

**DETECTING WEAPONS TO INFORM CONCERNED AUTHORITY ABOUT
CRIMINAL ACTIVITY BASED ON COMPUTER VISION**

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This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled “**DETECTING WEAPONS TO INFORM CONCERNED AUTHORITY ABOUT CRIMINAL ACTIVITY BASED ON COMPUTER VISION**”, has been submitted to the Computer Science & Engineering Department of Daffodil International University by S. R. Sakib-Ahmod, Abu Shyed Hemel and Shoyeb Hossain. The project has been accepted as satisfactory as the partial fulfillment of the requirements needed for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on the 14th of January 2021.

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DECLARATION

We herewith sincerely declaring that, we have completed the project under the supervision of **Ohidujjaman, Senior Lecturer, Department of CSE**, Daffodil International University. We furthermore declaring that, not the full project or none of the part of this project has been submitted anywhere else to receive any degree, award or diploma by any means.

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ABSTRACT

This report book is intended to clarify the whole perspective of the project titled to provide a clear view of the whole aspect of the project that we have gone through. Computer vision is said to be the eyes of computers. Many have a keen interest in this field. In this Computer vision-based project, we have managed to detect weapons of two types (Different guns and knives) to inform the concerned authority of property about crimes. When a property is under such criminal activity that the criminals carry guns or knives with them, then the system will detect those weapons via a camera integrated module and run the necessary functions accordingly. After detecting weapons, the system immediately informs the concerned authority of the property to alert them about the upcoming risk to their property via mobile SMS message and call. Thus, the authority will be alert about the upcoming risk and can take possible measures to handle the situation. Apart from that, the system is capable of making sound alarm within the place of crime so that the common people outside of the property may come forward to help. We can use this project in any property like banks, offices, homes, or anywhere to protect our valuable properties from being theft or robbed.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

It's a matter of great joy for computer engineers throughout the world that nowadays machine learning and computer vision have gone a long way that these technologies are being used to recognize lots of things all from our daily surroundings. It is often seen that; many criminal activities happen around the world. Due to the poor security issue, the criminals cannot be caught, rather they escape. Although there are CCTV cameras, criminals are being able to make crimes like robbery, snatching, etc. The authority knows about the crime by checking the camera footage later which does not provide them better security for their property. But if it would be a smart machine to detect the criminal activity and take necessary action immediately, then the property would be saved. Here we are going to propose a solution for that type of problem. By detecting crime weapons, our system will immediately take action to inform the corresponding authorities about the danger going on to their property. Humans are bestowed with a God-gifted brain which they use to perform operations with their organs. The human being can understand a situation and able to act accordingly. It's natural for a human. But if a machine needs to understand a worldly matter like a human for a specific purpose and we want that machine to understand about an occurrence and take decision accordingly, the machine needs to be trained about the world which is called 'machine learning'. In this project, we have used python programming language integrated with Computer vision to teach the machine to let it learn about weapons and detect similar afterward. We have used 5000 images of several guns and knives. For the betterment of accuracy, we have trained the machine with more than 10,000 null backgrounds to ensure the detection confidence high.

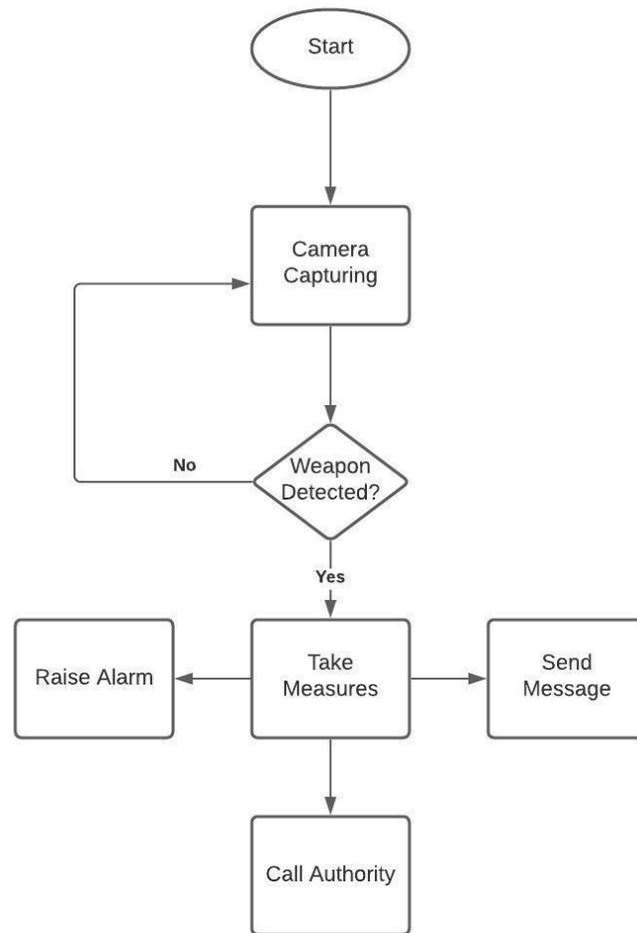


Figure 1.1: Flow Chart of the project

1.2 Motivation

The world is developing every day. With the advancement of our lifestyle, we are being modern day by day. For the sake of modern life, people have established lots of usable resources and properties that are very very precious. But it's a matter of regret and defamation that, there are not enough security appliances to ensure the safety of the precious properties. For example, people preserve money and valuable resources in the bank. But it is sometimes seen that the banks are robbed although there is human security outside. There is also CC TV camera inside. But the CC tv camera can only capture the scene but cannot understand the scenario. So, the bank authority can only watch the video of their office being robbed after the occurrence has already been done.

In Bangladesh, On 21 April 2015, an estimated 8-10 robbers have come for robbery at Kathgora Bazar, Ashulia and they have made a serious robbery there including killing people.

It's often seen that many shops are robbed too. For example, gold shop robbery, pharmacy robbery, snatching with guns, etc.

So, if there would be a smart system to detect the criminal activity by their arms or weapons and the system could immediately inform the property owner and also the people around that property, then the people from outside and the property owner could come forward to take action against crime.

Noticing the gradual activities in our daily lives, it can be said that with the growing numbers of new properties, risks are also rising. The security risk is one of the most undeniable concerns for every property holder.

From this point of view, we have been motivated to create a system that could help in a security perspective like this. We the team members are also keenly interested in machine learning and computer vision that is a part of our motivation too. So, we have started to go for the project journey to make it possible.

