NHSEMH - 2023
2nd National Conference on New Horizons in Science, Engineering, Management and Humanities
International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)

Real Time Tracking and Detection of Enemy Through Machine Gun Technique

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ABSTRACT

Border's restricted areas are dangerous for our soldiers. We have heard a lot about increasing rate of ceasefire violation at our border from Pakistan side causes death of our soldier. It provoked us with a feeling of being forced to think about our soldiers . So our study aims to find out the solution of a question that how it looks like to be , if our border is protected by a third eye instead of our soldier which save our soldier from being killed by enemy instantly.

We came up with a solution , friend of our soldier and quietus to our enemy ," VAJRA" an autonomous enemy detection camouflage gun and kill them which detects enemy and kill them in few minute under defined range.

I. INTRODUCTION

1.1 Overview:

We have many valuable possessions that needs protection but can't be everywhere at once. Luckily, by using image recognition and motion detection software, we can built automatic gun turrets to protect our border as well as most prized possessions even in our absence. Object Detection is very challenging and practically useful technology in the field of Computer Vision. Object detection deals with identifying the object present in Source image. Considerable amount of research is being done in the territory of object detection in the last decades. Incredible achievement had been accomplished in this area. **Autonomous Camouflage** gun are the best example of this at instance. Sometimes certain incidents arose at As per the data cited in the annual report (2017-18) of **Ministry of Home affairs , government of India ,**The ongoing militancy in the State of Jammu and Kashmir is intrinsically linked with infiltration of terrorists from across the border both from the **"International border"** as well as the **"Line of Control" in J&K.** The reported infiltration attempts and net infiltration in J&K since 2013 is indicated in the table below:

Year	2013	2014	2015	2016	2017
Infiltration attempts	277	222	121	371	406
Net Estimated infiltration	97	65	33	119	123

Table-1: soldiers killed data from 2013 to 2017

Presently at Indo-Pak border, 656 BOPs are held by BSF along the IPB. A proposal for construction of 96 Composite BOPs along the Indo-Pakistan border has been sanctioned. Construction of these Composite BOPs will provide necessary infrastructure for accommodation, logistic support and the combat functions of the BSF troops deployed on the Indo-Pakistan borders. The project is targeted for completion by July, 2018. Construction activities

in 84 BOPs have been completed and work is in progress in remaining 9 BOPs. So we required a framework that can detect enemies precisely and can work in real time and we find out the solution of a question that how it looks like to be if our border is detected by a third eye instead of our soldiers which saves our soldier from being killed by enemy instantly. If this incident happen in the night time it will also be able to detect the enemy where object detection is very challenging. In planning this framework, several challenges are confronted .Some of the challenges are detecting enemy and then differentiating it from our soldiers. Other than that it should be applicable for the night vision. In this project we made a motion detection airsoft turret with Raspberry Pi . The gun turret is autonomous so it moves and fires the gun when it detects motion. There is also an interactive mode so that you can control it manually from your keyboard. We used an airsoft gun for thus project but you can easily modify this build to use a nerf instead. This project is small, lightweight and entirely battery operated.

