International Journal of Scientific Research and Engineering Development-– Volume 5 Issue 2, Mar-Apr 2022

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Design of IOT Based Multifunctional Camouflage Military Robot

Mrs.M.Vijaya Lakshmi[1],V.Sarath Babu[2], K.Sravani [3], M.Roshni[4], J.Reddy Prasad Raju[5] ,A.Ramya[6]

(Associate. Prof , ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[1]
(B.Tech. IV Year Student, ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[2]
(B.Tech. IV Year Student, ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[3]
(B.Tech. IV Year Student, ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[4]
(B.Tech. IV Year Student, ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[5]
(B.Tech. IV Year Student, ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[6]
(Email.id:- sarathroyal764@gmail.com)

OI: 10.1109/ICAIS50930.2021.9395991

International Conference on Artificial Intelligence and Smart Systems (ICAIS) | 978-1-7281-9537-7/20/$31.00 ©2021 IEEE | D

----------**********----------

Abstract:

In this modern era, huge capital of the country has been spent for the defence field to deploy primitive and high security measures and safeguard the border security forces from the trespassers. Some defence organizations utilizes robotics in the defence field and the efficiency of robots are very high when compared to the human forces. Camouflage Robot plays a vital role in saving human loses as well as the damages that occur during disasters. Thus, it will gain more importance in the upcoming era. The robot basically consists of a vehicle mounted with one camera, which captures the images and detects colour accordingly as a part of the camouflaging feature. The robot can quietly enter into enemy area and send information via camera to the controller. The main motive of this paper is to make the defence more strong by using the robots, which will help defence to safeguard the human lives. This paper has proposed the system using the Arduino, metal detectors, gas sensors which help the robot to do multi functionalities to do rescue operations.

Keywords— Arduino Mega, Camouflage, GPRS, Metal detector, IRSensor, PIRSensor, ColorSensor, GSM module, GPS.

----------**********----------

I.INTRODUCTION

Robots are mechanical devices, that are capable of performing the difficult and complex tasks on their own and also based on the commands. As the technology was booming in the present era, it is safe to use robots rather than the human for performing particular tasks and robots can do more difficult tasks and it can be moved to places, where human cannot go and complete the tasks in a more efficient way [13], [2].

Defence system is a major asset to any country in this world. Safeguarding the country against the enemies is one of the prioritised things to keep the country's economy, assets, valuable treasures and lives of the people in a safest way. In the defence the most required and the new equipments are the military robots [3], [1]. Nowadays, military robots are considered to be the future of modern warfare. At the same time, military robotics is considered to be the game-changing technology that could change the structure and employment of armed forces[4]. Society is aware of the military employment of robots today. The last decade has witnessed a surge of military robots on the battlefield [7].

These military robots are of various types for the uses like transportation, attacking enemies, disaster management and civil supplies. Nowadays, the robots are used in the defence system of many countries for attaining the supremacy and gaining a place towards supreme power in the world.

The proposed model utilizes the different sensors like PIR se

nsor, IR sensor, and metal detectors for different operations as robots are speed and their capabilities, strengths and calculations are very efficient. The technology has grown in such a way that the robots can be operated wirelessly and can be operated in remote areas, human loss can be minimized in the defence, surgical strikes and military operations which leads to less human loss. Using the camouflage principle, we can able to build a robot which can act as spy and can deliver the particular location and the images of trespassers. Existing system has some faults like noise in the channel of transmission of information to nearest camps.

II LITERATURE SURVEY

Premkumar. M presented a paper that low power X-bee wireless sensor network and use to propose a new system for tracing out the trespassers and robot took the action on the trespassers that are found while the robot was under surveillance, by this error made by humans can be reduced. [1]

AkashRavindran proposed a system that interfaces between the controller and android, the communication by Bluetooth is established, and it was made by using Bluetooth module that was interfaced using UART protocol. The controlling of robot can be done by the use of android app [2].

Hymavathi proposed a paper for interfacing the X-bee and the implementation of multipurpose robot by wireless technology, the model can be controlled by using the personal computer (PC) and it navigates through the disaster areas and identifying the enemy [3].

Yadnika Warang proposed a paper on implementation of the robot which has multifunctionality and camouflaged technology by using the smart phone connected by Bluetooth.

