

## Intelligent Terrain Battlebot with Motion Detection Capabilities Using Python

S.E. Grace Kiriti<sup>1</sup>, Sai Nikhil<sup>2</sup>, Sai kumar<sup>3</sup>, Anupam singh<sup>4</sup>

Dept. ECE CMR Technical campus

Corresponding Author: S.E. Grace Kiriti

Received 06 September 2019; Accepted 21 September 2019

**ABSTRACT:** With the aim of making computers behave as humans in many aspects for satisfying and meeting the changing needs of human from manufacturing unit to the household unit robotics, automation and artificial intelligence has been a distinct key player. Military is the area which need most of automation to reduce the human victim. There are many human controlled robots which are already applied in military field. Making this robots more intelligent will be a blessing to our country. This can be possible by using a microcontroller which behaves intelligently. Raspberry pi is that platform which provides AI support. This can be done by using open CV which provides computer vision which is nothing but computer eye that can interpret human visual system. This project focuses on building a RF based spying robot attached with wireless camera which can imitate some features of human eye in the aspect of motion detection. This robot sends the signal to our laptop or desktop using wireless camera on open CV plat form and uses web pages to transmit captured images through mail. The other section of our project is robot vehicle which is operated through a RF remote. The remote sends the signal to the RF receiver mounted on the robot via RF transmitter at the base station. Using this signals we can operate the movement of the robot in desired direction. The robot in this project can move on rough terrain surfaces without fail, this feature will make our project perfectly fit for military applications. The controlling system of this vehicle is done using arduino board. The intelligent block will use raspberry pi as its controller and vehicle uses arduino as its controller so that there will be no delay in the processing of two different tasks. In intelligent block the open cv which creates virtual environment to enter and connect to network which makes easier to capture the motion it can also does the face detection, body detection if we enable the code .It also supports live streaming which sends the live video to the monitor or any gadget like phone by using the ip address through the network. Thus this robot will do spying in the target area.

**Keywords:-** Open CV, RF receiver and transmitter, live streaming, motion detection ,automatic mailing system.

### I. INTRODUCTION

With the aim of developing a high-tech technology which serves advanced capacity to control the robots and to device new methods of control theory and has ability to imitate some features of humans. The realize above standards some technical improvement along with the need of high performance robot is required to create a faster, reliable, accurate and more intelligent robot which can be devised by advanced control algorithm, robot control devices, new technologies and new drivers. Earlier the robots were controlled through wired networks but now to make robot more users friendly, they are framed to make user commanded work. Therefore to attain the requirements we can use RF technology to control the user friendly robot.

The design of our project is aimed to create a rough terrain intelligent beetle bot for military applications based on RF technology for the remote operation connected with the wireless camera mounted on the robot for monitoring purpose and raspberry pi 3B board which servers as intelligent box with face detection, body detection and motion detection features. The robot is embedded with a raspberry pi 3 board and arduino board for desired operation and is generally used for spying purposes. The arduino board servers for robot movement for front, back, left and right movement<sup>[1]</sup>and raspberry pi 3B board serves as intelligent box which can detect motions, human faces and bodys.<sup>[4]</sup> The transmitting module consist of the push buttons that send the commands to the receiving module for controlling the movement of robot either to right, left, forward, downward. In the receiving module of the robot two motors are interfaced with the arduino UNO board to control its movement via motor driver IC. The remote control (RF transmitter) has a range of 200m that transmits the signals to the RF receiver. The receiver collects and decodes the received signals before feeding it to the arduino to drive the DC motors via motor drivers. The wireless camera used for spying purpose with intelligent features. The raspberry pi 3B board has open CV which is used for live streaming, image capturing

when motion or face or body is detected and sending the captured image through mail to the user inbox using gmail.<sup>[4]</sup>

