# DESIGN AND IMPLEMENTATION OF SPY ROBOT

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## ABSTRACT

*A robot is usually an electro-mechanical machine that guided by computer and electronic programming.Many robots have been built for manufacturing purpose and can be found in factories around the world.Designing of the latest robot which can be controlling using an android mobile.In developing the remote buttons in the android app can be control the robot motion.Android Bluetooth enables phones and Bluetooth module HC-06 and communication among Bluetooth devices.It is concluded that smart living will gradually turn into are reality that consumer can control their home remote and wirelessly.According to commands received from android the robot motion can be controlled.In IP web camera interface will also be through wireless communication for need to have a receiver installed in mobile.so both the camera view and the navigation of the camera can happen simultaneously from pc using Bluetooth interface.*

**Keywords**:  *Radio frequency, propotional integral derivative control*

## 1.0 INTRODUCTION

Robotics study becomes an extremely large field because it contains a huge amount of different technologies, but I have covered the most important areas.In discuss about some  automation system and different types of automation.we need robots in our life. What kind of advantages we can receive from robots by viewing robot applications and the quality that can be provided by comparison to human work. The typical industrial robot which looks like a human arm has six different joints like an elbow joint, a shoulder joint and a rest joint. These joints are powered by a servo motor or a hydraulic motor or whatever type of motor. These powered motor joints enable robot to reach objects in several ways. The amount of joint space motor drive is depending on the nature of a robot task. The more sophisticated the job the more motions we require so extra motor drive is need. All these six motor drives need to be controlled to achieve specific task and sometimes we do not need to use all of them so we eliminate some motor joint depending on the task requirements.

## 1.1AUTOMATION

### 1.1.1 Hard automation:

This kind of automation cannot handle product designvariations, mass production for example; conventional machinery, packaging, sewing and manufacturing small parts. Adjustability is possible but it can only handle specific tasks with no possibility of changing its own task. These machines can be seen in our homes (washing machines, dish washers, etc).

### 1.1.2 Programmable Automation:

This form of automation began with the arrival ofthe computer. People began programming machines to do a variety of tasks. It is flexible because of a computer control, can handle variations, batch product, and product design.

### 1.1.3 Autonomous (Independent):

A robot belongs to this kind of automation and it is a combination of microprocessor and conventional automation systems which can provide a very powerful system. Its high level machinery capabilities combined with fault recognition and correction abilities provided by highly evolved computer systems. This means it can carry out work traditionally carried out by humans. Examples of existing autonomous systems are animals and human beings.

**1.1.4 Human beings:**

The highest level of autonomous systems because they thinkand they can change plan at any moment due to their high intelligence robotscannot reach the same high level as humans because they areprogrammed to do certain tasks according to certain factors which are completely programmed by human beings, but they have no possibilities to change plan like humans or plan new things unless the programmer programs them to change the plan. Because of high development of machines, sensors, actuator, digital electronics and microprocessor technology it became possible to create a robot which is autonomous.

