

# Security Surveillance Monitoring System Using Open CV

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## ABSTRACT

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The Project Security Surveillance Monitoring System Using OpenCV is based on Monitoring the persons with the help of Desktop's Web Camera. It has a graphical user Interface window which has several advanced features unlike normal surveillance cameras. Some of the features include Monitoring (which identifies the stolen Objects. When a thief enters the room and steals some objects it makes some buzzing sound. And warns the owner). Identifying (Face Identification of known and unknown persons with some accuracy). Noise detection (It generally detects the motion of a person). In and Out feature (it generally detects the person either entered into the room or gone out of the room through directions either the person moves in left or right). Finally Live recording and capturing the Video is the same as normal Surveillance Cameras. This application mainly uses some of the OpenCV functions and some face detection algorithms such as Haarcascade, LBPH etc. and it also uses Computer Vision which allows computers to watch or it gives vision capability to computers.

Keywords : Face identification, OpenCV, LBPH Algorithm, HaarCascade, Monitoring, ComputerVision.

## I. INTRODUCTION

The Project Security Surveillance Monitoring System Using OpenCV is a desktop application which works on desktop's web camera. It can be run on any operating system. This project was built using some python libraries such as Tkinter (for entire User Interface and Frontend), OpenCV (for image processing, machine learning and Computer Vision),

Numpy (for Numerical calculations) etc. This project's main aim is to monitor a particular area (Let's assume a room) by using desktop surveillance web camera and provide some security to the user or owner. Unlike Normal CCTV (Closed-Circuit Cameras which has only live recording and storing the recorded data) this application has different features such as: Monitoring (Which identifies the stolen things in a room), Noise detection (it detects motion when

someone is in front of the camera), In and Out detection (It detects who entered into the room and get exit from the room), Identify the person (This feature identifies the known and unknown persons), Record function (same as live recording by using web camera), Exit Button (the application closes or terminates by clicking this). In this way this application has different advanced features when compared to normal surveillance cameras.

## II. LITERATURE SURVEY

Many people have published many research papers explaining different applications of OpenCV, NumPy, LBPH, and many face detecting and motion detection algorithms.

- [1] A paper written by Pravin Khandagale, Anant Chaudhari, Amol Ranwade, Prof.P.M.Mainkar titled: Automated Video Surveillance to detect suspicious Human Activity, performs a survey on various research papers on the topic to develop a system to automatically detect the suspicious activity during online examinations, that serve as a useful surveillance system for educational institutions.
- [2] The paper titled: Face detection and recognition using OpenCV, written by Ramadan TH. Hasan, Amira Bibo Sallow, discusses various methods and approaches to performing Face detection such as HaarCascade etc.
- [3] The paper Titled: Human Face Recognition using LBPH face recognition algorithm, written by Swati Sucharita Barik, Sasmita Nayak, addresses about Face Detection, Extraction, Recognition, and simulation of the result using LBPH face recognition algorithm.
- [4] The paper written by Shubham Mishra, Mrs Varsha Verma, Dr. Nikhat Akhtar, Shivam Chaturvedi, Dr. Yusuf Perwej, titled: An Intelligent Motion Detection System Using OpenCV, in this they have made clear research

on Motion detection and Computer Vision and how it is useful in many applications.

- [5] The paper written by Naveen Kumar Mahankali, Vadivel Ayyasamy, titled: OpenCV for Computer Vision Applications, this follows a strategy of capturing Video and taking two sequence frames and comparing both of them and identifying whether they differ or same and by what percentage.

## III. PROBLEM STATEMENT

The main problem statement of this project is to detect the unusual things happening by monitoring the owner's or user's room using desktop's surveillance web camera and provide some security to the user or owner of the room and record the things happened in the room and store it in the local database.

## IV. METHODOLOGY

1. Installing IDE, Tools and Libraries:  
Python programming language is used to implement this project. The version of python used is python 3.8.3. The IDE used is PyCharm Community Edition 2021.1.3. The libraries required for the project are OpenCv, tkinter and face\_recognition. The OpenCv module is used for reading the image or video. Tkinter module is used to create faster GUI application for user. Face\_recognition algorithm is used to identify and verify the identity of the user.
2. Architecture