Additionally, it has based on artificial intelligence and safety of the Robot[4].

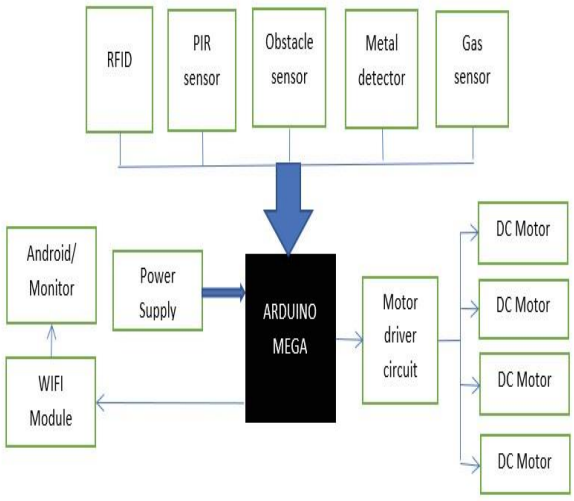
The following survey is to show the number of soldiers died in defending their country yearly. The deaths caused due to the non-development of the defence system in India. The survey is completely based on the - Information Bureau of Ministry of Defence , Government of India.

Table 1.1 Table for Survey of Deaths in Indian Defence System

YEAR	DEATHS IN ARMY	DEATHS IN AIR FORCE
2014	1084	124
2015	1378	215
2016	2104	319
2017	1474	121

III. EXISTING SYSTEM

This System consists of Arduino Mega that operates PIR sensor, IR sensor, RFID, Metal detector, Gas detector for detecting any intruders and obstacles and also scanning radio frequency, and dangerous metals and harmful gases respectively to each sensor. It can be operated using a WIFI module. It is the interface between the user and the system. The motor driver circuit drives the Robot as per the commands given by the user using WIFI module. We can only receive the information from the sensors and we can't see or hide using this system.



IV. PROPOSED SYSTEM

The main principle of this army robot device is based on camouflage techniques. The main aim of

this project is to be design and develop the army robot and it is operated by a smart phone and it is being controlled by using remote. Different from this it can be able to also be reproduce the colour with the colour sensor according to the ground surface where the robot is moving around the path hence it has been camouflaged from the outside world. In order to the reach these goals we have been used a LED that can be the uniform colors are diffused in it and coupled to the sensors which can be precisely identify the colour from the surrounding ground.

On the other side we also created a system which can be the receive and implement the information which is received from the smart phone using the Arduino Mega to the further control of the motor drives which can be the drive a robot in the required direction. Hence this model is design for the making of the multitasks performing along with the checking to the several parameters for system monitoring for this it requires other significant tasks on its own using the Arduino Mega.

On the other hand, we also introduced a spy camera to capture the real time data as video and images. It consists of a WIFI connection to get operated according to the necessity. We can rotate the camera according to the information we need.

A. Block Diagram Description

The system proposed here consists of Arduino, LED, BLYNK cloud, sensors, Wi-Fi module, IR sensor, GPRS, metal detector, DC motor, gas sensor and they are arranged as shown in figure 2. PIR sensor was high temperature and electronic device for which if any changes are there in the radiation pattern and the device movement and change in the surrounding, it generates the electric charges, Metal detector will detect the metal that was near to the device based on the eddy current losses that are produced on high frequency according to that the signals of output change. GPRS is used to send the data with the location and the coordinates of that location.