1.2 COMPONENTS:

1.2.1 HARDWARE COMPONENTS:

1. **Electric or Airsoft nurf gun**
2. **Raspberry Pi 3 B+ :**The raspberry pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse . It is a capable little device that enables people of all ages to explore computing. This model is a latest product in the Raspberry Pi 3 range , boasting an update 64 bit quad core processor running at 1.4 GHz with build in metal heat sink ,dual band 2.4 GHz and 5GHz wireless LAN , faster (300 mbps) Ethernet , and PoE capacity via a separate PoE HAT.
3. **Logitech C210 Webcam:** for motion detection and image processing
4. **Adafruit TB6612 Motion Motor Control Shield board(Hat):** The sense hat is powerful, multifunctional add on for the Raspberry pi. As well as an 8*8 matrix of 64 red, green and blue (RGB) programmable LEDs which can be control to produce any colour from a range of millions , a sense HAT includes a 5-way joystick controller and 6 on-board sensors.
5. **Stepper motor**
6. **Single Relay board 12V:** This module is a convenient board which can be used to control high voltage, high current load as well as it is designed to interface with microcontroller. The board works on 12V but the input signal can come directly from microcontroller output working at 5V to control relays. Each relay can switch variety of AC or DC high voltage, high current loads working at 110V or 220V AC mains like lights, fans, motors and such. The status of relay is indicated by individual LEDs.
7. **Portable cell phone charger:** used for power supply of 5V to Raspberry Pi.
8. **Jumper wires:** A jumper wire is an electric wire or group of them in a cable, with a connector or pin at each end , which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.
9. **Metal bracket (90 degree):** Metal brackets are used to support the turret legs on the base on an angle of 90 degree.
10. **Screws:** #8 1/2”Countersink screws are used.
11. **Washers:** It is a thin plate with the hole that is normally used to distribute the load of a threaded fastener, such as bolt or nut.
12. **MDF Sheet:** The medium-density fibre board is used for building the turret.
13. collar with a notched 5mm hole for attaching a 5mm motor shaft to a flat surface.
14. **Flanged shaft:** It is used for controlling the motion of gun in upward and downward side. A shaft with a flange allowing it to be mounted onto a flat surface. The gun will be attached to a

flange, while the shaft will allow it to rotate about a hole.

15. **SD Card:** It is used in raspberry pi for the storage purpose like storing the operating system and other data.

1.2.2 SOFTWARE COMPONENTS:

1. **NOOBS:** NOOBS ("New Out Of the Box Software") is a operating system for the raspberry pi and is a unique installation image. SD Card having NOOBS can install a wonderful range of operating systems for your Raspberry Pi. This makes Raspberry Pi easy to use by simplifying the installation of an operating system. Instead of using specific software to prepare an SD card, a file is unzipped and the contents copied over to a FAT formatted (up to 16 GB) SD card. That card can then be booted on the Raspberry Pi and a choice of six operating systems is presented for installation on the card. The system also contains a recovery partition that allows for the quick restoration of the installed OS, tools to modify the config.txt and an online help button and web browser which directs to the Raspberry Pi Forums.

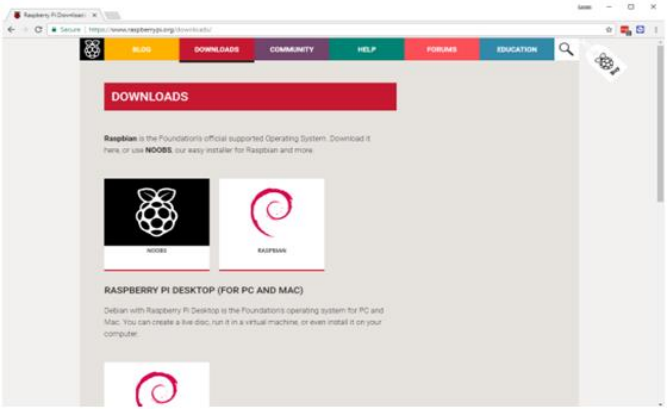

Fig: 1 Installation of NOOBS

(Ref:https://www.google.com/url?sa=i&source=images&cd=&cad=rja&uact=8&ved)

2. **OPEN CV INSTALLATION:** Open cv stands for Open Source Computer Vision Library. It is an open source computer vision and machine learning software library. The library has more than 2500 optimized algorithms which can be used to detect and recognizes faces, identify objects, classify human actions in videos, track camera movements track moving objects. Open cv is widely used all over worldwide ranging from stitching streetview images together, detecting intrusions in surveillance video in Israel, monitoring mine equipment in China, helping robots navigate and pick up objects at Willow Garage, detection of swimming pool drowning accidents in Europe, running interactive art in Spain and New york, checking runways for debris in Turkey, inspecting labels on products in factories around the on to rapid face detection in Japan. After installing NOOBS, we are ready with our operating system. After that installation of open cv for motion detection and image processing can be done for our project.

