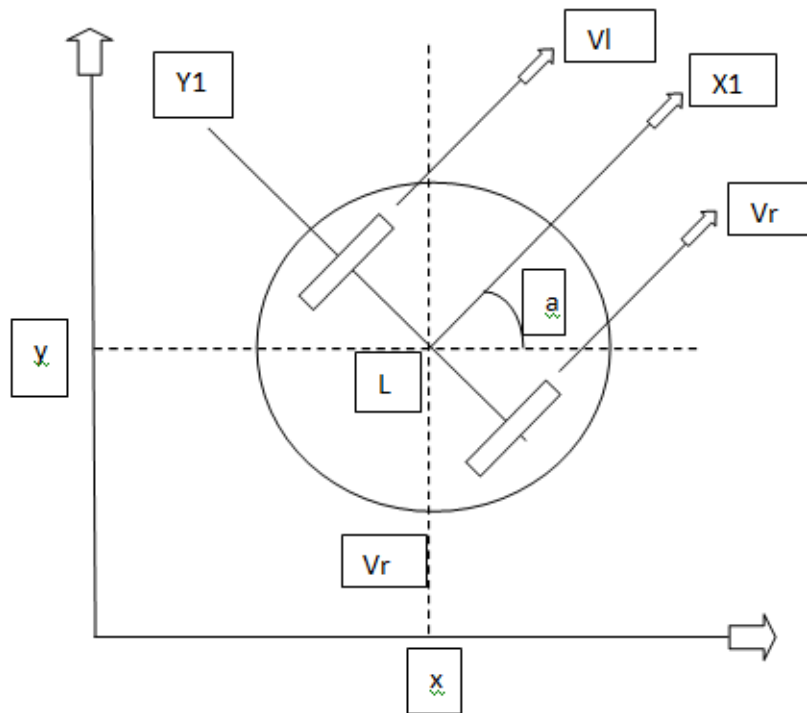
deteriorate the ending with the sheltered free portion which then provides most limited way. The procedure is propelled from the methodology given by Kyihwan and Jinpyo. In reality, the technique introduced in handling with couple of key destinations: the path length and the path wellbeing. The same methodology is centered right off the bat around looking through the ending value of an independent portion that then provides most limited way. Henceforth, if the separation of the free fragment chose is bigger than the robot measurement, the ending values is taken intop account as a defining moment. In the event that this isn't the situation, it should relay the calculation to look through another ending values of the free sections. The inconveniences of same procedure are that it should be centered right off the bat around finding the most limited way without contemplating the security and, from that point onward, it is centered around guaranteeing a sheltered way route which prompts a broad and substantial calculation and needs more opportunity for arranging the sufficient way for a versatile robot. So as to conquer these impediments, our created calculation serves to guarantee from the outset the way security by choosing the most secure free sections. At that point, it look through the way longing by deciding the ending values of the most secure free fragments which provides with briefest way. Utilizing same system, we will quickly decide upon most secure and the briefest way. Additionally, when the way is arranged, a following law dependent on slicing the controller is utilized for the bot to obey the structured direction.

Our commitment was to build up another calculation for taking care of the issue of robot way arranging with static obstructions shirkings. This arranging, likewise called non moving way plan, presents the upside of guaranteeing wellbeing and brevity of the way. Additionally, this told calculation is portrayed with receptive conduct to discover a crash free direction and easy way.



### 3.2.2 Mobile bot Model

With various discovery works for autonomy steersmanship this has been applied to various types of bots controlled by mobile. Given in this work, we will consider the Khepera model for which has two independent driving tyres which will be causable for orienting and instructing on stage by moving on the pace of each tyre. Thus, the given model of the moving mobile robot Khepera is shown in Fig 3.3 .



