IoT Based Multi-Functional Robot

B.E. Project Report

Submitted in partial fulfillment of the requirements

For the degree of

Bachelor of Engineering

(Electronics Engineering)

by

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and is submitted in the partial fulfillment of the requirement for the degree of

Bachelor of Engineering

(Electronics Engineering)

to the

University of Mumbai.

Examiner 1	Examiner 2	Supervisor
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Abstract

The purpose of this project is to develop a multifunctional robot using arduino and Iot(internet of things). It is basically a helper bot which could be used at different places such as hospitals, mines, household chores. The functions of this robot are to pick and place material used by patients in hospital and dispose the used materials which can spread germs or bacteria of diseases, this can disposes tissues syringe, needles etc. It can also be used for surveillance since it will also have a camera. One can use this robot for patients under observation, to keep record of their activities. This robot is equipped with hardware and software. This robot can be controlled by using the remote controller and also using computer program. The main objective of this project is to develop a prototype a multifunctional robot robot that can be used as a teaching method to deliver a better understanding of basic function, operation and programming of a robot. The application of this project is also can be used in other related field such as industry, mining, medical, military and so on. This project was successfully developed and tested and the hardware and the software could be integrated and working well without error.

Keywords:
IoT,Wi-Fi shield,sensors,Arduino IDE,IP Webcam,Multi-functional robot

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Abbreviations

ASIC	Application Specific Integrated Circuit
IC	Integrated Circuit
PCB	Printed circuit board
Tx	Transmitter pin
Rx	Receiver pin
HDL	Hardware description language
I/O	Inputs and Outputs
ISE	Integrated software environment
IEEE	Institute of Electrical andElectronic Engineers
IoT	Internet Of Things

Chapter 1

Introduction

Robots these days are reducing human efforts and enhancing the lifestyles,they can be used in dangerous or remote conditions. Basically, the multifunctional robot can be controlled manually and automatically. The robot will initially provide a remote control and control of movement of bot and also the other functions included in it. Next, the purpose of this robot is to pick up object from one place to another and also to move back and forth. We can mainly use it in hospitals where the things used by patients (tissues, syringes, needles) can cause the spread of contagious diseases, hence we can use this robot to dispose such materials without the damage of getting infected by the bacteria and viruses. This robot will have some utilitarian features such as camera, Wi-Fi control, movable parts so that it will be able to lift objects etc. The hardware and software which is been used is definitely a user-friendly programmed that will connect through robot. Motors will be used to move the bot . The camera used will be a part of surveillance and will be controlled by Wi-Fi shield. Some extra features such as metal detection will be used for mining industry and military purposes.

The basic block diagram of the working model of this IOT based multifunctional robot is given in the hardware implementation section.
We performed a detailed study of therobotic arm and the Arduino.we carried out testing at each step for the robotic arm when loaded and without any weights .we also learnt and familiarized with the arduino using assembly language.

Arm controlled robotics is quite popular among the various available robotics today . The robot arm these days has been a trend in robotics .this can be used in several industries as well as factories and other places .It is going to be controlled manually and will be connected to the arduino. In manual mode ESP8266 will do the work and control this pick and drop arm using a webpage this makes it simpler and easy to use.then arm has 4 servo motors which move up and down to the left and right . this will be fixed on the robot will be moving.The ultrasonic sensor will detect the object in a particular range and the arm will be used to pick it up and keep it or dispose it.

It is basically a helper bot which could be used at different places such as hospitals, mines, household chores. The functions of this robot are to pick and place material used by patients in hospital and dispose the used materials which can spread germs or bacteria of diseases, this can disposes tissues syringe, needles etc. It can also be used for surveillance since it will also have a camera. One can use this robot for patients under observation, to keep record of their activities. This robot is equipped with hardware and software. This robot can be controlled by using the remote controller and also using computer program. The main objective of this project is to develop a prototype a multifunctional

robot robot that can be used as a teaching method to deliver a better understanding of basic function, operation and programming of a robot. The application of this project is also can be used in other related field such as industry, mining, medical, military and so on. This project was successfully developed and tested and the hardware and the software could be integrated and working well without error.

1.1 Motivation

In this project titled as "Multifunctional Robot using Arduino and Wi-Fi shield we are planning to make a robot which will reduce human efforts. This project is based on Arduino and can be used in various situations. The design of the robot is kept simple so that it can be accessed by every individual with using a remote controlled.The camera used in this robot can be used to record videos which can be seen on the mobile phones or laptops using the IP Webcam Application. The multifunctional robot can also be able to pick and place objects as well as it can avoid obstacles with the help of sensors

1.2 Objectives of the project

For this project objectives are ,

1. To develop a robot which will be useful for medical purposes such as disposal of infectious materials used by patients in hospital for example tissues, syringes, needles etc.

2. To design a multifunctional robot with Wi-Fi shield which can operate a surveillance camera , which will be further used for observing patients in hospitals and also for military and industrial uses.

3. To design a robot with the abilities of metal detection using metal detector sensors.

4. To build both robot hardware and software system that could be integrated to support the application system of multifunctional robot.

5. Doing the theories and practical researches to develop the multifunctional robot and to generate the report on it.

1.3 Problem Definition

Robots have become important over a wide range of application from manufacturing,surgery, handling of hazardous materials.Consequently it is important to know how they work and what problems exist in designing a real robot. In the hospitals the things used by the patients can cause the spread of disease germs or bacterial infections, these objects can be picked and disposed by the multifunctional robot. Metal detection module can detect any kind of threat thus can be used in military applications.It can also be used in house-hold chores, basically it will reduce human efforts.
we have thus designed a robot which could be really reducing the efforts as well as reduces the spread of the disease and root causes for it. We can design it to be human friendly

so that a lay man can handle the robot with all the convenience or even the staff at the hospital can handle it. We can add as many applications as we require in the robot as the title justifies it.

1.4 Scope of the present work

Scope of the project is as follows:

- The multifunctional robot is based on the IOT system (Internet of things) so we can handle it using the network connection.
- since the robot has a ip webcam it can be used as a constant monitoring or observing tool. It can also be used for surveillance purposes
- the ultrasonic sensor is used for the automatic mode of operation of the robot.In which the sensor will detect the obstacles and keep moving in a particular direction
- We also provide a manual mode to the controller of the robot where it can be controlled by the user by using the ESP device.

1.5 Organisation of Report

report is organised as follows:

- Chapter 2 includes the literature survey
- Chapter 3 includes the hardware implementation
- Chapter 4 discusses the software implementation
- Chapter 5 shows the hardware output of the proposed design method
- Chapter 6 focuses on result.
- Chapter 7 is conclusion and chapter 8 is future scope of the current project.

Chapter 2

Literature Survey

PLC (Programmable Logic Controller) has been and still is the basic component of the industrial automation world. Industrial application made the PLC systems being very expensive, both to buy and repair, and also because of the highly specific skills requested to software designers to extract the maximum potentials from controllers.

Arduino is a kind of universal open source programmable controller, although it is only the core and in any case it has been built for general applications; with a little of external hardware; essentially interfaces capable of transferring signals from sensors and to actuators, reducing the EMI which may damage the microcontroller and an appropriate software may, however, become something very similar to a PLC. Since for a long time PLCs earned a trust and reliability of industy due to its ruggedness and performance but its programming softwares makes it costlier.
Now a days, some of manufacturers avail low cost PLC units but they charged high for its softwares. Arduino has the core of Atmega microcontroller which makes it a strong competitor of PLCs. As open source electronics development becomes a hot topic now a days, it is recommended to find out effective innovative solutions in place of traditional methods.

In this project titled as "Multifunctional Robot using Arduino and Wi-Fi shield we are planning to make a robot which will reduce human efforts. This project is based on Arduino and can be used in various situations. The design of the robot is kept simple so that it can be accessed by every individual with using a remote controlled.The camera used in this robot can be used to record videos which can be seen on the mobile phones or laptops using the IP Webcam Application. The multifunctional robot can also be able to pick and place objects as well as it can avoid obstacles with the help of sensors

In recent years, wireless technology has given rise to a large number of available mobile tools and their emerging applications are becoming more and more sophisticated by years. Therefore, many mobile robot platforms use wireless technology to communicate with off-line computing resources, human machine interfaces or others robots. Many mobile robots have equipped with wireless technology such as Bluetooth,Wi-Fi, Wireless LAN etc.
Currently, more than 100 million anti-personnel mines are under the ground all over the world. These mines not only disturb the economic development of mine-buried nations, but also injure or kill more than 2000 people a month. As a result, the removal of landmines has become a global emergency.