Fig: 2 Detection of object using open cv

(Ref: https://www.google.com/url?sa=i&source=images&cd=&cad=rja&uact=8&ved)

II. LITERATURE REVIEW

This chapter is a survey of research related to object detection using automatic gun, till date. The main aim behind this survey is to understand the method techniques developed to improve our product for getting very high accuracy as compared to development till date. We will study our survey by interpreting the work done by year so that we have a

beautiful glance of development till date. As we have done a lot of research ,and we found that there is no product available in the market till now .Automatic guns are available in the market but there automatic refers to the machine guns which are fired automatically for few minutes according to the specifications but they are controlled by the soldiers i.e., directions get defined by the soldiers.

2.1 Contribution in History:

Automatic gun is always a point of interest for engineers and developers from a long time. Developer had starting working on it since 18th century and the first fully automatic weapon was developed by **Hiram Stevens Maxim** in 1884, his Maxim machine gun used a recoil system to fire up to 500 rounds per minute [sources: LSU Civil War Centre, Spartacus Educational].

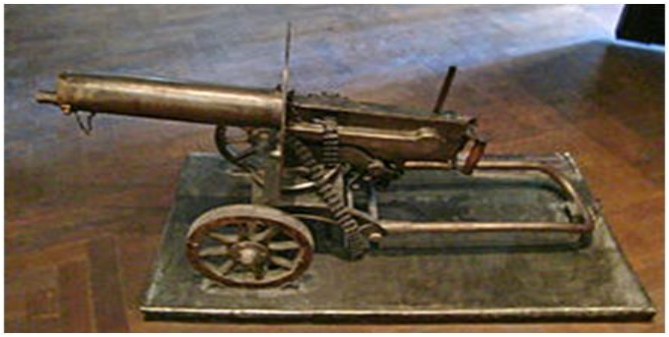

Fig: 3 PM M1910, Russian Maxim gun

(Ref: https://en.wikipedia.org/wiki/Maxim_gun#/media)

The first widely seen semi-automatic pistol, meanwhile, was created by John M. Browning in 1910 and originally used by U.S. soldiers the following year. Browning and company produced nearly 2 million of its Long Colt pistols during World War II and the .45-caliber weapon was the official sidearm for U.S. Army soldiers for nearly 75 years. In 1914, Browning also introduced the first semi-automatic rifle, a .22-caliber weapon that saw heavy action in World War II

[sources: Browning, Johnston, Smithsonian].

Fig; 4 A .50 caliber M2 machine gun John Browning's design

(Ref: https://en.wikipedia.org/wiki/Machine_gun#/media)

With the advance of gun technology came the dawn of gun control. Fully automatic machine gun-type weapons have been tightly regulated since Congress passed the National Firearms Act of 1934, largely in response to the growing prevalence of weapons like the Thompson submachine gun ("Tommy gun"), a machine gun with the cartridge of a pistol. Originally developed for use in World War I, the Tommy gun later became popular among Prohibition-era bootleggers and gangsters before the ban [source: Higginbotham].

Fig:5 A group of U.S. Army soldiers using a machine gun

(Ref: JACOM STEPHENS/VETTA/GETTY IMAGES**)**

III. METHADOLOGY

In this chapter, we are going to discuss about the experimental work which consists of experimental setup, Selection Raspberry pi 3 model B+, Selection of webcam, Selection Adafruit TB6612 motion motor control shield board (HAT) and our main operation

carried out using virtual environment created using OpenCV enable python by implementing image detection technique to the input for getting output real time.

Construction of Hardware

1. Building the base

First we take medium-density fiber board (MDF) and trace out two 9-inch diameter circles with a pencil and cut them out using a electric jigsaw. A motor will be mounted to the center of one circle, and 3D-printed flanged collar will be mounted to the center of the circle. For motor mounting , drill the four holes and one on the center of the MDF sheet. Usingfour M3 machine screws and four washers, mount one of the stepper motors to the MDF circle. With the other MDF circle, center a 3D -printed collared flanged onto the center of the board and use a pencil to mark the drilling location for each of the three mounting screws holes. Using a hand drill attach the flanged collarto the board.

Figure:6

2. Wire the gun

Before moving onto the next step, first we prepared our gun so it is ready to be mounted onto the turret. Now first we find out the switch that gets closed when trigger is pulled. We remove the wire from the switch and solder them directly to the longer power and ground wires and feed them out of the gun. Then we reassemble the gun. The physical switch actuated by the trigger that we just disconnected and later be replaced by an electric relay controlled by raspberry pi.