**Figure 3.3:** Geometrical representation of movement.[8]

The kinematic model of a driven bot is given in the following:

$$dx/dt = \{(V_r + V_l)/2\} * \cos a$$

$$dy/dt = \{(V_r + V_l)/2\} * \sin a$$

$$da/dt = \{(V_r - V_l)\}/L$$

where (x,y) is the bot's coordinates on the plane, "a" will be the angle among the bot direction and the X axis provided,  $V_l$  and  $V_r$  will be, respectively, the bot left and right wheel velocities, and  $L$  will be the displacement between the two wheels.

### 3.2.3 Path allotment Algorithm

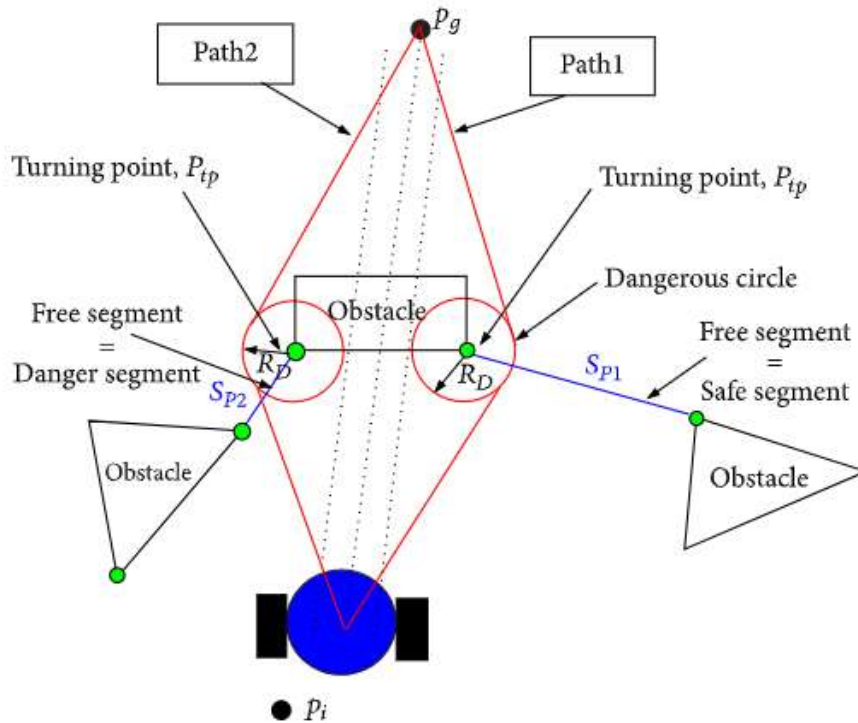
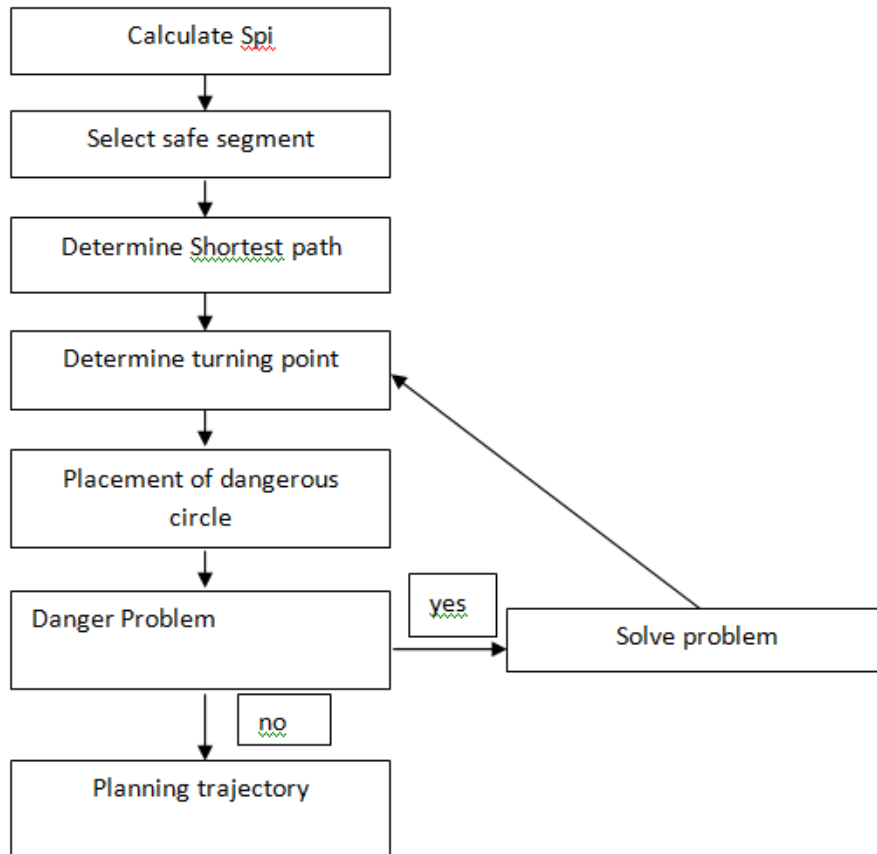