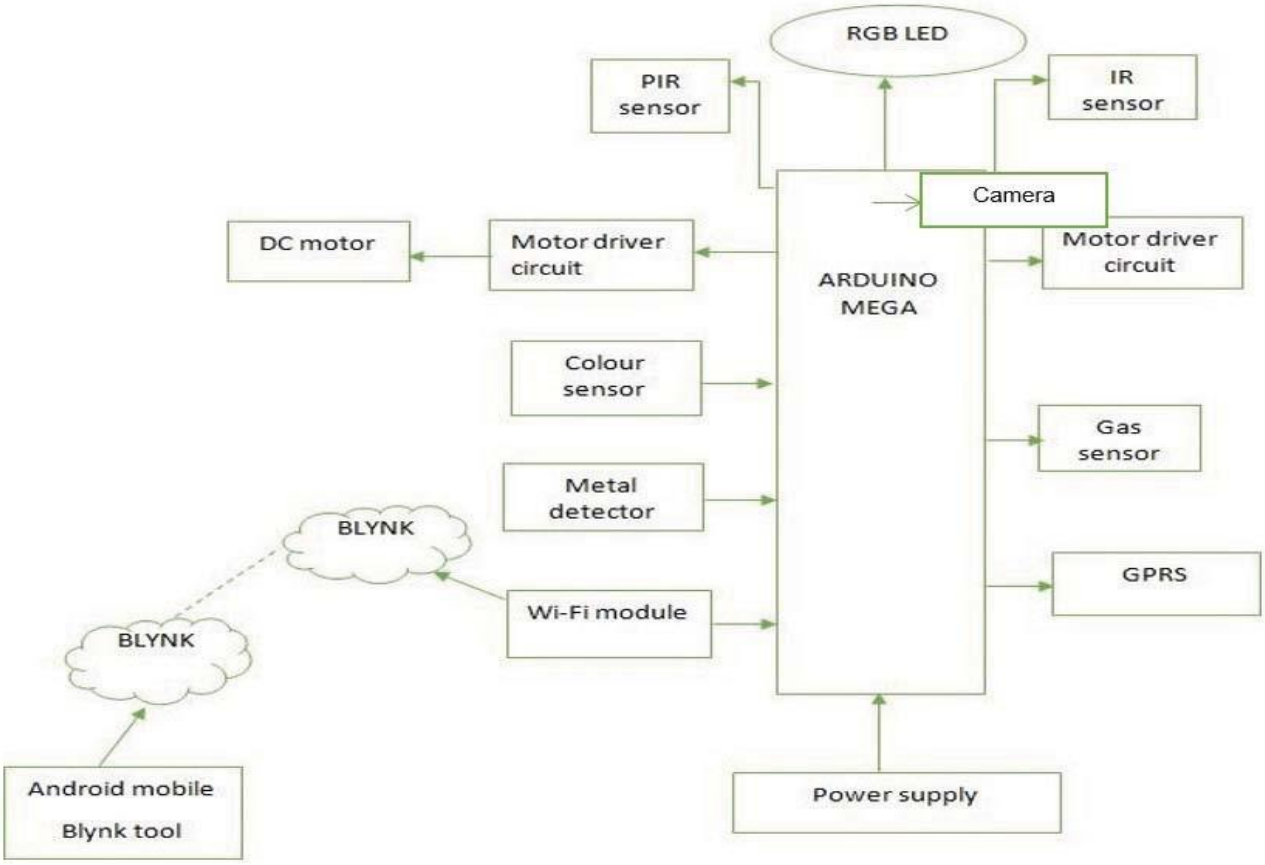
Arduino will provide the commands and it processes the information from the sensor. The colour sensor senses the colour of the surroundings and it changes the body colour of the robot and it moves based on the commands that are provided from the BLYNK cloud tool. The Arduino will provide the commands to the dc motors that are used to drive the robot.

B. Metal Detector

Metal detectors consist of a coil that transfers the electromagnetic field into ground. If any object or metal or landmines are within the electromagnetic field then the EMF gets activated and send back the same signal. Metal detector is a device that is used to detect the presence of metal bodies that area nearby the detector, this is used for fetching the devices that are hidden the surroundings or the objects that are underground surface.

C. PIR Sensor

PIR is also known as passive infrared sensor. It mainly grasps the Infrared radiation coming out from the objects. It works on the radiant heat coming out or absorbed by the objects. PIR sensor is defined as passive infrared sensor is an electronic sensor that is used to measure the infrared rays that are radiating from the objects in the view of the sensor



D. Colour Sensor

The colour sensor consists of four filters viz. red filter, blue filter, green filter and clear filter. It works on the principle of chromatic light. Colour sensor is nothing but the colour detector. It has white LEDs that can measure the visible range of colours in the environment

E. IR Sensor

Infrared sensor works on the concept of heat radiated from an object. It senses the heat or any radiation that is coming out of an object.IR is defined as the infrared radiation and it is used to detect the heat that was present in the surrounding and based on this it will detects the motion of the object it is also known as passive IR sensor.

