SONARGAON UNIVERSITY (SU)

A Project On Android Controlled Fire Fighting Robot

Supervised By

Nurul Ambia Alaul

Lecturer
Department of EEE
Sonargaon University (SU)

Submitted By

Md. Mahamudur Rahman	**ID: EEE1602008039**
K.M Shariful Islam Sumon	**ID: EEE1602008078**
Md. Al-Mamun	**ID: EEE1602008040**
Prodip Kumar Sarkar	**ID: EEE1602008016**
Md. Imran Hossain	**ID: EEE1602008041**

Department of Electrical & Electronic Engineering (EEE)
Sonargaon University (SU)
147/I, Panthapath,
Dhaka-1215, Bangladesh

Declaration

It is declared hereby that this thesis paper or any part of it has not been submitted to anywhere else for the award of any degree.

.....	….....
Md. Mahamudur Rahman	**K.M Shariful Islam Sumon**
.....	….....
Md. Al-Mamun	**Prodip Kumar Sarkar**
.....	
Md. Imran Hossain	

Under the Supervision of

.....

Nurul Ambia Alaul

Lecturer

Department of EEE

Sonargaon University (SU)

Certification

This is to certify that this project entitled "**Android Controlled Fire Fighting Robot**" is done by the following students under my direct supervision. This project work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering, Sonargaon University (SU) in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

Supervisor

.....

Nurul Ambia Alaul

Lecturer

Department of Electrical and Electronic Engineer (EEE)

Sonargaon University (SU)

ACKNOWLEDGEMENT

The report titled as on ”**Android Controlled Fire Fighting Robot**” has been prepared to fulfill the requirement of our practicum program. In the process of doing and preparing our project report, we would like to pay our gratitude to some persons for their enormous help and vast co-operation.At first, we would like to show our gratitude to the University authority to permit us to do our project.Specially, we would like to thank to our honorable teacher **Nurul Ambia Alaul,**Lecturer, Department of Electrical & Electronics Engineering, SU– Sonargaon University, Dhaka, for his valuable and patient advice, sympathetic assistance, co-operation, contribution of new idea. Deep theoretical and hardware knowledge & keen interest of our supervisor in this field influenced us to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project.We are, indeed, grateful to all those from whom we got sincere cooperation and help for the preparation of this report.

ABSTRACT

The project is to develop a robotic vehicle capable of detecting the presence of fire and extinguishing it automatically. It is a movable robot that consists of fire sensor for detecting the fire, gear motor and motor driver for the movement of the robot, relay driver for pump control and a Bluetooth module which are used for the detecting and extinguishing the fire. Usually, the robot moves at a steady speed. When the fire sensor detects the fire in the environment, the signal indicating the presence of fire will be sent to the Arduino through which the extinguishing is done. In the extinguishing process, whenever the detection of fire is positive the robot will stop at the place of fire occurred and starts the pump and sprinkle water through a sprinkler until the fire is put off. The entire control is achieved using Arduino which is interfaced with the android mobile via Bluetooth module, so that the control of the robot can be made from an android mobile as well.

TABLE OF CONTENTS

Topics	Page No
ACKNOWLEDGEMENT	IV
ABSTRACT	V
TABLE OF CONTENTS	VI
CHAPTER NAME	VI
LIST OF FIGURES	VIII
LIST OF TABLES	IX

CHAPTER 1: INTRODUCTION

TOPICS		Page No.
1.1	Introduction	10
1.2	Objectives	10

CHAPTER 2: WORKING PRINCIPLE AND DESIGN OF THE SYSTEM

2.1	Introduction	11
2.2	Working Principle	11
2.3	Block Diagram	12
2.4	Used material	12
2.5	Cost Estimation	13

CHAPTER 3: HARDWARE DESCRIPTION

3.1	Introduction	14
3.2	Arduino Uno	14
3.3	Microcontroller ATMEGA328	15
3.4	Bluetooth Module (HC-05)	16
3.5	Relay Driver	17
3.6	DC Gear Motor	18
3.7	Motor Driver	19
3.8	Servo Motor (SG90	19
3.9	Controlling Of Servo Motor	20
3.10	IR Flame Sensor	21
3.11	5V DC Submersible Water Pump	22
3.12	Li-ion Battery Charger	22
3.13	Robot Body	23

CHAPTER 4: PROJECT OVERVIEW

4.1	Circuit Description	24
4.2	Flow Chart	25
4.3	Image of project	26

CHAPTER 5: ADVANTAGE AND LIMITATION

5.1	Introduction	27
5.2	Result	27
5.3	Advantage	27
5.4	Limitation	27
5.5	Application	28

CHAPTER 6: CONCLUSION

		Page No.
6.1	Conclusion	29
6.2	Future scope of works	29

LIST OF FIGURES

FIGURE NO.	FIGURE NAME	PAGE NO
2.3.1	Block diagram of the project	13
3.2.1	Arduino UNO Pin Diagram	14
3.3.1	ATmega328 Microcontroller	15
3.4.1	Bluetooth Modul	17
3.5.1	Relay Drive	17
3.6.1	DC Gear Motor	18
3.7.1	Motor Driver L293N	19
3.8.1	Servo Motor	20
3.9.1	Variable Pulse width control	21
3.10.1	IR Flame Sensor	21
3.11.1	Water Pump	22
3.12.1	Li-ion battery charger	23
4.1.1	Circuit Diagram of the project	24
4.2.1	Flow chart of the project	25
4.3.1	Real image of the project(Top Side View)	26
4.3.2	Real image of the project(Back Side View)	26

LIST OF TABLES

Table 2.5.1.1	Cost Estimation	13
Table 3.2.1.1	Technical specification of Arduino UNO	15

References 30

Appendix 31-34

CHAPTER 1

INTRODUCTION

1.1 Introduction

As the robotic field is developed a lot, human interaction is made less and the robots are widely used for the purpose of safety. Fire accidents have become common in our day-to-day life and sometimes it may lead to dangerous problems which will be harder for the firemen for protecting the human life. In order to avoid these cases, this robot is used to guard human lives, surroundings and wealth from the fire accidents. For engineering students, who are interested in robotics, this firefighting robot project is an advanced project. The Bluetooth technology for remote operation and Arduino UNO are incorporated in this project.