The current method of removing mines manually is costly and dangerous. Moreover, removal of all mines by this method would require several hundred years (it would takes one thousand according to a CMAC report based on Cambodian Mine Action Center Current Activities 1998), during which time, more mines might be buried in war zones.

It is basically a helper bot which could be used at different places such as hospitals, mines, household chores. The functions of this robot are to pick and place material used by patients in hospital and dispose the used materials which can spread germs or bacteria of diseases, this can disposes tissues syringe, needles etc. It can also be used for surveillance since it will also have a camera. One can use this robot for patients under observation, to keep record of their activities. This robot is equipped with hardware and software.

This robot can be controlled by using the remote controller and also using computer program. The main objective of this project is to develop a prototype a multifunctional robot robot that can be used as a teaching method to deliver a better understanding of basic function, operation and programming of a robot. The application of this project is also can be used in other related field such as industry, mining, medical, military and so on Arm controlled robotics is quite popular among the various available robotics today . The most important section of robotic arm is a programmable Arduino based brick capable of driving basicallya servos 4 dc motors design to form an anthropomorphicstructure. Our primary objective is to make the Robotic arm, having a servo motors 4 dc motor to interface with the In-development of a Robotic arm.availability of memory In Arduino helps us in storing programs. We performed a detailed study of therobotic arm and the Arduino.we carried out testing at each step for the robotic arm when loaded and without any weights .we also learnt and familiarized with the arduino using assembly language.

Chapter 3

Hardware Implementation

Components used in this project are as follows:

3.1 Arduino UNO Board

The microcontroller used here is arduino uno, which is based on atmega 328p.
In general it consists of 14 i/p o/p pins out of which 6 are used as PWM outputs, 6 as analog inputs.
The other important sections of the microcontroller are the 16 mhz quartz crystal, a usb connection a power jack and an icsp header.
It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.
You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

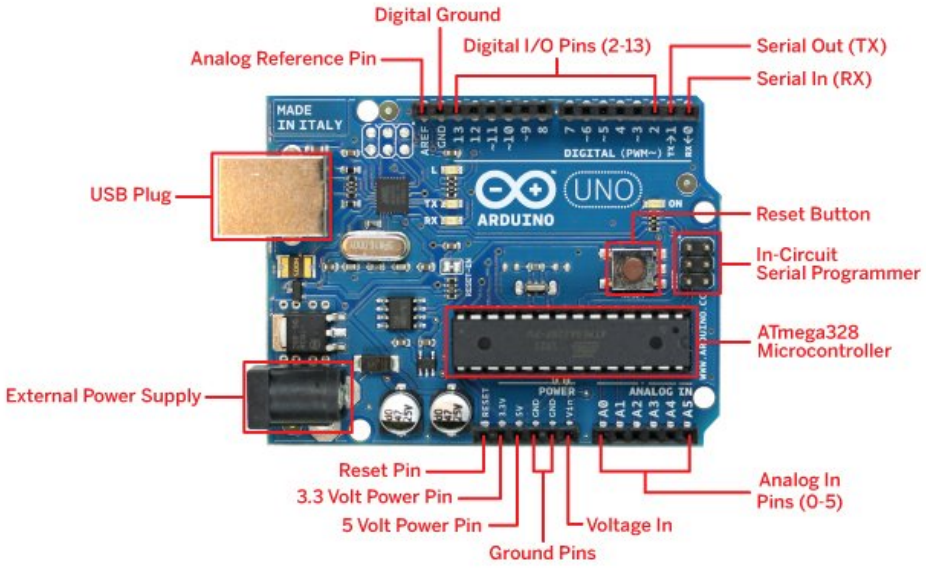

Figure 3.1: Arduino UNO Board [8]

The Arduino Uno board can be powered via the USB connection or with an external power supply. The power source is selected automatically.
External (non-USB) power can come either from an Analog Current to digital current adapter or battery. The adapter which works as external power supply which will help the Arduino function by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector.
The board needs minimum power supply of 6volts to 15volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. Also at the same time if supplied with more than 12v, the voltage regulator may overheat and damage the board.in order for the smooth functioning of the robot the voltage should be in the range of 7 to 12 volts.

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. TThese pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip .
- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.
- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.
- LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The power pins are as follows:

Vin-The input voltage to the Arduino/Genuino board when it's using an external power source

5V-This pin gives a regulated 5V. The board gets a power supply from various points viz. power jack, or from pc.

GND-There are tow ground pins.

3.2 DC Motors

DC motors consist of one set of coils, one of which is called as armature winding, inside another set of coils or a set of permanent magnets, called the stator.
Applying a voltage to the coils produces a torque in the armature, resulting in motion.

- **Stator -** The stator is the stationary outside part of a motor.
  The stator of a permanent magnet dc motor is composed of two or more permanent magnet pole pieces. Electromagnets creates the magnetic field. A DC coil (field winding) is wound around a magnetic material that forms part of the stator.

- **Rotor -** The rotor is the inner part which rotates. The rotor is composed of windings (called armature windings) which are connected to the external circuit through a mechanical commutator. Both stator and rotor are made of ferromagnetic materials. The two are separated by air-gap. Winding A winding is made up of series or parallel connection of coils.
- **Armature winding -** The winding through which the voltage is applied or induced.
- **Field winding -** The winding through which a current is passed to produce flux (for the electromagnet). Windings are usually made of copper.

motor.jpg

Figure 3.2: DC Motor [11]

Motor Spec (Model 25GA370D12, i = 20.3)

- Voltage: 24.0VDC
- Output Speed: 300 RPM
- No-Load output current: 70 mA
- Rotation Output: CW / CCW
- Noise: No Gear Noise

- Stall output: : Slip Gear, Broken Gear is no allowed
- Output shaft of the axial clearance: =¡ 0.1 0.3mm, Horizontal clearance requirement =¡ 0.05
- Stall Current: 2.0A

Electrical Spec

- No-Load Speed: 6000 RPM
- No-Load Current: =¡ 50mA
- Rotation: CW 4. Motor: 370

3.3 Ultrasonic Sensors

Figure 3.3: Ultrasonic Sensor [10]

Ultrasonic sensors are based on measuring the properties of sound waves with frequency above the human audible range. Main operating principle of this sensor is consists of three basic principles:
Time of flight
The Doppler effect
The attenuation of sound waves.
This sensor is non-intrusive in that it do not require physical contact with their target, On the other hand, sensitivity towards temperature and angle of flight of this sensor is very impressive.
Pins of the ultrasonic sensor are as follows:

- 5V DC Supply

- Trigger Pulse which is Input
- Echo Pulse which is Output
- Ground

3.4 Motor Driver Module L298N

These L298 H-bridge dual motor controller modules are very cheap and easy to use, connection of this are given below.
This module is consist of L293D driver IC. This module id used to drive Dc motor or stepper motor on power supply greater than 5V. This module is used because most of the microcontroller boards provide output voltage upto 5v only, which is insufficient to drive DC motors.
There is also an onboard 5V regulator, so if your supply voltage is up to 12V you can also source 5V from the board.

