DTMF controlled vehicle for surveillance by image acquisition using Arduino and Raspberry Pi.

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ABSTRACT

The objective of designing this robot is simply to facilitate the humans in the future for security purposes. In the present scenario, there are many recent developments of robotics and communication on a large scale. The robot is in the form of a vehicle mounted with a web cam, which acquires and sends pictures to the user by the means of a web application or a web application gateway. The movement of vehicle is controlled by microcontroller in fusion with DTMF module and L293D IC. Our idea is to make a robot to tackle the hostage situation & the worst conditions which cannot be handled by human being. Hence Humans are moved out from direct exposure to potentially dangerous situations. Robotic system can perform many security and surveillance functions more effectively than humans. The main purpose of this project is to build a surveillance vehicle which can be controlled through mobile phone and surveillance through **W**LAN. This can find many applications in remote warzones where risk of life is very high. Cellular connectivity eliminates the internet accessibility issues and provides a wide coverage area. It can also be used for non-commercial purposes to keep the track of activities which require remote monitoring. This is the robot whose activities can be controlled by a cell phone from everywhere throughout the world utilizing the DTMF flagging and HTTP protocols.

The problem to this solution should be cost effective, compact, robust, durable, reliable and in addition to all of this it should be open sourced so as the facilitate the user with any dynamical addition of functionalities to the system.

1 INTRODUCTION

In this project, we have made a surveillance bot which can be controlled over the Internet or a personal network in an efficient and economical way. Therobot uses DTMF technology that takes the input from mobile phone attached with it and streams the live footage from a camera mounted over it.DTMF (Dual Tone Multi Frequency) is the flag to the telephone organization that we create when we press a conventional phone's keys.

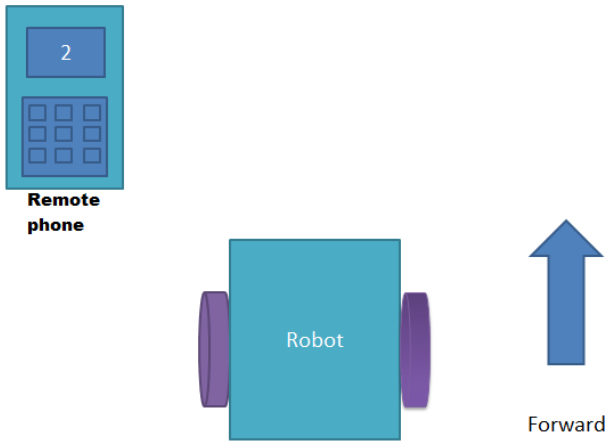
The robot is controlled by a cell phone that makes call to the cell phone connected to the robot and throughout the call, whenever a match of frequency occurs at the robot's side the robot performs the desired function and moves accordingly.

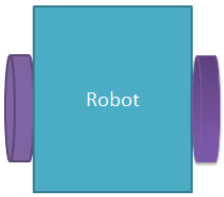
DTMF relegates a particular recurrence to each key that it can undoubtedly be recognized by the electronic circuit. The flag produced by the DTMF encoder is the direct logarithmic accommodation, progressively of the amplitudes of two sine(cosine) influxes of various frequencies, for instance: squeezing key5 will send a tone made by adding 1336hz and 770hz to the next end of the versatile.

The received tone is handled by the Arduino microcontroller with the assistance of DTMF decoder. The decoder deciphers the DTMF tone into its equal parallel digit and this paired number is send to the microcontroller as 4 different binary inputs, the microcontroller then converts the binary digits into the equivalent decimal number. The microcontroller is pre programmed to take a choice for any given decimal number and the signals to the L293D are issued accordingly which aid in the motion of the robot.

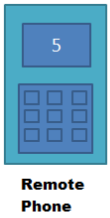
The camera mounted on the robot is independently connected to a Raspberry Pi which continuously streams the data to a web IP Address or a web application gateway and the live video feed can be seen anywhere in the world.