Figure 3.4: Algorithm diagram. [8]

When there are no deterrents, the way arranging issue doesn't emerge. Truth be told, the bot goes from an underlying portion 'Pi' to an objective portion 'Pq' in an orderly fashion which will be considered as the most limited way. In any case, when the portable robot experiences with snags as appeared , the bot ought to turn and not crash with hindrances. Along these lines, the serious issue is the means by which to determinate an appropriate way from a beginning stage to an objective value of non moving situation. For tackling the same issue our created calculation will be given to scan for a defining moment of a sheltered free fragment which gives the most brief way and permits the robot to keep away from obstructions. When the defining moment is found, a risky hover with span 'Rd' is certain at this point. For same situation, our given system plans to scan for the defining moment 'Ptp' of the sheltered free portion over the scene in which robot comes out securely. For guaranteeing wellbeing, we choose the section whose separation  $S_{pi} = (i=1, \dots, n-1)$  is bigger than the robot distance across 'Dr'. Then again, the section whose separation 'Spi' is littler than the robot distance across is considered as a peril portion. In this work, we consider just safe sections and peril portions are overlooked. Besides, and to determinate the most limited way, we have decided the point 'Ptp' of the most secure portion which gives the briefest way. At that point a perilous circle is fixed now and the robot switches and is moving in the distracting course to this path. In any event, when there will be threat issue, our provided calculation will be receptive to permit the robot to stay away from hindrances and arrive at the objective. For this situation, the robot saves the decided defining moment and looks for another defining moment to maintain a strategic distance from impact with snags. To more explain our procedure, the various ideas of the calculation are consolidated in Figure and the essential standard is summed up in a flowchart introduced.

### 3.2.4 Proposed Flowchart



### 3.2.5 Methods to connect Wifi module:

- \* Utilize the Arduino's (3.3V) output supply with the red line to breadboard.

- \* Connect the ground wire with blue line.
- \* Connection of RESET pin with blue line
- \* Connection of the RXD pin in Arduino with RX pin ESP8266
- \* Connection of the TXD pin given in Arduino with TX pin on ESP.

## APPENDIX

### 4.1 Arduino Motor Shield Code

```
#include<AFMotor.h>

constint IN1 = 7;

constint IN2 = 6;

constint IN3 = 5;

constint IN4 = 4;

constint ENA = 9;

constint ENB = 3;

void setup(){

pinMode (IN1, OUTPUT);

pinMode (IN2, OUTPUT);

pinMode (IN3, OUTPUT);

pinMode (IN4, OUTPUT);

pinMode (ENA, OUTPUT);

pinMode (ENB, OUTPUT);

}

void loop(){

analogWrite(ENA, 255);

analogWrite(ENB, 255);

digitalWrite(IN1, HIGH);

digitalWrite(IN2, LOW);
```

```
digitalWrite(IN3, HIGH);  
  
digitalWrite(IN4, LOW);  
  
}
```