1.2 Objectives

The need for a robot or a device that detects and extinguishes fire on its own is long past due. Fire accidents originate when someone is either sleeping or not at home or due to some carelessness in laboratories, stores etc. By inventing such a device, humans as well as property can be saved at higher rate with minimum damage caused by the fire. As instrumentation engineers, our task was to design and build a prototype system that could autonomously detect and extinguish a fire and also aims at minimizing the air pollution. The possibilities of fire are at any remote area or in an industry such as in garments go down, cotton mills, and fuel storage tanks, electric leakages may result in terrible fire & harm. To the worst case of accidents, fire causes heavy loss both financially and by taking lives. It can navigate alone actively and scan the presence of fire and extinguish . In cases this robot can be used as an emergency device. It is designed in such a manner that could identify the fire as soon as the fire catches and extinguish before the fire spread out and cause heavy damage. The firefighting robot will have future scope that it can work with firefighters, which greatly reduce the danger of injury to victims. It is a innovative work in the field of robotics that operates towards a sensible and obtainable access to save the lives and prevents the danger to property.

CHAPTER 2

WORKING PRINCIPLE AND DESIGN OF THE SYSTEM

2.1 Introduction

In this chapter fully cover with discuss working principle and design of this system. Here we will discuss about developed block diagram and briefly describe about the working principle.

2.2 Working Principle

In this system is working based on bluetooth communication and signal of the IR sensor.

- Starting with read the signal of bluetooth command and Signal of IR flame sensor.
- Then the signal will be convert to digital signal.
- The control system continuously checks IR signal & bluetooth command and will send command to motor driver,servo motor and water pump.
- If the bluetooth command available the robot will move as per setting program.
    - For command **1**=Move Forward
    - For command **2**=Move Backward
    - For command **3**=Turn Left
    - For command **4**=Turn Right
    - For command **5**=Stop the robot etc
- If IR sensor sense or detected the fire,the robot will be stop and pump will be turn ON and put off the fire.

2.3 Block Diagram

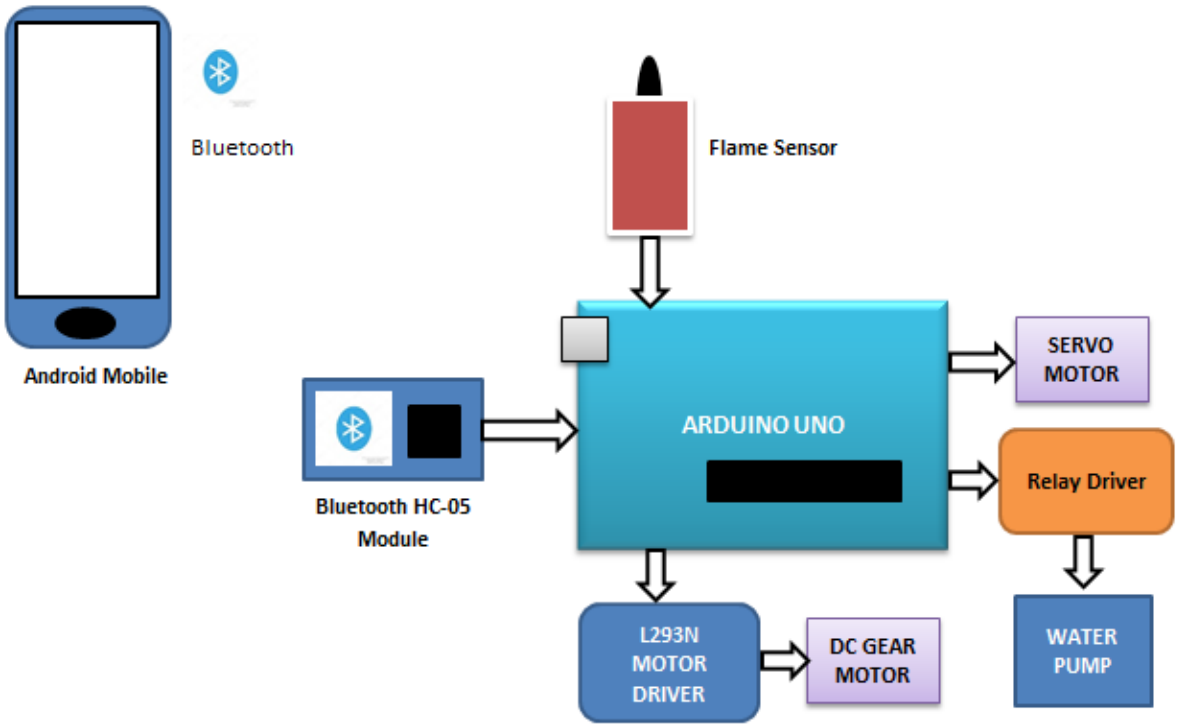


Fig: 2.3.1: Block diagram of the project

Here's the block diagram of our Android base fire fighting robot system. We can clearly describe the working process through this block diagram. In this project, a flame sensor is used to detect the occurrence of the fire in the surrounding environment. Actually here a flame sensor is connected to a circuit which produces an digital output(1/0) when the fire is detected. This digital output is connected to the Arduino pin as interrupt signal. A water pump has installed, which will sprinkle the water by Hoses pipe when the fire is detected by the sensor.On the other hand we can control the gear motor by sending command via bluetooth communication.

