SMART SURVEILLANCE

A Project Report

Submitted to the APJ Abdul Kalam Technological University

in partial fulfillment of requirements for the award of degree

Bachelor of Technology

in

Computer Science Engineering

by

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CERTIFICATE

This is to certify that the report entitled **SMART SURVEILLANCE** submitted by **MALAVIKA MANOJ** (CHN19CS075), **APARNA** (CHN19CS022), **SNEHA S KUMAR** (CHN19CS114) & **AISWARYA SANKAR** (CHN19CS005) to the APJ Abdul Kalam Technological University in partial fulfillment of the B.Tech. degree in Computer Science Engineering is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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DECLARATION

We hereby declare that the project report **SMART SURVEILLANCE**, submitted for partial fulfillment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by us under supervision of Mrs. Angel Thankam Thomas

This submission represents our ideas in our own words and where ideas or words of others have been included, we have adequately and accurately cited and referenced the original sources.

We also declare that we have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

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Chapter 1

Abstract

CCTV camera system is a very popular method of keeping a building or a place under surveillance. In Conventional security systems, the cameras only record and stream the video feed so that someone can watch what happened in that place at that time. But it can't prevent a burglary or can't immediately alert the authorities. In this project, we proposed a system to identify any individual in an institutional building from real-time video surveillance footage.

Image processing and computer vision techniques can now be implemented using computer processing. And with readily available libraries like OpenCV, it has become easier than ever to use such technologies to improve upon the traditional security systems for our benefit. By the creation of this project, we aim to make it a very easy process to secure the homes and workplaces at a relatively cheaper cost. Traditional CCTVs, in addition to being expensive, do not offer much in terms of control over devices.

The aim of this project is to develop a smart and cost-efficient smart system and, as a result, provide a cheap and manageable option to small business owners and households.

Acknowledgement

We are greatly indebted to **God Almighty** for being the guiding light throughout with his abundant grace and blessings that strengthened us to do this endeavour with confidence. I express my heartfelt gratitude towards **Dr. Smitha Dharan**, Principal, College of Engineering Chengannur for extending all the facilities required for doing our project. We would also like to thank **Dr. Manju S Nair**, Head of Department, Computer Science Engineering, for providing constant support, encouragement and guiding us in doing this project. Now we extend our sincere thanks to our project co-ordinators **Mrs. AngeL Thankam Thomas**, Assistant Professor, in Computer Science Engineering, and **Mrs. Nasseena N** , Assistant Professor, in Computer Science Engineering, for guiding us in our work and providing timely advice and valuable suggestions. Last but not the least, we extend our heartfelt gratitude to our friends and family for their support and assistance.

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Chapter 2

Introduction

2.1 Introduction

Video surveillance systems play very vital role in various fields of our society such as in personal security, banking, business etc. Starting from small houses to huge industries, now video surveillance is essential and plays very vital role to fulfill our safety aspects in many ways. Burglary and theft have always been a problem for normal residents, particularly for those living in the big cities. Thus it is rather essential to find an efficient way to drastically reduce it. Throughout the world the usage of video surveillance system began from 20th century.

Survelliance means monitoring the peoples changing information like activities, behaviour for the purpose of protecting, managing and influencing. The surveillance is French word which means “watching over”. Actually the surveillance means watching over from a distance by means of electronic equipment such as CCTV cameras. Surveillance is very helpful to law enforcement to investigate/prevent criminal activities, for recognizing and monitoring threats.

The main advantages of this device are it is simple to implement, small size portable stand-alone device with its own power source, energy capable with instantaneous alert, truly cheap for residential use.

2.2 Motivation

Security and surveillance are important issues in today's world. The recent acts of terrorism have highlighted the urgent need for efficient surveillance. Contemporary surveillance systems use digital video recording (DVR) cameras which play host to multiple channels. The major drawbacks with this model is that it requires continuous manual monitoring which is infeasible because of factors like human fatigue and cost of manual labour. Moreover, it is virtually impossible to search through recordings for important events in the past since that would require a playback of the entire duration of video footage. Hence, there is indeed a need for an automated system for video surveillance which can detect unusual activities on its own.

2.3 Problem Statement

Even though, the monitoring can be done remotely, with some help in image processing will increase the efficiency of the system. In this project, image processing is applied to let the user know there is object movement. This will reduce time consuming of the user. This will make the monitoring a lot more easier.

2.4 Proposed Solution

In vision of the problem statement described in the introduction section, a GUI-based application, which can detect a variety of unusual activities on its own has been proposed. Smart Surveillance can be used to monitor a particular location, to indicate whether a motion has been detected in that region or not. Anti-theft feature has been incorporated in to this project where it could identify the stolen object from the frame. Another feature included is the Face Identification where it can be trained to recognise people.This could also work as an alert system in which an alert is send through a mail when a motion is detected.

Chapter 3

Software Requirement Specification

3.1 Introduction

Nowadays, people want one sole thing that is to make them feel safe and secure. The most commonly used security system is the CCTV (closed circuitTelevision). The cost of implementation of CCTV varies depending upon the size and use of the system. It is usually installed in hospitals, malls, parking lots etc. However, with the help of CCTV one can monitor the area 24/7, or the footage if stored in a location can beretrieved when required. Although, it can be used to deter crime and allows the authorities to identify and solve a crime, it doesn't detect neither recognize the person who is involved.We have implemented a system which provides both face detection and face recognition.Thus, when dealing with the real-time image processing, Open source computer vision(openCV) software,a powerful library of image processing tools, is a good choice. With the help of a smart surveillance system, we have achieved a system that can record the event, detect and recognize the person.

Computer vision is a highly branched scientific field that deals with things like how computers can be used to gain a high level of understanding from digital images or videos. From the perspective of engineering, its goal is to automate tasks that the human visual system is capable of. OpenCV (Open source computer vision) is a library of programming functions mainly concerned with and focusing on real-time computer vision. Originally, it was developed by Intel. It was later supported by Willow Garage then Itseez, which was then later acquired by Intel.

3.2 Literature Survey

Nowadays, security is measure concern in every organization. To this satisfy issue the organizations use surveillance cameras. The limitation in using them is that there must be an operator to watch the stream from the cameras and take respective decisions. The use of camerabased surveillance has extended from security to tracking, environment and threat analysis and many more. By using the power of modern computing and hardware it is possible to automate the process. The emergence of machine learning, Deep learning, and computer vision tools have made this process efficient and feasible for general purpose use. So instead of using human support for monitoring and insight generation, we can let the processor and machine learning system do the task in a more efficient and errorless way. Here are the few approaches which had helped us in solving this problem.