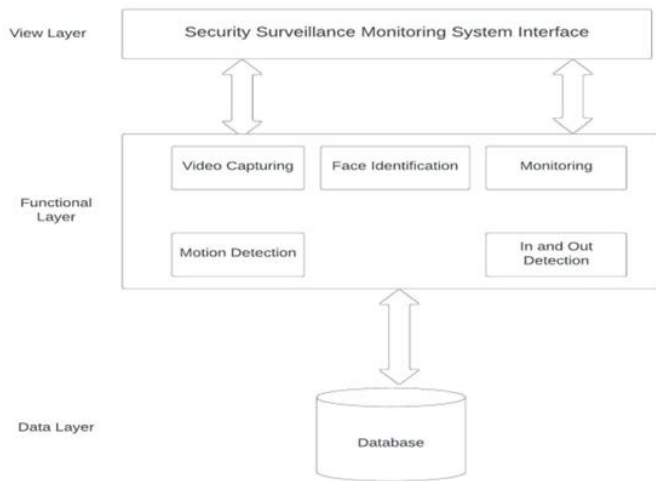


Fig.1 Architecture Diagram

3. Monitoring Feature Methodology:

This capability is used to determine what has been stolen from the frame shown to the web camera. That is, it constantly watches the frames and checks to see if the robber has taken anything from the frame. The differences in the two frames are found using Structural Similarity (SSIM). The first frame was caught when there was no noise in the frame, and the second frame was captured after noise stopped happening in the frame. SSIM is a metric that is used to compare the similarity of two photographs. Because SSIM has been available since 2004, there is a lot of information discussing the theory behind it, but few sites go into great detail, especially for a gradient-based implementation, as SSIM is frequently used as a loss function.

The measure SSIM (Structural Similarity Index) derives three main aspects from an image:

- Luminance
- Contrast
- Structure

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

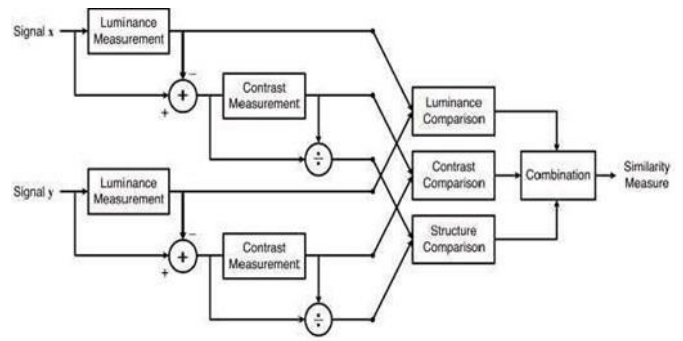


Fig.2 Monitoring feature Methodology

4. Face Identification

This characteristic is important for identifying known and unknown individuals. It's used to determine if the individual in the picture is well-known or not. It is accomplished in two steps:

- Look for the people in the pictures.
- Predicts the person from an already trained model using the LBPH face recognizer algorithm.

So, let's break this down into the following categories:

- 1 – Detect faces in the frames

This is achieved through Haarcascade classifiers, which are built-in functions in Python's OpenCV library. The cascade classifier, or more specifically, a cascade of boosted classifiers working on haar-like features, is a type of boosting ensemble learning. Adaboost classifiers are usually used (and other models such as Real Adaboost, Gentle Adaboost or Logitboost). Cascade classifiers are trained on a few hundred example pictures of images that have and do not contain the item we wish to identify.

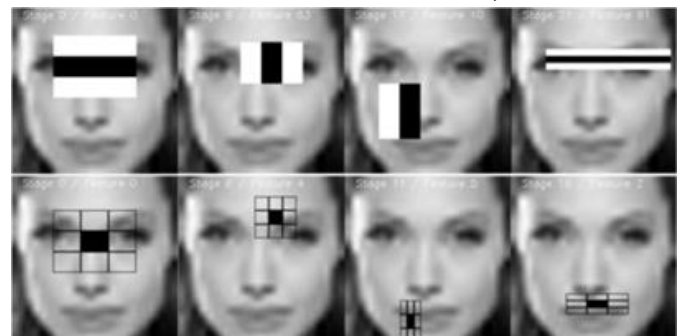


Fig.3 Cascade classifier

2 – Using LBPH for face recognition

Now that we've spotted faces in the picture, it's time to identify them and see if they're in the dataset we used to train our LBHP (Local, Binary, Pattern, Histogram) model.

There are four parameters in the LBPH:

- Radius
- Neighbors
- Grid X
- Grid Y

The LBPH's initial computational step is to build an intermediate picture that better describes the original image by emphasizing the facial features. To accomplish so, the method employs a sliding window idea based on the radius and neighbors of the parameter. It is nicely demonstrated by the image above. The Histograms are extracted in the following manner: Now, using the picture created in the previous phase, we can divide the image into numerous grids using the Grid X and Grid Y parameters, as seen in the following image.

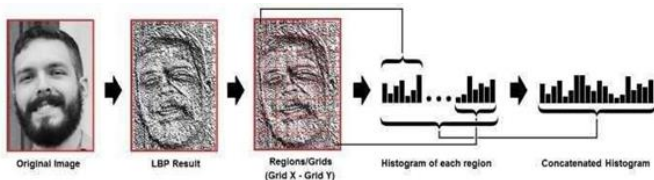


Fig.4. Extracting Histograms from an image

After that, the model is trained, and when we want to make predictions, the same processes are done to the model, and its histograms are compared to the model that has previously been trained, resulting in this feature working.

**V. EXPERIMENTAL SETUP**

1. User Interface

When executed main.py file in anaconda prompt the following GUI window will appear on screen. As in

the figure5 below it has different features such as Monitoring, identify, Rectangle, Noise, In Out, Record and Exit. Each has its own function.



Fig.5. User Interface Window

2. Monitoring feature

In the above figure5 when clicked on Monitoring the following window appears on figure6. It captures the video that what is happening in the room. If something unusual things happen then the system makes buzz sound which detects that an object is stolen.