2.4 Used Materials

1. Microcontroller (Arduino UNO) - 1 pcs
2. Battery 9V - 1 pcs
3. Battery 3.7V - 1 pcs
4. IR Flame sensor - 3 pcs
5. Motor Driver (L293N) -1 pcs
6. Servo Motor (5V) - 1 pcs
7. Gear Motor (5V) - 2 pcs
8. Car Wheel set - 2 pcs
9. Wheel - 1 pcs
10. Water pump - 1 pcs

11. Single channel relay module(5V) - 1 pcs
12. Bluetooth Module (HC-05) - 1 pcs
13. DC-DC Voltage booster (3.7 to 5V) - 1 pcs
14. Switch - 1 pcs
15. Jumper Wires - As needed

2.5 Cost Estimation

Table:2.5.1.1: Cost Estimation

SI	Particulars	Specification	Qty.	Unit Price	Total Price
1	Arduino Uno		1	350	350
2	Battery	9V	1	60	60
3	Battery	3.7V	1	90	90
4	IR Flame sensor		3	100	300
5	Motor Driver	L293N	1	220	220
6	Servo Motor	(SG90)	1	270	300
7	Gear motor	(3.7v to 5V)	2	60	120
8	Car wheel set		1	100	100
9	Wheel		1	100	100
10	Water pump	(5V)	1	130	130
11	Single channel relay module	(5V)	1	200	200
12	Bluetooth Module	(HC-05)	1	250	250
13	DC-DC Voltage booster	(3.7 to 5V)	1	120	120
14	Switch	SPST	1	20	20
15	Jumper Wires		As needed	90	90
16	Others				100
				Total	**2470**

CHAPTER 3

HARDWARE DESCRIPTION

3.1 Introduction

This chapter includes the total over view of the device. In this chapter we have followed-up the theory of Arduino Uno, Microcontroller ATMEGA328P, Bluetooth Module, Relay Driver, DC Gear Motor, Motor Driver,Servo Motor,IR Flame sensor,Water pump and other components.And we will also know that how the equipment are working with each other.

3.2 Arduino Uno

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language and the Arduino Software (IDE), based on Processing.

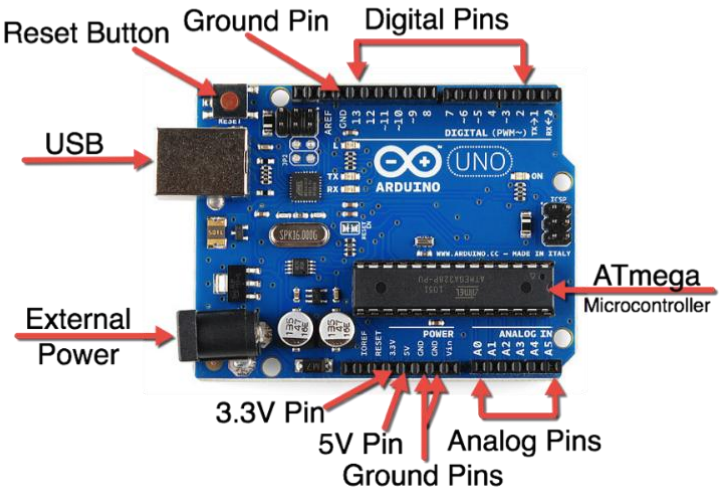


Fig: 3.2.1 Arduino UNO Pin Diagram

Technical specifications:

Table 3.2.1.1: Technical specifications of Arduino UNO

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz

3.3 Microcontroller ATMEGA328P

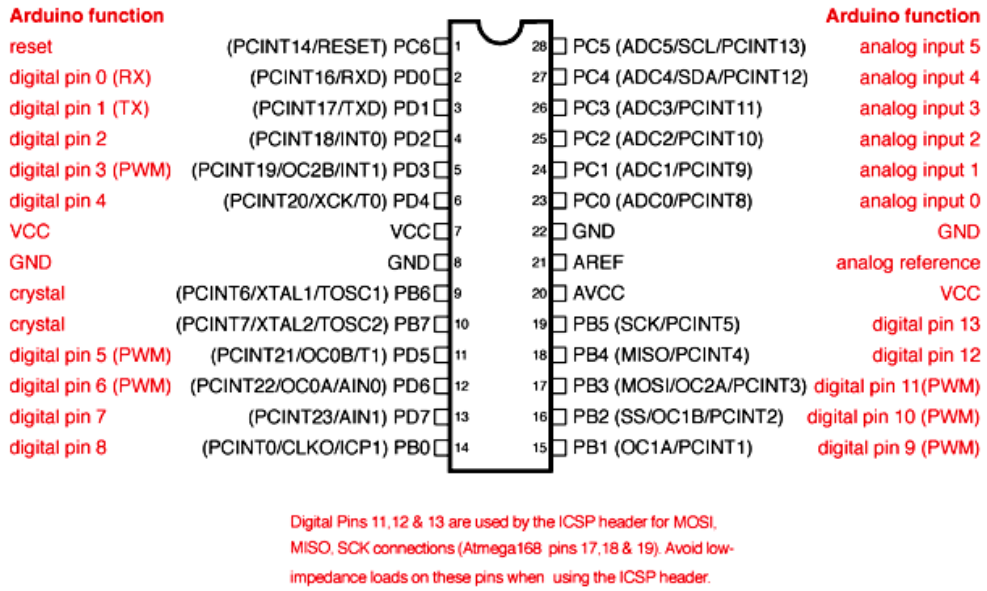


Fig: 3.3.1 ATmega328 Microcontroller

The Atmel® picoPower® ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per MHz. This

empowers system designer to optimize the device for power consumption versus processing speed.The Atmel AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in a single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers. The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs , 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages) , a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption. In Extended Standby mode, both the main oscillator and the asynchronous timer continue to run. Atmel offers the QTouch® library for embedding capacitive touch buttons, sliders and wheels functionality into AVR microcontrollers. The patented charge-transfer signal acquisition offers robust sensing and includes fully debounced reporting of touch keys and includes Adjacent Key Suppression® (AKS™) technology for unambiguous detection of key events. The easy-to-use QTouch Suite toolchain allows you to explore, develop and debug your own touch applications. The device is manufactured using Atmel's high density non-volatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed In-System through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core. The Boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega328/P is a powerful microcontroller that provides a highly flexible and cost effective solution to many embedded control applications. The ATmega328/P is supported with a full suite of program and system development tools including: C Compilers, Macro Assemblers, Program Debugger/Simulators, In-Circuit Emulators, and Evaluation kits.