- For DC motor 1 "+" and for stepper motor A+
- For DC motor 1 "-" and for stepper motor A-
- 12V jumper - We have to remove this at the time of using a supply voltage greater than 12V DC. This enables power to the onboard 5V regulator. Connect your motor supply voltage here upto 36V DC or remove it if voltage supply is less than 12V DC.
- GND
- 5V output if 12V jumper in place.
- DC motor 1 enable jumper. keep this in place at the time of using stepper motor. Connect to PWM output for DC motor speed control.
- INPUT PIN 1
- INPUT PIN 2
- INPUT PIN 3
- INPUT PIN 4
- Same as for motor 1, DC motor 2 enable jumper. keep this in place at the time of using stepper motor. Connect to PWM output for DC motor speed control.
- DC motor 2 "+" or stepper motor B+
- DC motor 2 "-" or stepper motor B

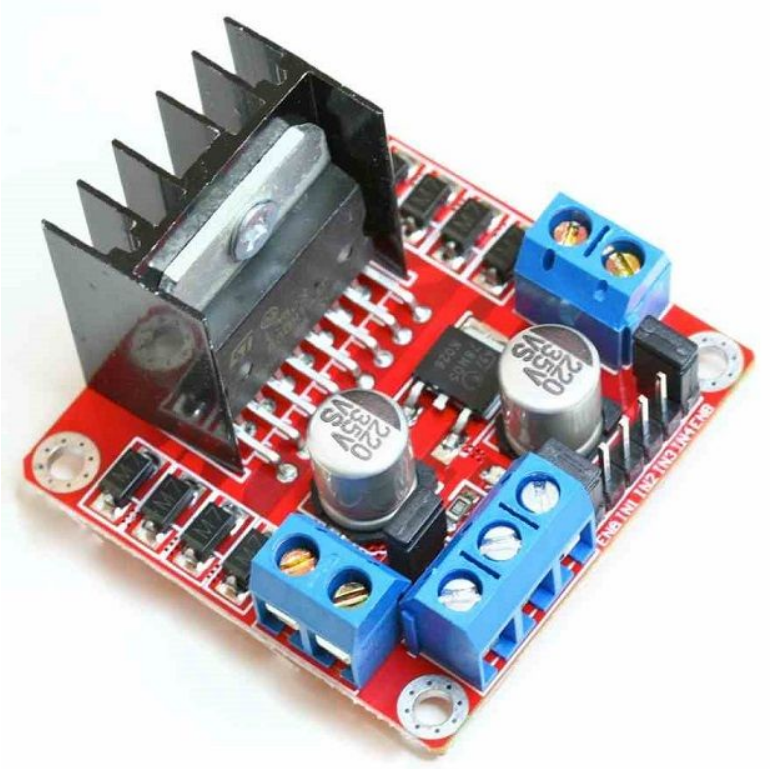

Figure 3.4: Motor Driver Module L298N [16]

3.5 ESP8266

The ESP8266 is a product of Shanghai based manufacturer. it is a low-cost Wi-Fi chip with supporting the protocol of full TCP/IP stack and MCU (Micro Controller Unit). The chip first came to the attention by the third party manufacturer AI-THINKER. At the initial stages they inventd small module named ESP-01, This small module can work as as unique server and also allows MCU to connect to the TCP/IP connections using different AT commands.

The very low price and the fact that there were very few external components on the module which suggests that it could eventually be very inexpensive in volume. Features

- 32-bit RISC CPU: Tensilica Xtensa L106 running at 80 MHz*
- 64 KiB of instruction RAM, 96 KiB of data RAM
- External QSPI flash: 512 KiB to 4 MiB* (up to 16 MiB is supported) IEEE 802.11 b/g/n Wi-Fi
- Integrated TR switch, balun, LNA, power amplifier and matching network WEP or WPA/WPA2 authentication, or open networks
- 16 GPIO pins
- SPI

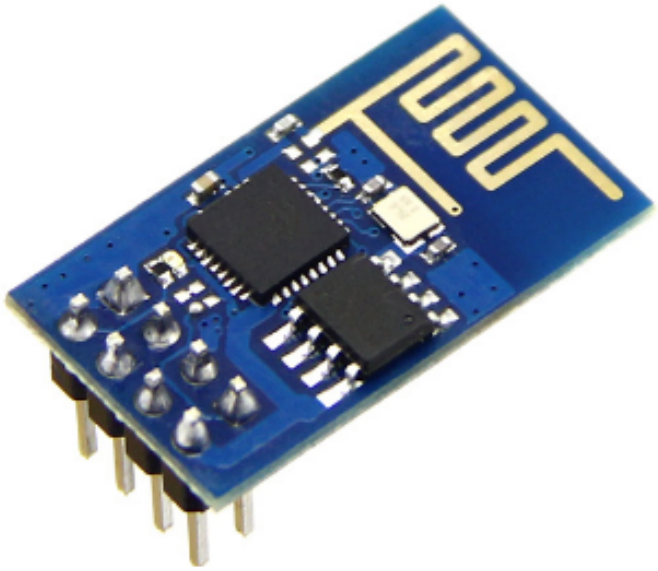

Figure 3.5: ESP[12]

- IC
- IS interfaces with DMA (sharing pins with GPIO)
- UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2
  10-bit ADC
  Both the CPU and flash clock speeds can be doubled by overclocking on some devices. CPU can be run at 160 MHz and flash can be sped up from 40 MHz to 80 MHz. Success varies chip to chip

3.6 Servo Motor

A servomotor is a rotary actuator and also work as a linear actuator that allows for precise control of angular or linear position, velocity and acceleration.
It consists of a suitable motor coupled to a sensor for position feedback. It also requires a respective proper controller, often a separate module designed specifically for use with servomotors.
Servomotors works on the programmed value of the rotatory angle which has been given to it. like for example if angle is 110 degrees then motor will move by 110 degrees only.

by this we can implement to and fro motion very easily with the help of servomotors. servomotors are generally used in closed-loop control systems.

This motor is closed-loop servomechanism which controls its position by using positioning feedback. there is a sepatare library file for servomotors in the Arduino IDE.

Figure 3.6: Servo Motor[12]

it makes it easier to program The input to its control is some signal, either analogue or digital, representing the position commanded for the output shaft.
The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller.

3.7 Circuit Diagram

Circuit Diagram of Wi-Fi controlled robot is given below. Connections of Arduino , ESP8266 and motor driver module are explained below:

- Vcc and GND pins of ESP8266 module are connected to 3.3V and GND pins of Arduino respectively, because ESP8266 only works on 3.3v.
- CH-PD pin to 3.3v.
- Tx and Rx pin of the wifi module are connected to pin 2 and 3 of Arduino.we can connect them to any output pins. Software Serial Library is used to allow serial communication on pin 2 and 3 of Arduino.
- Reset pin is connected to the 3.3v through 3K resistors.
- A L298N Motor Driver IC is used for driving DC motors. Input pins of motor driver IC is directly connected to pin 8, 9, 10 and 11 of Arduino.
- DC motors are connected to the output pins of the l298N driver module.we can use maximum of 36V battery here.

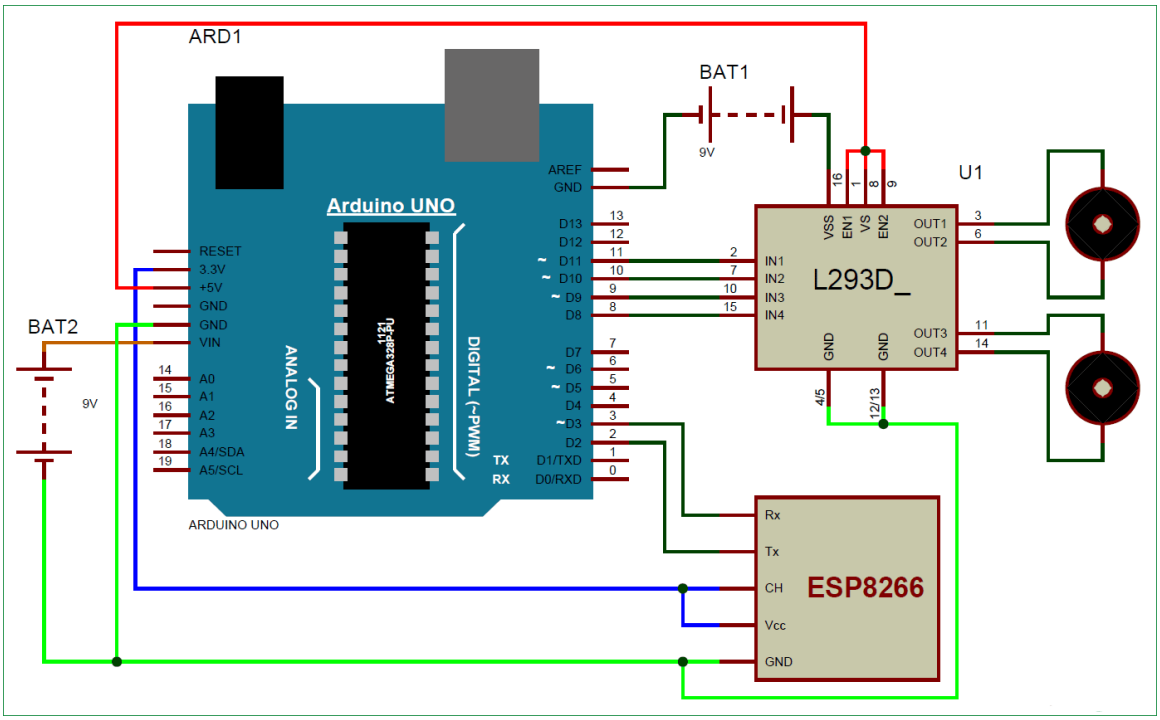

Figure 3.7: Circuit Diagram [7]