3.2.1 Implementation of Closed-circuit Television (CCTV) Using Wireless Internet Protocol (IP) Camera

The author Michael F.Adaramola in this paper presents three techniques for configuring, interfacing and networking of a wireless IP-based camera for real time security surveillance systems design. The three different real-time implementations techniques proposed for configuring, interfacing and networking the IP camera are:
1) Accessing the IP-based camera by using the WANSCAM or XXCAM vendor software
2) Accessing the IP-based camera by Firefox® web browser
3) Accessing the IP camera by MATLAB with SIMULINK on an internet system.

The live streaming of video based on the proposed techniques can be adapted for image detection, recognition and tracking for real-time intelligent security surveillance systems design. The paper also carried out a thorough comparative analysis of the three methods of achieving video streaming resulting from the output of the IP-based cameras. The analysis shows that the WANSCAM or XXCAM software displays the best video animations from the IPbased cameras when compared with the performance of the other methods

3.2.2 IOT based Smart Surveillance System

The author C M Srilakshmi1, Dr M C Padma2 has elaborated the way of using the power of IOT in the field of Surveillance. IOT based security system enables the user to view the activity from the remote location and capture the image based on his interest. Android app facilitates the user to receive the notifications when intrusion is detected and view the image from remote area. PIR sensors are used to detect motion. The system works in both Auto and Manual mode, notifications are sent to the user only when Auto mode is enabled in order to avoid frequent interruptions. The controlling power of Raspberry pi from window is established i.e., user can update the position of camera from android phone window and capture the new image.

3.2.3 The Design and Implementation of a Wireless Video Surveillance System

The author Tan Zhang†, Aakanksha Chowdhery elaborates that camera-based system generates a huge amount of data, but most of the video they generate is transmitted over wires and analyzed offline with a human in the loop. The ubiquity of cameras limits the amount of video that can be sent to the cloud, especially on wireless networks where capacity is at a premium. In this paper, we present Vigil, a real time distributed wireless surveillance system that leverages edge computing to support real-time tracking and surveillance in enterprise campuses, retail stores, and across smart cities. Vigil intelligently partitions video processing between edge computing nodes co-located with cameras and the cloud to save wireless capacity, which can then be dedicated to Wi-Fi hotspots.

3.3 Functional Requirements

- It should be able to record the video when any motion is been detected in the survelliance area.

- The recordings should be stored along with date and time.
- It should monitor the restricted area and indicate whether motion is detected or not.
- An alert mail should be sent to respective authorities when any motion is detected.
- It should be able to identify the members

3.4 Interface Requirements

3.4.1 User Interfaces

1. Front-end : Tkinter The most commonly used library for developing GUI (Graphical User Interface) in Python. It is a standard Python interface to the Tk GUI toolkit shipped with Python. As Tk and Tkinter are available on most of the Unix platforms as well as on the Windows system, developing GUI applications with Tkinter becomes the fastest and easiest.

2. Back-end : Python Python is a high-level, general-purpose and a very popular programming language. Python programming language (latest Python 3) is being used in web development, Machine Learning applications, along with all cutting edge technology in Software Industry

Reasons for Selecting this language :

1 – Short and Concise Language.

2 – Easy to Learn and use.

3 – Good Technical support over Internet.

4 – Many Package for different tasks.

5 – Run on Any Platform.

6 – Modern and OOP language.

Python is a widely used general-purpose, high level programming language. It was created by Guido van Rossum in 1991 and further developed by the Python

Software Foundation. It was designed with an emphasis on code readability, and its syntax allows programmers to express their concepts in fewer lines of code. Python is a programming language that lets you work quickly and integrate systems more efficiently.There are two major Python versions: Python 2 and Python 3

Some specific features of Python are as follows:

• an interpreted (as opposed to compiled) language. Contrary to e.g. C or Fortran, one does not compile Python code before executing it. In addition, Python can be used interactively: many Python interpreters are available, from which commands and scripts can be executed.

• a free software released under an open-source license: Python can be used and distributed free of charge, even for building commercial software.

• multi-platform: Python is available for all major operating systems, Windows, Linux/Unix, MacOS X, most likely your mobile phone OS, etc.

• a very readable language with clear non-verbose syntax

• a language for which a large variety of high-quality packages are available for various applications, from web frameworks to scientific computing.

• a language very easy to interface with other languages, in particular C and C++.

3.4.2 Hardware Interfaces

- Working PC or Laptop
- Webcam with drivers installed
- Flashlight/ LED if using this at night. .

3.5 Product Requirements

- Correctness: It follows a well-defined set of procedures and rules to compute and also rigorous testing is performed to confirm the correctness of the data.
- Ease of Use: The front end is designed in such a way that it provides an interface which allows the user to interact in an easy manner.

- Modularity: The complete product is broken up into many modules and well defined interfaces are developed to explore the benefit of flexibility of the product.

- Robustness: This software is being developed in such a way that the overall performance is optimized and the user can expect the results within a limited time with utmost relevancy and correctness.
  whereas evolution quality involves testability, maintainability, extensibility or scalability

3.6 Non Functional Requirements

Non-functional requirements are the requirements which are not directly concerned with the specific function delivered by the system. They specify the criteria that can be used to judge the operation of a system rather than specific behaviors. They may relate to emergent system properties such as reliability, response time and store occupancy

- Processor: Dual-Core processor, 1.8 GHz

- Memory: 512MB of RAM (1GB recommended)

- A stable internet connection

3.7 Basic Operational Requirements

• Mission profile or scenario: It describes about the procedures used to accomplish mission objective. It also finds out the effectiveness or efficiency of the system.
• Performance and related parameters: It points out the critical system parameters to accomplish the mission
• Utilization environments: It gives a brief outline of system usage. Finds out appropriate environments for effective system operation.
• Operational life cycle: It defines the system lifetime

Chapter 4

Project Design

4.1 Introduction

The design phase of software development deals with transforming the requirements specified in the SRS documents into a form implementable using a programming language.LBPH algorithm is included in this project. The process model used is Waterfall model.

4.2 System Architecture Design

Python make up the back-end code. There are various features within the project. In order to reduce the complexity, different features are implemented in different files. This is how abstraction is being carried out in this project. In the main.py where the GUI has been implemented, each of these files are imported. Readability and keeping relevant code together are benefits of excellent programming practices.To describe the structure and the presentation of the GUI, tkinter in python is used.