3.4 Bluetooth Module (HC-05)

The HC-05 Bluetooth Module makes a great solution for wireless communication as it can be used in a Master or Slave configuration. To establish a connection between MCU and GPS, PC to your embedded project, etc you can use it simply for a serial port

replacement. The HC-05 Bluetooth Module has 6 pins namely-VCC, GND, TX, RX, Key and LED.

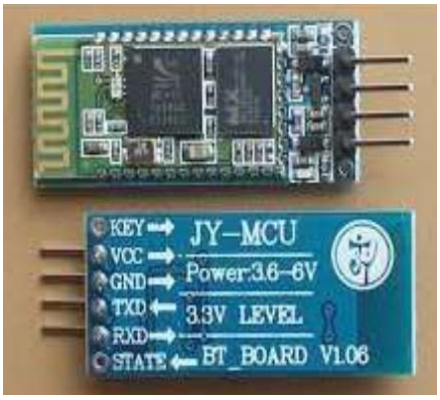


Fig:3.4.1: Bluetooth Module

It is pre-programmed in a Slave mode, so there is no need to connect the Key pin, unless you need it to change it to Master mode. The main difference between a Master and Slave modes is given as, the Bluetooth module cannot initiate a connection, it can however accept incoming connections in a Slave mode. The Bluetooth module can transmit and receive data regardless of the mode it is running in, after the connection is established. To connect a mobile phone to the Bluetooth module, it can be simply used in the Slave mode. This module has a default data transmission rate of 9600kbps and the range for Bluetooth communication is usually 30m or less.

3.5 Relay Driver

Single channel relay driver is an electrically operated device which has a control system and controlled system. A control system is also called as input circuit or input contactor and the controlled system is also called as output circuit or output contactor that are frequently used in automatic control of a circuit.

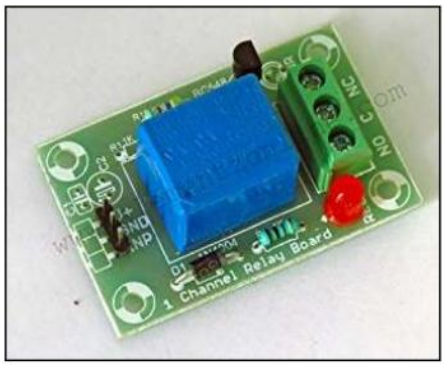


Fig:3.5.1: Relay Driver

It is an automatic switch that controls a high-current circuit with a low-current signal. Some advantages of a relay are its lower moving inertia, stability, high reliability and small volume. It has wider application in power protection device, automation technology, sports, remote control, reconnaissance and communication and in electro mechanics and power electronics devices. A relay consist of an induction part that is capable of reflecting the input variable like current, voltage, temperature, pressure, speed, light, power, resistance and frequency etc. To energize or de-energize the connection of controlled circuit an actuator module (output) is present inside it. For coupling and to isolate input current as well as to actuate the output there is an intermediary part between input part and output part is used for the operation to be dones. The controlled output circuit of relay will be energized or de-energized when the rated value of input (voltage, current and temperature etc.).

3.6 DC Gear Motor

The 5V DC gear motors are simply an extension of the DC motors. It consists of a gear assembly attached to the motor. The gear assembly is used for reducing the speed and increasing the torque of the motor. The speed can be reduced to any desirable figure by using the correct combination of gears in a gear motor. Gear reduction is the concept where gears reduce the speed of the vehicle but increase its torque. The speed of motor is counted in terms of RPM (rotations of the shaft per minute).This 5V DC gear motor has a RPM of 60.This speed is capable of changing its value, according to the input voltage given to drive the motor. The structure of 5V DC gear motor is described in the following.



Fig:3.6.1: DC Gear Motor

3.7 Motor Driver

H-Bridge's are typically used in controlling motors speed and direction, but can be used for other projects such as driving the brightness of certain lighting projects such as high powered LED arrays. An H-Bridge is a circuit that can drive a current in either polarity and be controlled by Pulse Width Modulation (PWM).

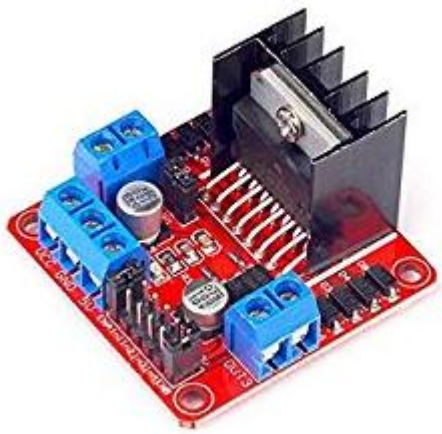


Fig: 3.7.1: Motor Driver L293N

Pulse Width Modulation is a means in controlling the duration of an electronic pulse. In motors try to imagine the brush as a water wheel and electrons as a the flowing droplets of water. The voltage would be the water flowing over the wheel at a constant rate, the more water flowing the higher the voltage. Motors are rated at certain voltages and can be damaged if the voltage is applied to heavily or if it is dropped quickly to slow the motor down. Thus PWM. Take the water wheel analogy and think of the water hitting it in pulses but at a constant flow. The longer the pulses the faster the wheel will turn, the shorter the pulses, the slower the water wheel will turn. Motors will last much longer and be more reliable if controlled through PWM.

3.8 Servo Motor (SG90)

The servo motor is most commonly used for high technology devices in the industrial applications like automation technology. It is a self contained electrical device, that rotates parts of machine with high efficiency and great precision. Moreover the output shaft of this motor can be moved to a particular angle. Servo motors are mainly used in home electronics, toys, cars, airplanes and many more devices.



Fig: 3.8.1: Servo Motor

Basically a servo motor is a closed-loop servomechanism that uses position feedback to control its motion and final position. Moreover the input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft .

The motor is incorporates some type of encoder to provide position and speed feedback. In the simplest case, we measure only the position. Then the measured position of the output is compared with the command position, the external input to controller. Now If the output position differs from that of the expected output, an error signal generates. Which then causes the motor to rotate in either direction, as per need to bring the output shaft to the appropriate position. As the position approaches, the error signal reduces to zero. Finally the motor stops.

