



# International Journal of Innovative Research in Computer and Communication Engineering

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## Security Surveillance Using Facial Recognition

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**ABSTRACT:** Advancement in computer technology has made possible to evoke new video processing applications in field of biometric face detection and recognition, one of which is facial recognition for security surveillance. There are various applications like gesture analysis, securing high risk avenues such as airport, government buildings etc. This paper divides the entire problem into three main phases: 'Detection', 'Recognition' and 'Integration'. The first phase is face detection in real time environment. This is done using Viola jones face detection algorithm. For the second phase, we are using Fisher Face Algorithm which gives the efficient result and is time friendly. The last phase is validation and deployment wherein we will integrate all the components and validate them.

**KEYWORDS:** FISHERFACE, EIGENVALUE, EIGENVECTOR, EIGENFACES, FACE RECOGNITION, SECURITY, EUCLIDEAN DISTANCE.

### I. INTRODUCTION

Security is a blooming field of technology with increase in demands of more secure locations, software, etc. Facial recognition can be used to revolutionize the security domain by automating the surveillance process by bringing in a more efficient and reliable agent as compared to human eyes. This project aims to create a video surveillance system which uses facial detection and recognition to secure the premises of any institution. Face recognition system used in security should automatically detect faces in an image or video which involves extracting its features and then recognizing it. In this project, we will use this technology to map individuals to surveillance footage or facial recognition based on their identity. The scope of this paper mainly covers various applications of facial recognition. Various such fields of application are crowd surveillance, face tracking, face identification in high-security area, etc.

### II. LITERATUR SURVEY

As opposed to earlier cryptosystems, facial recognition requires a special hardware support like all other biometrics system for detection and identification of a person. This research work promises a new direction of research in the field of asymmetric biometric cryptosystems providing us with additional security which is highly desirable in today's world. Also, since there are multiple algorithms available we had selected two famous algorithms and did some deeper research to find the more efficient one. We have added features where one can start a search for a particular individual like a criminal and a notification will be sent out whenever the search results in a hit. We are also implementing face recognition for improving security where-in we can search for a particular person via images or from a database and then notify the admin about that person's last seen location and time.

The facial recognition system is made efficient with genetic algorithm invariants of the facial surface resulting to a recognition rate of 95.4% Elena Alionte and Corneliu Lazar in their paper[1],

"A practical implementation of face detection by using Matlab cascade object detector" describes how to use the viola-jones algorithm in MATLAB and using it's various tuning parameters for enhancing performance. Viola Jones



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algorithm is an object detection algorithm which can be fine-tuned to detect faces. It is renowned for being robust i.e. very high detection rate (true-positive rate) & very low false-positive rate, it works really well in real time and also it can easily distinguish between face and non-face elements in the frame. Now, Human Face Detection and Recognition in Videos September 2016[2], by S. V. Tathe, A. S. Narote and S. P. Narote focuses on using this technology in a video environment. This paper mainly circles around the concepts of video and image processing to extract and process frames from a real-time source, detecting motion, face detection and finally, face recognition. It aims to use Viola Jones face detection algorithm [3] to detect motion and a face using Haar features. It concentrated on subtracting the background from the frame, cropping and re-sizing the detected face and finally using recognition algorithm. The first stage captures the video. Pre-processing algorithms are employed to remove the unwanted artefacts like noise present in the image. The second stage detects faces in frames. Next stage is to identifying the detected face in the camera's view Face Recognition Using Principal Component Analysis (PCA) Method November 2012, written by Liton Paul and Abdulla Suman[4] focuses on building a face recognition system using PCA algorithm. The approach is to obtain eigenvectors of the images from the training dataset as well as the image that we obtain from the live surveillance feed and then compare them both to decide whether we have a match or not. Fisher's Linear Discriminant is a "classical" technique in pattern recognition, first developed by Robert Fisher in 1936 for taxonomic classification. Depending upon the features being used, it has been applied in different ways in computer vision and even in face recognition. It maximizes the ratio of between-class scatter to that of within class scatter. The Eigenface is the first method considered as a successful technique of face recognition. The Eigenface method uses Principal Component Analysis (PCA) to linearly project the image space to a low dimensional feature space. The Fisherface method is an enhancement of the Eigenface method that it uses Fisher's Linear Discriminant Analysis (FLDA or LDA) for the dimensionality reduction. The LDA maximizes the ratio of between-class scatter to that of within-class scatter, therefore, it works better than PCA for purpose of discrimination. The Fisherface is especially useful when facial images have large variations in illumination and facial expression, PCA retains unwanted variations due to lighting and facial expression. Eigenface tries to maximize variation. So, with PCA they usually get a decent model of the face. Fisherface wants to maximize the mean distance of different classes while minimize the variance within class. It gives face models that are more useful in discrimination. We also observed that the error rate was comparatively less as compared to that of PCA and the result also took few micro seconds less as compared to that of PCA. Yet, no claim is made about the relative performance of these algorithms on much larger databases.