Chapter 4

Software Implementation

4.1 Arduino IDE

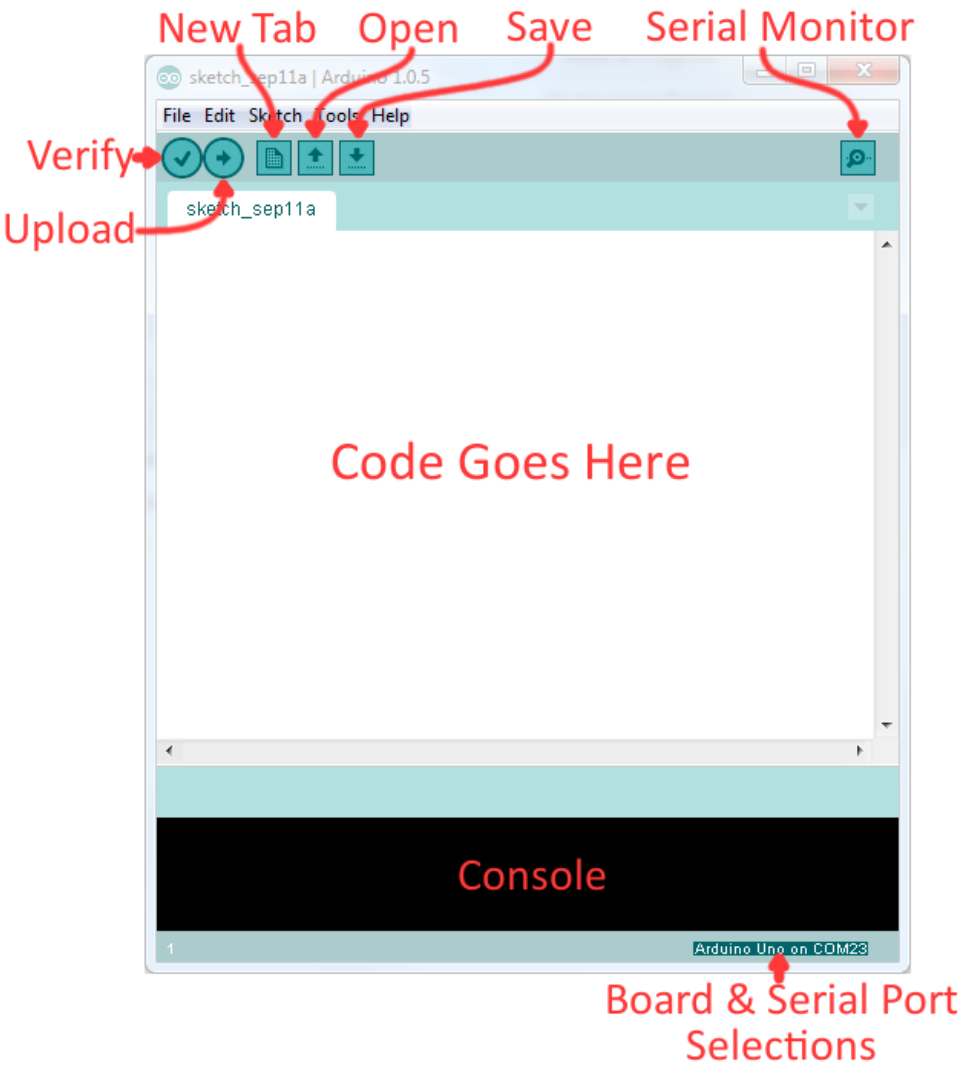

Figure 4.1: Arduino IDE [14]

The arduino software is very simple to understand and write programs in .this software is compatile in any kind of operating system a device is associated with. This makes

it more user friendly and most commonly used programming software.the software is vaguely based on Java language. This open source software is compatible with any kind of arduino board be it arduino uno,mega or some other atmel board od arduino series.
The arduino has some special functions we start the program with void() we can make different functions in it and then call the function in the program whenever required .sertup() is a special function in this software.loop() function call be called or used to repeat a particular sub-routine. this reduces the efforts and consumes less time.
The .pde file extension is the one used by the Processing, Wiring and the Arduino IDE. Processing is not C based but Java based and with a syntax derived from java. It is a Java framework that can be used as a java library. It include a default IDE that use .pde extension.

4.2 IP Webcam application

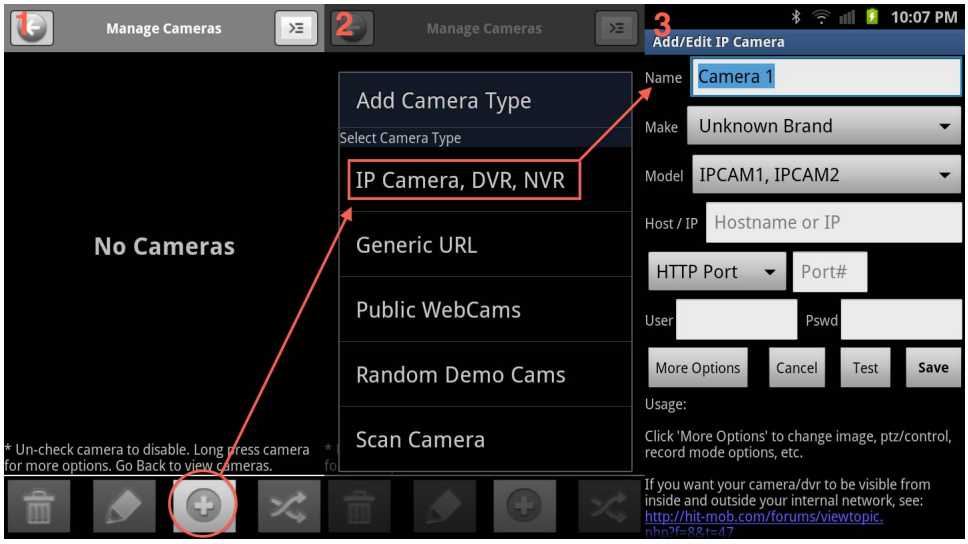

Figure 4.2: IP Webcam application [15]

The Ip webcam application helps to record the visuals in the surrounding.Ip web cam can be used to capture and play the videos .The ip webcam application provides an interface between the camera and the digital platform.this makes it useful in every aspect.
The reorded videos can be played on almost all the media players suh as vlc media player.The audio here is two way audio which can be played in any android device.This software doesn't need Internet access or wifi network for streaming of videos.The streaming can also be seen in the web browser.

The few important features of this are as follows:

- This shows the date time which are useful for the surveillance purpose.
- Also shows the battery percentage and has a videochat feature which can be played in windows and linux.

- The videos can be uploaded to the dropbox using SFTP and FTP protocols these videos can also be mailed.
- There is Ivideon option for cloud broadcasting globally.It has some interesting features such as audio detection and motion detection in-built in it also has sound triggering and task integration.
- The data acquisition is possible along with the web graphing.
- This application uses a third party software which is known as MJPEG it can do security monitoring.
- this is also provided with the night vision for video reording and security check reasons.
- Uses WEBM,MOV,MPEG4,MKV,AAC etc has cloud push notifications option in it.

Lite version has no ads ie. it is ad-free and also is fully functional uses customizable user interface.it gives out the water marks on the recorded videos and captured images.