3.9 Controlling Of Servo Motor

Servos are controlled by sending an electrical pulse of variable width, or **pulse width modulation** (PWM), through the control wire. There is a minimum pulse, a maximum pulse, and a repetition rate. A servo motor can usually only turn 90° in either direction for a total of 180° movement. The motor's neutral position is defined as the position where the servo has the same amount of potential rotation in the both the clockwise or counter-clockwise direction. The PWM sent to the motor determines position of the shaft, and based on the duration of the pulse sent via the control wire; the rotor will turn to the desired position. The servo motor expects to see a pulse every 20 milliseconds (ms) and the length of the pulse will determine how far the motor turns. For example, a 1.5ms pulse will make the motor turn to the 90° position. Shorter than 1.5ms moves it in the counter clockwise direction toward the 0°

position, and any longer than 1.5ms will turn the servo in a clockwise direction toward the 180° position.

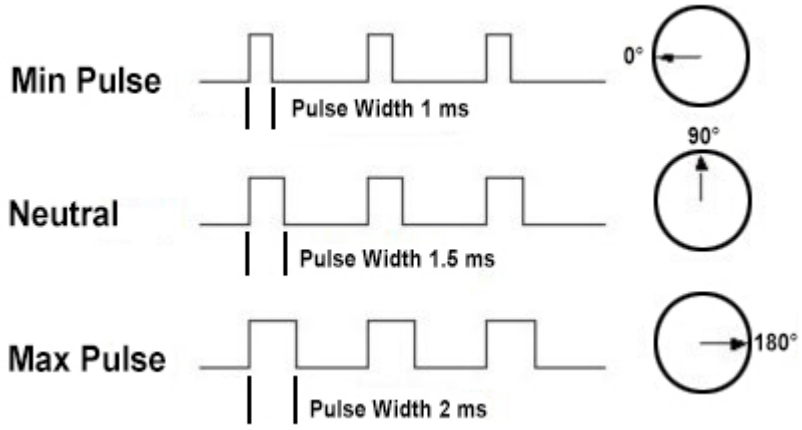


Fig: 3.9.1: Variable Pulse width control servo position

3.10 IR Flame Sensor

A flame sensor module that consists of a flame sensor (IR receiver), resistor, capacitor, potentiometer, and comparator LM393 in an integrated circuit. It can detect infrared light with a wavelength ranging from 700nm to 1000nm.The far-infrared flame probe converts the light detected in the form of infrared light into current changes. Sensitivity is adjusted through the onboard variable resistor with a detection angle of 60 degrees.

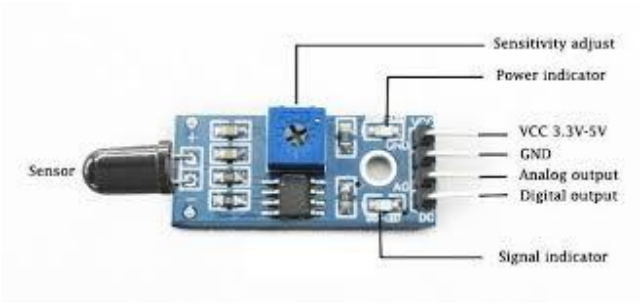


Fig: 3.10.1: IR Flame Sensor

Working voltage is between 3.3v and 5.2v DC, with a digital output to indicate the presence of a signal. Sensing is conditioned by an LM393 comparator.

3.11 5V DC Submersible Water Pump



Fig: 3.11.1: Water Pump

Electric submersible pumps are multistage centrifugal pumps operating in a vertical position. Liquids, accelerated by the impeller, lose their kinetic energy in the diffuser where a conversion of kinetic to pressure energy takes place. This is the main operational mechanism of radial and mixed flow pumps.

The pump shaft is connected to the gas separator or the protector by a mechanical coupling at the bottom of the pump. Fluids enter the pump through an intake screen and are lifted by the pump stages. Other parts include the radial bearings (bushings) distributed along the length of the shaft providing radial support to the pump shaft. An optional thrust bearing takes up part of the axial forces arising in the pump but most of those forces are absorbed by the protector's thrust bearing.

3.12 Li-ion Battery charger (TP4056)

This TP4056 1A Li-ion lithium Battery Charging Module with Current Protection – Mini USB is a tiny module, perfect for charging single cell 3.7V 1 Ah or higher lithium ion (Li-Ion) cells such as 16550s that don't have their own protection circuit. Based on the TP4056 charger IC and DW01 battery protection IC this module will offer 1A charge current then cut off when finished.



Fig: 3.12.1: Li-ion battery charger

3.13 Robot Body

The robot body consists of wheels which are to drive the robot and extinguishing components like water tank, pump, and sprinkler. A water tank with pump is placed on the robot body and its operation is carried out from the Arduino o/p through the proper signal from the transmitting end. The entire operation is controlled by a Arduino. A motor driver IC is interfaced to the Arduino through which the controller drives the gear motors for the movement of the robotic vehicle.