4.2.1 Site Map

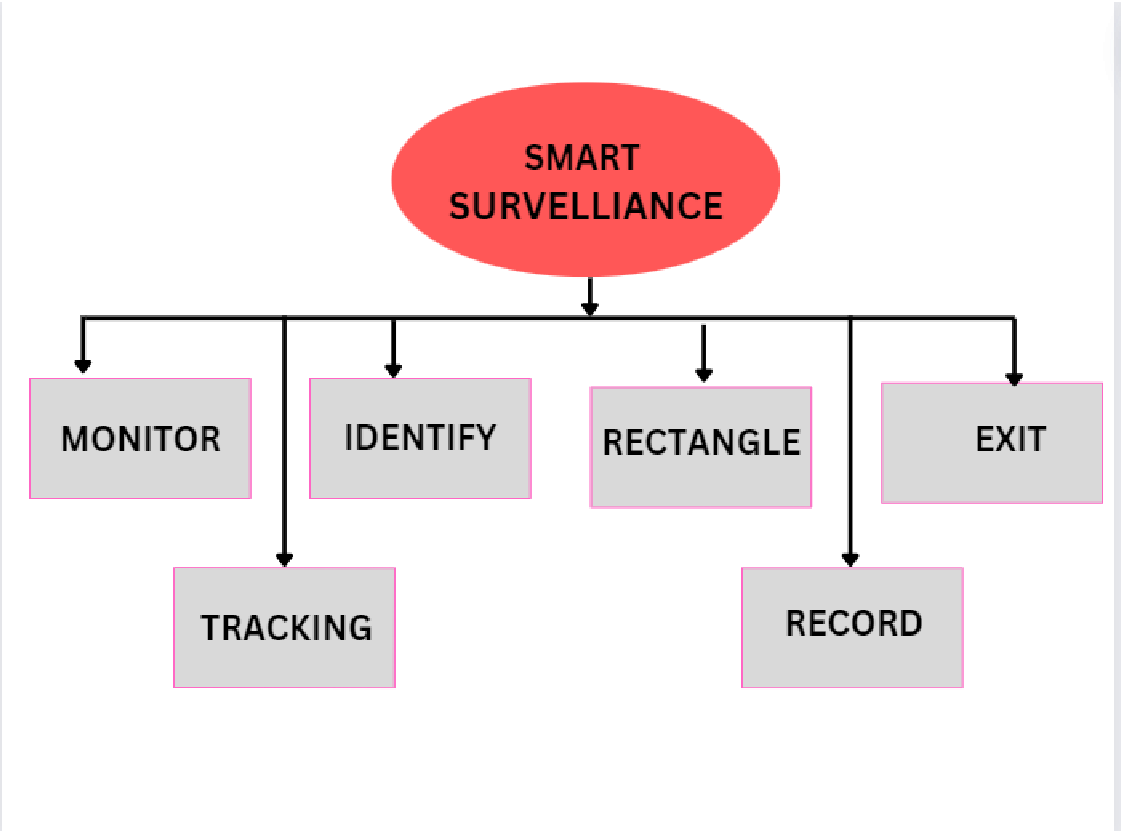


Figure 4.1: Site Map

The home page contains the links to each modules, each of which is associated with its own buttons. On clicking any of these buttons, the respective window of monitoring ,tracking and identifying .The modules are:

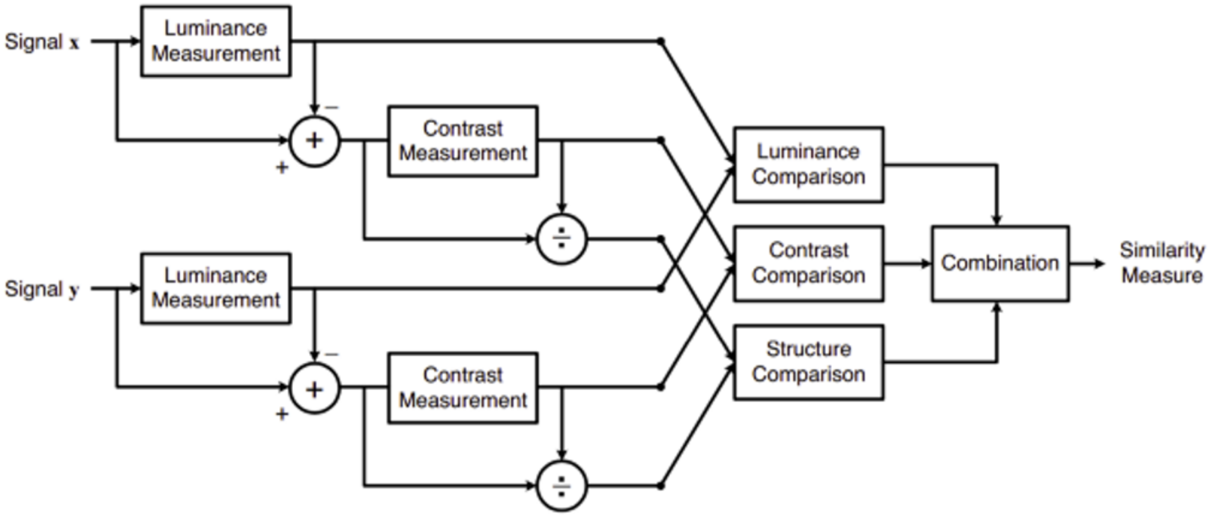
1.MONITOR

This feature is used to find what is the thing which is stolen from the frame which is visible to webcam. Meaning It constantly monitors the frames and checks which object or thing from the frame has been taken away .This uses Structural Similarity to find the differences in the two frames. The two frames are captured first when noise was not happened and second when noise stopped happening in the frame.The Structural Similarity Index (SSIM) metric extracts 3 key features from an image:

- Luminance
- Contrast

- Structure

The comparison between the two images is performed on the basis of these 3 features.



This system calculates the Structural Similarity Index between 2 given images which is a value between -1 and +1. A value of +1 indicates that the 2 given images are very similar or the same while a value of -1 indicates the 2 given images are very different. Often these values are adjusted to be in the range [0, 1], where the extremes hold the same meaning.

•Luminance

Luminance is measured by averaging over all the pixel values. Its denoted by μ (Mu) and the formula is given below,

$$\mu_x = \frac{1}{N}\sum^{N} x_i.$$

$$\sigma_x = \left(\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \mu_x)^2\right)^{\frac{1}{2}}.$$

•Structure

The structural comparison is done by using a consolidated formula (more on that later) but in essence, we divide the input signal with its standard deviation so that the result has unit standard deviation which allows for a more robust comparison.

$$(\mathbf{x} - \mu_x)/\sigma_x$$

Luckily , thanks to skimage package in python we dont have to replicate all this mathematical calculation in python since skimage has pre build feature that d o all of these tasks for us with just calling its in-built function.

We just have to feed in two images/frames which we have captured earlier, so we just feed them in and its gives us out the masked image with score.

2.TRACKING

This feature allows us to detect the motion in the frame. Once the motion is detected it will send an alert mail from the authenticated email id.Using the smtplib , login to an email id from which the mail has to be sent. Once the authentication is done, the alert mail could be sent to any specified mail address.