F. Gas Sensor

Gas sensor is a device that is used to detect the gases that are present in that area they are often used for safety purposes in office, banks etc. this is used for detection of leakage of the gases

G. WiFi Module

WIFImodule is device which is based on the IEEE standard i.e., 802.11 it was based on TCP/IP protocol

H. WiFi Module

WIFImodule is device which is based on the IEEE standard i.e., 802.11 it was based on TCP/IP protocol

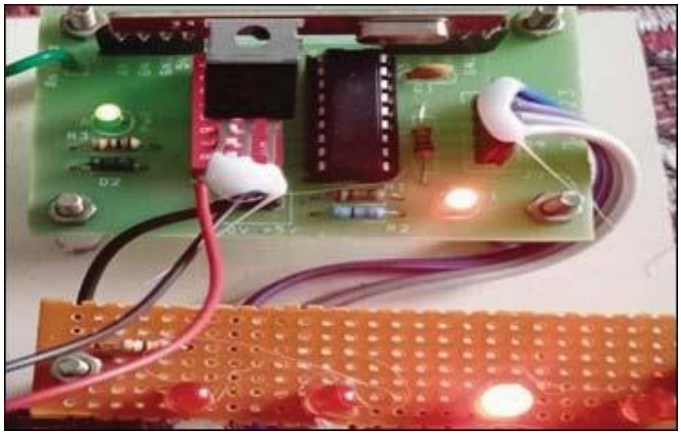
I. GPRS

GPRS stands for general packet radio service it is used for the communication purpose by the GSM technology and it is packet oriented mobile data, it has the standards of 2G, 3G ,4G communication network.

V. IMPLEMENTATION

The We are proposing a system used for controlling the robot using BLYNK application in the android device. The controllers of the BLYNK app are designed for managing the movements of the robot. In the BLYNK application these controllers are defined by embedded C program which is dumped in the Arduino Mega and displayed by using the BLYNK app that was interfaced with the Arduino Mega. Small DC motors can be switched "On" or "Off" by means of switches, relays, transistors or MOSFET circuits with the

The PIR sensor gets activated when there is an movem of humans, animals or any intruders in it's range



simplest form of motor control being "Linear" control. The GPRS is used to detect the location of the robot and sends the coordinates where the metal, obstacles and gases are present. The colour sensors detect the surrounding colours and changes its body colour according to the surroundings by the help of the matrix LED, this LED glows and this robot acts as the spy. The other hardware components are used in this are dc motors to moving the robot and sensors are also used in it. Gas sensors are used to the detect the toxic gases, metal detector is used to detect the metal arms andweapons,IR sensor to detect the obstacles,PIR sensor to detect the movement of animals or humans etc, Color sensor to camouflage the robot. Total
Hardware build is given below