**2.1 Design of spy robot:**

In spy robot made up of six basic constituent elements, they are dynamic system, the end-of-arm tool, the computerized digital controller, the actuators, the feedback devices and the sensor.
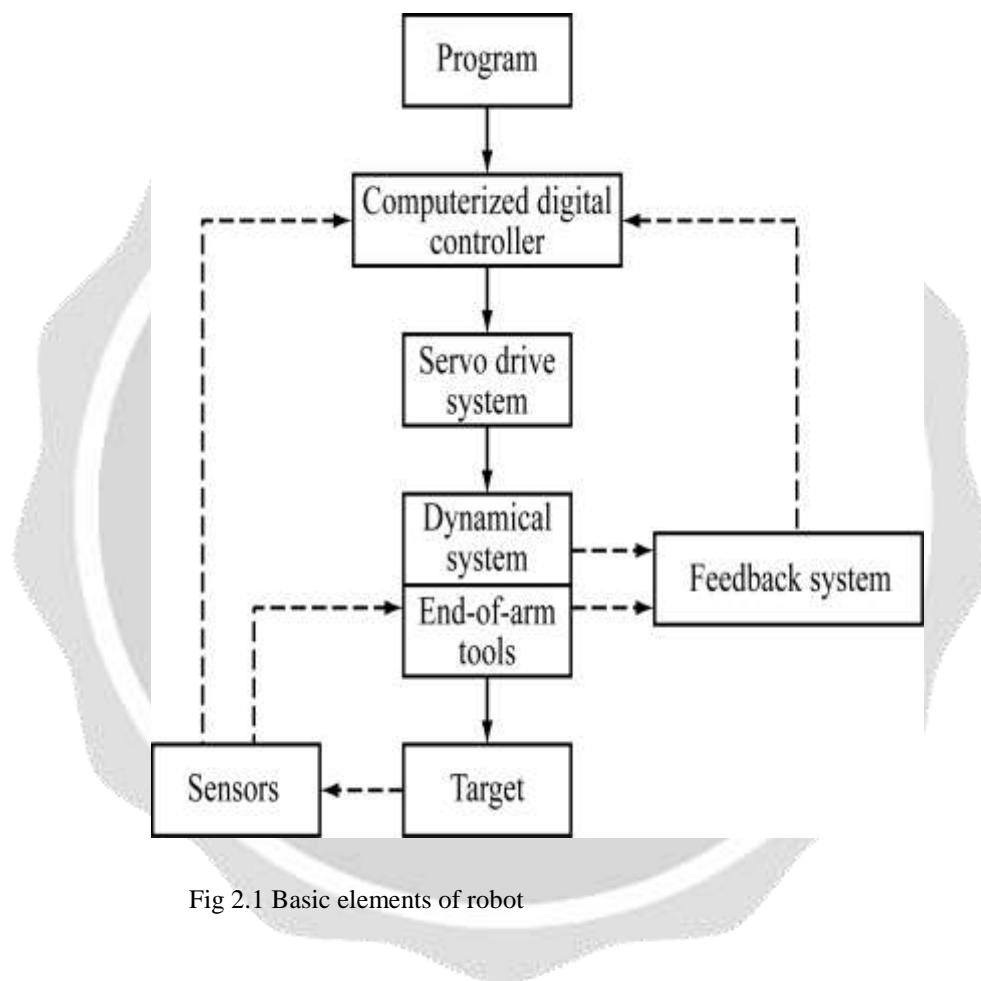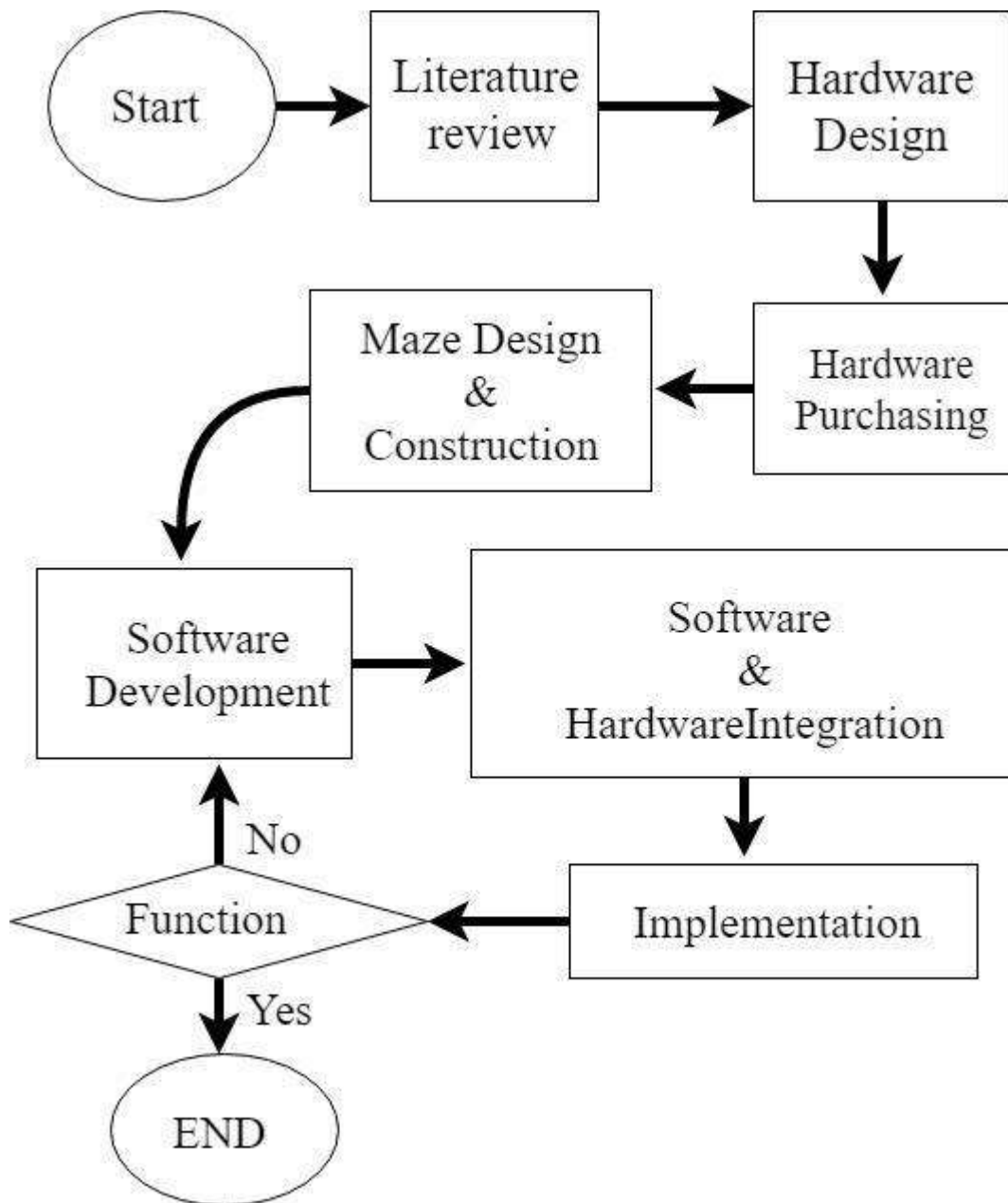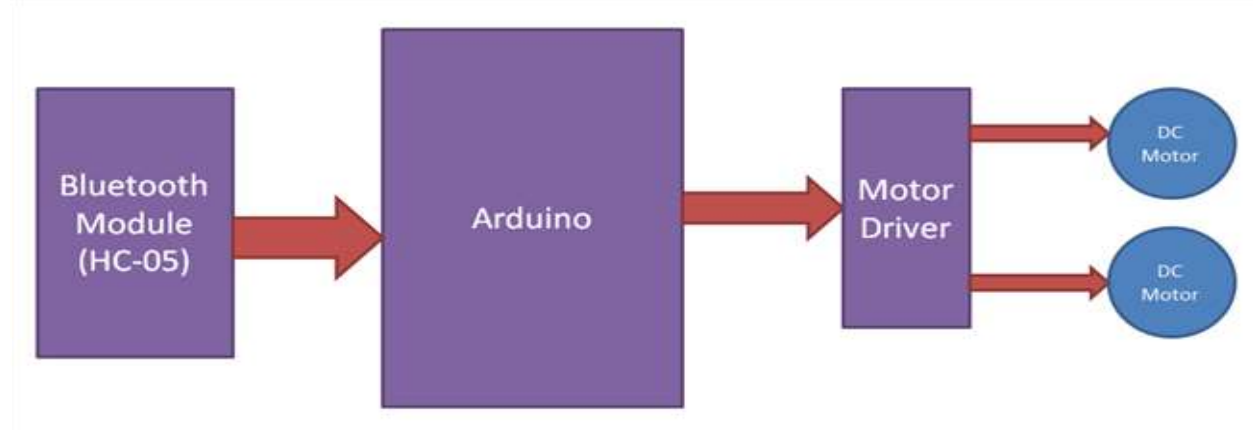