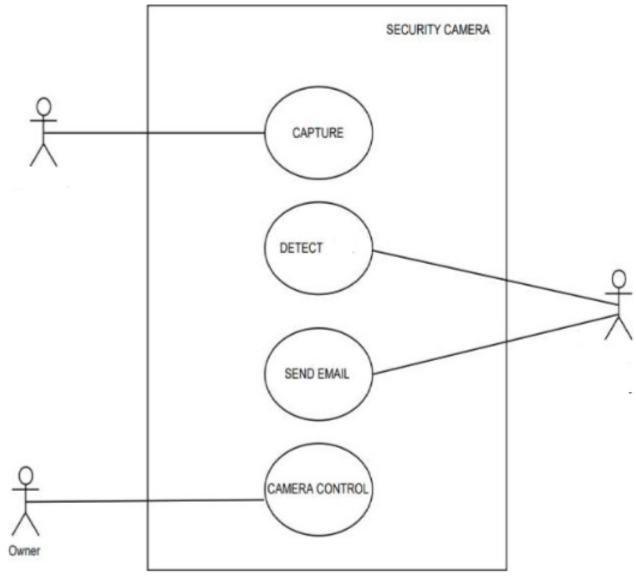


Figure 4.2: Use Case Diagram

3.IDENTIFY

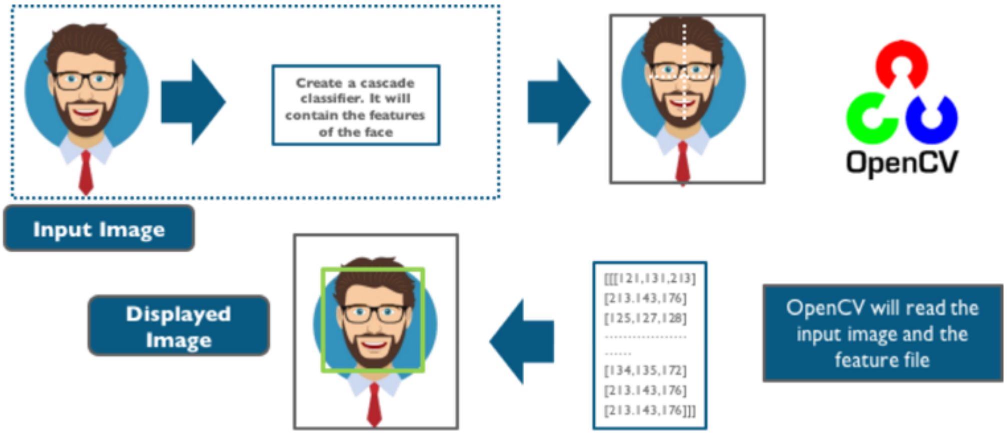
It is used to find if the person the frame is known or not. It do this in two steps :

1 – Find the faces in the frames

2 – Use LBPH face recognizer algorithm to predict the person from already trained model.

1-Detecting faces in the frames

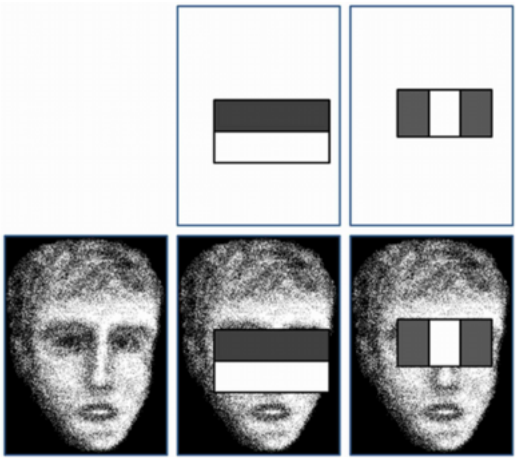
This is done via **Haarcascade** classifiers which are again in-built in openCV module of python.

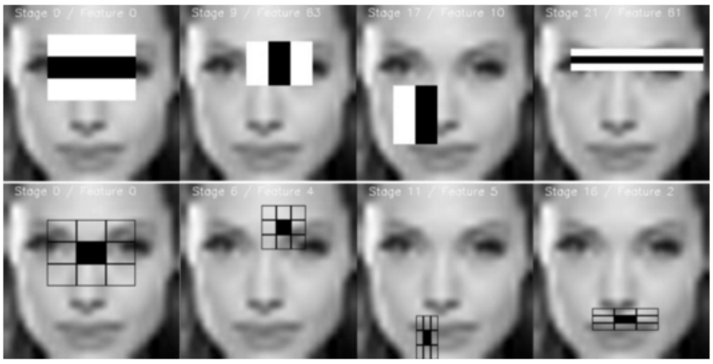

Create a cascade classifier. It will contain the features of the face
OpenCV
Input Image
Displayed Image
[[[121,131,213]
[213.143,176]
[125,127,128]
[134,135,172]
[213.143,176]
[213.143,176]]]
OpenCV will read the input image and the feature file

Cascade classifier, or namely cascade of boosted classifiers working with haar-like features, is a special case of ensemble learning, called boosting. It typically relies on Adaboost classifiers (and other models such as Real Adaboost, Gentle Adaboost or Logitboost). Cascade classifiers are trained on a few hundred sample images of image that contain the object we want to detect, and other images that do not contain those images. There are some common features that we find on most common human faces:

- a dark eye region compared to upper-cheeks
- a bright nose bridge region compared to the eyes
- some specific location of eyes, mouth, nose. . .

The characteristics are called **Haar** Features. The feature extraction process will look like this : Haar features are similar to these convolution kernels which are used to detect the presence of that feature in the given image. For doing all this stuff openCV module in python language has inbuild function called cascadeclassifier which we have used in order to detect for faces in the frame





2-Using LBPH for face recognition

So now we have detected for faces in the frame and this is the time to identify it and check if it is in the dataset which we've used to train our lbph model.

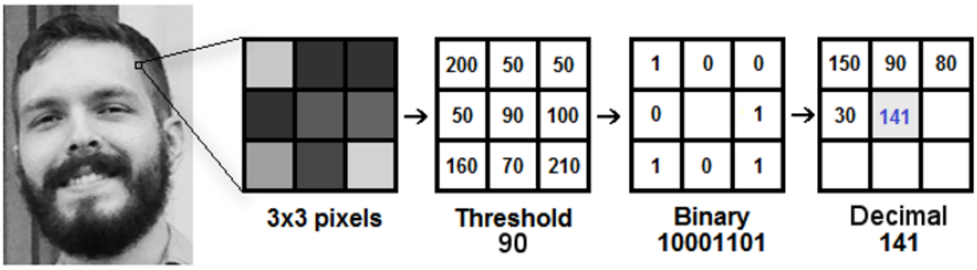
The LBPH uses 4 parameters:

•**Radius:** the radius is used to build the circular local binary pattern and represents the radius around the central pixel. It is usually set to 1.