### III. IMPLEMENTATION

We have divided our system into 3 main phases which are:

- i. Facial Detection.
- ii. Facial Recognition
- iii. Validation and Deployment.

We have built our UI and have implemented features like 'add camera'-which adds a new camera and enables us to implement multiple camera interface. While adding a camera in order to distinguish it from the rest we give unique names/index to the camera, this helps us in deleting a camera by selecting the desired camera name we want to delete.

#### 1. Add Camera Functionality.

We can add multiple camera interfaces in the application by clicking Add a camera from the Menu. In the interface shown below (a), you are requested to enter the location of the camera, which thereafter shows you the preview from that camera.

By clicking submit you can add the camera to your application and thereafter can see the live footage from that camera. Also, you can add more cameras to the interface.

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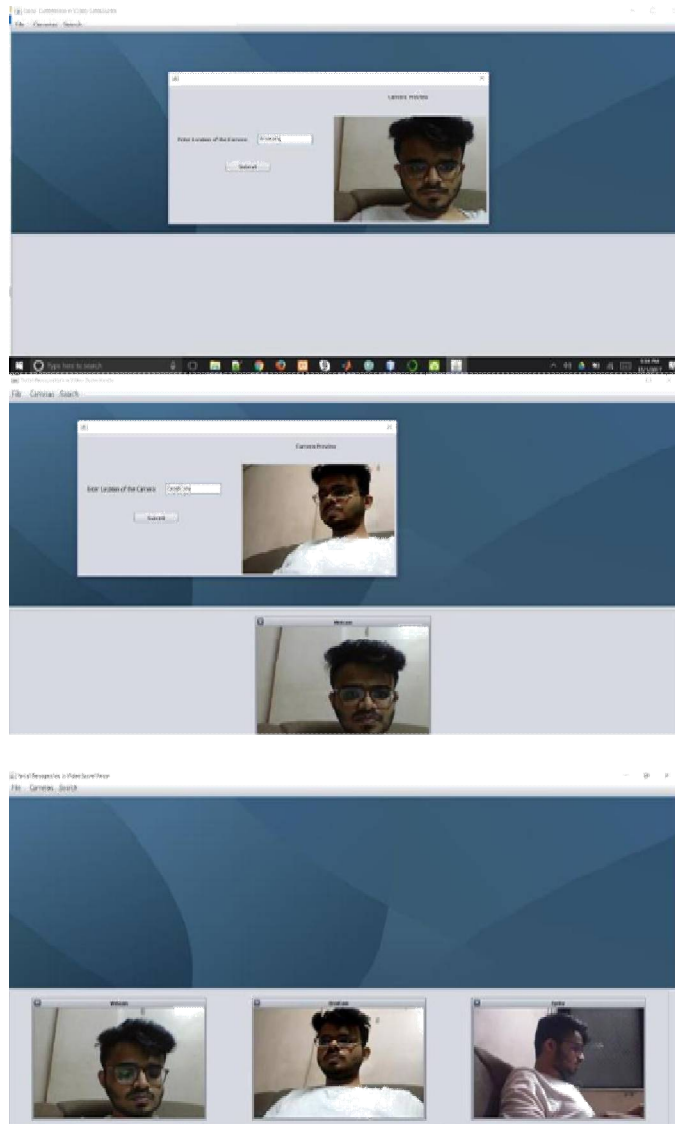


Figure 1. Live Camera Images

This is how the multiple camera interface would look like. Here we have added three cameras.

## 2. Delete Camera Functionality.

You can also remove a camera from the interface if required. The input required is the index number of the corresponding camera as seen in the image below.

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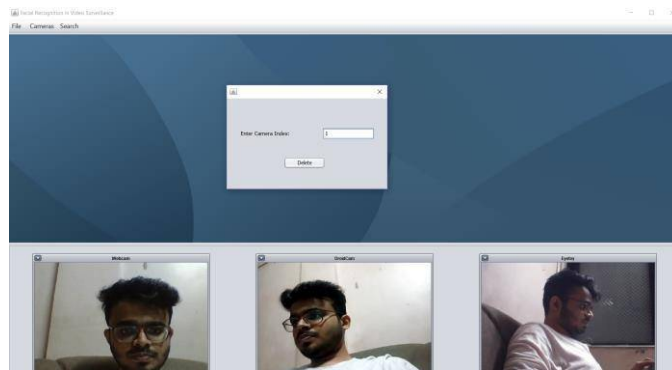


Figure 2. Removal of Images

The indexes of the cameras are 0-based index that is how the computer accesses the cameras in sequential manner.