Fig 2.1 Basic elements of robot

**2.2 OBJECTIVE**

- ➢ To design a robot for military application with live video streaming.
- ➢ To achieve the surveillance of human activities using spy robot.

**2.3 METHODOLOGY**

## 2.4 BLOCK DIAGRAM



The project aim in designing a Robot that can be operated using Android mobile phone. The controlling of the Robot is done wirelessly through Android smart phone using the Bluetooth feature present in it. Android smart phone is used as a remote control for operating the Robot. Android boasts a healthy array of connectivity options, including Wi-Fi, Bluetooth, and wireless data over a cellular. Android provides access to a wide range of useful libraries and tools that can be used to build rich applications. In addition, Android includes a full set of tools that have been built from the ground up alongside the platform providing developers with high productivity and deep insight into their applications. Bluetooth is an open standard specification for a radio frequency (RF)-based, short range connectivity technology that promises to change the face of computing and wireless communication. It is designed to be an inexpensive, wireless networking system for all classes of portable devices, such as laptops, PDAs (personal digital assistants), and mobile phones. It also will enable wireless connections for desktop computers, making connections between monitors, printers, keyboards, and the CPU cable-free. The controlling device of the whole system is a Microcontroller. Bluetooth module, DC motors are interfaced to the Microcontroller. The data received by the Bluetooth module from Android smart phone is fed as input to the controller. The controller acts accordingly on the DC motors of the Robot. The robot in the project can be made to move in all the four directions using the Android phone. The direction of the robot is indicated using LED indicators of the Robot system. In achieving the task the controller is loaded with a program written using Embedded 'C' language.