•**Neighbors:** the number of sample points to build the circular local binary pattern. Keep in mind: the more sample points you include, the higher the computational cost. It is usually set to 8.

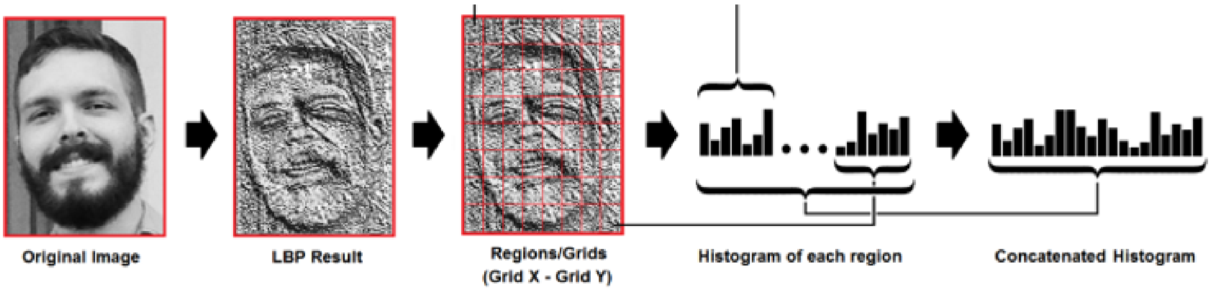
•**Grid X:** the number of cells in the horizontal direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.

•**Grid Y:** the number of cells in the vertical direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.



The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters **radius** and **neighbour**

Extracting the Histograms : Now, using the image generated in the last step, we can use the **Grid X** and **Grid Y** parameters to divide the image into multiple grids, as can be seen in the following image:



And after all this the model is trained and later onwhen we want to make predictions the same steps are applied to the make and its histograms are compared with already trained model and in such way this feature works.

4.RECTANGLE

This feature allows us to detect the motion in a specified region. Its main purpose is to monitor the restricted area and indicate whether motion is detected or not.For that a region is been selected within the frame using the setMouseCallback() .If motion is detected in the selected area, it is indicated by displaying motion on the screen

5.RECORDING

It works like an ordinary CCTV It captures the video using **cv2.VideoCapture()**. Then it stores the captured video in the system using cv2.VideoWriter fourcc()

6.EXIT

To exit from the main window.

4.2.2 Technology Stack

- Tkinter - to describe the structure and the presentation of the GUI including colors, layout, and fonts.

  Libraries Used:

- Open CV -It is a library of programming functions mainly aimed at real-time computer vision.

- Scikit-Image-It is a collection of algorithms for image processing and computer vision.

- Numpy-It is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays.

- Smtplib-Python comes with the built-in smtplib module for sending emails using the Simple Mail Transfer Protocol (SMTP).

Chapter 5

Implementation

5.1 Introduction

This project is implemented using Python. There are various features within the project. In order to reduce the complexity, different features are implemented in different files. This is how abstraction is being carried out in this project. In the main.py where the GUI has been implemented, each of these files are imported. Readability and keeping relevant code together are benefits of excellent programming practices.To describe the structure and the presentation of the GUI, tkinter in python is used.

5.2 Dataset

The only dataset being used is the dataset of faces in order to implement the identify feature.

5.3 Project Implementation

This project is implemented using waterfall model.Reasons behind choosing waterfall model -

- Clear project objectives.
- Stable project requirements.
- Progress of system is measurable.

- Strict sign-off requirements.
- Helps you to be perfect.
- Logic of software development is clearly understood.
- Production of a formal specification
- Better resource allocation.
- Improves quality. The emphasis on requirements and design before writing a single line of code ensures minimal wastage of time and effort and reduces the risk of schedule slippage.
- Less human resources required as once one phase is finished those people can start working on to the next phase.

Waterfall model

Classical waterfall model is the basic software development life cycle model. It is very simple but idealistic. Earlier this model was very popular but nowadays it is not used. But it is very important because all the other software development life cycle models are based on the classical waterfall model. Classical waterfall model divides the life cycle into a set of phases. This model considers that one phase can be started after completion of the previous phase. That is the output of one phase will be the input to the next phase. Thus the development process can be considered as a sequential flow in the waterfall. The different phases are:

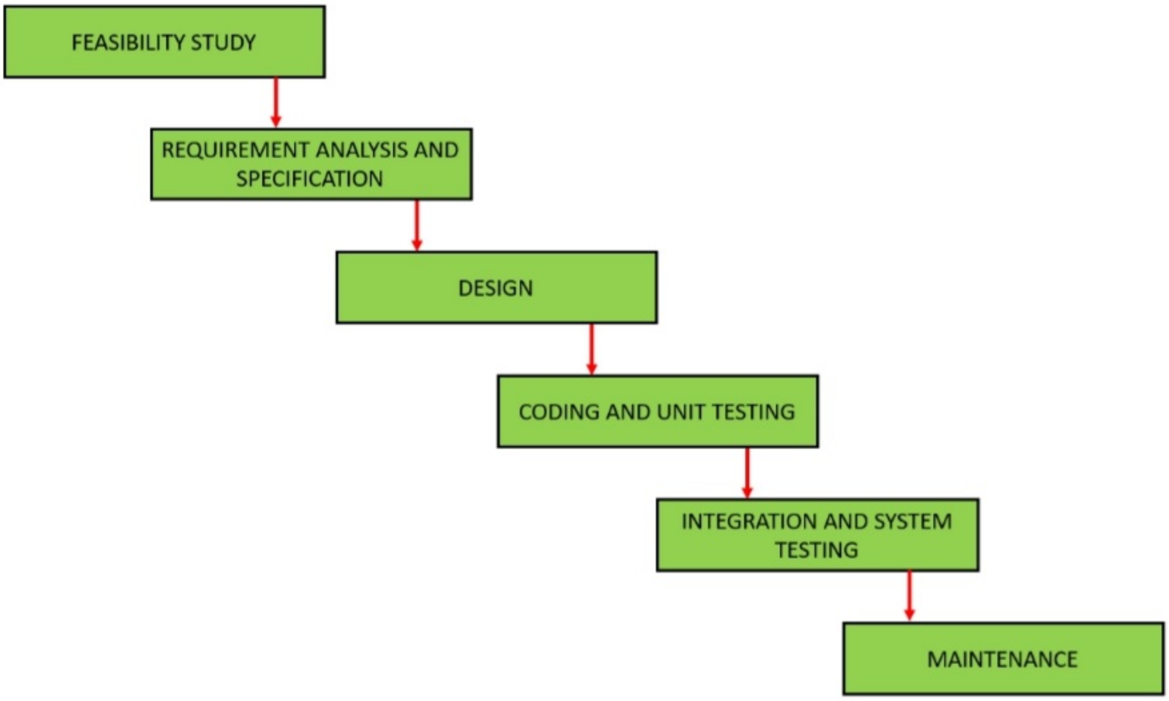
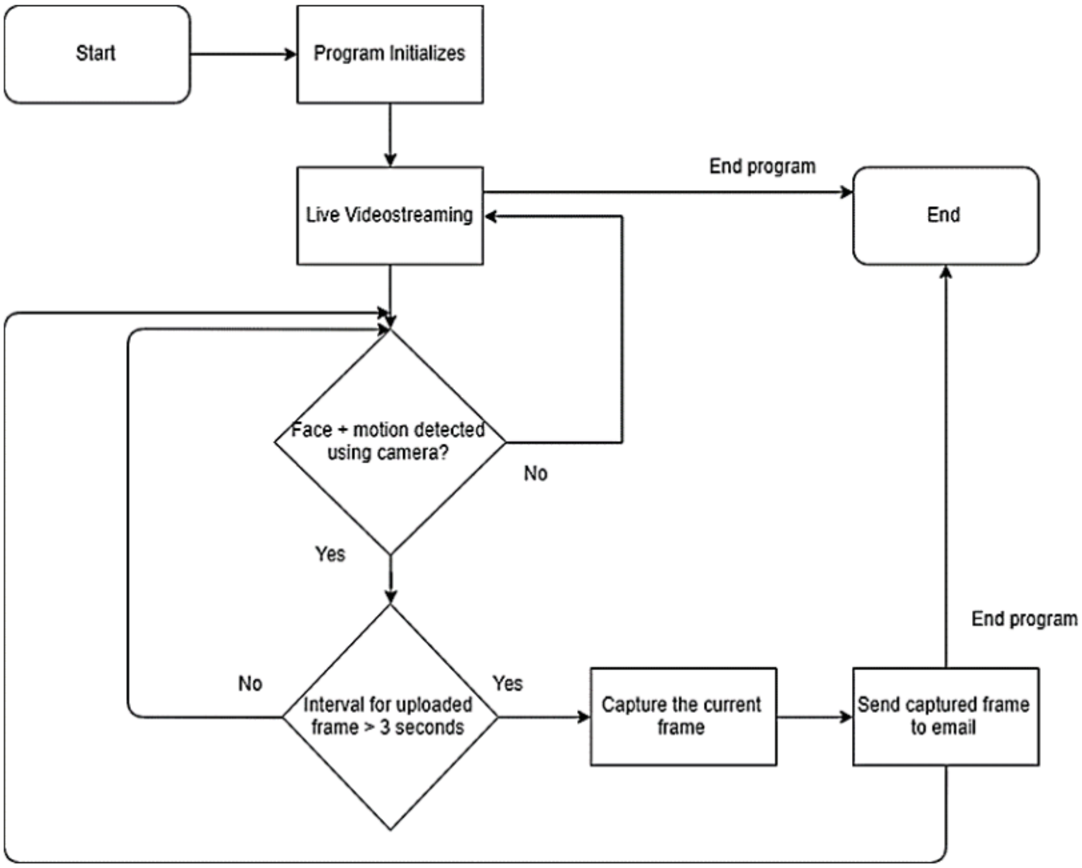

FEASIBILITY STUDY
REQUIREMENT ANALYSIS AND SPECIFICATION
DESIGN
CODING AND UNIT TESTING
INTEGRATION AND SYSTEM TESTING
MAINTENANCE

Figure 5.1: Waterflow model

SYSTEM IMPLEMENTATION

OpenCV is a cross-platform library using which we can develop real-time computer vision applications. It mainly focuses on image processing, video capture and analysis including features like face detection and object detection. This project is mainly implemented on the OpenCv library.Given is the flow chart of developed system using camera with OpenCV implementation


Start
Program Initializes
Live Videostreaming
End program
End
Face + motion detected using camera?
No
Yes
End program
No
Yes
Interval for uploaded frame > 3 seconds
Capture the current frame
Send captured frame to email

5.4 Test Plan and Scenario

Testing is an important phase in the development life cycle of the product this was the phase where the error remaining from all the phases was detected. Hence testing performs a very critical role for quality assurance and ensuring the reliability of the software. Once the implementation is done, a test plan should be developed and run on a given set of test data. Each test has a different purpose, all work to verify that all the system elements have been properly integrated and perform allocated functions. The testing process is actually carried out to make sure that the product exactly does the same thing what is suppose to do. Testing is the final verification and validation activity within the organization itself. In the testing stage following goals are tried to achieve:-

- To affirm the quality of the project.
- To find and eliminate any residual errors from previous stages.
- To validate the software as the solution to the original problem.

• To provide operational reliability of the system.

During testing the major activities are concentrated on the examination and modification of the source code. The test cases executed for this project are listed below. Description of the test case, steps to be followed; expected result, status and screenshots are explained with each of the test cases.

5.4.1 Testing Methodologies

There are many different types of testing methods or techniques used as part of the software testing methodology. Some of the important types of testing are:

White Box Testing

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level. Using white box testing we can derive test cases that:

• Guarantee that all independent paths within a module have been exercised at least once.

• Exercise all logical decisions on their true and false sides.

• Execute all loops at their boundaries and within their operational bounds.

• Execute internal data structure to assure their validity.

Black Box Testing

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .you cannot see into it. The test provides inputs and responds to outputs without considering how the software works. It uncovers a different class of errors in the following categories:

• Incorrect or missing function.

- Interface error.
- Performance errors.
- Initialization and termination errors
- Error in objects.

Advantages:

- The test is unbiased as the designer and the tester are independent of each other.
- The tester does not need knowledge of any specific programming languages.
- The test is done from the point of view of the user, not the designer.
- Test cases can be designed as soon as the specifications are complete

Unit Testing

Unit testing is usually conducted as part of a combined code and unit test phase of the software life cycle, although it is not uncommon for coding and unit testing to be conducted as two distinct phases. Test strategy and approach Field testing will be performed manually and functional tests will be written in detail.