## II. EXISTING METHOD

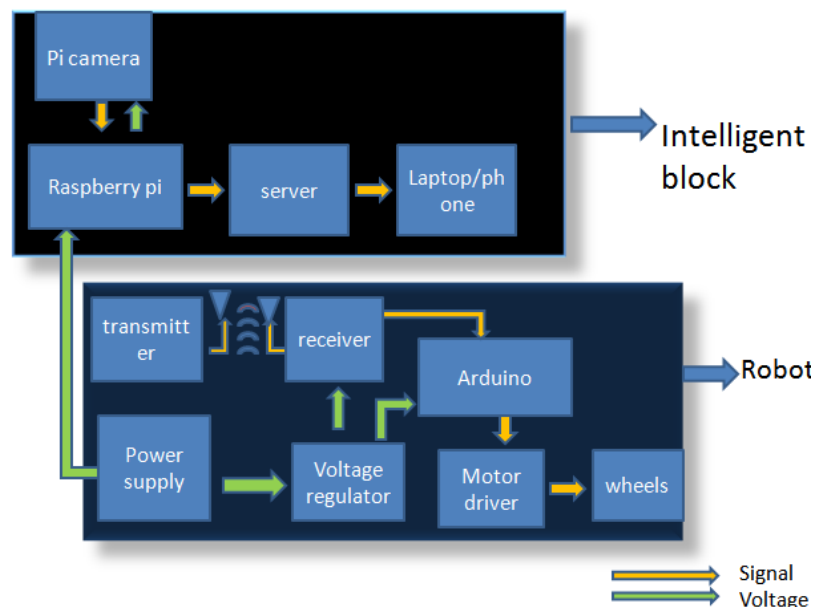
The existing systems has robot with different controlling technologies like Bluetooth with video surveillance using different micro controllers like 8051 controller and controls the motor by motor driver L923D , Arduino boards and raspberry pi. Some of the existing projects can even have night vision capability to operate under dark regions, a system to build a real-time live streaming and monitoring system using Raspberry pi with installed WIFI connectivity. In monitoring phase, the pi will record the video of the location in real-time. Capturing video is done through commands given through the computer to the raspberry pi. This command will be communicated to the pi using Wi-Fi. The pi camera is being used which will give a very good quality of the picture in the video.

The connection of Raspberry pi with the motor driver is done using the General Purpose Input Output (GPIO) pins of Raspberry Pi. The GPIO pins are connected to the input pins of the motor shield. The output pins of the motor shield are connected to the motors. A portable charger of 2 amp current is connected to the motor shield and raspberry pi. Once the connections are done properly the raspberry pi is ready to boot up. A Python program is written for controlling the motors wherein the GPIO pins will give out the output from the raspberry pi to the motor shield. The robot movement is controlled through the directions mentioned on the web page created using Hyper Text Markup Language (HTML) code and webpage Universal Resource Locator (URL) address. This process is communicated through Wi-Fi to the Raspberry Pi model B. The camera module is installed into its port and it is enabled in raspberry pi settings. For the Live Streaming of videos, MJPEG streamer is installed and configured. After the configuration steps are done just view the live streaming in the app as well as the website. The website has been developed to allow a large number of people to experience the live streaming irrespective of their location. Here admin rights are given to authenticate the visibility of critical information by only authentic users.

## III. PROPOSED METHOD

The proposed method consist of two micro controllers one is arduino uno and the other is raspberry pi3B. Arduin uno is used to make a rough terrain betel bot which is controlled by RF module and the raspberry pi 3B board is served as an intelligent system which is used to detect motions. This is made possible by using open CV in the raspberry pi. Open CV is a frame work which is designed to do image processing. This open CV has potential to make system identity human faces, bodies, motions etc. Open CV is also helpful in doing live streaming and enables web pages sends emails automatically whenever an image is captured.

### 3.1Block diagram:



Char-1: block diagram of the robot

There are two blocks which are used for fairly different purposes. The first block is intelligent box which does intelligent tasks. The other block is call robot block which is capable of moving in rough terrain surfaces without falling.