## 3.1 PROPOSED WORK

The proposed workperformed with help of a spy robot used to monitor and keep watch of areas not easily accessible by humans. Surveillance is the process of monitoring a situation, an area or a person. It is generally practiced in a military scenario where surveillance of borderlines and enemy territory is essential to for the country's safety.Human surveillance is achieved by deploying personnel near sensitive areas in order to constantly monitor changes.

## 3.2 CIRCUIT DIAGRAM

The electronic circuit controlling the robot is built around Arduino Pro Mini. The L293D motor driver IC and HC-05 Bluetooth module are interfaced to the controller board. A pair of geared DC motors are attached at the rear wheels which are interfaced with the motor driver IC. A mobile phone whose camera is used as IP web camera is mounted on the robot body.
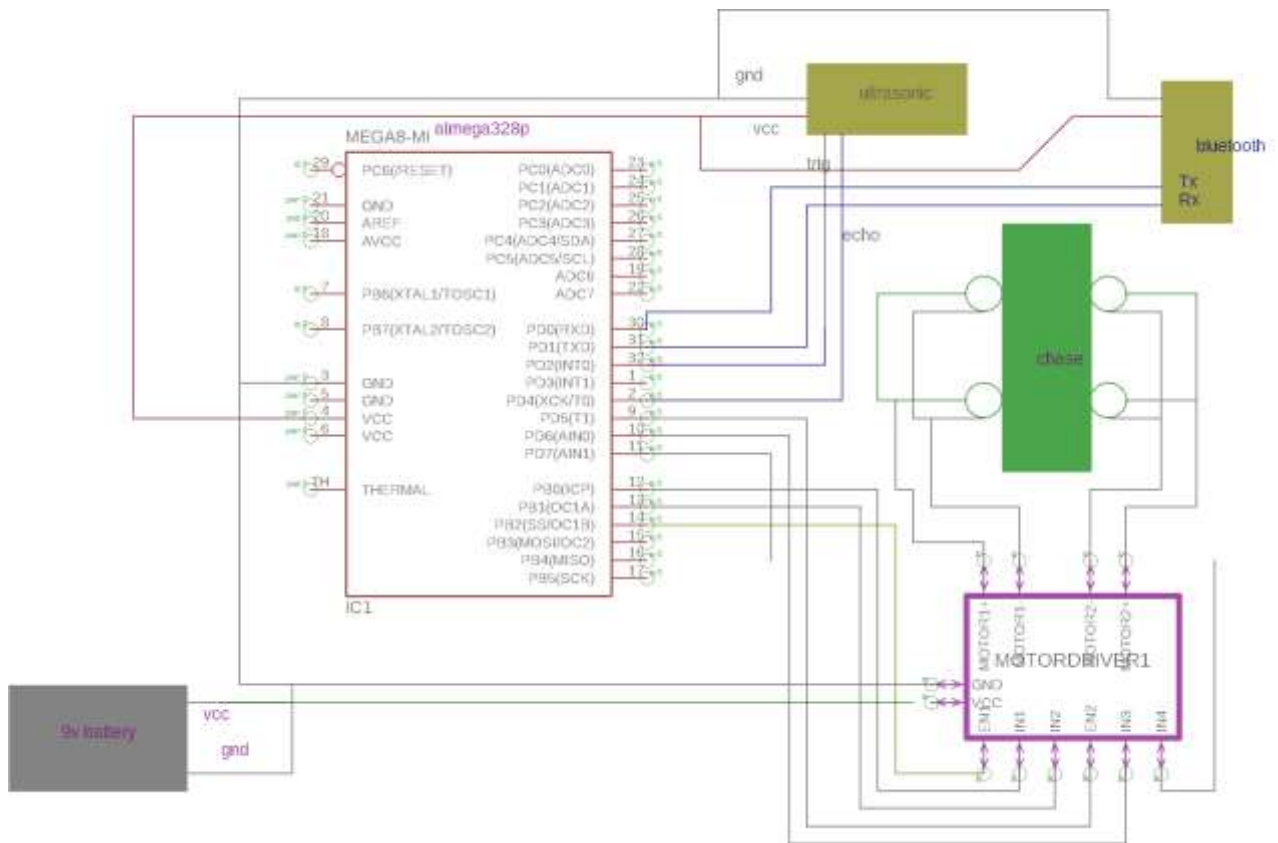
**3.2 Motor driver circuit diagram**