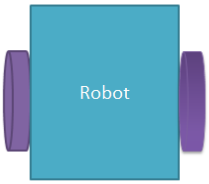
2 DESIGN AND IMPLEMENTATION



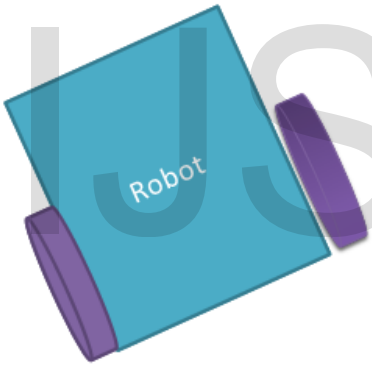


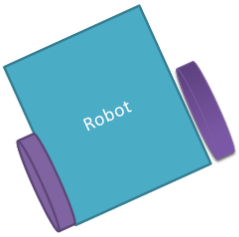
Backward





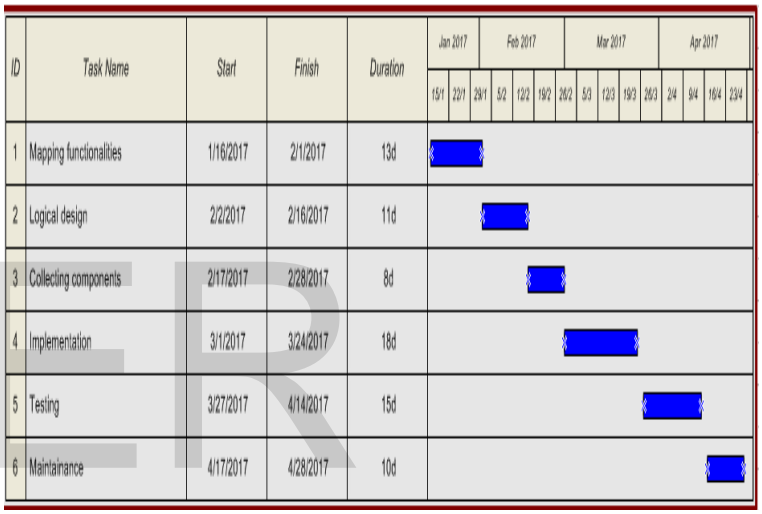
Stop





Turning Left

PROJECT PLAN GANTT CHART



ID	Task Name	Start	Finish	Duration
1	Mapping functionalities	1/16/2017	2/1/2017	13d
2	Logical design	2/2/2017	2/16/2017	11d
3	Collecting components	2/17/2017	2/28/2017	8d
4	Implementation	3/1/2017	3/24/2017	18d
5	Testing	3/27/2017	4/14/2017	15d
6	Maintainance	4/17/2017	4/28/2017	10d

Note:

All the activities and tasks carried out in the course of our project are mutually exclusive and had no overlapping between the tasks.

HARDWARE DESIGN OR CIRCUIT DIAGRAM

3 HARDWARE AND SOFTWARE SPECIFICATION

3.1 HARDWARE SPECIFICATION

S.NO	NAME	DESCRIPTION	PRICE
1	Arduino UNO R3	We will use the Arduino Microcontroller to control the actuation of the whole system, it will get the input from the DTMF Decoder and provide the output to the motor driving module.	Rs. 390/-
2	Raspberry Pi	A microcontroller like an Arduino cannot	Rs. 2950/-

		handle High processing tasks such as image acquisition and hosting server processes, hence we will be using a RaspberryPi 3 to perform this task along with an USB Camera.	
3	DTMF decoder	To decode the dual tone multi frequency from the cellular network and provide the instructions to the Arduino board.	Rs. 350/-
4	Motor Driver L293D	Depending upon the input from the Arduino it would manage the direction of motion of each motor drive connected to it by using H-Bridges .	Rs. 140/-
5	Web Camera	Used for image acquisition from the context of the vehicle.	Rs. 340/-
6	12 V DC Motors	The Actuators for the locomotion of the system.	Rs. 300/- 2 Units, 300 RPM
7	Mobile Phone	To give the input as key presses.	Not Applicable
8	Jumper Wires	To connect the hardware components.	Rs. 50/-

3.2 SOFTWARE SPECIFICATION

S.NO	NAME	DESCRIPTION
1	Arduino IDE	The Arduino IDE is the official software provided to Program the Arduino boards, it is an open source platform
2	Raspberry Pi	(Linux, Shell Script ,motion library ,Apache server) : **1)Raspbian Jessie** - The operating System for Raspberry Pi **2)Shell Script** - Used to reload the acquired images. **3)Motion Library**- For Hosting the Images over a Server. **4)Apache Server** - To create a Server process over the local area network.