Figure.3
Hardware Setup

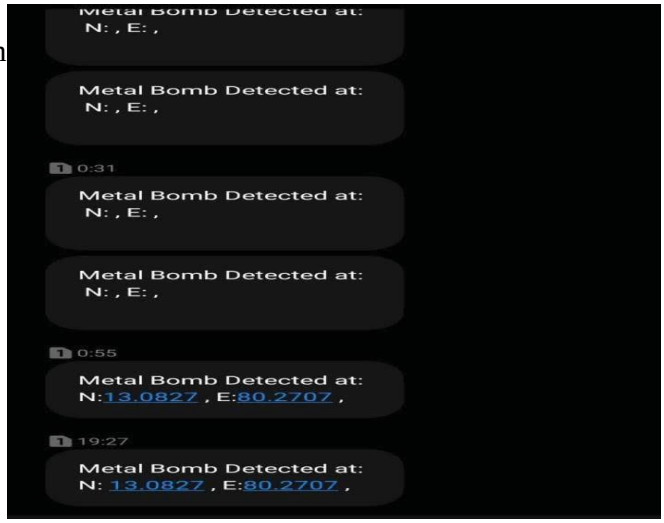


Figure 7. Activation of GSM for Sending SMS when metal is detected

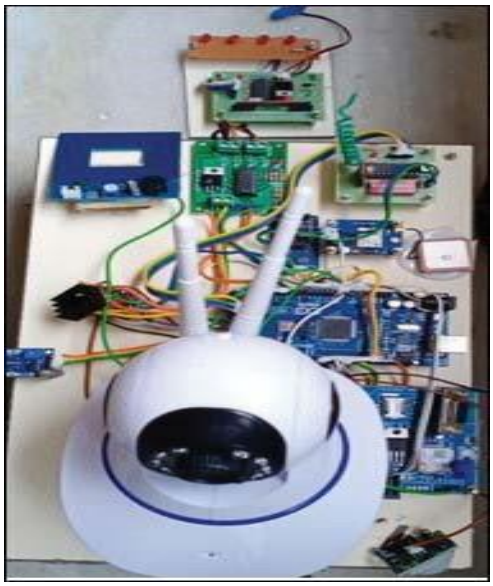


Figure.5 When IR sensor is HIGH

The IR sensor gets activated when any obstacles are present in front of the robot by the process of thermal radiation

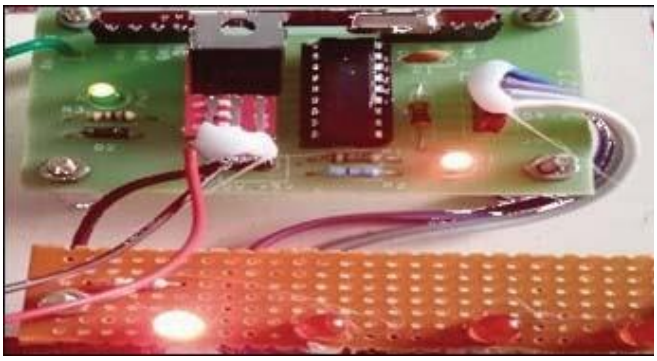


Figure 4. When metal detector is HIGH

When the Metal detector gets activated, the GPRS also comes into the function to find the location of the metal or bombs and send the location coordinates to the user. The Metal Detector gives the result of any bombs landmines or metals that are present in the range of the robot.

Figure.6 SMS through GSM when metal is detected

It is possible to send SMS from the GSM module present in the robot. Metal is detected by metal detector

The user receives the SMS from the GSM module present in the robot. GPS is used to find out the location coordinates (Latitudes and Longitudes)

Figure 8. When colour sensor detects the color in front of it,then RGB turns to that identified color.

Examole 1: blue color

The Colour sensor senses the color in the surroundings of the robot and makes changes to the robot colour according to it by framing the colour on the RGB LED matrix.

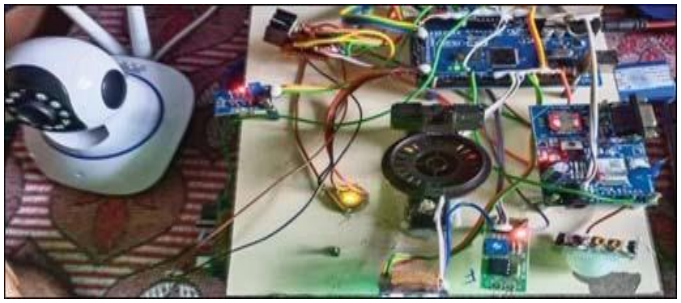


Fig 9 Example 2 : Green color The Camera shows real time data that can be processed or viewed at the monitor or mobile phone of the user. It gives the fast and accurate data as the transmission of data takes place through the wifi module. It is very fast and most reliable. It's a 360 degree view from the camera.The robot movement can be operated by using the monitor or mobile phone. Based on the necessity the robot can be moved forward, backward, left and right directions to find the harmful traces in the surroundings.