4.3 Code

Arduino Code for object detecting robot using ultrasonic

```
#include NewPing.h
#include ¡Servo.h¿
//define lr 8 // left motor
//define lb 9
//define rr 10 // right motor
//define rb 11
#define handred 4
#define handblck 5
#define gearred 6
#define gearblck 7
#define TRIG_PIN A4
#define ECHO_PIN A5
#define MAX_DISTANCE 200
NewPing sonar(TRIG_PIN, ECHO_PIN, MAX_DISTANCE);
Servo myservo;

boolean goesForward=false;
int distance = 100;
int speedSet = 0;
void up()
{
digitalWrite(gearred,HIGH);
```

```
digitalWrite(gearblck,LOW);
}
void down()
{
digitalWrite(gearred,LOW);
digitalWrite(gearblck,HIGH);


void spread()
{
digitalWrite(handred,HIGH);
digitalWrite(handblck,LOW);
}
void pick()
{
digitalWrite(handred,LOW);
digitalWrite(handblck,HIGH);
}
void forward()
{
digitalWrite (8,HIGH);
digitalWrite (9,LOW);
digitalWrite (10,LOW);
digitalWrite (11,HIGH);
}
void backward()
{
digitalWrite (8,LOW);
digitalWrite (9,HIGH);
digitalWrite (10,HIGH);
digitalWrite (11,LOW);
}
void left()
{
digitalWrite (8,HIGH);
digitalWrite (9,LOW);
digitalWrite (10,LOW);
digitalWrite (11,LOW);
delay(300);
}
void right()
{
digitalWrite (8,LOW);
digitalWrite (9,LOW);
digitalWrite (10,LOW);
digitalWrite (11,HIGH);
delay(300);
}
```

```
void Stop()
{
digitalWrite(8, LOW);
digitalWrite(9, LOW);
digitalWrite(10, LOW);
digitalWrite(11, LOW);
digitalWrite(handred, LOW);
digitalWrite(handblck, LOW);
digitalWrite(gearred, LOW);
digitalWrite(gearblck, LOW);
}
void setup()
{
Serial.begin(9600);
pinMode(8, OUTPUT);
pinMode(10, OUTPUT);
pinMode(11, OUTPUT);
pinMode(handred, OUTPUT);
pinMode(handblck, OUTPUT);
pinMode(gearred, OUTPUT);
pinMode(gearblck, OUTPUT);
myservo.attach(12);
myservo.write(115);
delay(2000);
distance = readPing();
delay(100);
distance = readPing();
delay(100);
distance = readPing();
delay(100);
distance = readPing();
delay(100);
}
void loop() {
int distanceR = 0;
int distanceL = 0;
delay(40);
if((distance¡=20)&&(distance¿10))
{
Stop();
delay(100);
backward();
delay(300);
Stop();
delay(200);
distanceR = lookRight();
delay(200);
distanceL = lookLeft();
```

```
delay(200);
if(distanceR¿=distanceL)
{
left();
Stop();
}else
{
right();
Stop();
}
}else
{
forward();
}
distance = readPing();
}
else if(distance¡=9)

down();
delay(5000);
pick();
delay(5000);
up();
delay(5000);
spread();
delay(5000);
}
int lookRight()
{
myservo.write(50);
delay(500);
int distance = readPing();
delay(100);
myservo.write(115);
return distance;
}
int lookLeft()
{
myservo.write(170);
delay(500);
int distance = readPing();
delay(100);
myservo.write(115);
return distance;
delay(100);
}
int readPing() {
delay(70);
```

int cm = sonar.ping$_cm$();
$if(cm == 0)$
{
$cm = 250$;
}
$returncm$;
}
}

NOTE

As the project is based on Arduino, the programming is very easy and can be easily modified. Doesnt require the Arduino Motor Shield. When using a 9V battery, at least 2 such batteries are needed to power the robot. It is better to use 3 9V batteries (one for Arduino and ultrasonic sensor, one for L293D and other for motors).
The ultrasonic sensor should not be connected directly to power supply as it might affect the normal performance. Additionally, a servo motor can be fixed to the ultrasonic sensor and only ultrasonic sensor rotates according to the servo. Based on the distance, the entire robot rotates. Instead of ultrasonic sensor, an IR transmitter receiver pair can also be used