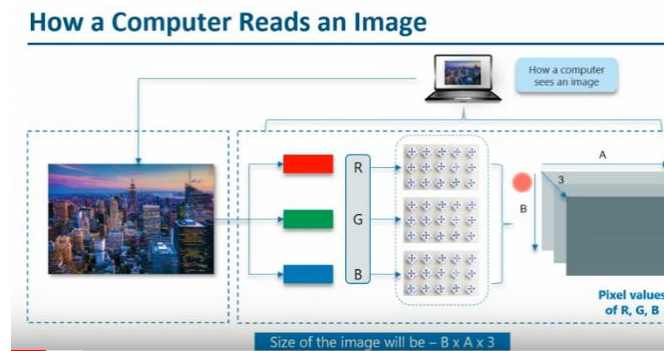
There are two main technologies are used for communication. The intelegent box uses the WIFI module which is built in on raspberypi 3 board. The communication technology to operate the robot is using RF technology. In this we use RF transmitter and RF receiver to operate the betel bot movements.

**3.2 Intelligent block:**

The main back bone of this intelligent box is using open CV. Open CV is a framework which supports the live streaming email sending and detection of face /bodu /or motion.

**3.3 Computer vision:**

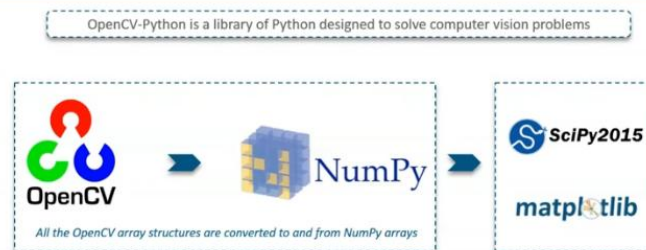
Computer vision is a interdisciplinary field that deals with how computer can be made to gain high level understanding with a digital images or videos. This CV is based on a idea of automating the task that human eye can do. That means computeellr should be able to recognize what is human face what is a building or tree etc. So the question is how a computer reads an image. Normal human can easily tell what is the image is displayed on screen but a computer will see an image in the form a matrix numbers which is from 0 to 255. For a colour image there are three channels red blue green and each channel is associated with a matrix and each element in this matrix represents intensity brightness of that pixel. This three channels are staged with each other and represents an image, that is a computer will interprete an coloured image in the from a 3D matrix.



**Char 2: How a computer reads an image<sup>[5]</sup>**

**3.4 Open CV:**

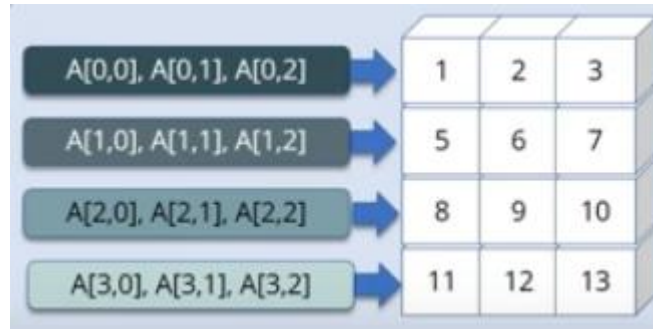
In open cv all images into an numpy arrays so that it is easy to intrepet with other softwares like scipy2015 etc.



**Char-3: open CV path<sup>[5]</sup>**

**3.5 Numpy:**

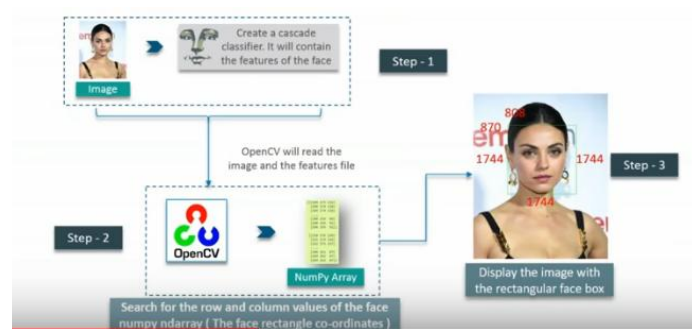
Numpy is the core library for scientific computing in python, it provides an high level multidirectional array object, and tools for working with this arrays, it also used for linear algebra, forurier transform and random number capabilities.