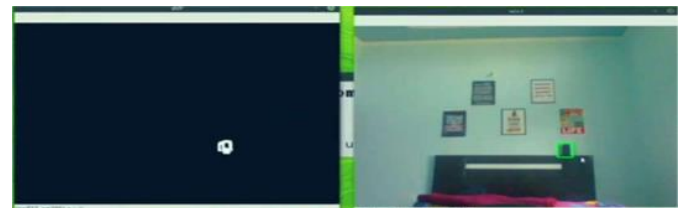


Fig. 6 Monitoring feature

Fig.6 Depicts the Monitoring feature, detects the stolen object in the room.

3. Noise detection

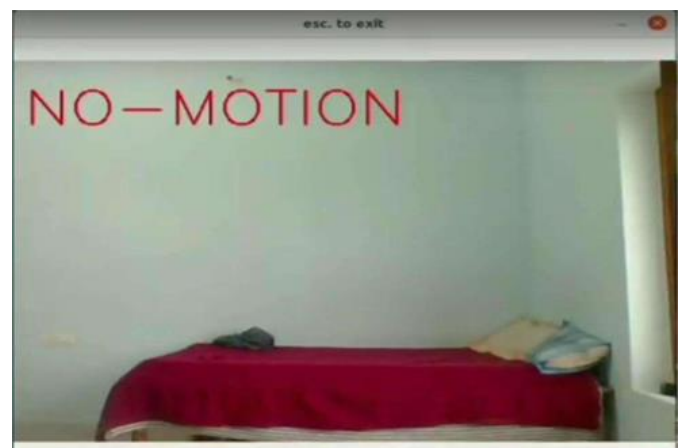


Fig.7 No Motion detected

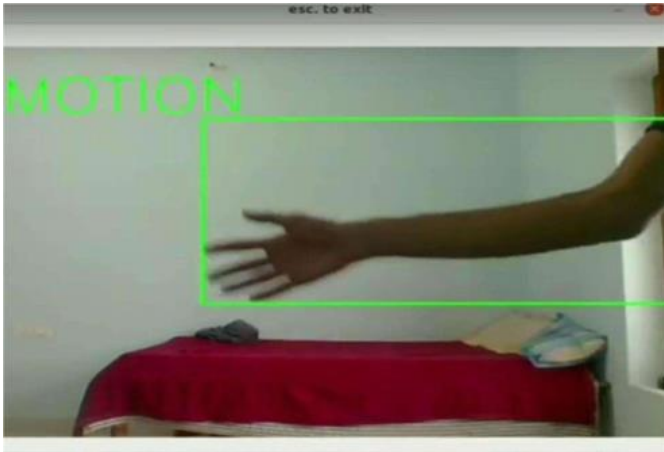


Fig.8 Motion detected

When clicked on Noise button the desktop's web camera as shown in figure7. Since there is no person in front of camera no motion is detected. But in figure 8 we can see that Motion is detected as one person is moving his hand.

#### 4. In and Out Detection



Fig.9 In and Out Detection

When clicked on InandOut button the window appears as in figure 9 As one person is entering into the room it detects In and if the person goes out of the room it detects Out.

#### 5. Face Identification

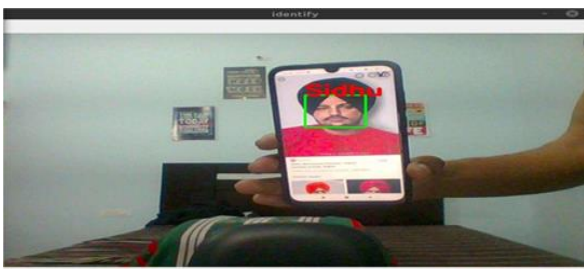


Fig.10 Face Identification

When clicked on identify button the window appears as shown in figure10. At first we have to train the system with an image of a person and his name and the next time when we place an image of that person in front of camera it identifies with some accuracy.

## VI. VI. CONCLUSION AND FUTURE ENHANCEMENT

### 1. Conclusion

This project established a high-definition of face identification, motion detection, and detection of stolen objects (Monitoring through web surveillance cameras), and also In and Out detection, that is visitors who entered into the room and who gone out of the room and also, live recording feature and storing it in the database which normal surveillance cameras doesn't have. All these features are executed and implemented successfully. Unlike normal surveillance cameras such as CCTVs this project has many advanced features which are useful for many applications.

### 2. Future Enhancement

This project can be used as a stepping stone to solve many problems. Unlike Normal Surveillance cameras this desktop application has some advanced feature such as Monitoring feature which are helpful in identifying the thief and the stolen objects. In and Out feature detects the visitors in the room, and their direction of moving. This project can also be helpful in conducting online examinations for educational institutions. And the Face Identification feature can be helpful in identifying Owner and can be Face lock for any protected information of owners and not allowing others to open that file. And when integrated with IOT and hardware this project can be

helpful for large area monitoring. In this way there are lot many applications.

## VII. REFERENCES

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