- Motor Shield Input Pin 1 will be connected with Pin Number 7 of arduino
- Motor Shield Input Pin 2 will be connected with Pin Number 6 of arduino
- Motor Shield Input Pin 3 will be connected with Pin Number 5 of arduino
- Motor Shield Input Pin 4 will be connected with Pin Number 4 of arduino
- Motor Shield Input Pin Enable A is connected with Pin Number 9
- Motor Shield Input Enable B is connected with Pin Number 3
- Motor Shield +12V Pin connected to 9V Battery Positive terminal
- Motor Shield GND Pin connected to 9V Battery Negative terminal

## 4.2 Arduino Bluetooth HC-05 Code

```
char t;  
  
constint IN1 = 7;  
  
constint IN2 = 6;  
  
constint IN3 = 5;  
  
constint IN4 = 4;  
  
  
constint ENA = 9;  
  
constint ENB = 3;
```

```
void setup() {  
  pin onMode(IN1, OUTPUT);/  
  pin onMode(IN2,OUTPUT);  
  pin onMode(IN3,OUTPUT);  
  pin onMode(IN4,OUTPUT);  
  pinMode (ENA, OUTPUT);  
  pinMode (ENB, OUTPUT);  
  Serial_begin(9600);  
}  
Void_loop() {  
  if(Serial_available()){  
    t = Serial_read();  
    Serial_pprintln(t);  
  }  
  
  if(t = 'F'){  
    analogWrite_(ENA, 255);  
    analogWrite_(ENB, 255);  
  
    digitalWrite_(IN1, HIGH);  
    digitalWrite_(IN3, HIGH);  
  
  }  
}
```



```
else if(t = 'B'){  
    analogWrite_(ENA, 255);  
    analogWrite_(ENB, 255);  
    digitalWrite_(IN2, HIGH);  
    digitalWrite_(IN4, HIGH);  
}
```

```
else if(t = 'L'){  
    analogWrite_(ENA, 255);  
    analogWrite_(ENB, 255);  
    digitalWrite_(IN3, HIGH);  
    digitalWrite_(IN4, HIGH);  
}
```

```
else if(t = 'R'){  
    analogWrite_(ENA, 255);  
    analogWrite_(ENB, 255);  
    digitalWrite(_IN1, HIGH);  
    digitalWrite_(IN2, HIGH);  
}
```

```
else if(t == 'S'){  
  
    analogWrite_(ENA, 255);  
    analogWrite_(ENB, 255);
```

```
digitalWrite_(IN1,LOW);  
digitalWrite_(IN2,LOW);  
digitalWrite_(IN3,LOW);  
digitalWrite_(IN4,LOW);
```

- Connection of VCC HC-05 to +5V
- Connection of GND of HC-05 to Ground
- Connection of Rx of HC-05 to Tx
- Connection of Tx of HC-05 to Rx

### 4.3 Arduino Ultrasonic Sensor Sr-04 Code

```
constinttrgPin = 10;  
constintecoPin = 11;  
  
float duration, distance;  
  
void setup() {  
  pinMode(trgPin, OUTPUT);  
  pinMode(ecoPin, INPUT);  
  Serial_begin(9600);  
}  
  
void loop_() {
```

```

digitalWrite_(trgPin, LOW);

delay_Microseconds(2);

digitalWrite_(trgPin, HIGH);

delay_Microseconds(10);

digitalWrite_(trgPin, LOW);

duration = pulseIn_(ecoPin, HIGH);

distance = (duration*_0343)/2;

Serial_print("Distance ");

Serial_println(distance);

Delay_(100); }

```

- Connection of VCC of SR-04 to +5V
- Connecton of GND of SR-04 to Ground
- Connection of Trigger of SR-04 to Pin number 10
- Connection of Echo of SR-04 to Pin number 11