**Working:**

      Power Supply - In the circuit, Arduino Pro Mini and the Bluetooth module need a 5V regulated DC for their operation while the motor driver IC needs 12V DC. A 12V NIMH battery is used as the primary source of power. The supply from the battery is regulated to 5V and 12V using 7805 and 7812 ICs. The pin 1 of both the voltage regulator ICs is connected to the anode of the battery and pin 2 of both ICs is connected to ground. The respective voltage outputs are drawn from pin 3 of the respective voltage regulator ICs. An LED along with a 10K Ω pull-up resistor is also connected between common ground and output pin to get a visual hint of supply continuity. Despite using 12V battery, 7812 is used to provide a regulated and stable supply to the motor driver IC.

**Geared DC Motors -** In this robot, 12V geared DC motors are attached to the wheels. Geared DC motors are available with wide range of RPM and Torque, which allow a robot to move based on the control signal it receives from the motor driver IC.

**Mobile Phones -** A mobile phone is mounted on the robot for live transmission of the video recording. The phone has IP camera app installed on it which records and transmits the live recording to a remote server. The app automatically uses the mobile camera as IP camera. Another mobile phone will be used to control the robot over Bluetooth. It has a custom app installed on it which can move the robot in forward, backward, left or right direction. The development of the custom app using "Rame App" is discussed in the programming guide section. In control circuitry of the robot is powered on, it initializes the controller and starts reading data from the Bluetooth module. The control commands can be passed to the robot using a custom app running on an android phone. The app has a user interface which allows moving the robot forward, backward, turn left, turn right and stop. The user has just tap the direction buttons to transfer the commands. The commands are passed by the app to the Bluetooth module interfaced in the control circuitry in the form of single character strings. The following strings are passed to transfer the control commands.

      These command strings are interpreted in the Arduino sketch to control the DC motors. The robot can be moved forward, backward, left or right by implementing the following input logic at the motor driver pins

.On receiving the string commands, the Arduino sketch just changes the digital output at the input pins of the motor driver IC to control the motion of the robot.

An Android smart phone is mounted on the robot to broadcast the video and audio from the robot to the control interface (computer). There are many IP webcam applications are available in the Google play store, but two applications are quite good - one is Alfred and second is IP webcam. An internet protocol (IP) camera is a type of digital video camera, generally employed for surveillance which can send and receive data via a computer network and internet. Any of these apps mentioned above can be used for using phone as IP camera.

### 3.3 ALGORITHM

Step1: To start the program

Step2: To design a spy robot and connecting the sensor..

Step3:To find the static or dynamic environment.

Step4: To connect the blue-tooth module and motor driver.

Step5:To build the bot and connect IP webcam information.

Step6:To write a arduino programming.

Step7:Stop the program

It then explains how to use the Android Bluetooth APIs to accomplish the four major tasks necessary to communicate using Bluetooth: setting up Bluetooth, finding devices that are either paired or available in the local area, connecting devices, and transferring data between devices.



**Figure 3.3 bluetooth controlled the robot**

In the control circuitry of the robot, Arduino sketch running on Pro Mini controls the robot's mechanism. The Arduino sketch starts with the declaration of constants. The following #define directives are used to determine the Arduino pins that should be connected to the motor driver IC.

```
#define LM1 2
#define LM2 3
#define RM1 7
#define RM2 8
```

The following code block list the function prototypes that are used to determine the task of the motor.

```
char data = 0;
voidmoveforward();
voidmovebackward();
```

```
voidturnleft();
voidturnright();
voidrobostop();
```

The following block of code is the setup() function where it is used to determine whether the connected pins are used as input or output and the serial communication with the Bluetooth module is enabled. Here Serial.begin is used to establish a serial communication between the Bluetooth and the Arduino and pins connected to the input pins of motor driver IC are declared as output.

```
void setup()
{
  Serial.begin(9600);
  pinMode(LM1, OUTPUT);
  pinMode(LM2, OUTPUT);
  pinMode(RM1, OUTPUT);
  pinMode(RM2, OUTPUT);
}
```