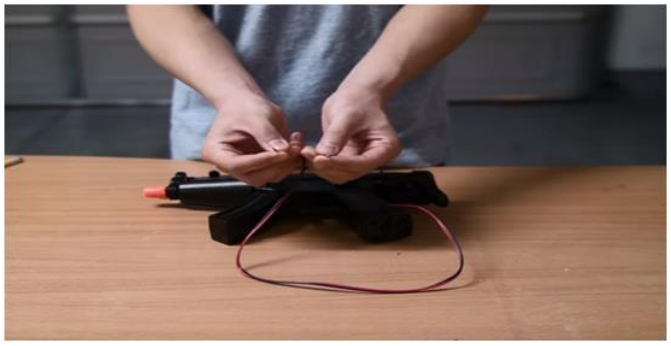

Figure:7

(https://hackster.imgix.net/uploads/attachments/340974/13_ms?auto=compress =740&h=555&fit=max)

3. Building the turret legs

Next we are ready to make the legs of the turret that will hold the gun. We used an 7.9 inch tall leg with a 6.3 inch wide base s about 2 inches wide at the top. Draw the leg shape onto a piece of paper, and cut it out with a pair of scissors. Then we use this paper, and cut it out. Use this paper to trace on MDF sheet to cut the legs out of MDF board. On one of the legs, drill a hole for the shaft of the motor to go through and on the other leg drill a hole for supporting the 3D-printed flanged shaft to rotate in. Now mount the second motor to the leg and insert the motor to the flanged collar. Take the 90-degree angled brackets and screw them into the bottom eachleg.

Figure:8

(https://hackster.imgix.net/uploads/attachments/340967/12_EL0gCdnrrY.PNG?auto=compress%2Cformat&w=740&h=555&fit=max)

4. Assembling the turret :

Now we have to figure out how far apart to space the legs from each other. Measure the width of our gun at our desired attachment point. Put the 3D-printed

flanged shaft into the hole of the other leg, and stand the legs up ,spacing them apart so the width of the gun is between the two flanged parts. After marking the circular MDF board. Screw the leg with the motor on it to one side. We use 3M double-sided tape and place it on the face of both flanged shaft and flanged collar. Placed the gun between the flanges to fix the gun.

ELECTRONICS

Raspberry Pi 3B+ model is used which have different components , just above the center point the system-on-chip(SoC) ,four USB ports which let us connect any USB-compatible peripheral, Ethernet port, Headphone jack can be used for audio video sound, Camera module, HDMI port use to connect the Raspberry pi to our display device, USB power port use to connect the Pi to a power source, camera connector use to connect the camera to Pi, 20 pins GPIO headers, microSD card contain all the file we save and all the software we install.

Figure-10
(https://www.raspberrypi.org/magpiissues/Beginners_Guide_v1.pdf)

Insert the stepper motor hat onto the Raspberry pi. Fix the hat with the Raspberry pi by solder. There are two stepper motor terminal on hat. Wire the motor on the base of the turret to right side of terminal shown in fig.5.Wire the gun pivot motor to the other terminal B. We use micro-USB cables to connect the raspberry pi. Connect the relay to the stepper motor and hat by connecting the power and ground(yellow and green) rail of motor hat and connect signal wire to GPIO pin 22(blue wire) on the Pi. Connect the output of relay to the wire of the gun. Plug in webcam to the pi using USB cables for detection. Insta

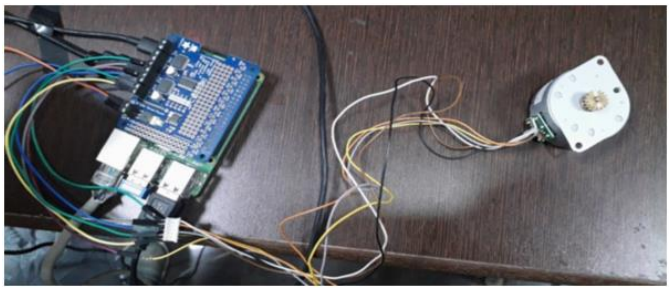

Figure-11

SOFTWARE

1. **NOOBS** :SD card having NOOBS can install a wonderful range of operating system for Raspberry pi. So we install NOOBS in our Raspberry pi.
2. **OpenCV:** It is an open source computer vision and machine learning software library. So we install OpenCV for motion detection and image processing for our project.