CHAPTER 4

PROJECT OVERVIEW

4.1 Circuit Description

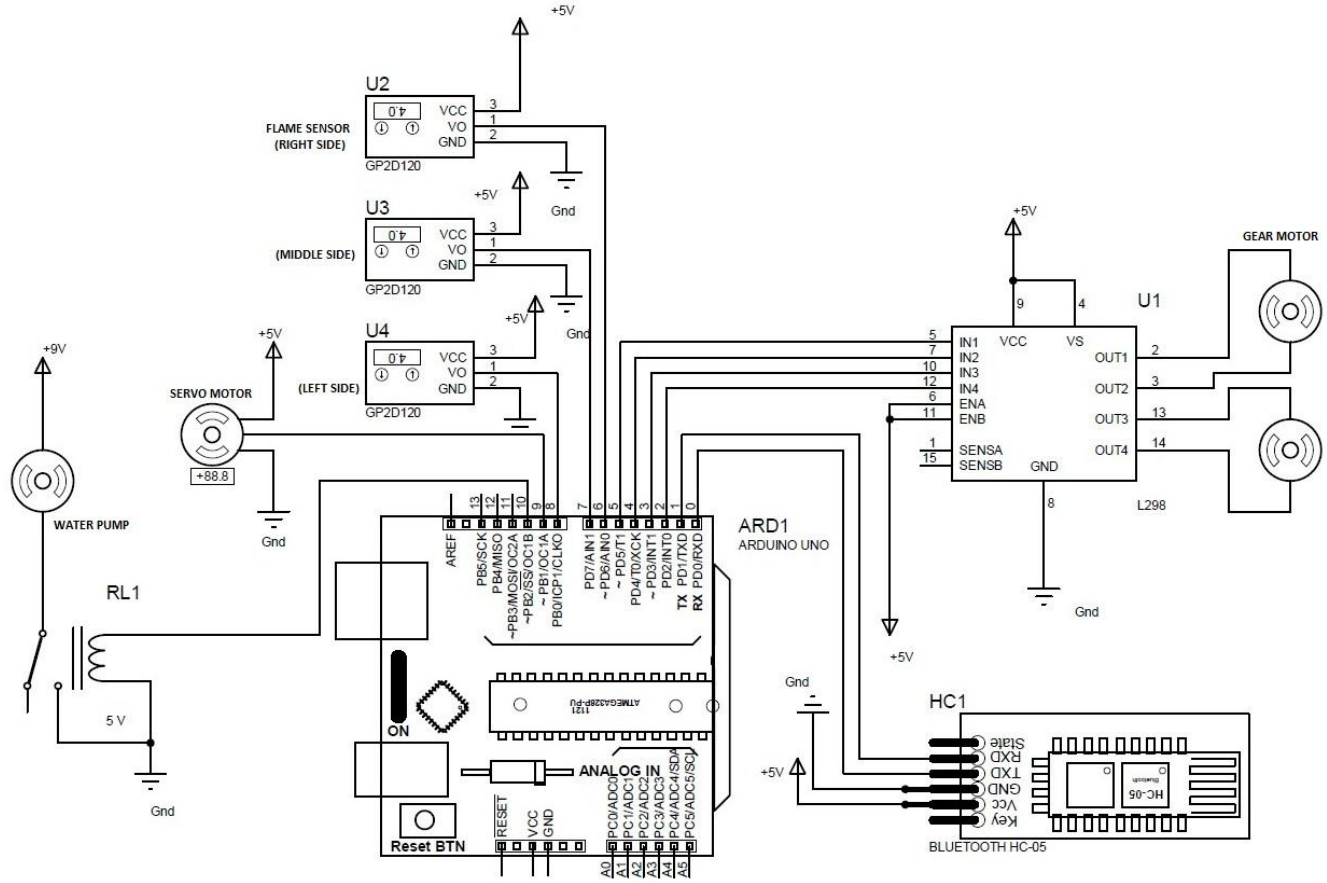


Fig: 4.1.1: Circuit diagram of the Project

In the above circuit you can see that there has three IR Flame sensor are connected with arduino board for detected the fire,and one bluetooth module also connected with arduino,which **Rx** pin has been connected to pin **Tx** of arduino and **Tx** pin has been connected to pin **Rx** of arduino,rest of two pin are connected to 5V DC power supply.Control pin of servo motor has been connected pin no. 9 with arduino board to control angle of servo motor.Four wire are connected with one motor driver to control the gear motor ,and one relay driver has been connected to control the pump.