**Char-4: numpy working<sup>[5]</sup>**

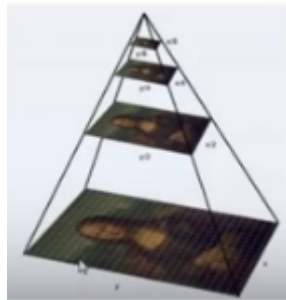
**3.6 Face detection using open CV:**

For face detection we will use and cascade classifier which will have the features of the face and we need open CV which will read the image and feature list and convert it into numpy array, then we will search the row and column values of an face numpy ndarray the is face rectangular co-ordinates.



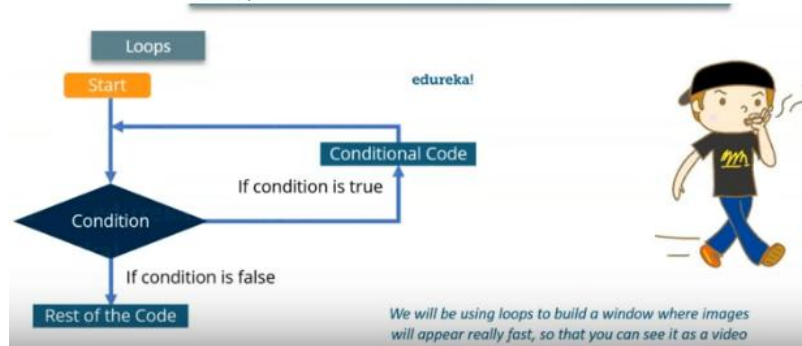
**Char-5: face detection<sup>[5]</sup>**

To search face rectangular co-ordinates we use ‘detectmultiscale’ method. This method will reduce the image into some scale factor until it found the original image, the smaller the scale value the greater the accuracy.



**Char-6: Detect multi scale method<sup>[5]</sup>**

The same thing is done to detect a face in the video. For this we use we use loop statement so that images captured appears as video. Video is nothing but multiple frames which appears to fast and appears as video. So first we will create frames and captures images continuously and play them quickly in a window so that it appears as video.