The main operation in the code is implemented by a decision-making loop which is called in the main() function. It checks whether the serial data is available and if any data is available, it reads the serial data using UART interface. The Read() method of the Serial object is used to read data and the data is then stored in a variable.

```
  if(Serial.available()>0)
  {
    data = Serial.read();
    Serial.print(data);
    Serial.print("\n");
```

The received serial data is compared with pre-determined string commands in if statements and accordingly the logic at the input pins of the motor driver IC are changed. Like if the serial data received is 'F',the function moveforward() is called to run the robot forward.

**OPERATION**

➢ In Mobile operated spy robot circuit which can be controlled by using mobile phone
➢ The Mobile operated spy camera robot has been designed in such a way that it can fulfill all the needs of military, police and also for personal security .
➢ It can capture audio and video information from the surroundings and can be sending to a remote station through transmitting signal. .
➢ It has countless application and can be used in different environments and scenarios. For instance, at one place it can be used by bomb disposal squad, while at another instance it can be used for handling mines.
➢ It can capture video information from the surroundings and can be sending to a remote station through transmitting signal.
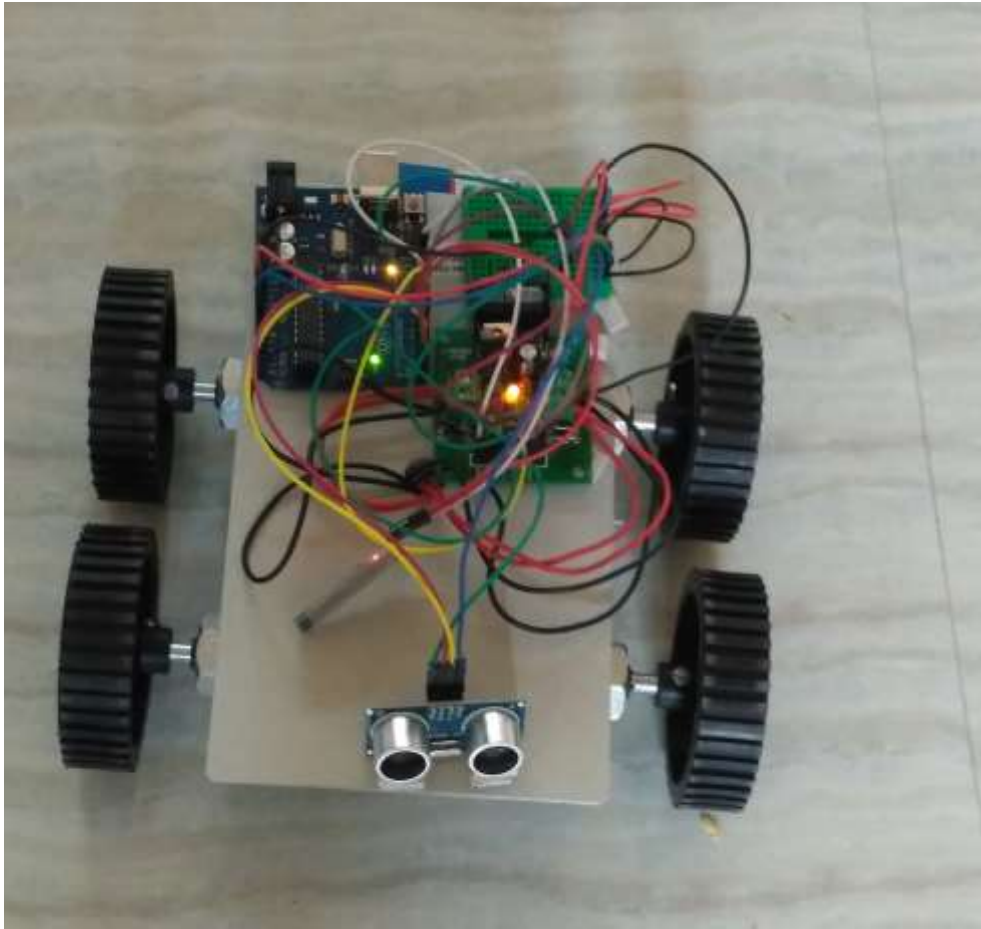
**3.4 HARDWARE CONNECTION:**