Arduino code for controlling robot and its arm

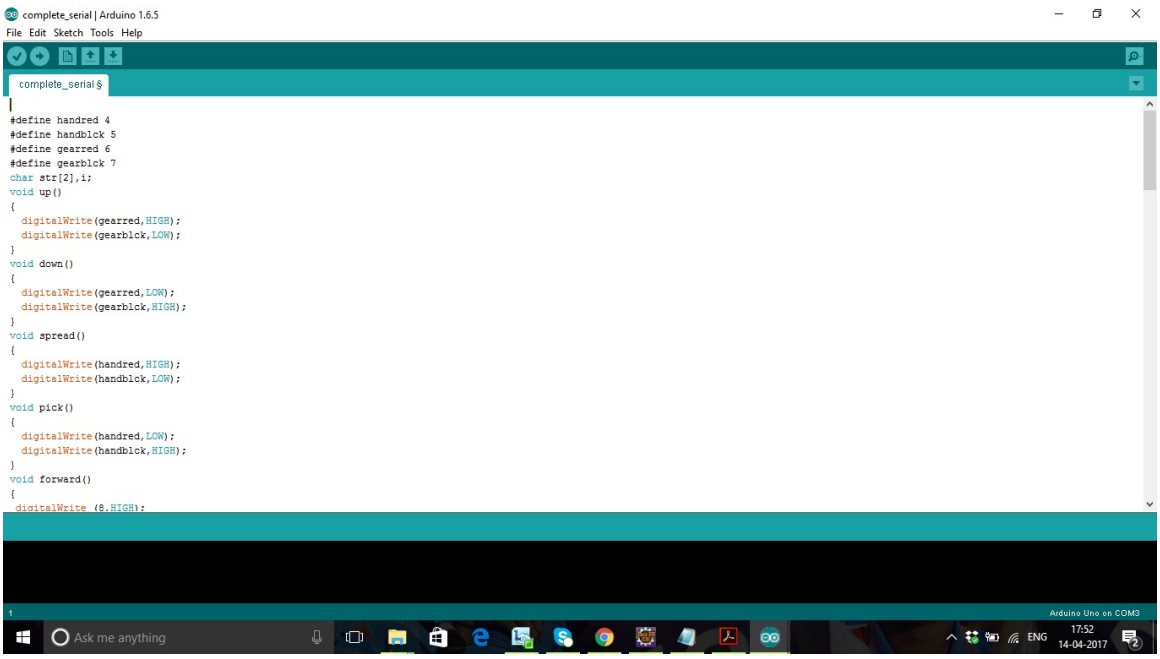

Figure 4.3: Code snap 1

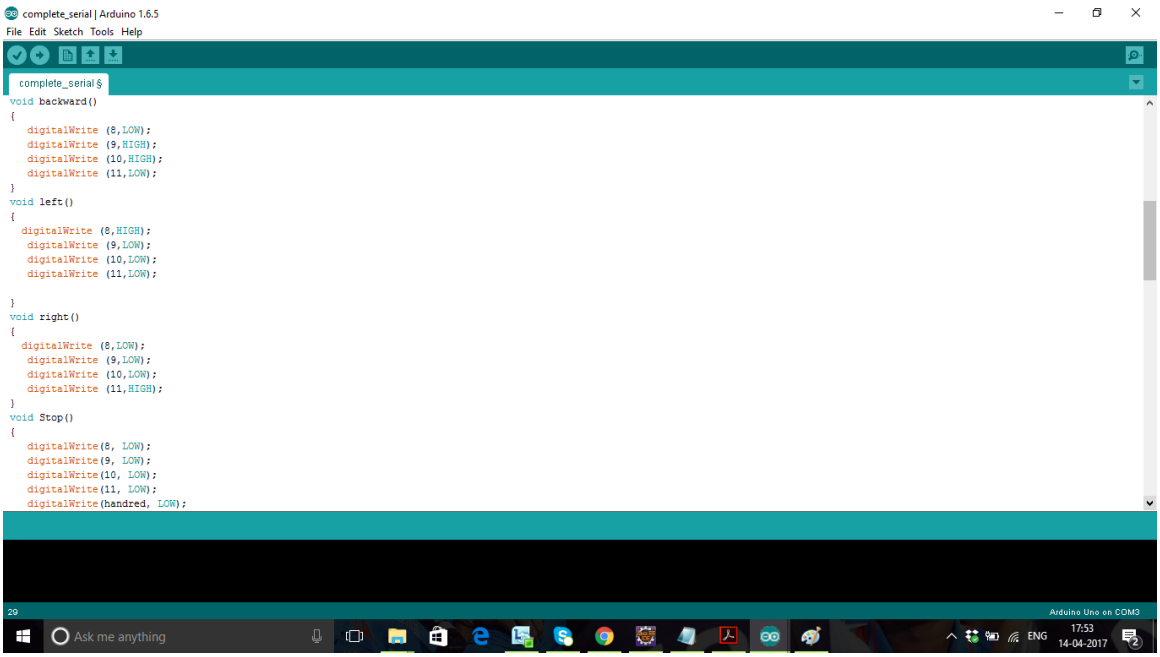

Figure 4.4: Code snap 2

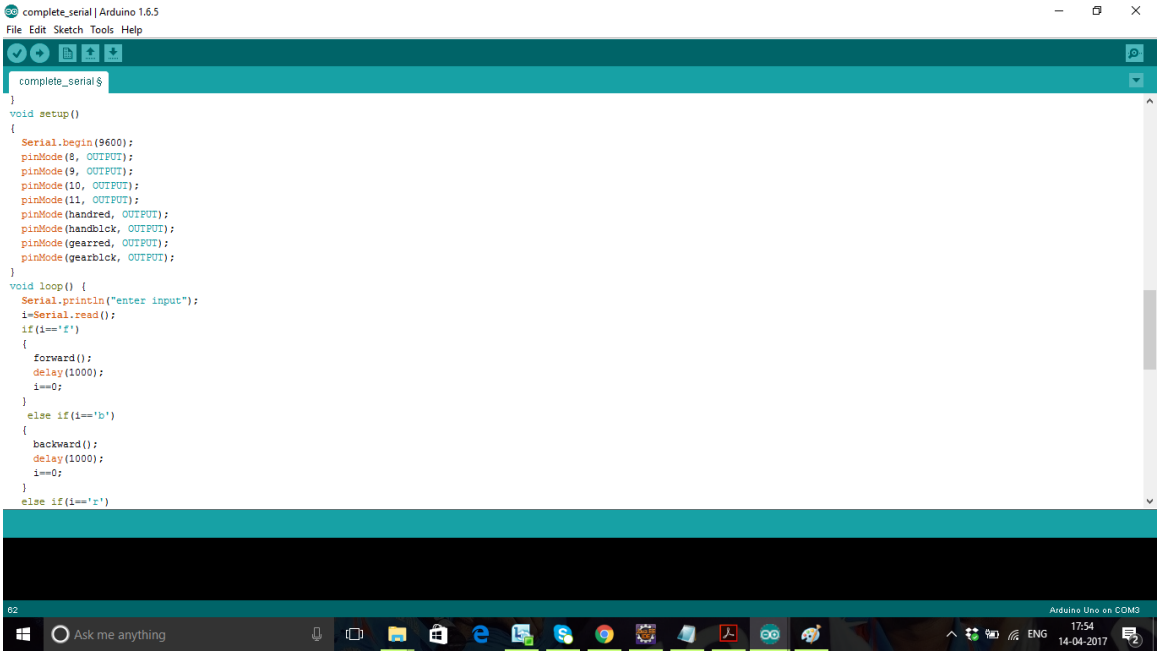

Figure 4.5: Code snap 3

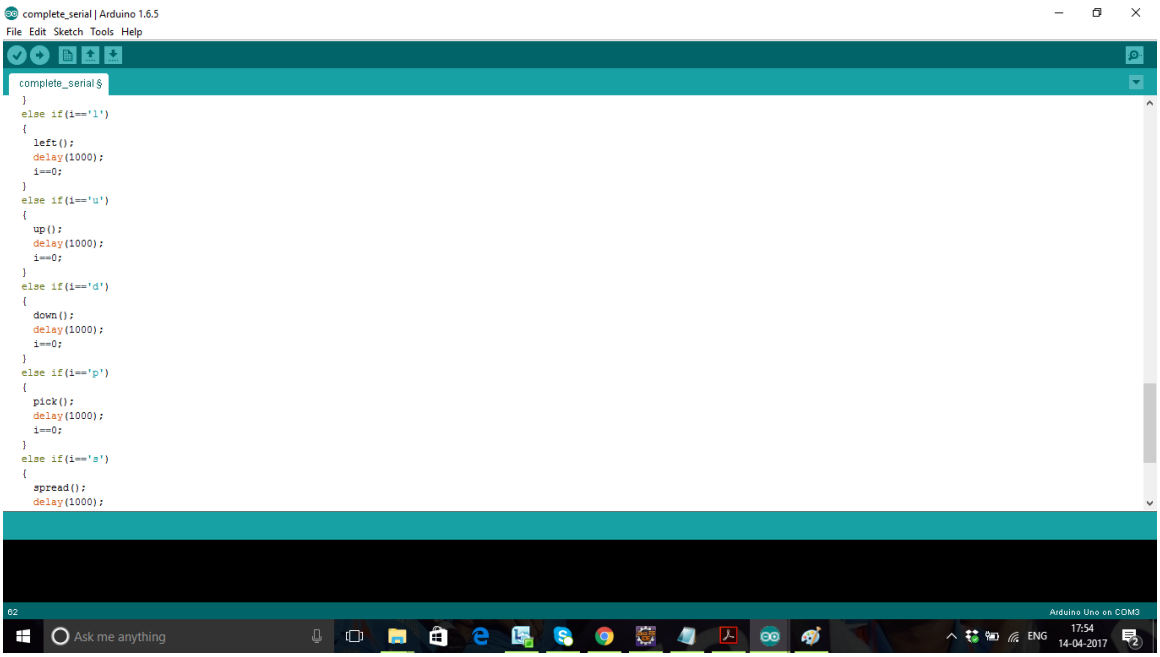

Figure 4.6: Code snap 4

4.4 HTML Code

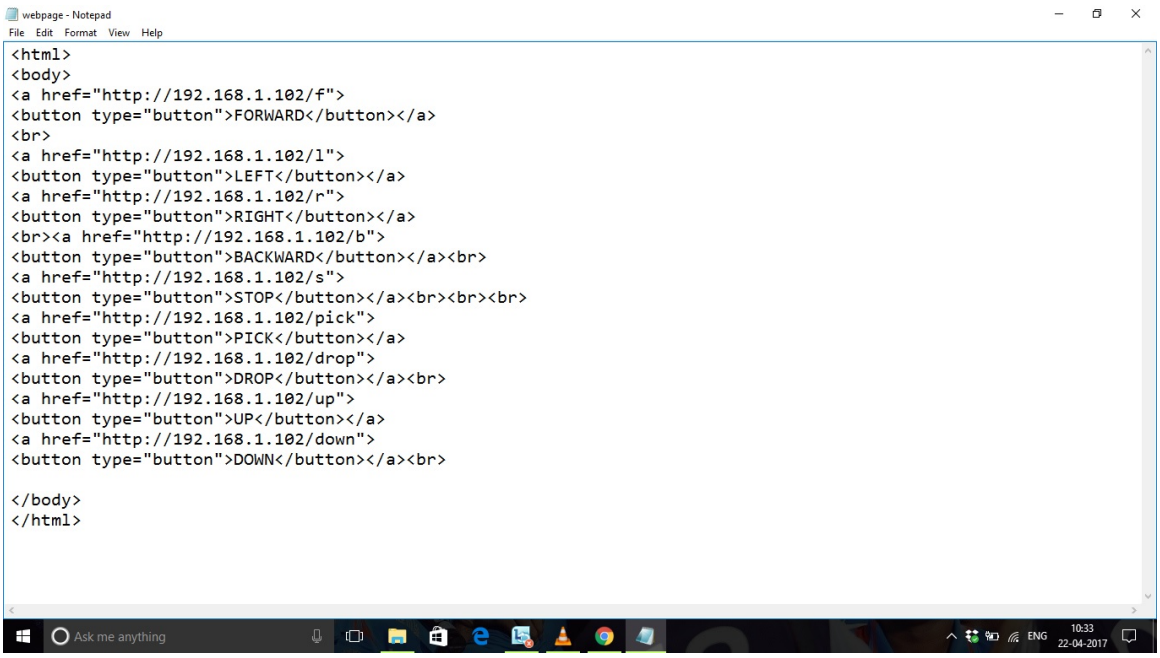

Figure 4.7: HTML Code

- This webpage will control the robot through ESP8266,
- After clicking on these different buttons this webpage would send some request to the ESP8266.
- Each button contains some information or some address.
- After clicking button, webpage would fed that specific information to th ESP8266. For Eg. On clicking FORWARD button, ESP8266 will get request from the HOST = http://192.168.1.102/f.
- After that by using if else condition statements we can control our robot.