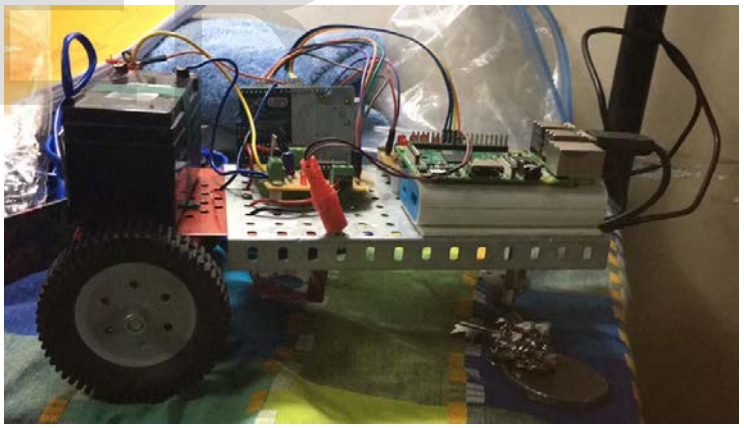
Total Price : **Rs. 4520/-**

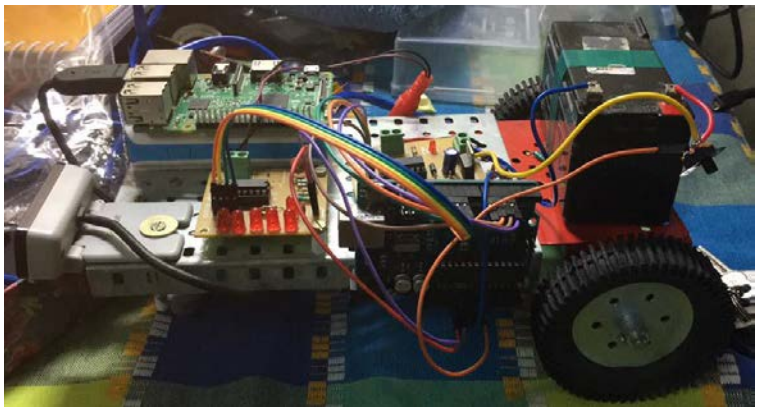
4 SIMILAR IMPLEMENTATION AND PUBLISHED WORKS

- Design and Implementation of Surveillance and Combat Robot Using Smart Phone.
- Remote Position Control System of Stepper Motor Using DTMF Technology
- DTMF based Surveillance Robot

5 CONCLUSIONS AND RESULTS

Through the implementation of the proposed project it can be seen that this is a very efficient method of Automation and surveillance. The major advantage is that the Surveillance vehicle can be controlled from literally anywhere in the world. Since GSM connectivity is present worldwide, it is a very useful system. Our work focuses on the security aspect of the existing facilities and points out its flaws. It shows how the concept of security and meaning of the word “intruder” has changed in modern homes. The project points out the shortcomings of existing security systems in identifying and preventing sophisticated intruders in any environment. It is also very simple, and the strings used to spy on the allies can be suitable modified according to the needs of the user. These DTMF based Surveillance systems are inexpensive, and their ease and flexibility of usage is unparalleled.





5 CODE

```
void setup() {

Serial.begin(9600);
for(inti=10;i<=13;i++){
pinMode(i,INPUT);
}
for(inti=4;i<=7;i++){
pinMode(i,OUTPUT);
}
stopped();
delay(1000);
}

int A = 4;
int B = 5;
int C = 6;
int D = 7;


void loop() {

int x = digitalRead(10) << 3 | digitalRead(11) << 2 |
digitalRead(12)<< 1 | digitalRead(13);

if(x==2){
forward();
   }
else if(x==8){
back();
  }
else if (x==6){
right();
  }
else if(x==4){
left();
  }
else{
stopped();
  }
}


void forward(){
digitalWrite(A,HIGH);
digitalWrite(B,LOW);
digitalWrite(C,HIGH);
digitalWrite(D,LOW);
  }
void back(){
digitalWrite(A,LOW);
digitalWrite(B,HIGH);
digitalWrite(C,LOW);
digitalWrite(D,HIGH);
  }
void left(){
digitalWrite(A,HIGH);
digitalWrite(B,LOW);
digitalWrite(C,LOW);
digitalWrite(D,HIGH);
  }
void right(){
digitalWrite(A,LOW);
digitalWrite(B,HIGH);
digitalWrite(C,HIGH);
digitalWrite(D,LOW);
  }
void stopped(){
digitalWrite(A,HIGH);
digitalWrite(B,HIGH);
digitalWrite(C,HIGH);
digitalWrite(D,HIGH);
  }
```

6 REFERENCES

[1] Kim, D. H., Park, Y. S., Kwon, S. G., & Yang, Y. Y. (2011). Design and implementation of surveillance and combat robot using smart phone. *Journal of the Institute of Electronics Engineers of Korea SC*, *48*(5), 93-98.

[2] Jayakumar, S., Bhagyalakshmi, L., Suman, S. K., &Porselvi, S. (2017). A Survey on GSM based Automation Cum Surveillance System using DTMF Technology.

[3] Kumar, J. A., Shilpa, D., Reddy, G. P., &Bhargavi, V. DTMF based Surveillance Robot.

[4] Akash, S. A., Menon, A., Gupta, A., Wakeel, M. W., Praveen, M. N., &Meena, P. (2014, September). A novel strategy for controlling the movement of a smart wheelchair using internet of things. In *Global Humanitarian Technology Conference-South Asia Satellite (GHTC-SAS), 2014 IEEE* (pp. 154-158). IEEE.