4.2 Flow Chart

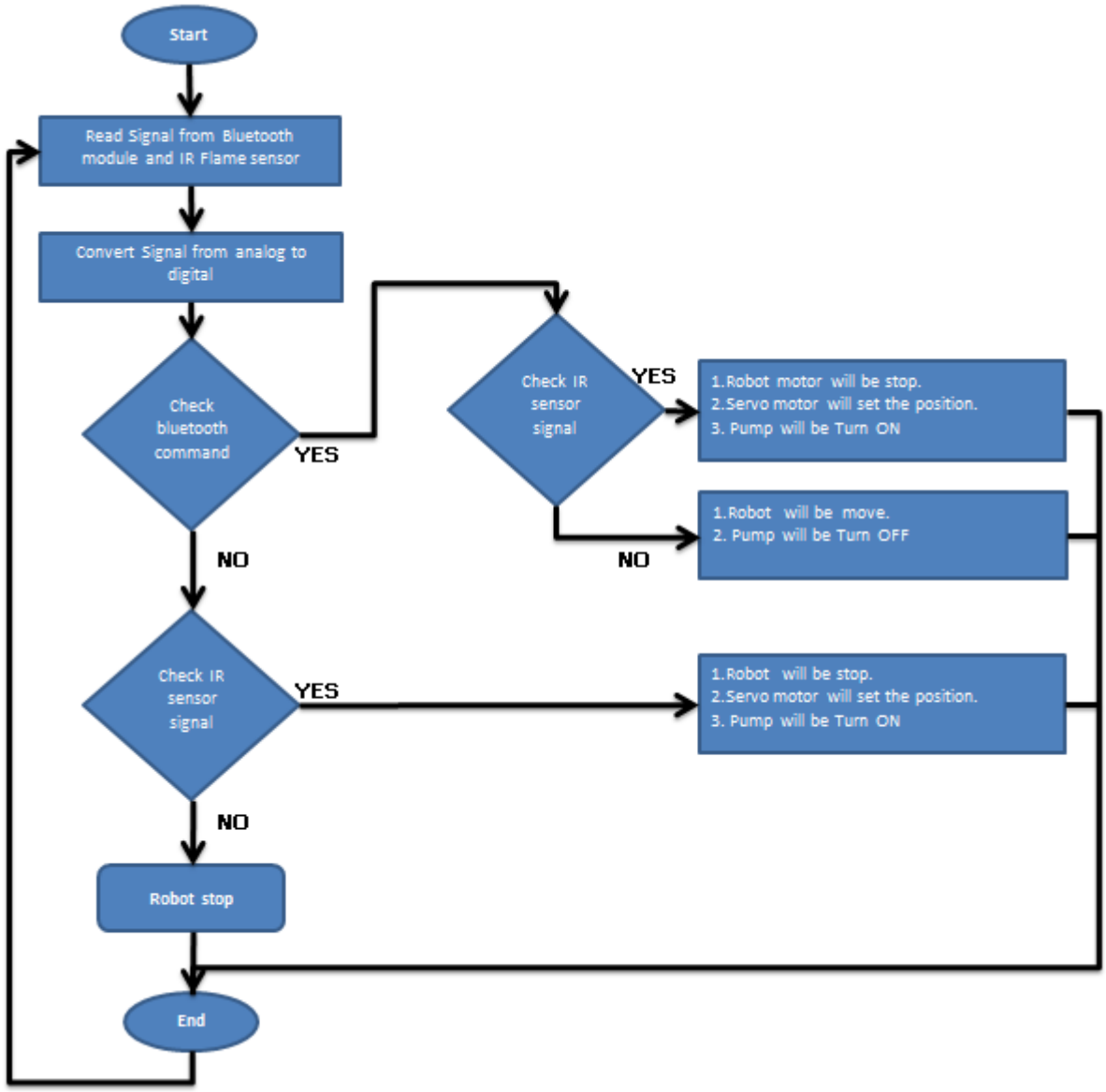


Fig: 4.2.1: Flow chart of the project

In this flowchart we can easily determine the working process of our system.

- Read the signal from Bluetooth module and IR Flame sensor.
- Convert signal into digital signal.
- If Bluetooth command available, Then It will check IR flame sensor signal. If IR sensor signal is available then robot will be stop and pump will be turn ON.If IR signal not available then robot will be move only.

- If Bluetooth command not available, Then It will check IR flame sensor signal again. If IR signal is available then robot will be stop and pump will be turn ON.
- If any signal not available then robot will be stop.

4.3 Image of the Project

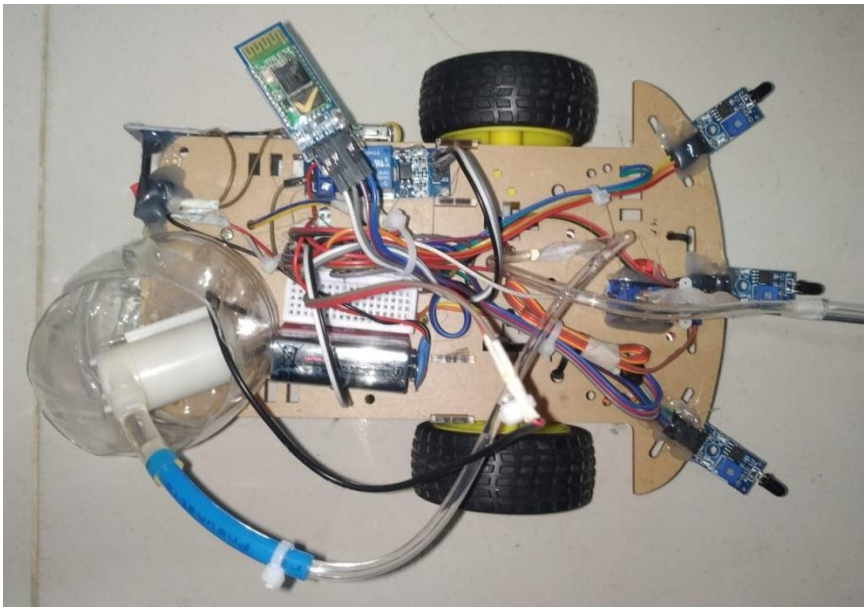


Fig: 4.3.1: Real image of the project(Top Side View)

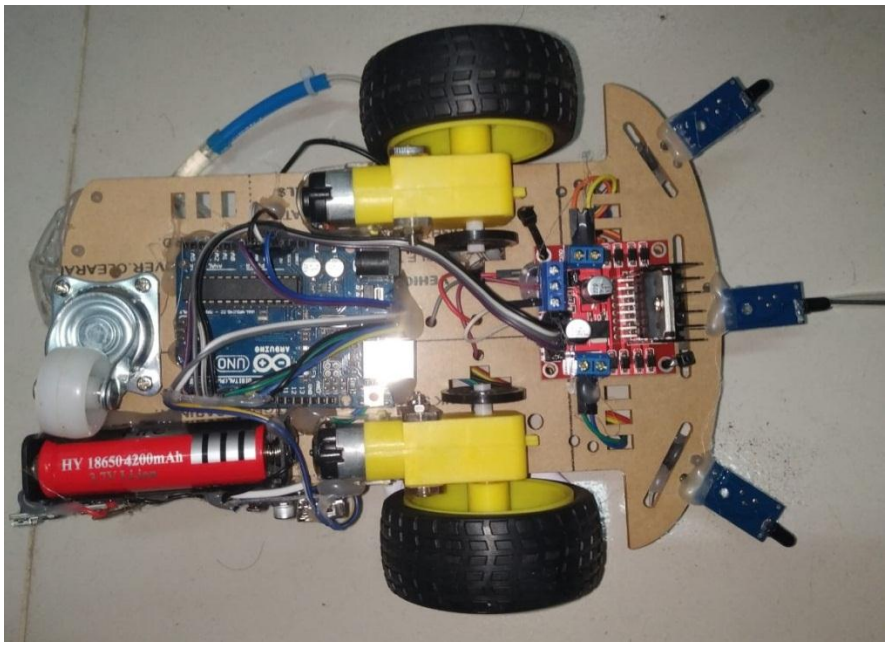


Fig: 4.3.2: Real image of the project(Back Side View)

CHAPTER 5

ADVANTAGE AND LIMITATION

5.1 Introduction

This chapter contains the results obtained and discussion about the project. We have also covered discussions about advantages, disadvantages and limitation of current version of the protection system.

5.2 Result

The robot can operate in the environment which is out of human reach in very short time, the delay employed is very minimal. The robot accurately and efficiently finds the fire and within minimum time after the fire is detected it is extinguished.

5.3 Advantage

- Reduce human effort.
- To detect the exact direction of the fire source.
- Capability of sensing accurately with increased flexibility.
- Useful were man cannot reach.
- Compact in size, low weight.
- Can work better than human being.
- Not sensitive to weather conditions.