1.3 Objectives

According to the name of our project “Detecting weapons to inform about Criminal Activity to the Concerned Authority based on Criminal Activity”, the objective is easily understandable.

As the criminal activities with weapons are noticeably increasing day by day, with the help of our project we would like to meet the following objectives:

- Real-time crime detection and informing authorities.
- Helping to protect property with 3 possible measures (Calling to the authority, sending SMS to an authority, raising alarm continuously.)
- To reduce the wish of criminals to commit crimes.
- To make it a versatile component for everyday use.
- Users of this system will be able to use it anywhere according to need.
- The project will be cost-effective.
- To compete with other technological devices similar to ours
- To learn about machine learning and computer vision thoroughly.

Moreover, armed criminals perform a lot of adverse effects on our society. Our main goal is to provide a sustainable solution that will be both helpful for the user of this app in terms of reliability, portability, and cost.

1.4 Expected Outcome

Our project is planned to work smoothly with the help of computer vision. There are some expected outcomes of the project to ensure its reliability. These are:

- The system should be reliable.
- The system will work properly every time in detecting weapons.
- The system will take measures immediately after detecting weapons.
- Users will be able to use it easily and successfully.

- The developed system must be free of bugs and full documentation shall be preserved.

1.5 Report Layout

Chapter 1 of our project report is titled “Introduction”. In this chapter, we have discussed the total aspect of the project by providing a brief overview, motivation, objectives, and Expected outcomes of the project.

Chapter 2 of this report is titled “Background”. This chapter clarifies the project background and some literature review to compare our system with the existing ones. We have added the scope of problems and some challenges faced by us during working with the project.

As Chapter 3 of this project is titled “Requirement Specification”, we have added the necessary information about the implementation of our project. All the necessary hardware and software has been described here.

Chapter 4 is namely “Impact on Society, Environment and Sustainability”. As the name suggests, this chapter focuses on how the system is going to impact our society and if it is worth making. Also, we will cover the environmental aspects associated with this system and its sustainability.

Chapter 5 is titled “Implementation and Testing” which covers our real-life testing of the system and the implementation of the project.

Finally, Chapter 6 is titled “Conclusion and Future Scope” which discusses the future scopes of the project and how we can develop it in the future. It concludes the discussion about the project.

CHAPTER 2

BACKGROUND

2.1 Introduction

Our proposed project is capable of informing about criminal activity. So at first we need to discuss about what criminal activity is.

Criminal activity or crime is a violation of law in which public injury is occurred. It is often a punishable offence which is done against the rules and regulations of a state. In every state, there are some rules and regulations bounded by the law. Crime is simply braking the law. Once one commits a crime, s/he would be punished.

There are many types of crimes and punishment for crimes are many too. Among the crimes, robbery and armed attack is a common scenario of today. Due to the lack of proper security, these type of crimes can lead to a deadly atmosphere. These type of crime causes loss of public safety and public property. In most of the cases, the criminals get away and remain uncaught because there is no risk of losing life inside of the property if someone raises voice against the armed criminal. In those time, the CCTV cameras can capture the moment and the activity can be seen after the robbers go away from that place. What if the criminals wear a mask during robbery?



Figure 2.1: Real life Bank Robbery

So there is nothing to do in this situation. But it could be helpful if an intelligent system was pre-installed in the place and it would detect weapons and inform to people set for communication in time of raising alarm. That's what our system is capable of doing.

2.2 Related Work

“Computer Vision” is an excellent term to hear and an excellent field of innovation in this technological era. It was not supposed to be one of the most engrossing fields of communication at the previous time. But nowadays with the advanced algorithms, there are lots of projects and related papers for this excellent field- “Computer Vision.” However, we have implemented such a project with the help of Computer Vision that can efficiently identify different weapons and can help the cops and authorities to be safe from let properties being robbed. Here we would like to go through some of the existing systems to review and compare with ours.

We have found an article presenting visual gun detection framework which has been presented by Rohit Kumar Tiwari along with his mate Gyanendra K. Verma [1]. In that paper, they have proposed a system to detect visual guns from images. For their approach, they have used color-based segmentation and SURF interest point detector. That system raises an alarm if the similarity score of detection is greater than 50%. Here we find that the system lacks the detection of weapons other than guns. Unlike their system, our proposed system is capable of detecting several weapons including guns, rifles, knives, shotguns. Moreover, our system is capable of raising alarms and also sending messages and calls to concerned authorities of the property.

There is another proposed system by Harsh Jain with Aditya Vikram, Mohana, Ankit Kashyap and Ayush Jain [2] which is a gun detection strategy. Their system focuses on gun detection accurately and classifying it properly. They have proposed the implementation with SSD and RCNN algorithm. However, our proposed system can

detect numerous weapons, not only the specific name of gun detection and of course we have the alarm, message and call facilities which are very convenient in case of informing about crime activity to concerned authorities.

Another proposed system is by Andrzej Glowacz along with Marcin Kmiec and Andrzej Dziech[3] which is a robust knife detecting system. Their study was mainly on the automatic knives detection in images. This one also lacks our objectives.

There is a project proposed by Justin Lai and Sydney Maples [4] which is the development of a Gun Detection Classifier that detects gun in real time. This project focuses on the rapid detection and identification of weapons from images and surveillance data. They have used a TensorFlow-based implementation of the Over feat network as an integrated network for detecting and classifying weapons in images.

A project by Mahadevi Parande, Shridevi Soma[5] in which their objective was developing an automatic detection system of concealed weapons. They applied sensor technologies integrated with image processing. They tried to detect concealed weapons inside the clothes of humans by using the infrared imaging (IR) method.

Kudzaishe Mahou, Dustin der Haar [6] have published a paper on detecting Concealed Weapon in which they have discussed each method separately from others intending to show the evolvment of the technology to detect concealed weapon.

A paper by Joseph Redmon along with Santosh Divvala and Ross Gihick and lastly Ali Farhadi [7] in which they have introduced a new approach to object detection which performs fast detection. The model name is YOLO (You Only Look Once). Some of the advantages of their approach:

- ✓ Image Processing happens real time
- ✓ 45 fps is the rate for image processing
- ✓ FAST YOLO version is also available that processes 155 fps

There is a system proposed by Kiran Kamble(B) along with Swapnil Sontakke, Pooja Mundada, Apurva Pawar[8] in which they have claimed that they combined weapon

detection with facial expression with the context. SSD and Faster RCNN have been used for the detection algorithm.