#### 4.4 Pathfinder Code

```

#include
#include
#define BuzzPIN A0
#define TrigPIN A1
#define EchoPIN A2
#define LEDBPIN A3
#define LEDGPIN A4 #define LEDRPIN A5
#define DCMROFF 25 AF_DCMotor M1 (1,
MOTOR12_64KHZAF_DCMotor M2 (2,
MOTOR12_64KHZ); Servo SER1;
int Search (void) {
float Duration = 0.0;
float CM = 0.0;

```

```

digitalWrite (TrigPIN, LOW);
delayMicroseconds (2 digitalWrite (TrigPIN,
HIGH
delay_Microseconds (10);
digitalWrite_r(TrigPIN, LOW);
Duration = _pulseIn (EchoPIN, HIGH);
CM = (Duration*58.8);
return Cm;
}
int RightDistance, LeftDistance;
float Distance = 0.00;
void setup () {
pinMode (BuzzPIN, OUTPUT);
pinMode (TrigPIN, OUTPUT);
pinMode (EchoPIN, INPUT);
pinMode (LEDBPIN, OUTPUT);
pinMode (LEDGPIN, OUTPUT);
pinMode (LEDRPIN, OUTPUT);
SER1.attach (10)
void loop () {
SER1.write (80);
delay (100);
Distance = Search ();
if (Distance < 30) {
digitalWrite (BuzzPIN, HIGH);
digitalWrite (LEDBPIN, LOW);
digitalWrite (LEDGPIN, LOW);
digitalWrite (LEDRPIN, HIGH);
M1.setSpeed (100);
M2.setSpeed (100);
ChangePath ();
}
else “_if ((Distance >= 30) && (Distance < 60)) {
digitalWrite_(BuzzPIN, LOW);
digitalWrite_(LEDBPIN, HIGH);
digitalWrite_(LEDGPIN, LOW);
M1-setSpeed (150);
M2-setSpeed (150);
Forward ();
}
else if ((Distance >= 60) && (Distance < 90))
digitalWrite_(BuzzPIN, LOW);
digitalWrite_(LEDBPIN, LOW);
digitalWrite-(LEDGPIN, HIGH);
digitalWrite_(LEDRPIN, LOW);

```

```

M1-setSpeed (200);
M2-setSpeed (200);
Forward ();
}
else {
digitalWrite_(BuzzPIN, LOW);
digitalWrite_(LEDBPIN, HIGH);
digitalWrite_(LEDGPIN, HIGH);
digitalWrite (LEDRPIN, HIGH);
M1-setSpeed (250);
M2-setSpeed (250);
Forward ();
}
}
Void_changePath () {
Stop(_);
Backward(_);
Stop(_);
SER1_write (12);
Delay_(500);
Right_Distance = Search ();
Delay_(500);
SER1-write (160);
Delay_(1000);
Left_distance = Search ();
SER1_write (80);
Delay_(500);
CompareDistance ();
}
void Compare_distance () {
if_(Right_distance > Left_distance) {
TurnRight_();
}
else if (Left_distance > Right_distance) {
TurnLeft_();
}
else {
TurnAround_();
}
}
void Forward () {
M1-run (FORWARD);
M2-run (FORWARD);
}
void Backward () {
M1-run (BACKWARD);
M2-run (BACKWARD);
delay (500);
}

```

```
void TurnRight () {
  M1.run (BACKWARD);
  M2.run (FORWARD);
  M1.setSpeed (100+DCMROFF);
  delay (300);
void TurnLeft () {
  M1.run (FORWARD);
  M2.run (BACKWARD);
  M2.setSpeed (100+DCMROFF);
  delay (300);
}
void TurnAround ()
  M1.run (FORWARD);
M2.run (BACKWARD);
M2.setSpeed (100+DCMROFF);
  delay (700);
}
void Stop () {
  M1-run (RELEASE);
  M2-run (RELEASE);
  Delay_(100);
}
```