5.4 Limitations

- In high flames robot can get damage.
- Can't rescue itself in sudden emergency.
- It is not used to put out large fires.
- It cannot work beyond the range.
- The robot could not be run through the batteries for long time because at some conditions the current requirment for the circuit rised to about 1A which is very high and can not be obtained using batteries.
- In the present condition it can extinguish fire only in the way and not in all the rooms.
- Communication devices mostly use similar frequency, so interference occurs if the addresses are not specified.

5.5 Application

- ❖ Can be used in server rooms and power plant control rooms .
- ❖ Extinguishes fire where probability explosion is high.
- ❖ Disaster area monitoring and rescue.

CHAPTER 6

CONCLUSION

5.1 Conclusion

This project describes about the real time firefighting robot which moves in a constant speed, identify the fire and then extinguish it with the help of pumping mechanism. The detection and extinguishing was done with the help of Arduino in which the IR Flame sensor, gear motor and its driver, relay driver etc. are interfaced. The robot is connected with mobile phone through the Bluetooth module and processes the analog and digital data received from the sensors in the Arduino control determine the fire in the environment. Both hardware and software has been realized successfully in this project. The "Android controlled firefighting robot" can be used easily in everyday life such as in homes, laboratories, parking lots, supermarkets, stores, shops etc. The fire extinguishing was done with the help of water through the pumping mechanism.However, in this project, extinguishing of fire is done with the water which is most suitable for both time and material work..

5.2 Future scope of work

- Camera and video transmission can be added.
- Improve weight capacity of the robot.
- Remote control using RF & GPS system.
- Will be extended to a real fire extinguisher by replacing the water tank by a carbon-di-oxide carrier and by making it to extinguish fires of all the room using microprogramming.

References

- https://www.google.com/search?client=firefox-b-d&q=fire+fighting+robot+using+arduino
- https://www.google.com/search?client=firefox-b-d&q=Arduino+UNO
- https://www.google.com/search?client=firefox-b-d&q=HC-05+bluetooth+module
- https://www.google.com/search?client=firefox-b-d&q=single+chennel+relay+driver+5v
- https://www.google.com/search?client=firefox-b-d&q=l293n+motor+driver+module
- https://www.google.com/search?client=firefox-b-d&q=5v+water+pump
- https://www.google.com/search?client=firefox-b-d&q=ir+flame+sensor+working
- https://www.google.com/search?client=firefox-b-d&q=servo+motor
- https://www.google.com/search?client=firefox-b-d&q=5v+gear+motor
- https://www.google.com/search?client=firefox-b-d&q=LIMITATION+OF+FIRE+FIGHTING+ROBOT

Appendix

Program Code:

```
#include <Servo.h>
Servo myservo;
int L1=3;
int L2=2;
int R1=4;
int R2=5;
int pos = 0;
int pump=10;
int Rx=0;
int middlesensor=7;  /////Front Sensor
int rightsensor=6;  /////Right Sensor
int lefttsensor=8; /////Left Sensor


void setup() {
  myservo.attach(9);
  Serial.begin(9600);
  pinMode(L1, OUTPUT);
  pinMode(L2, OUTPUT);
  pinMode(R1, OUTPUT);
  pinMode(R2, OUTPUT);
  pinMode(rightsensor, INPUT);
  pinMode(middlesensor, INPUT);
  pinMode(lefttsensor, INPUT);
  pinMode(pump, OUTPUT);
  digitalWrite(L1, LOW);
  digitalWrite(L2, LOW);
  digitalWrite(R1, LOW);
  digitalWrite(R2, LOW);
  digitalWrite(pump, HIGH); //Pump OFF};
```

```
void loop() {
int rightsensor = digitalRead(6);
int middlesensor = digitalRead(7);
int lefttsensor = digitalRead(8);

if(Serial.available() > 0)
{ Rx = Serial.read();

 if (Rx == '1')
{
digitalWrite(L1,HIGH);
digitalWrite(L2,LOW);
digitalWrite(R1, HIGH);
digitalWrite(R2,LOW);
}

 if (Rx == '2')
{
  digitalWrite(L1, LOW);
  digitalWrite(L2, HIGH);
  digitalWrite(R1, LOW);
  digitalWrite(R2, HIGH);
  }
 if (Rx == '3')
{
digitalWrite(L1,LOW);
digitalWrite(L2,LOW);
digitalWrite(R1, HIGH);
digitalWrite(R2,LOW);}
if (Rx == '4')
{
digitalWrite(L1,HIGH);
digitalWrite(L2,LOW);
digitalWrite(R1, LOW);
digitalWrite(R2,LOW);}
```

```
 if (Rx == '0')
{
digitalWrite(L1,LOW);
digitalWrite(L2,LOW);
digitalWrite(R1, LOW);
digitalWrite(R2,LOW);
digitalWrite(pump,HIGH);}

 if (Rx == '5')
{
Rx = Serial.read();
Rx='0';
}
//For Pump OFF
 if (Rx == '6') {digitalWrite(pump,HIGH);}

//For Pump ON
  if (Rx == '7') {digitalWrite(pump,LOW);}

 if (rightsensor==LOW)
{
Rx=0;
myservo.write(65);
digitalWrite(L1,LOW);
digitalWrite(L2,LOW);
digitalWrite(R1, LOW);
digitalWrite(R2,LOW);
digitalWrite(pump,LOW);
//delay(7000);
}
 if (middlesensor==LOW)
{
Rx=0;
myservo.write(110);
```

```
digitalWrite(L1,LOW);
digitalWrite(L2,LOW);
digitalWrite(R1, LOW);
digitalWrite(R2,LOW);
digitalWrite(pump,LOW);
//delay(7000);
}

 if (lefttsensor==LOW)
{ Rx=0;
myservo.write(165);
digitalWrite(L1,LOW);
digitalWrite(L2,LOW);
digitalWrite(R1, LOW);
digitalWrite(R2,LOW);
digitalWrite(pump,LOW);
//delay(7000);
}

//When fire not dected
 if (rightsensor==HIGH && middlesensor==HIGH && lefttsensor==HIGH)
{digitalWrite(pump,HIGH);}

}
```