A system proposed by CONSTANTINE PAPAGEORGIOU AND TOMASO POGGIO [9] in which they have proposed a trainable system for object detection. They have claimed that the output of the system is applicable for people and their face. It's also applicable for detecting cars. It is trainable and works for static images. They have also claimed that their project is capable of capturing a significant amount of information. Those information are about the object class elements. The representations happen due to an overcomplete dictionary. The dictionary consists Haar wavelets to capture information. A classification engine of high power was applied to their project to obtain a flawless detection system with standard accuracy and low false positive rates.

We have gone through a paper written by Paul Viola and Michael J. Jones [10] in which they have proposed a system. The system is capable of detecting objects that are visual. They have claimed that the visual objects can be detected with a very fast speed and high detection rates. A detection framework made by them has done the whole process. They have expressed about the framework with 3 different introductions. The 1st one is namely "Integral Image" which detects images very fast. Another thought they have introduced is a "Adaboost" based learning algorithm. The third one contributes to 'classifier-combination' in a "cascade". This one removes the background region of the image very fast.

2.3 Comparative Studies

From the studies above, in comparison, we would like to say that our system is highly efficient, lightweight and easily can be installed in any required place. Rather only detecting and raising alarm; or rather only detecting only a specific weapon like the existing systems, our system is capable of detecting several weapons at a time and we have made our system possible to take three measures while detecting a criminal activity with weapons. Our system is reliable, can be easily installed. One thing is necessarily important to tell that, if the authority of a property need not run the system at a particular

time, then they can simply change its working activity according to their need. Both AC and DC power can be supplied to the system to run it.

2.4 Scope of the Problem

We have noticed some other scopes by which the problem of criminal activity can be informed to the nearby people by raising alarms. But our proposed technology is more wide spread in scope to solve the problems specially in our country. With the help of our computer vision based technology, it will be much more fruitful to make it easier to solve the criminal activity lessened.

In our country, it is often noticed that there happens lots of criminal activity by weapons. To ensure the property holder's safety and make the property holder free of tension, our proposed system works as a versatile scope.

2.5 Challenges

There are challenges in every revolution. Our proposed system is no other than that.

There are some challenges that are being faced by us:

- Due to COVID-19, we, the teammates were unable to meet for the project research for a certain period of time.
- Online meeting was needed to hold on.
- Unavailability of instruments nearby.
- Internet connection problem.
- Inability to directly meet with teammates in real time.

Apart from that, there arises network issues in our country that hinders the GSM module to work properly sometimes.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Requirement Collection and Analysis

A project needs many requirements to be collected. Our project also needed many requirements to be fulfilled to make it. All the requirement collection that we needed can be divided into two parts. These are the hardware and software.

3.1.1 Hardware

Our proposed system, “Detecting Weapons to inform Concerned Authority about Criminal Activity” is equipped with the following key components as hardware:

- Raspberry Pi 3 Model B
- GSM module (SIM800L)
- Monitor
- VNC
- Buzzer
- Raspberry Pi Camera
- GPIO

3.1.1.1 Raspberry Pi 3 Model B:

Being cheap and card-sized, many computing areas can be explored with the help of Raspberry Pi. It's very affordable. Using languages like Scratch and Python, people can create many essential systems. It can do all the operations like a computer such as internet browsing, playing HD videos or making spreadsheets, playing games, etc. Raspberry Pi model 3 model B v1.2 has been used as the connector board for our system. All other hardware has been set to this board and all required code for our operation has been installed in it. Raspberry Pi 3 Model B is capable of performing our task in a sophisticated success.

The specification of Raspberry Pi 3 Model B:

- Equipped with Broadcom BCM2837 CPU.
- CPU is 1.2 GHz Quad Core, 64 bit.
- Equipped with 1 GB of Random-Access Memory (RAM)
- It has BCM43438 wireless LAN.
- The board has Bluetooth Low Energy or BLE.
- It has an ethernet of 100 bases.
- An extended GPU header of 40-pin.
- Full-sized compatible HDMI is enclosed.
- It has a total number of 4 USB ports supporting USB v2.0.
- Raspberry Pi camera can be connected via CSI camera port.
- Raspberry Pi touchscreen display can be attached via DSI display port.
- To load OS and store data, micro-SD card port has been pre-installed.
- There is a micro-USB power source comprising up to 2.5A



Figure 3.1: Raspberry Pi 3 Model B

3.1.1.2 GSM module (SIM800L):

A GSM module is said to be a special type of modem that accepts a sim card and operates over a mobile network. GSM module just acts like a mobile phone. It can be connected to a computer or a PCB. By using the GSM module, we can do several IoT (Internet of Things) related activities. Typically sending and receiving SMS, mobile internet connectivity, etc. can be done by connecting the GSM module with a computer.

Here in our system, we have used the SIM800L GSM module with our Raspberry Pi 3 Model B+. SIM800L is very cheap and portable. We have used it in our proposed system to send a message and call to the concerned authorities. It supports Quad-band: GSM850, ECGM900, DCS1800, and PCS1900. Although it is very tiny in size having only 1 *inch*², it packs some cool features like connecting sim cards, sending and receiving messages, sending and receiving GPRS data, making LED blinks for three types of connection which indicates the connection status.



Figure 3.2: GSM Module (SIM800L)

3.1.1.3 VNC (Virtual Networking Computing):

VNC, broadly the Virtual network computing is a remote-control software. Remote Frame Buffer (RFB) is used here to control another computer over a network connection. Although the computers are not in the same physical state, with the help of VNC, it is possible to command from a computer to a remote computer with a keyboard and mouse. Thus, multiple clients can join a VNC server at the same time.