## REFERENCES

- [1] Hou-Tsan Lee, Wei-Chuan Lin, Ching-Hsiang Huang, Yu-Jhih Huang, “Wireless indoor surveillance robot”, in 2011 Proceedings of SICE Annual Conference (SICE), 2017, p. 2164- 2169
- [2] Christian Hernández, Raciél Poot, Lizzie Narváez, Erika Llanes and Victor Chi, “Design and Implementation of a System for Wireless Control of a Robot”, IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 5, September 2016
- [3] K. Pooventhan, R. Achuthaperumal and C. Manoj Balajee, "Surveillance Robot Using Multi Sensor Network", *International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control*, vol. 3,no. 2, pp. 113-115, 2015.
- [4] J. Garcia, A. Alsuwaylih and S. Tosunoglu, "Security Patrolling Autonomous Robot", in *Florida Conference on Recent Advances in Robotics*, 14-15 May 2015.
- [5] Kyunghoon Kim, “Intelligent surveillance and security robot systems”, in IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO), 2010, p. 70- 73.
- [6] Change Zheng, “Mechanical design and control system of a miniature surveillance robot”, in ICIA '09, International Conference on Information and Automation, 2009, p. 1228- 1233.
- [7] Tahzib Mashrik, Hasib Zunair, “Design and Implementation of Security Patrol Robot using Android Application”, 2017 Asia Modelling Symposium.
- [8] Imen Hassani, Luis Gracia, “Robot Path Planning with Avoiding Obstacles in Known Environment Using Free Segments and Turning Points Algorithm”, 2018.
- [9] <https://www.build-electronic-circuits.com/h-bridge/>.

[10] <https://www.rhydolabz.com/wiki/?p=902>.

[11] <https://components101.com/wireless/hc-05-bluetooth-module>.

[12] <https://www.theengineeringprojects.com/2018/06/introduction-to-arduino-uno.html>.



**JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT**  
**PLAGIARISM VERIFICATION REPORT**

Date: ...14.7.2020

Type of Document (Tick):  PhD Thesis  M.Tech Dissertation/ Report  B.Tech Project Report  Paper

Name: Bhavya Chadha

Department: ECE

Enrolment No: 161075

Contact No. 8679272757 E-mail. bhvchadha@gmail.com

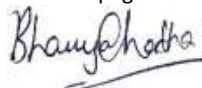
Name of the Supervisor: Dr.Shweta Pandit

Title of the Thesis/Dissertation/Project Report/Paper (In Capital letters): WIRELESS SURVEILLANCE ROBOT

**UNDERTAKING**

I undertake that I am aware of the plagiarism related norms/ regulations, if I found guilty of any plagiarism and copyright violations in the above thesis/report even after award of degree, the University reserves the rights to withdraw/revoke my degree/report. Kindly allow me to avail Plagiarism verification report for the document mentioned above.

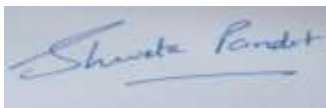
- Total No. of Pages = 64
- Total No. of Preliminary pages = 9
- Total No. of pages accommodate bibliography/references = 2



(Signature of Student)

**FOR DEPARTMENT USE**

We have checked the thesis/report as per norms and found **Similarity Index** at ...18 (%). Therefore, we are forwarding the complete thesis/report for final plagiarism check. The plagiarism verification report may be handed over to the candidate.



(Signature of Guide/Supervisor)

Signature of HOD

**FOR LRC USE**

The above document was scanned for plagiarism check. The outcome of the same is reported below:

Copy Received on	Excluded	Similarity Index (%)	Abstract & Chapters Details	
	<ul style="list-style-type: none"> <li>• All Preliminary Pages</li> <li>• Bibliography/ Images/Quotes</li> <li>• 14 Words String</li> </ul>		Word Counts	
<b>Report Generated on</b>			Character Counts	
		<b>Submission ID</b>	Page counts	
			File Size	

Checked by  
Name & Signature  
Librarian

.....