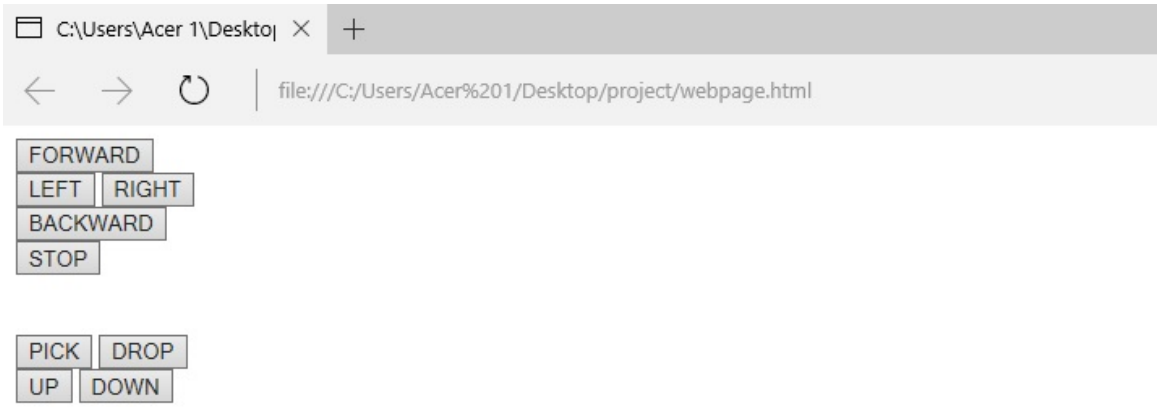

Figure 4.8: Webpage

About the Webpage buttons:

- As we can see from the image above the buttons help the robot to move , they actually act as commands .The movement of robot vehicle and the robotic arm is controlled by these buttons.
- FORWARD: Will make the bot move in forward until the button is pressed
- BACKWARD :Will make the bot go in reverse directions will the motors moving in opposite direction.
- RIGHT :For taking the right turn the motors on the left side of the robot will stop moving and with the help of motors on right side the robot will take a right turn.
- LEFT : For taking a left turn the motors on the right side will be off and with the help of left motors the robot will make a left side turn.
- STOP: As the motors all stop at once the robot in motion will now come to rest.
- PICK :Is the command for the robotic arm this will cause the movement of the claw and will result in grabbing of the object and making the grip tight.IT can pick up any object which weighs around or less than 300gms.
- DROP :This will loosen the grip of the claw and the object will be dropped as a result of it.This is useful while disposing the unwanted materials or things in the hospital or any other household object for that matter.
- UP :This is lift the arm upwards with the help of dc motors.Can take the object up to a certain height.
- DOWN :Results in downward motion of the arm.

Chapter 5

Hardware Outputs

5.1 Pick up an Drop robotic Arm

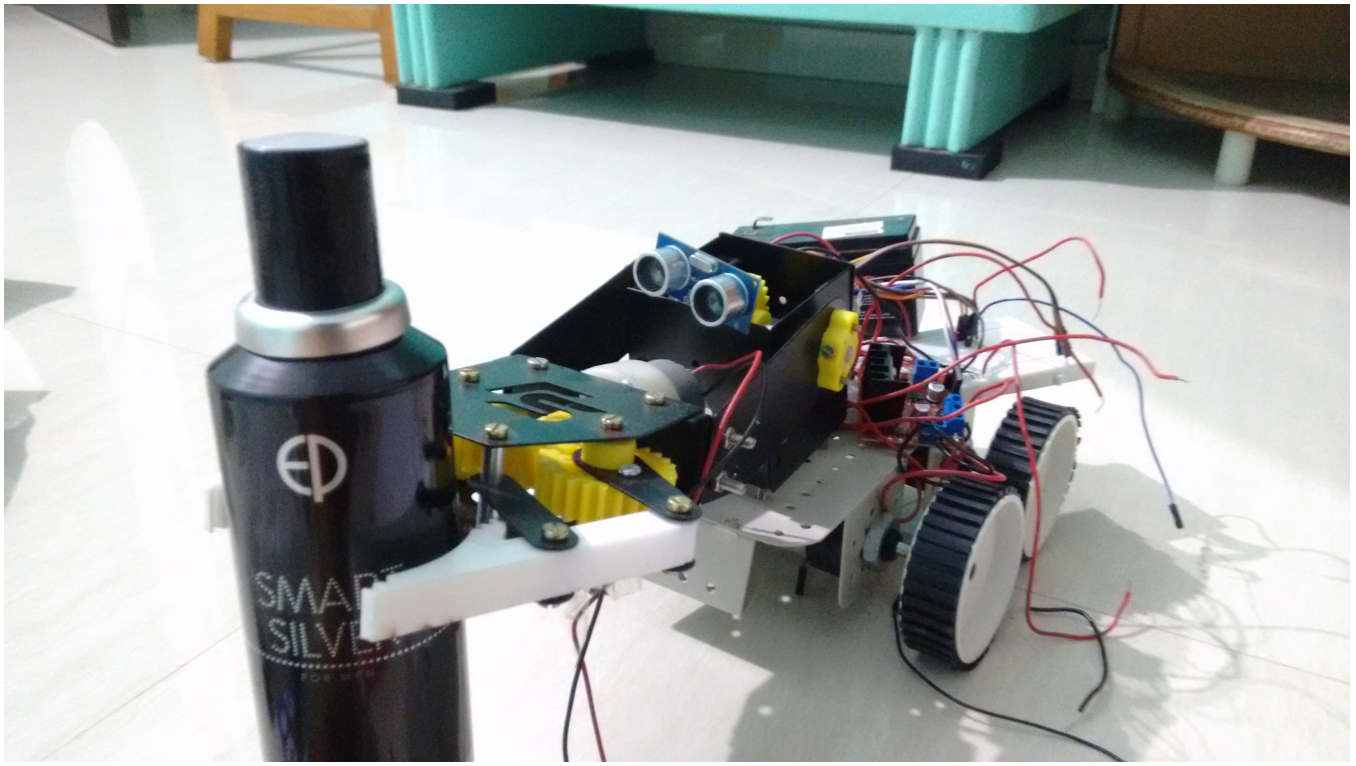

Figure 5.1: Lifting of an object

The multifunctional robot has a robotic arm which works as a claw and grabs objects, Mainly this feature will used to pick and drop objects in the hospital which may be virus/bacteria infused.Hence saving the human effort and preventing the spread of diseases.