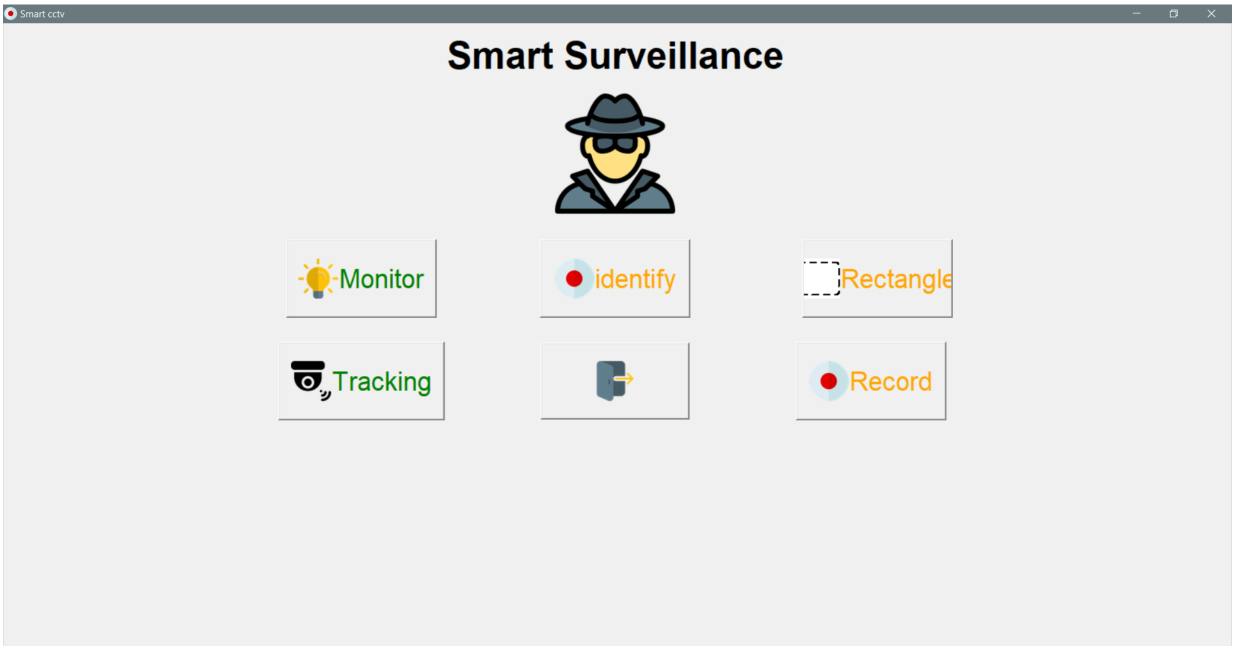


Figure 5.2: Graphical user interface

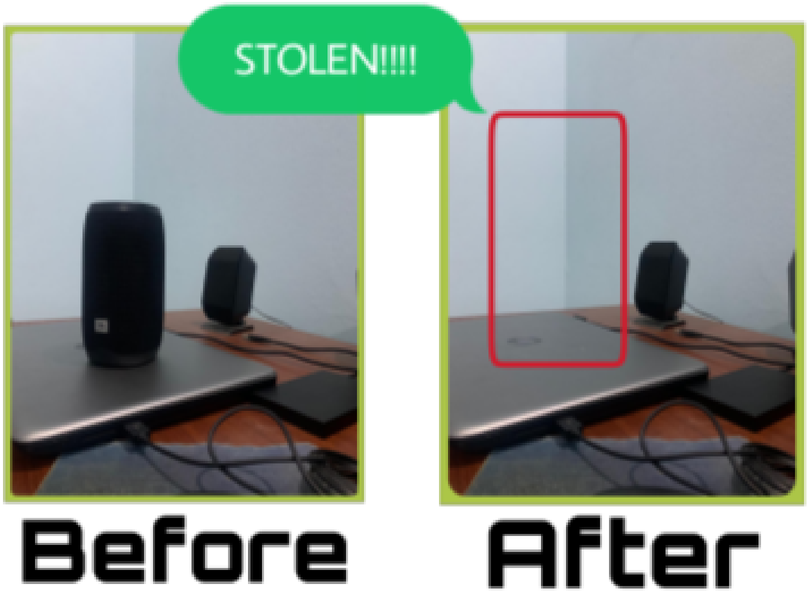


Figure 5.3: Monitor

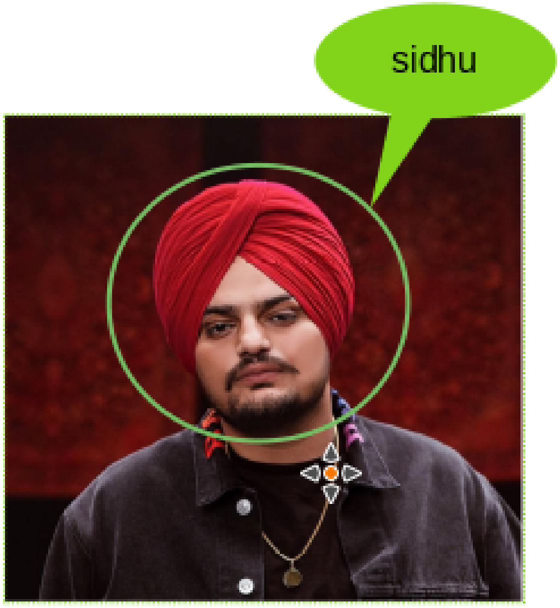


Figure 5.4: Identify

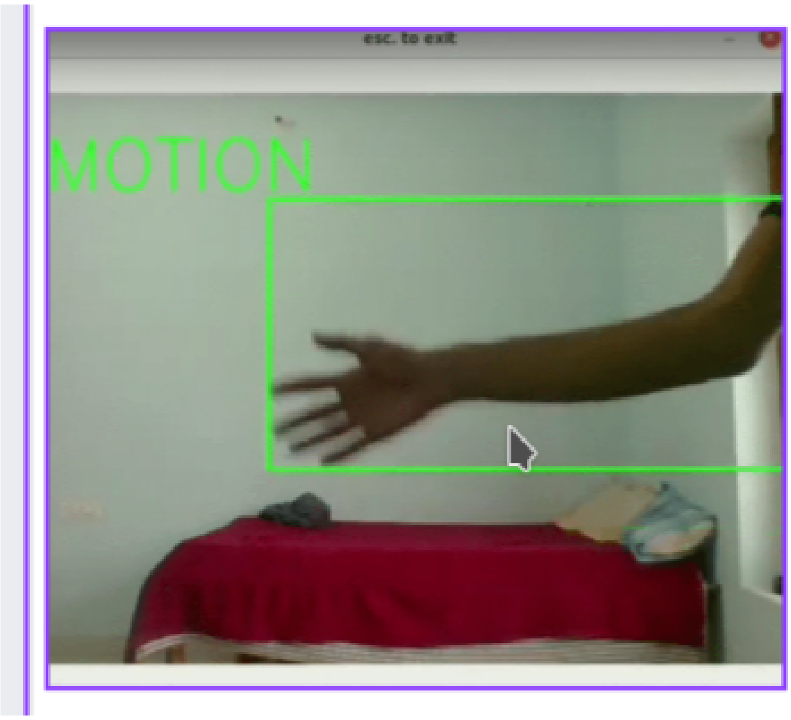


Figure 5.5: Rectangle

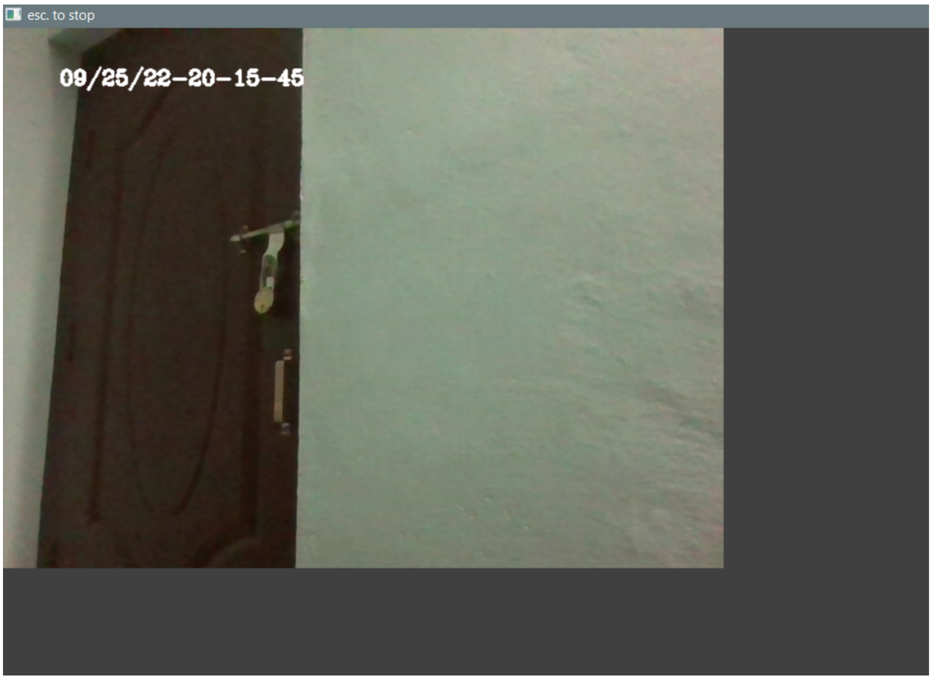
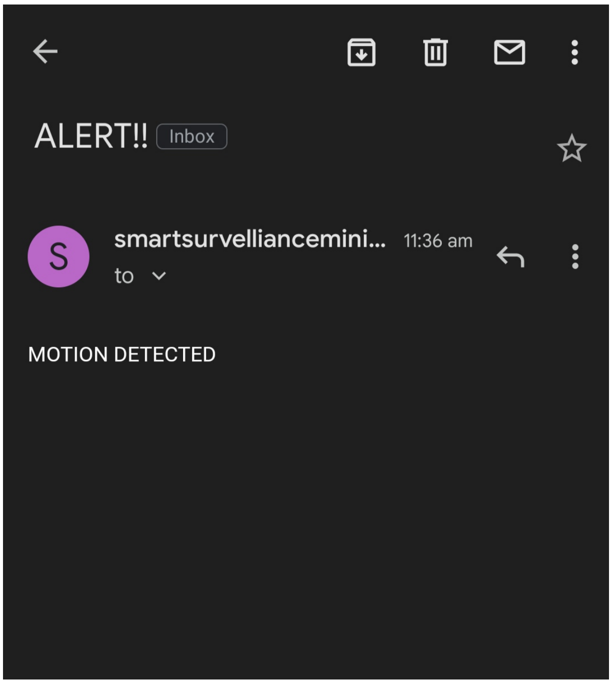


Figure 5.6: Record



ALERT!!

smartsurvelliancemini... 11:36 am

to

MOTION DETECTED

Figure 5.7: Alert

Chapter 6

Results

Traditionally the surveillance monitoring system is done in the larger room and by a mount of manpower. But nowadays, monitoring surveillance system can be done through online network. This type of monitoring is more time consuming and can reduce the manpower. Moreover, it gives the user flexibility to monitor their properties where ever they want as long as they have the internet network. Either than that, this project also manage to detect the movement in the video, this will be a greater help to the user to observe their properties. In the end, this project is not only can reduce the cost for monitoring but also give advantages to the user The use of camerabased surveillance has extended from security to tracking, environment and threat analysis and many more. By using the power of modern computing and hardware it is possible to automate the process. The emergence of machine learning, Deep learning, and computer vision tools have made this process efficient and feasible for general purpose use. So instead of using human support for monitoring and insight generation, we can let the processor and machine learning system do the task in a more efficient and errorless way.

Chapter 7

Conclusion

This system has a wide range of uses in various fields, such as banking, forensic department, etc The reason this system is quiet useful is due to the fact that it is highly compact and it provides face detection and an instant notification about the same through email. In addition to this face recognition can also be tried in future. Recognition is the main part of any security system. Usually for a best recognition system, we require a well-trained database, which can provide the base for our recognition. So to obtain the database, first collect the images of the subject individual for the recognition. Once we obtain and train our system, we can provide face recognition.