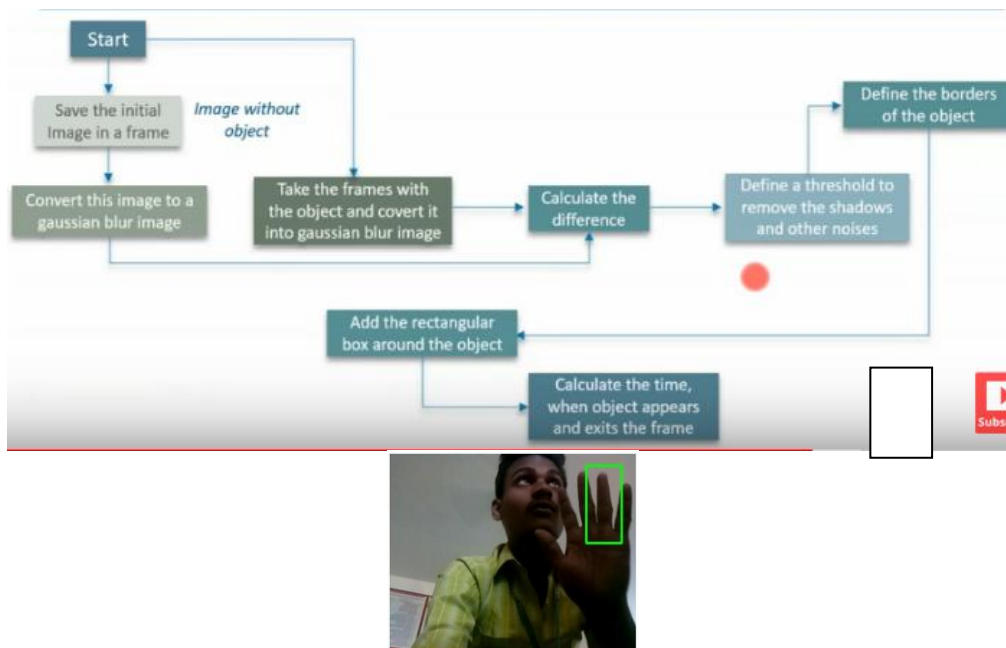


Char-7: loop statement for video.<sup>[5]</sup>

Check and frame are the commands which are used to take frames, check is a numpy array, it represents the first image that video captured and frame is a bool data type which returns true when python is able to capture the object. The video is captured by using an while loop which will run 'check' is true. There is a step which we use to convert the image to gray scale image .

**3.7 Motion detection:**

The logic is quite simple in motion detection, in this we will capture and initial image in an video and convert it into Gaussian blur image and subsequently we will capture the images after the initial frame and convert them also them into an Gaussian blurr image. Now we will compare this both Gaussian blur images, if there is any motion then there will be difference between this two blur images, in the process we also remove some unwanted noise like shadows to obtain accuracy in motion detection by defining some threshold.<sup>[3]</sup>

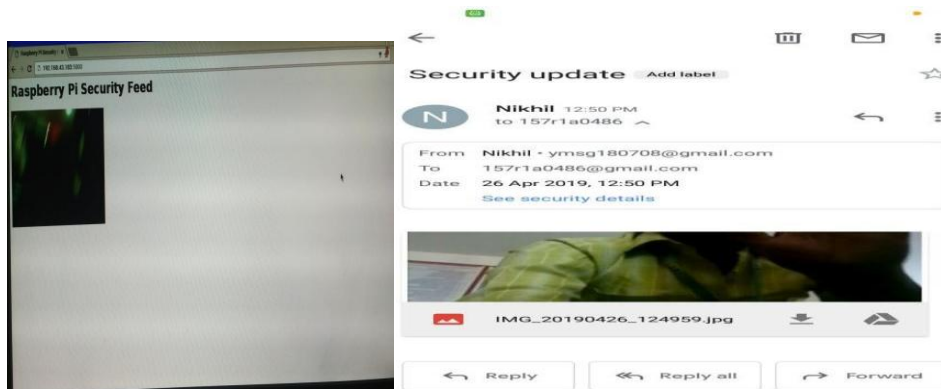


Char-9: motion detection<sup>[5]</sup>

**3.8 Mailing system and live stream:**

The open CV uses web pages to stream live videos and also to send the image which is captured through mail. For this we use html scripting language to support web page and mailing. We use scripting language to create this web page.<sup>[2]</sup>

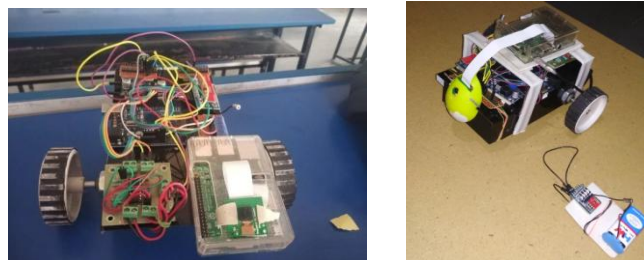




**Char-10: live stream and mail sent by pi.**

### 3.9 Robot:

The control system for robot is with arduino, arduino board is programmed with c language so that it controls the wheel via motor driver, the operation of this wheels is done using RF module. RF transmitter has four buttons which support direction in left right front and backward. The RF receiver receives the signals which are transmitted from RF transmitter. We use monopoly antenna to transmit the signals, this receiver will receive the signals wirelessly and according to the received signals the motors will move. We are using special wheels such that it can move under rough surface.<sup>[1]</sup>