5.2 Live streaming

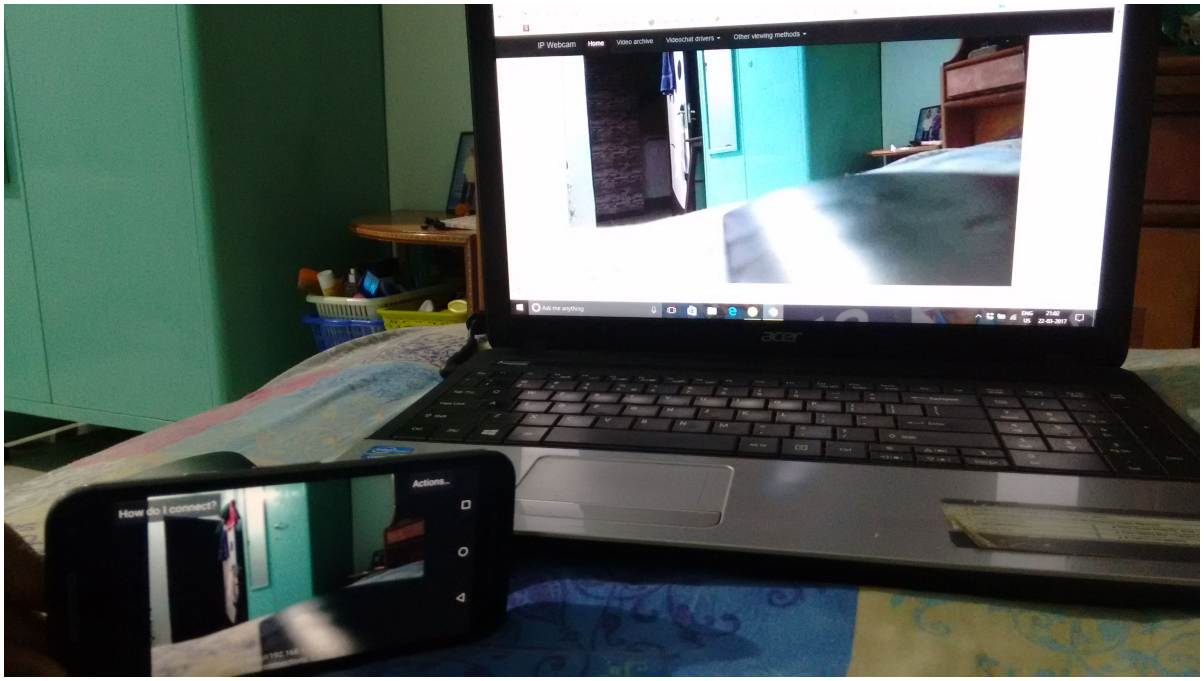

Figure 5.2: Live streaming

In live streaming the ip webcam records the continuous footage of the surroundings. This can be used by the relatives or hospital staff to keep the record of the patient's health and activities.this feature can also be used for surveillance purposes.Such kind of a feature helps the people to keep the track of activies going around.

5.3 Software outputs

ESP8266 SERIAL MONITOR OUTPUT

- AT+CWMODE=1 ..... this command decides the operating mode of the ESP8266. (in this case its 1).
- AT+CIPMUX=1 .....this command initiates the server and also allows multiple connections.
- AT+CIPSERVER=1,80 ..... starts the server at port 80.
- AT+CIPSEND=0,250..... this command is use to send 250 characters through channel 0

ULTRA RESULT

Figure 5.3: ESP result

This is the basic serial monitors window which shows the distance between detected object in front of ultrasonic sensor and sensor itself.
This result is useful at the time of deciding the direction of the movement of the robot.
9600 is selected baud rate of serial monitor.

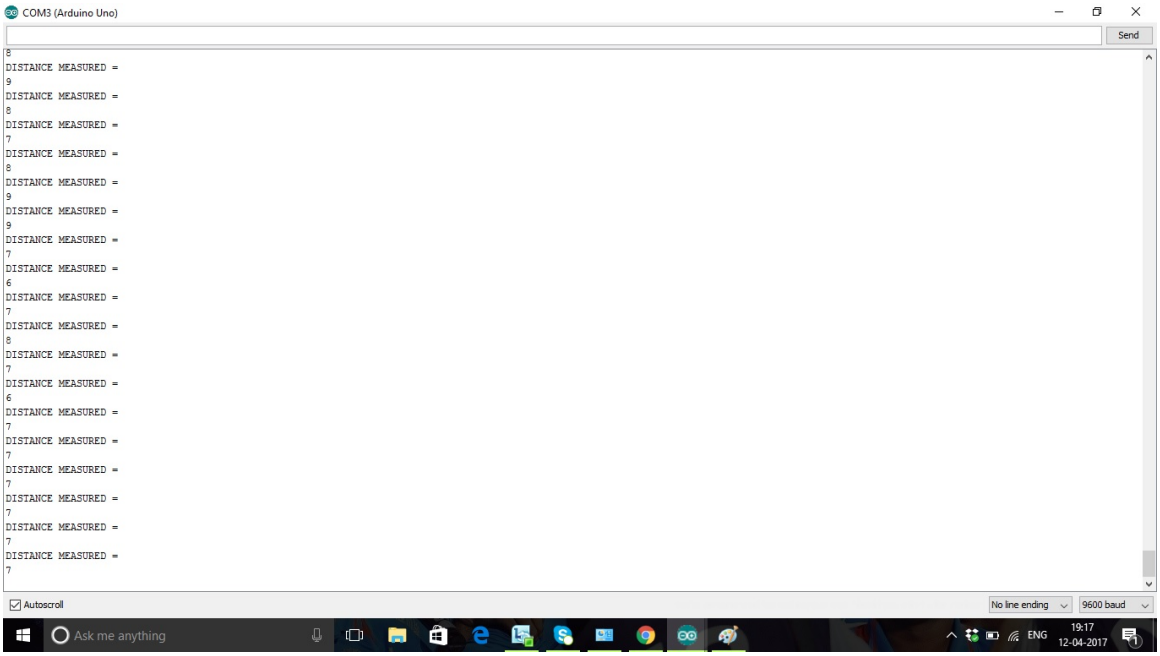

Figure 5.4: result

Chapter 6

Result

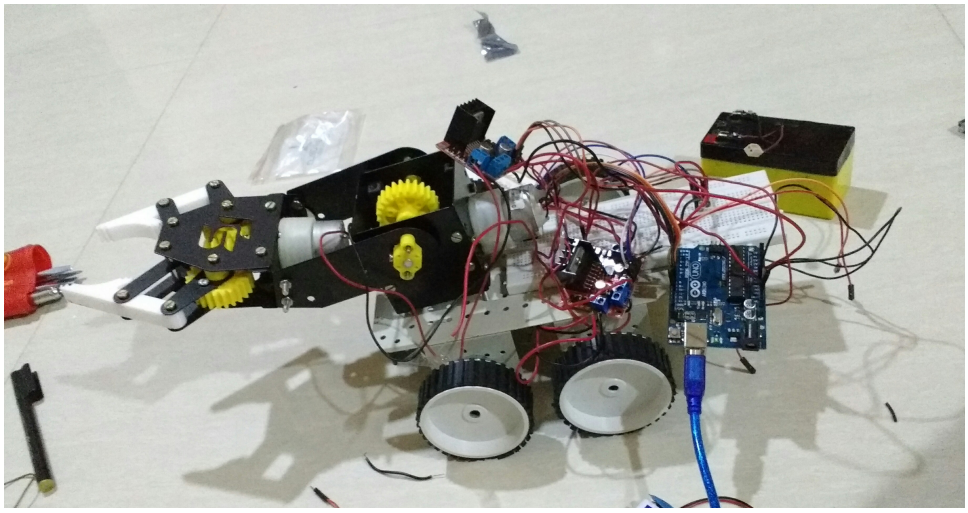

Figure 6.1: Multifunctional Robot

- This robot can be used in almost all mobile robot navigation systems.
- They can be used for household work like automatic vacuum cleaning.
- They can also be used in dangerous environments, where human penetration could be fatal.

Chapter 7

Conclusion

The aim of our project is to construct a multifunctional-bot. As its name implies it is an efficient robot which could be used in hospitals, military, household-chores, etc. The robot can be operated manually or automatically. The robot will initially provide a remote control and control of movement of bot and also the other functions included in it. Next, the purpose of this robot is to pick up object from one place to another and also to move back and forth. We are adding some features such as an IP web-camera , a robotic arm to pick up things, ultrasonic sensors and servo motor to cause the movement of this sensor.

Chapter 8

Future Scope

- The project on multifunctional robot has a purpose of detecting object using ultrasonic sensor,picking and disposing them .But we can use MATLAB simulations to pick up a specific object.
- Since we are using live streaming of videos, the facility of saving the video or recording it can be provided so that it could be used for surveillance purposes in any field.
- This robot has an automatic mode as well as a manual mode so to increase the accuracy and precision we can use more number od sensors which will send the input to the processor.
- There is a web page which gives out command to the robot while it is working in a manual mode we can add some other tasks if required in the web page so that it will reduce the human efforts.
- As the name suggests it can incorporate many other functions to truely make it a multifunctional robot.

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_____ _____

Date Signature