**Figure 3.4 Hardware connection**
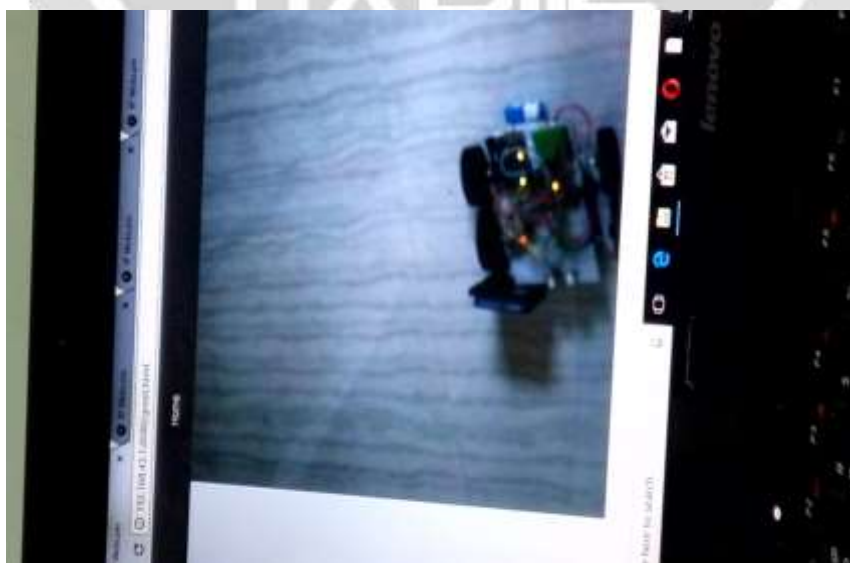
**3.5 MONITORING THE INFORMATION USING IP WEBCAM**:



**Figure 3.5 Monitoring the information**

**4.0 RESULTS AND ANALYSIS:**
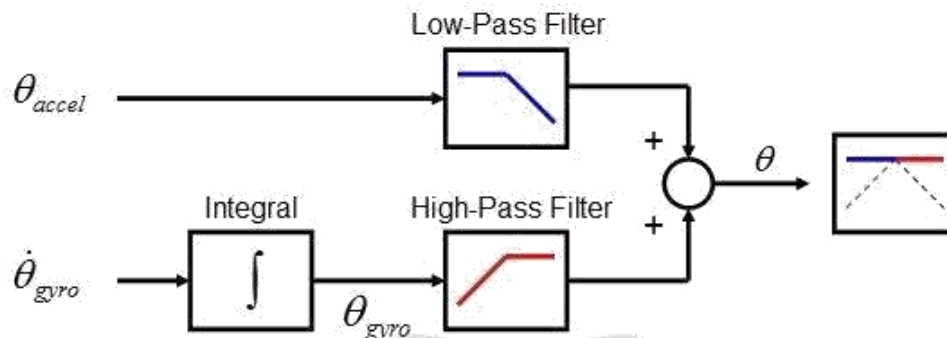
**4.1 KALMAN FILTER ESTIMATION:**



**Figure 4.1 kalman filter estimation**

**4.2 BALANCING ALGORITHM:**

The balancing achieved PID controller propotional,Integral,derivative controller.Each provides distinct characteristics to the system.Proportional controller is the easiest to implement and proportional part of PID controller corrects the present. Integral part of PID controller is used to add long term precision to a control loop and it eliminates the accumulation of errors. Derivative part of PID controller is used to predict how the system can behave.

$$u(t) = K_p e(t) + K_i \int_0^t e(\tau)d\tau + K_d \frac{d}{dt} e(t)$$

**Figure 4.2 Characteristics of Co-efficient of PID Controller**

**4.3 TIME DOMAIN ANALYSIS:**

| PID CONTROLLER | RISE TIME | PEAK OVERSHOOT | SETTLING TIME | ERROR |
|---|---|---|---|---|
| $K_P$ | Decrease | Increase | Small change | Decrease |
| $K_I$ | Decrease | Increase | Increase | Eliminate |
| $K_d$ | Small change | Decrease | Decrease | No change |

In PID controller used to stabilize the robot by giving suitable PWM signals to the motors. The mathematical modelling of the robot would be done and it would be transformed using Laplace transform. Using MATLAB the equation would be used in PID controller and its behaviour can be observed.

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