IV. CODING

```
int limitSwitch = 2;
const int lm35_pin = A1;
```

```
int temp_adc_val;
float temp_val;
int state = LOW;
int trigPin=10;
int echoPin=11;
int distance;
long duration;
#define S0 4
#define S1 5
#define S2 6
#define S3 7
#define sensorOut 8
#define gas 3
#define buzzer 9
#define red A2
#define yellow A3
#define green  A4
#define pirPin 12
int calibrationTime = 30;
long unsigned int lowIn;
long unsigned int pause = 5000;
boolean lockLow = true;
boolean takeLowTime;
int PIRValue = 0;
// Stores frequency read by the photodiodes
int R = 0;
int Y = 0;
int G = 0;
String str1;

void setup() {

  Serial.begin(9600);
  pinMode(limitSwitch,INPUT);
  pinMode(gas,INPUT);
  pinMode(pirPin, INPUT);
  pinMode(buzzer, OUTPUT);
  pinMode(S0, OUTPUT);
  pinMode(S1, OUTPUT);
  pinMode(S2, OUTPUT);
  pinMode(S3, OUTPUT);
  pinMode(red, OUTPUT);
  pinMode(yellow, OUTPUT);
  pinMode(green, OUTPUT);
  pinMode(sensorOut, INPUT);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin,INPUT);
  digitalWrite(S0,HIGH);
  digitalWrite(S1,LOW);
  digitalWrite(red,LOW);
  digitalWrite(yellow,LOW);
  digitalWrite(green,LOW);
  digitalWrite(buzzer,LOW);
}

void loop() {
    digitalWrite(buzzer,LOW);
    int gas_val=digitalRead(gas);
//    Serial.println("GAS");
//    Serial.println(gas_val);
    delay(1000);
    str1= "@" + String(gas_val);
    Serial.println(str1);
    delay(2000);
    if(gas_val==0){
      digitalWrite(buzzer,HIGH);

    }
    int val = digitalRead(limitSwitch);
//    Serial.println("limitSwitch");
//    Serial.println(val);
    delay(1000);
    str1= "$" + String(val);
    Serial.println(str1);
    delay(2000);
    if( val ==1){
      Serial.println( "(1) Target Hit!" );
      digitalWrite(buzzer,HIGH);

    }

  temp_adc_val = analogRead(lm35_pin);
  temp_val = (temp_adc_val * 4.88);
  temp_val = (temp_val/10);
//  Serial.println("Temperature = ");
//  Serial.println(temp_val);
//  Serial.println(" Degree Celsius\n");
  delay(1000);
  str1= "*" + String(temp_val);
  Serial.println(str1);
  delay(2000);
  if(temp_val > 50){
    digitalWrite(buzzer,HIGH);
  }
  digitalWrite(trigPin, LOW);
   delay(200);
   digitalWrite(trigPin, HIGH);
   delay(500);
   digitalWrite(trigPin,LOW);
   duration = pulseIn(echoPin, HIGH);
   distance = duration* 0.034 / 2;
//   Serial.println("Distance: ");
//   Serial.println(distance);
//   Serial.println("cm");
   delay(2000);
    str1= "%" + String(distance);
    Serial.println(str1);
    delay(2000);
```

```
  if (distance<15){
 digitalWrite(buzzer,HIGH);
 delay(1500);
  }
  int pir_val=digitalRead(pirPin);
//   Serial.println("value");
//   Serial.println(pir_val);
  delay(1000);
  str1= "#" + String(pir_val);
  Serial.println(str1);
  delay(2000);
    if(pir_val==0) {

//       Serial.println("Motion detected.");
      delay(50);
    }
    else{
//       Serial.println("Motion ended.");
      delay(50);
    }
 digitalWrite(S2,LOW);
 digitalWrite(S3,LOW);
 R = pulseIn(sensorOut, LOW);
//  Serial.print("R = ");
//  Serial.print(R);
 delay(100);
 digitalWrite(S2,HIGH);
 digitalWrite(S3,HIGH);
 G = pulseIn(sensorOut, LOW);
//  Serial.print(" G = ");
//  Serial.print(G);
 delay(100);
 digitalWrite(S2,LOW);
 digitalWrite(S3,HIGH);;
 Y = pulseIn(sensorOut, LOW);
//  Serial.print(" Y = ");
//  Serial.println(Y);
 delay(100);
if(R >= 30 && R <= 100 && G >=80 &&  G<=200
&& Y >= 70 && Y<=120)
{
// Serial.println("Red colour detected");
 digitalWrite(red,HIGH);
 digitalWrite(yellow,LOW);
 digitalWrite(green,LOW);
 delay(1000);
}
else if(R >= 140 && R <= 240 && G >=100 &&
G<=190 && Y >= 110 && Y<=170)
{
// Serial.println("Green colour detected");
 digitalWrite(red,LOW);
 digitalWrite(yellow,LOW);
 digitalWrite(green,HIGH);
 delay(1000);
}
else if(R >= 50 && R <= 120 && G >=40 &&
G<=100 && Y >= 20 && Y<=100)
{
// Serial.println("Blue colour detected");
 digitalWrite(red,LOW);
 digitalWrite(yellow,HIGH);
 digitalWrite(green,LOW);
 delay(1000);
}
else
{
//  Serial.println("No colour detected");
  digitalWrite(red,LOW);
 digitalWrite(yellow,LOW);
 digitalWrite(green,LOW);
 delay(100);
}
}
```