So, while removing we need to specify the index of that camera which has to be removed. As you can see below the camera is removed, and only two camera feeds can be seen.

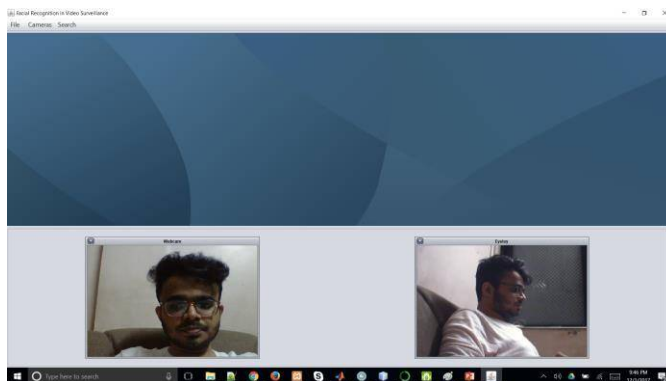


Figure 3. Remaining Camera Images

### 3. Add known Person.

Another functionality which allows you to add a particular person in the database. You enter the first name, last name, phone no, email ID. Images option is used to browse images in which my face is visible.

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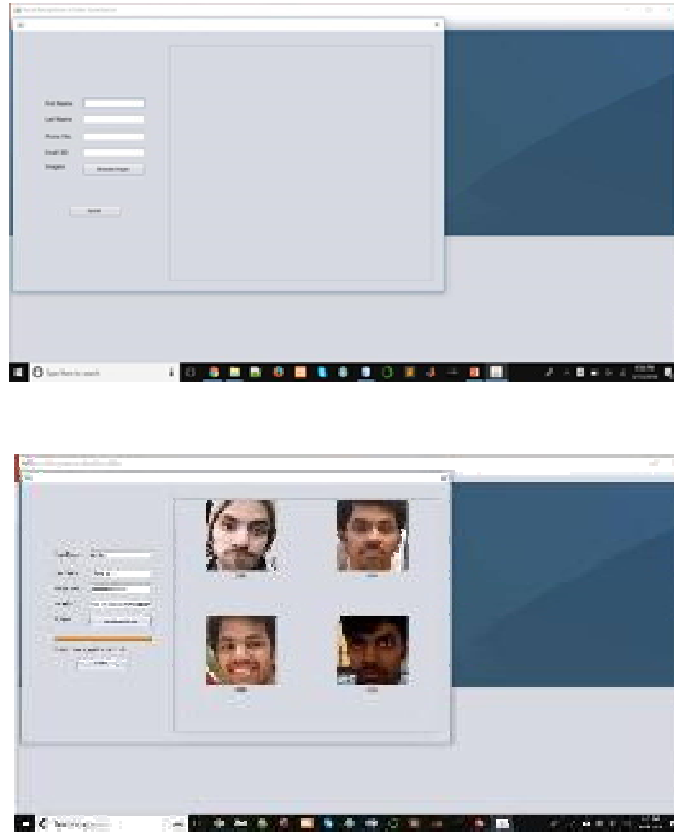


Figure 4. Addition of Images into Database

After entering the details and picking out the images, all the images are verified for their validity. All of these faces associated with the name are stored in the database as that person along with his personal details.

#### 4. Recognition

A green box is formed around the face recognized and the name blinks above it if the person is detected.



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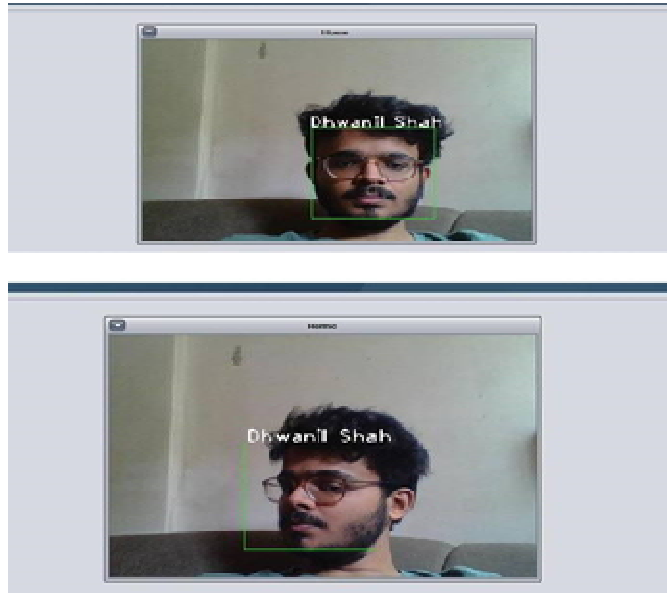


Figure 5. Detection of Image

## 5. Start a search:

You need to enter the persons phone number or email id of the person you want to search.