For communicating with stepper motor hat, we will have to configure our Raspberry Pi for I2C communication .Then we install the library for controlling the stepper motor hat. There are also a few libraries we need to install for image processing and recognition.

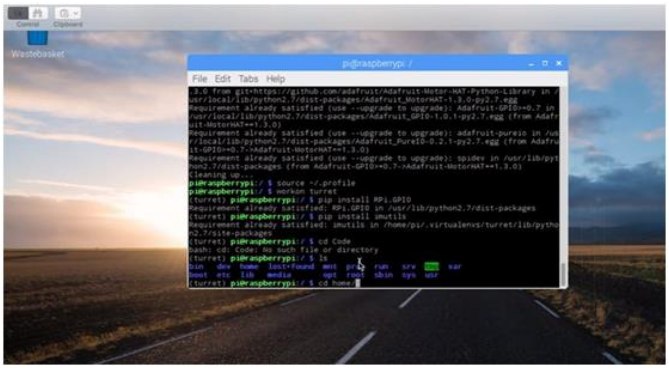

Figure-12

(https://hackster.imgix.net/uploads/attachments/340984/27_swwHAmA2Sc.PNG?auto=compress%2Cformat&w=740&h=555&fit=max)

Motion tracking mode calibration

The software does not know the position of the gun on startup, we will need to calibrate the turret when it is turned on. Python program will prompt to use the keyboard to adjust angle of turret. The software will then calibrated the exposure level of camera and pick a reference image for motion detection. Motion detection works by comparing subsequent images to initial reference image for change so we have to make sure that there is nothing move in front of the camera during image calibration.

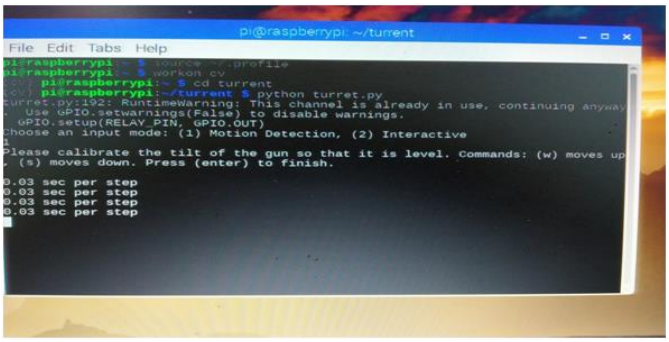

Figure-13

Interactive mode

Place the camera in line with the gun barrel and use keyboard to move and fire our turret. Use “a” and “d” keys left and right, “w” and “s” keys up and down. Enter to fire.

IV. RESULT AND DISCUSSION

As per the study we have done till now on our project, we will get a wide range of results. With the help of our algorithm, we can able to detect almost all the moving object.

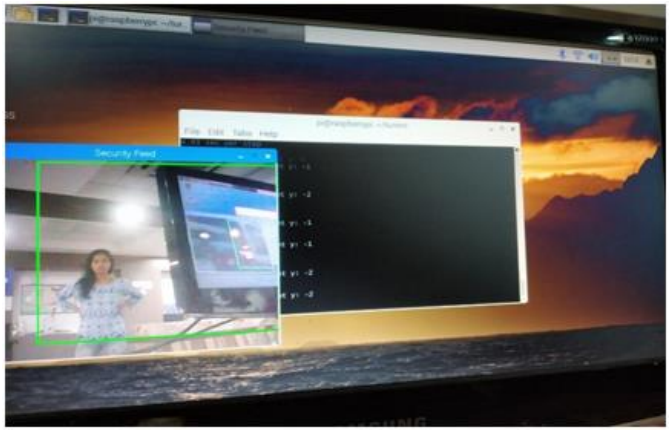

Fig: 14 (enemy detection)

4.1.1 HEIGHT OF THE SYSTEM:

Our turret lies at the height of approximately 25-30cm from the ground level.