VI. CONCLUSION

We are concluding our paper that camouflage robot changes the colour by using the colour sensor and utilizing the usage of chameleon technique it also detects the gases that are present in the surroundings, by the use of BLYNK cloud we can give the commands and the send the information to the nearest camp bases that are recognized

VII. FUTURE SCOPE

We can enhance the system by equipping and increasing the sensors and its capabilities and to give greater accuracy by using the artificial intelligence.

References

[1] Premkumar. M “Unmanned Multi-Functional Robot Using Zigbee Adopter Network For Defense Application” International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 2, Issue 1, January2013.

[2] AkashRavindran and AkshayPremkumar “Camoflage Technology” InternationalJournalofEmergingTechnology inComputerScience&Electronics(IJETCSE)ISSN:0976-1353Volume8Issue1– April 2014.

[3] P. Hymavathi, T. Jyothi “Surveillance Alive Human Detection Robot using X-bee

Technology" SSRG International Journal of Electronics and Communication Engineering (SSRG-IJECE) – volume issue 4, June2014.

[4] DipakPatil, HimaliPatil, AbhijeetPatil, Sunil Kalal "Camouflage Technique Based Multifunctional Army Robot" International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 4, Issue 2, February2015.

[5] YadnikaWarang, TejaliMahadik, SupriyaOjha, AshaRawath "Camouflage Robot-A Colour Changing Spy Robot" IJARIIE-ISSN (O) - 2395- 4396, Vol-3 Issue-2,2017.

[6] Tarunpreet Kaur, Dilip Kumar, "Wireless Multifunctional Robot for Military Applications" Proceedings of 2015 RAECS UIET Panjab
University Chandigarh 21-22nd December 2015 : 978-1-4673-8253-3/15
©2015IEEE

[7] Kunal Borker1, Rohan Gaikwad2, Ajaysingh Rajput3, "Wireless Controlled Surveillance Robot" International Journal of Advance Research in Computer Science and Management Studies. ISSN: 23217782,Volume.2,Issue.2,February2014.

[8] Pooventhan K, Achuthaperumal R, Kowshik S3 Manoj Balajee C "Surveillance Robot Using Multi Sensor Network". International journal of innovative research in electrical, electronics, instrumentation and
control engineering Vol. 3, Issue 2, February 2015 ISSN (Online) 2321-2004

[9] Yu Jun, Yang Wuxia, Hu Zhiyi, Chen Hongshu. Research of Digital Camouflage Generation Algorithm[J]. Opto-Electronic Engineering,
2010,37(7):110-114

Dr. Shantanu K. Dixit, "Design and Implementation of e-surveillance Robot for Video Monitoring and Living Body Detection", International Journal of Scientific and Research Publication, Volume 4, issue 4, April
2014,ISSN2250-3153

[10] Robert T. Collins, Alan J. Lipton, and Takeo Kanade, Fellow, IEEE, Introduction to the Special Section on Video Surveillance, IEEE Transaction on Pattern Analysis and Machine Intelligence, Vol. 22, No. 8,August2000.

[11] Balaji.M, Karthick.S, Manikandan.V, Benedict Ebinesar.J, Vijay Nagaraj "Survillance and Target Engagement using Robots" IOSR Journal of Electronics and Communication Engineering 2017, pp.01-06.

[12] S. A Joshi, Aparna Tondarkar, Krishna Solanke, Rohit Jagtap, "

Surveillance Robot for Military Application", International Journal Of Engineering And Computer Science ISSN:2319-7242, Volume.7 Issue.5 May2018,PageNo.23939-23944

[13] T Kaur and Dilip Kumar, "Design of Cell Phone Operated Multipurpose Security Robot for Military Applications using Solar Panel".

 ©IJSRED: All Rights are Reserved