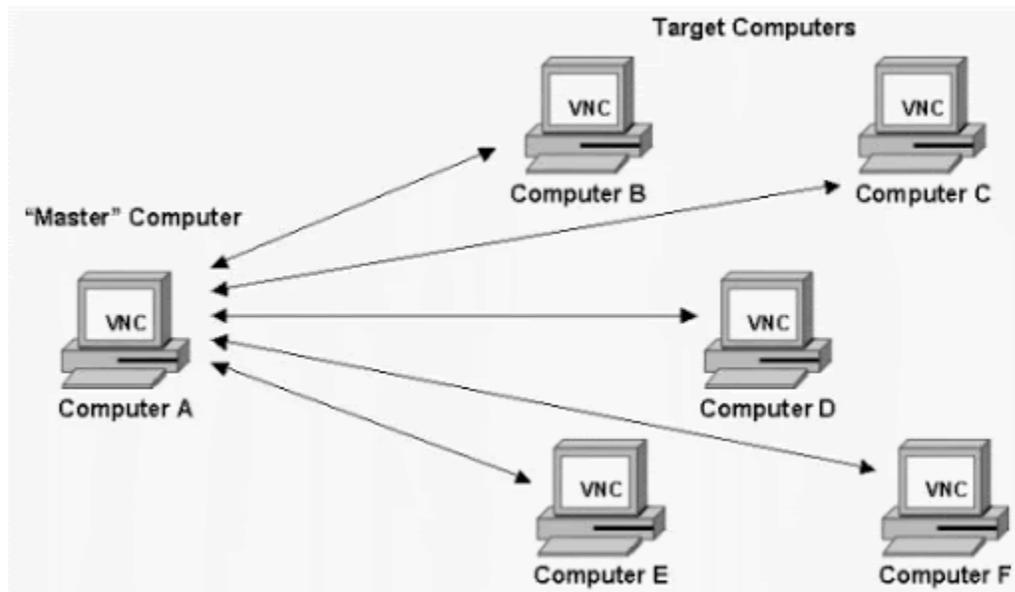


Figure 3.3 : VNC Connection

3.1.1.4 Computer Monitor:

A computer monitor is a display device that outputs information in a pictorial form. It is a combination of a visual display, circuitry, power supply, and a casing. In our project, we have used a monitor to display the detection process and all the visual inputs from our Raspberry Pi Camera.



Figure 3.4: Computer Monitor

3.1.1.5 Buzzer:

A buzzer is an audio signaling device. It can produce beeps so it is also called a beeper. There is three types of buzzers. These are mechanical, electromechanical, and Piezoelectric. There are different types of use of buzzer or beeper like using an alarm device, timers, etc. In our proposed system, we have used a piezoelectric buzzer to raise alarm and informing the outsiders of the property when the system detects a weapon.



Figure 3.5: Buzzer

3.1.1.6 Raspberry Pi Camera:

We have used Raspberry Pi Camera's Module v1 as our video capturing camera. This model is equipped with some good specification. Although this original camera has been replaced with an updated camera version with v2, we have used v1 to minimize the cost. This camera is equipped with a 5-megapixel Omni Vision OV5647 sensor.

We have used this camera to capture high-definition video. The camera is user-friendly, yet complies plenty to offer advanced users for gaining advanced knowledge. Many effects can be created in the time of video capturing by using the libraries bundled with the camera. The camera provided us satisfactory outputs during video capturing.

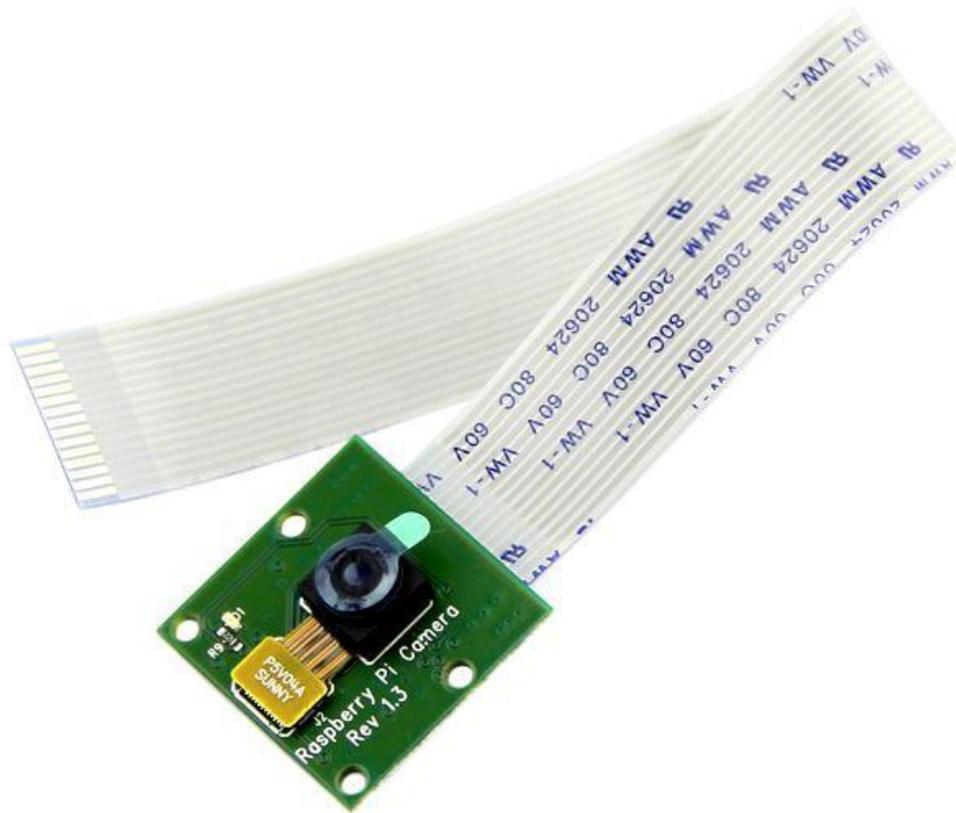


Figure 3.6: Raspberry Pi Camera Module v1

3.1.1.7 GPIO:

GPIO stands for General Purpose Input/Output. This is an interface that connects microcontrollers and other electronic devices. Sensors, diodes, displays, and System-on-Chip modules can be used with GPIO. It is an uncommitted digital signal pin or IC or circuit board that is of versatile use. It is used as an input or output, even both, and user can control it during runtime. The use of GPIO is customizable.