We use the local binary pattern histogram (LBPH) for providing face recognition. This method helps us to provide a recognition model. The image is converted into a gray scale image. Then, the image pixels are compared with the neighboring pixels in a clock-wise or anti-clock-wise manner. Histogram is performed and normalization is done and a feature vector is generated for every image. These feature vectors can now be processed with some algorithms to classify images which is used to identify the texture. Once the face is recognized, it is checked to see if the detected face is familiar or not. Thus we integrate the face detection and recognition to provide a smart surveillance system for the domestic purposes in our everyday life.

Chapter 8

Future Scope

Smart video surveillance system significantly contributes to situation awareness. Such systems transform video surveillance from data acquisition tool to information and intelligence acquisition systems. Real-time video analysis provides smart surveillance systems with the ability to react in realtime. Our system senses the intrusion and sends notifications to authorized persons so that action can be taken in response to the intrusion. Based On the technology improvements such being having the capability of small size but high processing power this project can be broadly used. Below are some future workout on this project.

- Creating Portable cctv.
- Adding in-built night vision capability.
- Adding deep learning if having high power device.
- Deadly weapon detection.
- Accindent detection.
- Fire Detection.

Adding Deep Learning support would create broad scope in this project such as with Deep Learning, we would be able to add up much more functionality.

References

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