**Char-11: Final robot**

### 3.10 RF module:

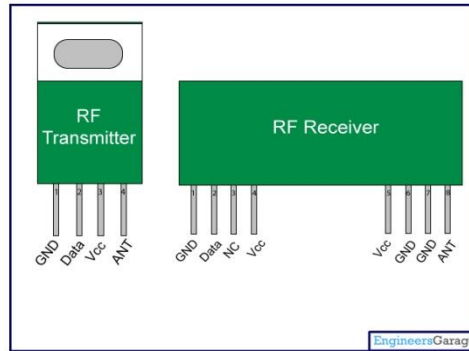
The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).

Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources.

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps. The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. [HT12E-HT12D](#), HT640-HT648, etc. are some commonly used encoder/decoder pair ICs.<sup>[1]</sup>

### Pin Diagram:



**Chart-13: Pin Description:**

**Table-1: RF Transmitter**

Pin No	Function	Name
1	Ground (0V)	Ground
2	Serial data input pin	Data
3	Supply voltage; 5V	Vcc
4	Antenna output pin	ANT

**Table-2: RF Receiver**

Pin No	Function	Name
1	Ground (0V)	Ground
2	Serial data output pin	Data
3	Linear output pin; not connected	NC
4	Supply voltage; 5V	Vcc
5	Supply voltage; 5V	Vcc
6	Ground (0V)	Ground
7	Ground (0V)	Ground
8	Antenna input pin	ANT

**3.11 Arduino uno and motor driver:**



**Char14:arduino uno**

Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328p microcontroller and developed by ino.cc. This board can be interfaced to various expansion boards and other circuits. In this project arduino is the main controller which is used to control the robot vehicle. In this we use L298N motor driver to interface DC motors to arduino. We can control the speed of the DC motor by simply controlling the input voltage to the motor and the most common method of doing that is by using PWM signal.

Pulse width modulation is a technique which allows us to adjust to the electronic device by turning on and off the power at a fast rate. The average voltage depends on the duty cycle, or the amount of time the signal is ON versus the amount of time the signal is OFF in a single period of time.

**IV. CONCLUSION**

Our project is mainly focusing on war field robot which can move on rough terrain surface and can detect objects which are programmed to detect. In our project we have made programming in such way that it detects motion. This project also provides basic features like video surveillance the special feature in our project

is that whenever it detects any motion or human face it will capture the picture and send that picture to the mail of user. This method can improve the quality of service at military.

#### REFERENCES

- [1]. War Field Spying Robot With Night Vision Camera , Journal of Network Communications and Emerging Technologies (JNCET) www.jncet.org Volume 2, Issue 1, May (2015) ISSN: 2395-5317 ©EverScience Publications 44.
- [2]. Ikhankar, R.; Kuthe, V.; Ulabhaje, S.; Balpande, S.; Dhadwe, M., "Pibot: The raspberry pi controlled multi-environment robot for surveillance & live streaming," in Industrial Instrumentation and Control (IIC), 2015 International Conference on , vol. no., pp.1402-1405, 28-30 May 2015.
- [3]. Smart Motion Detection System using Raspberry Pi, International Journal of Applied Information Systems (IJ AIS) – ISSN : 2249-0868 Foundation of Computer Science FCS, New York, USA Volume 10 – No.5, February 2016 – [www.ijais.org](http://www.ijais.org) 37.
- [4]. <https://github.com/HackerShackOfficial/Smart-Security-Camera>.
- [5]. <https://www.youtube.com/watch?v=-ZrDjwXZGxI>, OpenCV Python Tutorial | Creating Face Detection System And Motion Detector Using OpenCV | Edureka

IOSR Journal of Engineering (IOSRJEN) is UGC approved Journal with Sl. No. 3240, Journal no. 48995.

S.E. Grace Kiriti ." Intelligent Terrain Bot with Motion Detection Capabilities Using Python." IOSR Journal of Engineering (IOSRJEN), vol. 09, no. 09, 2019, pp. 55-61.