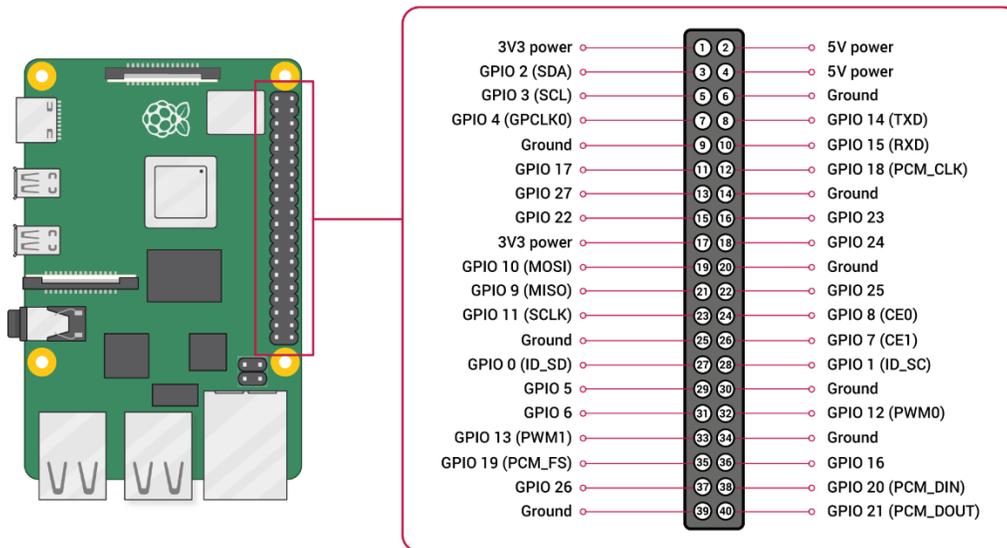


Figure 3.7: GPIO with documentation

3.1.2 Software

Every technological architecture projects need the touch of software to work. In our project, both hardware and software are equally important in our project. To give the overall experience a fluidity, we have made our project with user friendly software.

Followings are the key software:

- Operating System: Raspberry Pi OS
- Development language: Python 3.7
- Tool to develop software: Pi Charm
- Computer Vision library OpenCV

Computer Vision (OpenCV):

Computer Vision is said to be a scientific field that is concerned with how computers can understand human like high-level thoughts from digital images or videos. According to the field of engineering, its task is to understand and automate task like human visual system does.

OpenCV library focuses on Computer vision in real time. We have used Computer Vision along with TensorFlow to train the model and thus to detect the weapons in our proposed system. OpenCV can be said the heart of our system as the whole process has been developed by this. Intel is the original developer of it and on later time it was supported by Willow Garage then Itseez. It's platform independent and open source.

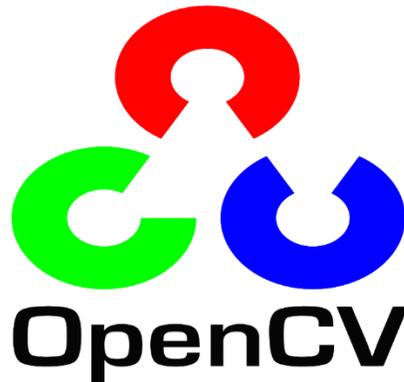


Figure 3.8 : Logo of OpenCV

3.2 Use case modeling and description

Use case model is a graphical representation on use cases and their connections. This one is meant for demonstrating the framework or subsystem of an application. We can easily understand the usefulness by looking into a use case model.

Use case charts are very useful to represent the inside and outside impact of a project.

Here is the use case model of our project:

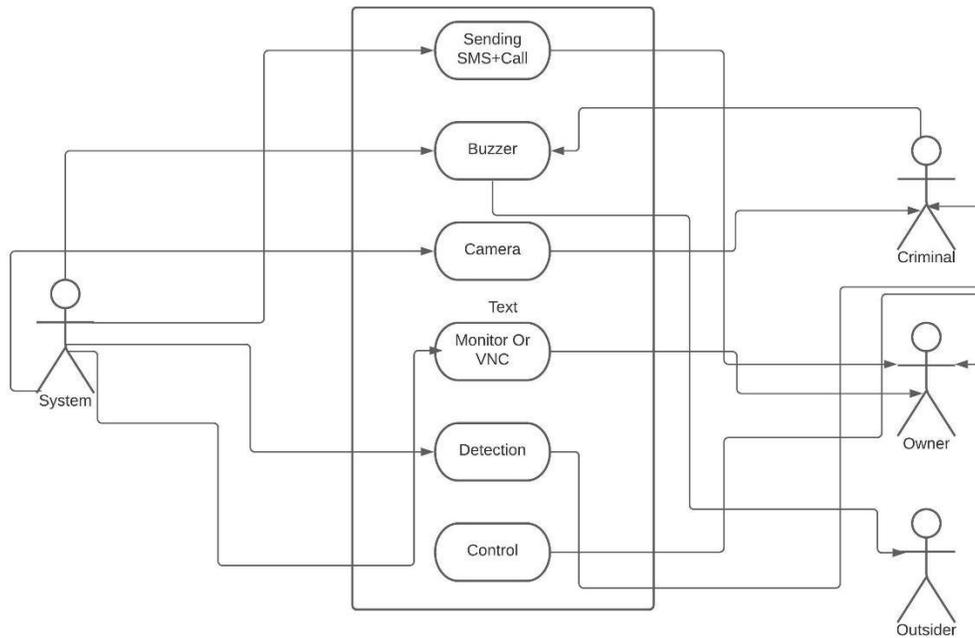


Figure 3.9: Use Case Diagram

In the above Use Case Diagram, there are mainly four actors. After detecting the weapons, the main function is done by the system. The actors are:

- System
- Owner
- Outsiders
- Criminal

All the actors are connected through their individual actions. The system owner can control the system according to their need. In the main time, the system is capable of raising alarm, sending sms and calling the owner. The outsiders can react by listening to the alarm. The owner can monitor the activity of his property using monitor/VNC. Criminals are detected through their weapon of the camera module.

The actions are given bellow:

- ✓ Sending SMS and Call
- ✓ Raising buzzer alarm

- ✓ Camera capture
- ✓ Monitor and VNC are controlled by owner
- ✓ Detection of weapons

The system is easy to perform operation and understandable easily.

3.3 Logical Data Model

A Logical Data Model is a expression of a specific problem domain that usage database or storage technology. As our Project is a real time object detection and monitory project, it can be expressed via an E-R diagram. The E-R diagram is given bellow:

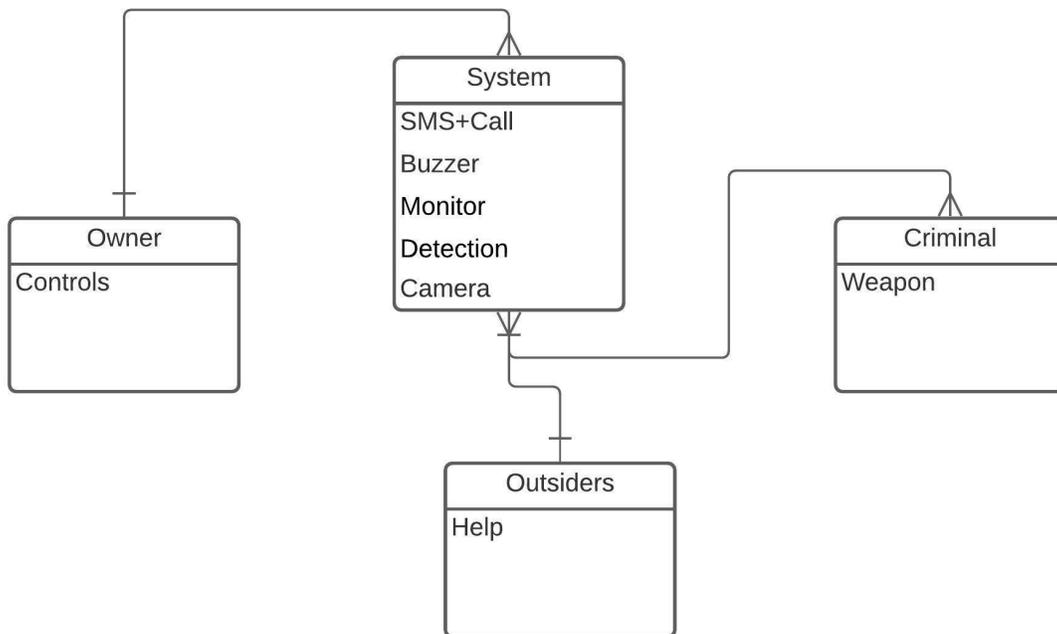


Figure 3.10: Logical Data Model

CHAPTER 4

IMPLEMENTATION AND TESTING

4.1 Proposed System

The system we have proposed in this report paper is namely “Detecting Weapons to inform Concerned Authority about Criminal Activity”. As the name suggests, the system is aimed at informing the authority of a property when it is under criminal activities like robbery or snatching with guns, knives, and other weapons. The system focuses on detecting the weapon via the camera setup attached to it. After capturing an image of weapons, it processes the image through the OpenCV and detects it. All the needed hardware is set to and all the software codes are installed in Raspberry Pi 3 Model B+. It has been already mentioned that we have trained our system with more than 5 thousand images of weapons and as the reliability of the system concerns, we have trained the system with more than 10 thousand images where weapons are not present. For doing so, the system needed a higher GPU speed. As soon as the detection is done, if the detected object’s similarity percentage with the weapon is greater than 70%, the system immediately performs the following 3 operations.

- i. The system continuously raises alarms via a buzzer.
- ii. The system sends a message about the ongoing danger (“Warning! Your Property is in danger!! Please take immediate action!!!”) to the authorities of the property as per their need via the GSM module enabled in it.
- iii. The system calls the phone number of the authorities of the property for better communication so that the authorities can take action accordingly.

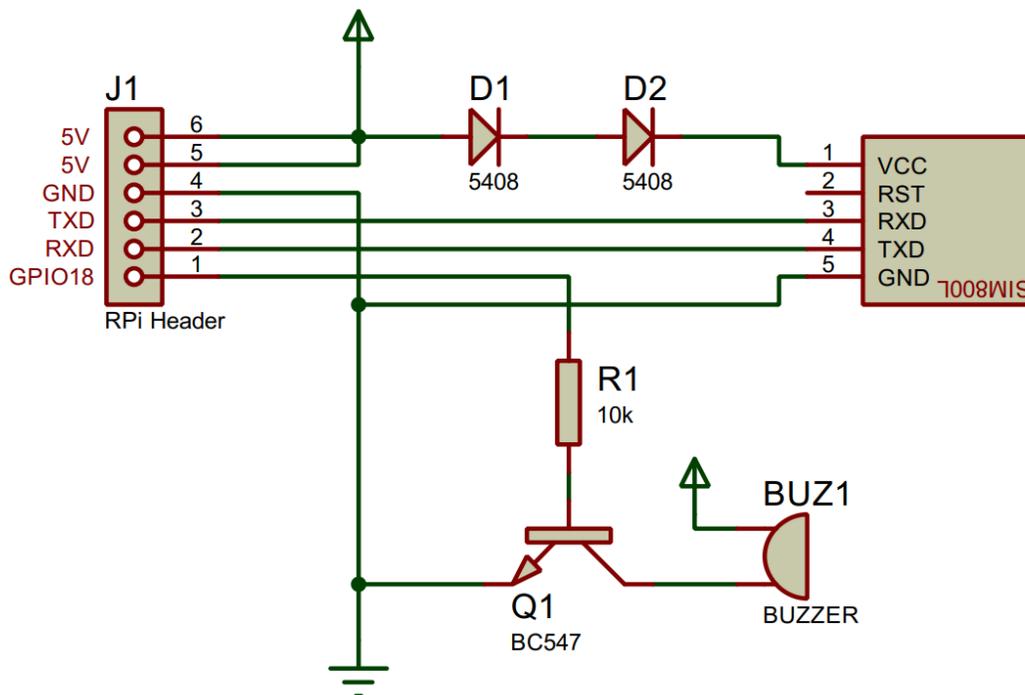


Figure 4.1: Circuit Diagram of the Implementation

4.2 Testing Implementation

We have implemented the testing implementation to measure the performance of the project. With the intention to test our project for the implementation in real time, we have implemented it as our own. To test the operation, we need to go through the following operations:

- i. At first we need to power on the Raspberry Pi
- ii. We need to open our project python file
- iii. We need to Run the program