Figure 6. Search UI

You can also start a search by uploading a reference image and providing a name for that person.



Figure 7. Search UI using Reference Image



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A notification will be shown when the search has started.

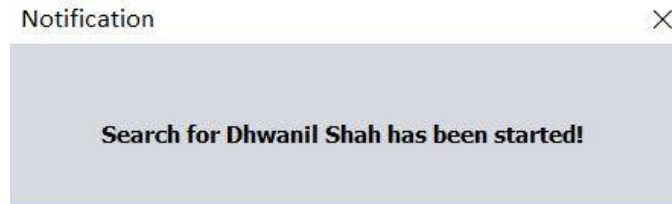
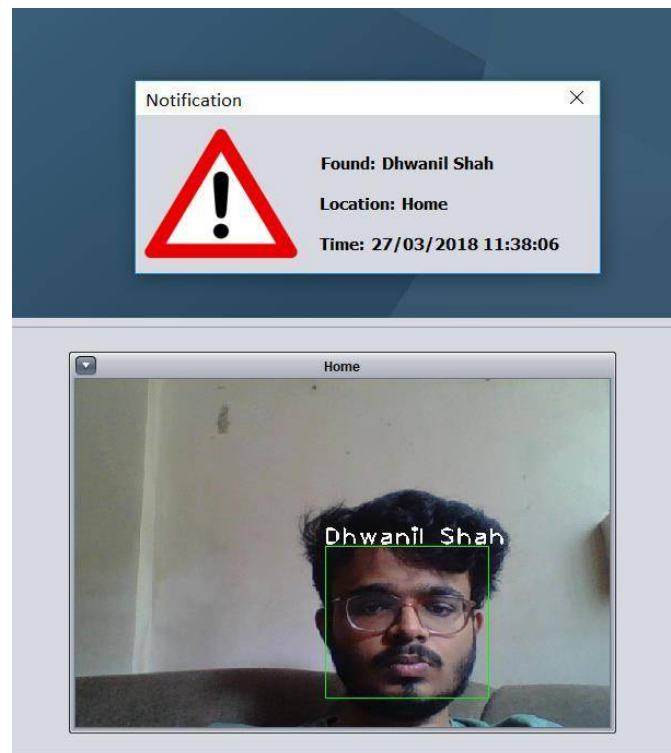


Figure 8. Notification Box

Once the person is found, a notification alert box is displayed.

## 6. Search results in a Hit

Location and time of the person is displayed when a hit occurs.





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The screenshot shows a web application window with a close button (X) in the top right corner. The window is divided into two main sections. The left section is titled "Enter Details of the Person:" and contains three input fields: "Phone:" with the value "9819406186", "Email:" which is empty, and "Enter Name:" which is empty. There are "Start Search" buttons below each of these fields. The right section is titled "Upload the Reference Image" and contains a "Browse Image" button and a placeholder image of a person's head and shoulders.

Figure 9. Details

## 7. Find last seen of a person

One can find the last seen of a person by entering details like phone number or email id of the person. The last seen location and time are displayed for the particular person.

The screenshot shows a web application window titled "Last Seen Details" with a close button (X) in the top right corner. The window displays the following information: "Phone:" with the value "9819406186", "Name: Dhwanil Shah", "Location: Home", and "Time: 27/03/2018 11:38:55". There is a "Find" button at the bottom.

Figure 10. Location and Time

For the detection phase we have used the viola jones algorithm as described earlier. It is an advanced face detection algorithm that detects a face from a video using frames, pre-processes it and remove the unwanted artefacts like the noise present in the image, crop and stores it in the database. Also while detecting, a boundary is defined which crops the face from the background and stores the cropped faces. We can also set a limit for the number of frames to be processed and then store the faces detected in those frames.

For the facial recognition phase, Fisher Face Algorithm is used. The third phase will be to integrate all these modules and perform multiple testing on the system and deploy it.

## IV. RESULTS

PCA was found to have a success rate of about 76.62% whereas Fisherface was recorded to have a success rate of 92.67%. The runtime for PCA was clocked at about an average of 2.2 seconds where as Fisherface is as fast as 0.6 seconds on an average. Fisherface also had better accuracy with dark images such as frames from surveillance cameras in poorly lit area as compared to PCA.

## V. CONCLUSION

The System will be able to collect input feed from various cameras and run simultaneous detection and recognition algorithms to automate the surveillancesystem and eliminate the need for human intervention. This system will find its place in areas ranging from commercial firms, airports, multinational stores to government offices.





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