4.1.2 RANGE OF THE SYSTEM:

The system will cover an area in range of approx. 60-80m for normal range and 80-100m for ceasefire for the detection of enemy.

4.1.3 VISION

The system will also be able to detect enemy in night.

4.1.4 FIRE PER ROUND

The system will be able to fire 500-1000 shots per round.

4.1.5 GUN BULLET:

It has high penetrating power hence enemy will die in 2-3 bullet.

4.1.6 RECOIL VELOCITY:

Minimum or very less recoil velocity, due to which vibration will not occur.

4.1.7 DETECTION SENSOR:

We will give a heat tag to our soldier in which individual barcodes are given which distinguishes enemy and soldier. The barcodes consist of all the essential information required for the identification of a soldier (e.g., aadharno. ,photo, eyesight vision). There are 13,00,000(approx..) Indian soldiers which includes Dogra regiments, Rajputana regiments, Cobra regiments etc. have their personal identification.

4.1.8 METAMATERIAL CLOAKING:

The system will become invisible from everyone by the metamaterial cloaking.

Fig: 15 (Prototype)

V. APPLICATION

5.1 FOR BORDER SECURITY:

Now a days we see lots of cease fire violation from our neighbouring country Pakistan and china due to which our soldiers got injured or died. By introducing **VAJRA** "an autonomous enemy detection camouflage gun" we can reduce the death rate of our soldier. The gun have motion tracking infrared camera fitted on it . If our enemy is doing any movement near border area this gun will automatic detect the enemy and start shooting until enemy dies. The gun haveheat sensor which will detect the heat radiated by the enemy body. If the enemy is dead heat will not radiate from the body and gun will identify that enemy is dead and stop firing. Now how it will differentiate between enemy and friend. We are going to fit heat tag on the Indian army soldiers in which there are bar code attached. The bar code consist of identification of soldiers like post, aadhar card, their images and vision of eye sight. The gun will detect that bar code and will not shoot the soldiers.

Figure – 16

(https://www.deccanherald.com/sites/dh/files/styles/article_detail/public/article_images/2018/05/30/file6yv890xq2xwcf8h8mqp.jpg?itok=QTAesScq)

5.2 For bank locker room:

Bank locker room(RBI) have so many precious atom like golds diamonds and so many cash. So, it needs high level security. By introducing **VAJRA** "an autonomous enemy detection camouflage gun" in the locker room we can easily secure the room. We will keep VAJRA inside the locker room .We are going to give the batch sensor to the selected staff of the bank who have the permission to enter in the locker room. Except those staffs if any other one who will enter in the room the gun will detect and start firing.

Figure – 17

VI. CONCLUSION AND SCOPE FOR FUTURE WORK

6.1 Conclusion:

The main aim of this thesis work is to detect the person and automatically fire the gun. We have run our algorithm on the detection of different person and accumulate our gun to fire. When motion is detected then bullet is fire out of the gun. Our system can effectively detect the person and fire the gun till the person is not alive. The person is alive or dead is detected by the radiation of heat ejected from the body of the person. If heat radiation is zero then the person is dead. The bullet is fired from the gun unless and until the death of person. The range of the gun is (80-100) m, and there is no any type of recoil velocity. Our aim is to develop a system which offers low cost solution and save the life of our soldier. Hence the death ratio of soldier at our border line minimizes. It also saves the man effort and money power of the government.

VII. REFERENCES

[1]. https://www.hackster.io/hackershack/raspberry-pi-motion-tracking-gun-turret-77fb0b
[2]. https://en.wikipedia.org/wiki/Machine_gun
[3]. https://science.howstuffworks.com/semi-automatic-weapon-vs-machine-gun1.h
[4]. https://en.wikipedia.org/wiki/Machine_gun#/media/File:M2_Browning,_Mus%C3%A9e_de_l'Arm%C3%A9e
[5]. https://en.wikipedia.org/wiki/Maxim_gun
[6]. https://en.wikipedia.org/wiki/Maxim_gun#/media/File:Maxim_gun,_Georgian_national_museum.