Figure 4.2: Project connected to power supply

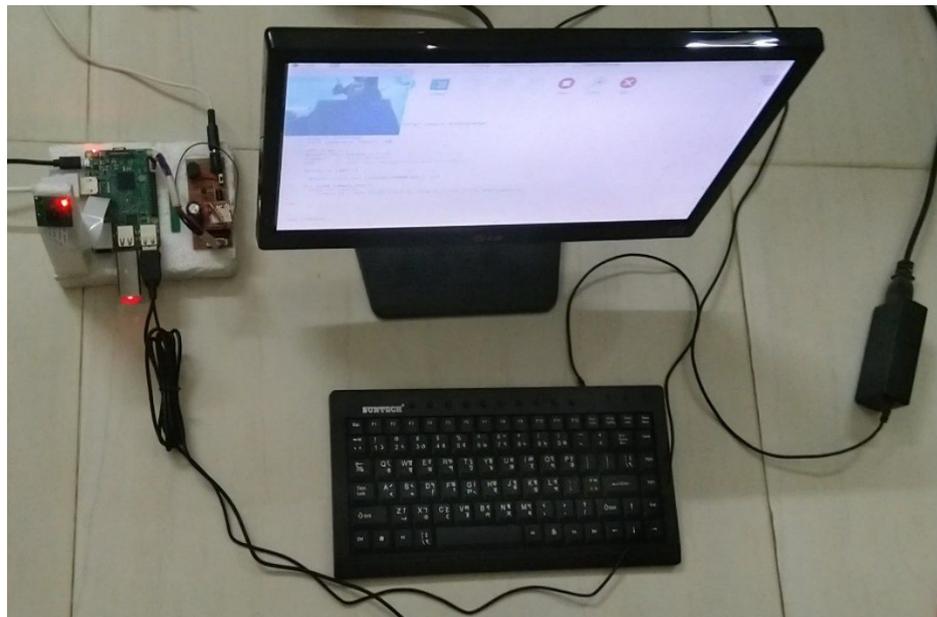
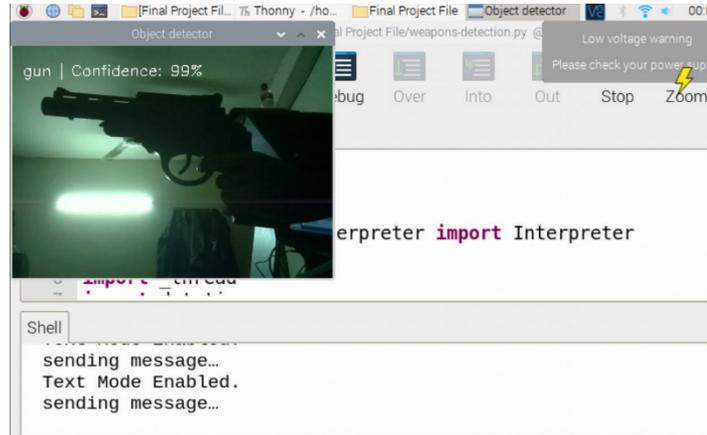


Figure 4.3: Running the program

After the successful run of the program, the GSM will start. At this moment we have to go for detecting weapons. After the detection of the gun, we were able to see that the

system is working through its camera and given codes through python. At this moment, as soon as the system detects the weapon it continuously performs the 3 operations including call, SMS, and raising buzzer alarm.

Figure 4.4:
Detection



Weapon

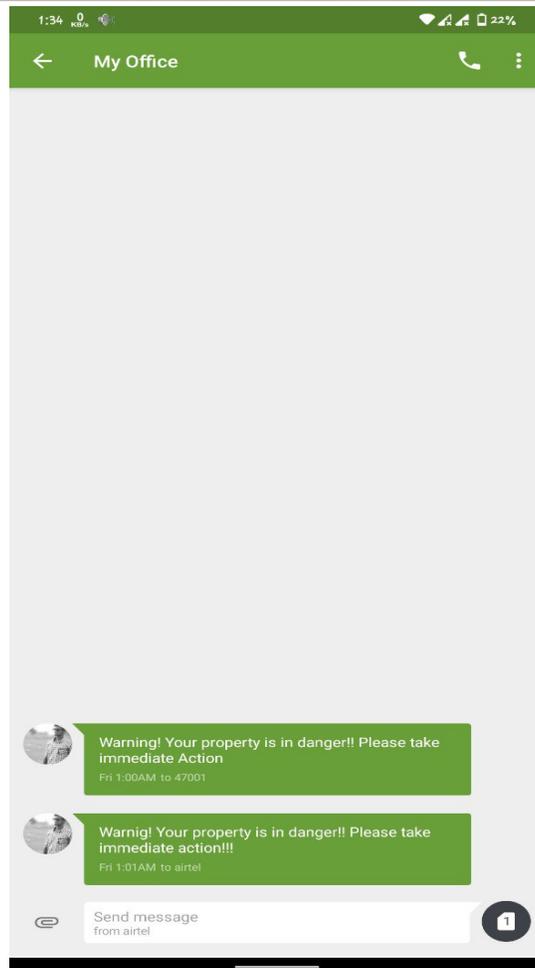


Figure 4.5: SMS notification

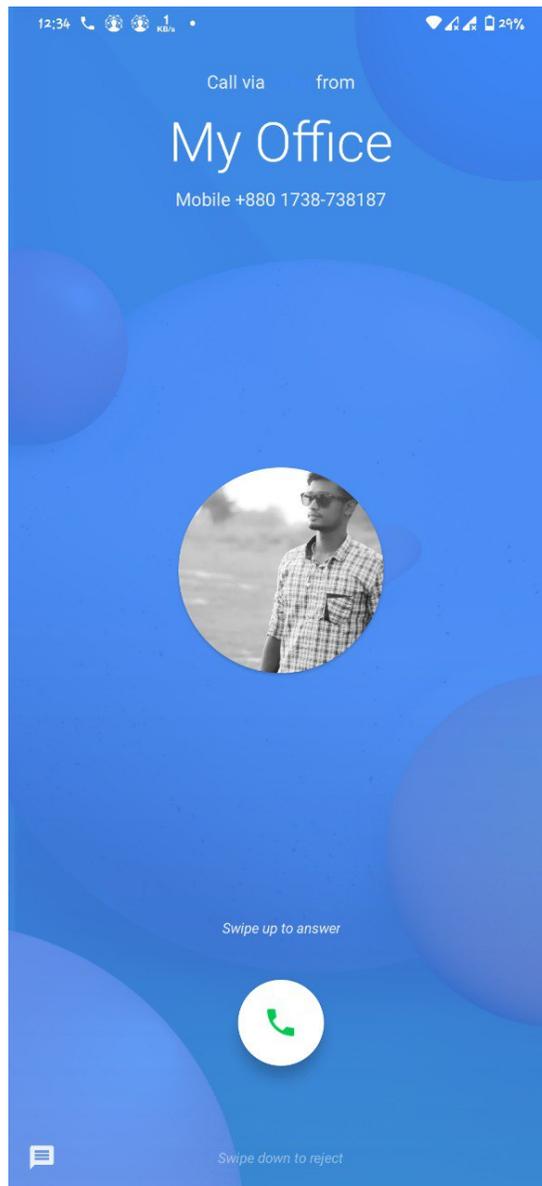


Figure 4.6: Calling reminder

The system can also be called through VNC (Virtual Network Computing) using a smartphone shown below:

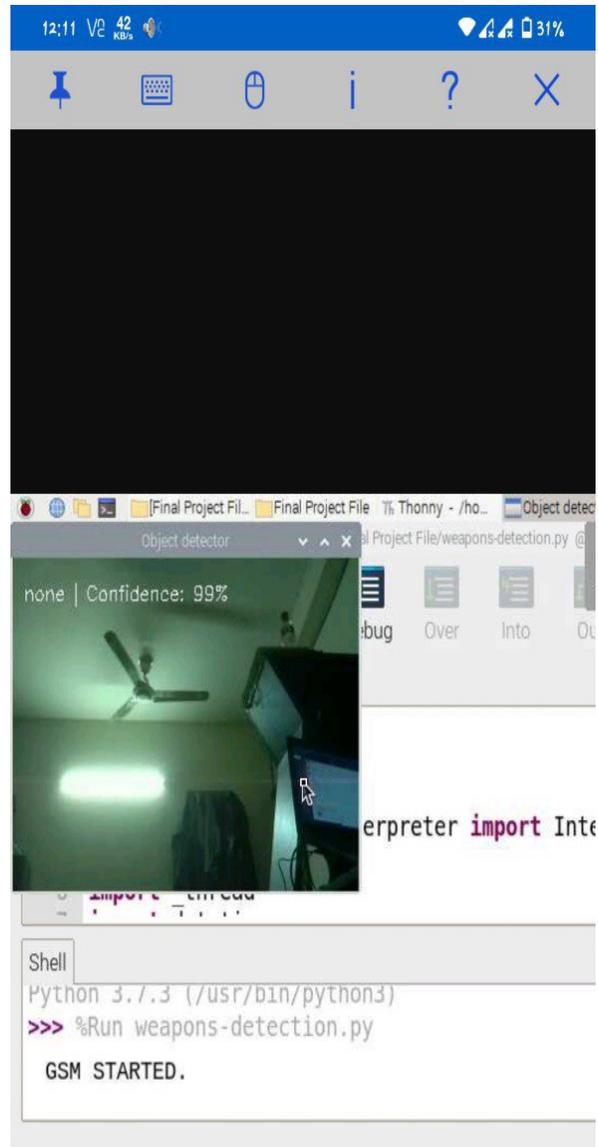


Figure 4.7: VNC interface on smartphone

4.3 Testing Result and Reports

We have tested our implementation several times and have obtained test results. In our testing, all the operations were working flawlessly. Here in the table, the result of the testing inputs and outputs are bellowed:

Table1: Testing of all aspects of our project:

Serial No.	Test Input	Expected Output	Actual Output	Result
1	Running the program	Run	Successfully Run	Alright
2	GSM test	Should Start GSM	GSM Started Normally	Pass
3	Showing Gun to camera	Detect with above 70% accuracy	Detected with 99% accuracy	Pass
4	Showing Knife to camera	Detected with above 70% accuracy	Detected with 99% accuracy	Pass
5	Raising alarm test	Buzzer on	Buzzer on normally	Pass
6	Sending SMS test	Should send SMS	SMS sent within a very short time	Pass
7	Phone call test	System should call to authority	Called the authority immediately	Pass

According to the table shown above, we can report that the system is working fine with proper accuracy. From this test, we can hope that the system will be able to handle every armed detection and taking action accordingly.

CHAPTER 5

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

5.1 Impact on Society

As our project is a social supportive project as we are intended the reduction armed criminal activities from the society like the bank, offices, and other places.

We would like to list out some social impacts on society:

- i. It will make a positive impression of the property owner.
- ii. The property owner will stay out of tension.
- iii. Social awareness will be uprisen among people about crimes.
- iv. Criminal activities will reduce.
- v. People will eventually know about such technology.
- vi. Society will be peaceful.

5.2 Impact on Environment

Our proposed system is harmless. So there will be no negative impacts on the environment. The environment will remain eco-friendly as there is no adverse effect on committing any pollution to the environment. All the operations are happening throughout network communications and wireless communications.

5.3 Ethical Aspects

The system has been proposed with a view to aware people in rising morality and ethics.

The ethical aspects of the projects are pointed bellow:

- i. It will lessen criminal activity
- ii. People will eventually be moral and cordial if they notice the features of the project.
- iii. There will be no unethical issues belonging to the project
- iv. It's ethically right to implement this project.
- v. There is no loss of any property by any means of anyone by this project.

5.4 Sustainability plan

The project will be sustainable for a long period. It will accomplish a long term usage facility. Apart from that, the system will be able to cover up any place where such security is needed. Our plan is to maintain the sustainability with great care. We would like to add more convenient features by further research and hardworking in future. Any drawback of the project should be solved in future with proper vigilance.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Discussion and Conclusion

Discussion: Our finalized hardware for our proposed system “Detecting weapons to inform Concerned Authority about Criminal Activity” has been designed and implemented. Our system can drastically reduce the effort of a human security guard to protest against criminal activity. Regular CC tv cameras can only capture video and an inspector needs to inspect that footage. If a crime happens, immediate detection cannot happen in most cases. The crime footage needs to be a rewind to check who did the crime. Our system is smart, inexpensive, and overall a very efficient solution to crimes like robbery, snatching, etc.

Conclusion: Our proposed system “Detecting weapons to inform Concerned Authority about Criminal Activity” has been experimentally proven to work flawlessly. We have tested the system lots of times with different dummy weapons and it worked every time with satisfactory output. The system has been tested with ongoing videos from smartphones and computer monitors too. Every time it had been able to fulfill our expectations. It detected the weapons with high accuracy and immediately got the job done by calling our number, sending us SMS messages, and raising the buzzer alarm. The system will be capable of doing the same for all the environments where it is installed. As described above, the features of the system will be much more convenient as well as innovative in the future.

6.2 Scope for Further Developments

At present, our system is capable of detecting weapons and work accordingly to inform the authorities that their property in danger. In the future, we will be working on making

security even better and even more versatile. For now, the system does not support the location tracking option. In the future, we will add a GPS based location tracking system to make the system useful for the cops. Then the system can be used in any suspicious area. Apart from that, we will be working on an unusual facial activity-based operation to this system to detect what is going inside the mind of that person. For example, if the sickness of a person is detected by the system then it will immediately inform the family members of that person.

6.3 Acknowledgment

It's a great pleasure for us that we have completed our journey in building up the proposed system. At first, we are gratefully expressing gratitude to our beloved Daffodil International University as this institution has bestowed us with priceless knowledge and inestimable straight-forward guidance that has made us possible to complete the work. In the way we have got the support of our supervisor has helped us a lot in the completion of the project in a very competitive, standard and a stable way. Finally, the help and cooperation of every teammates of this project including knowledge and information sharing, doing lots of tasks to research has made the project possible to complete. We praise and appreciate the co-operation of every teammates as without that, the project could never exist.

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