Advanced Security Surveillance Using Motion Detection

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Abstract— Computer vision field is becoming the area for the research these days. Technological improvement made the computers and imaging hardware to find their applications in the field of computer vision. Hence they found applications in the military for targeting, surveillance and biometric etc. Originally, business used video surveillance as both a deterrent to thieves and evidence to help police to apprehend criminals. Objective of our work is to 'Provide foolproof' security in the restricted zones like bank, jewelry shops etc. There are many traditional technologies which provide security to restricted zones but these traditional technologies do not take quick action and are not foolproof. To give strong security solutions for restricted zones, this will have smart camera connected to the cell phone by which one can take quick action without wasting time. In our project approaches used for face recognition and face detection are SMQT algorithm, split up Snow classifier and PCA for efficient face recognition.
Keywords : Security Surveillance, Face detection, Face recognition, Eigenvalues, Eigenface

I. INTRODUCTION

A. Preamble

Computer vision field is becoming a very interesting area for research these days. Improvement in the technology made computers and imaging hardware enabled the applications in the field of the computer vision. An automated computer vision system that capture and analyze images has found application in the military for the targeting, surveillance and biometrics. In the future, computer vision may be used in consumer applications such as:

- Assisted automobile navigation & collision avoidance,
- Improved human-computer interfaces,
- Virtual simulations & games,
- Video summarization,
- Home entertainment.

Also, some useful commercial applications that are currently or soon-to-be in development include:

- Home robotics,
- Recognition biometric systems,
- Motion capture for movie special effects

Computer vision makes use of multidisciplinary knowledge from many different fields, including machine learning, optical physics, pattern recognition, computer graphics and signal processing. It could be useful to divide computer vision research into four levels:

- Image Formation (physics, optics, & cameras)
- Low-level Vision (derivatives, optical flow)
- Mid-level Vision (segmented objects, tracking)
- High-level Vision (understanding underlying semantics)

While theoretical knowledge is well-developed for image formation and low-level vision, many mid-levels and high-level vision problems lack theoretical descriptions or solutions. The task of having computers is capable of recognizing faces, without using the principal component analysis, is a formidable one. To a computer a face like any other image, is a matrix of several hundred pixels by several hundred pixels. Dealing with many faces, in the form of pictures, can be very time consuming and also difficult. However if someone applies principal component analysis, the task becomes much more manageable. Face recognition can be applied for a wide variety of problems like image and film processing, human-computer interaction, criminal identification, etc.

Human face detection plays an important role in the application such as video conferencing, biometric identification, face image database management ,intelligent human computer interface and face recognition. Face detection is not perfect because of lots variation in the image appearance such as occlusion, image orientation, pose variation, facial expression and illuminating condition. Many researchers proposed different approaches to address the problem of the face detection. They have been categorized into four categories:1)Knowledge-basedmethods,2)Feature invariants approaches ,3)Template matching methods and 4) Appearance based method .

Illumination and sensor variation are major issues in the visual object detection. It is convenient to transform the raw illumination and sensor varying image so that information only contain the main structures of the object. The Successive Mean Quantization transform [SMQT] can be visualized as a tradeoff between the number of quantization level in the analysis and the computational part. In the proposed project we have used the SMQT algorithm to extract face features from the local area of the image and have used an extension to the SNoW classifier, the split up SNoW for the classification task.

Face detection is the first step in the face recognition system. It also have several application such as video coding, security surveillance in the bank, jewellery shops, video conference and human –computer interface .This motivated the researchers to develop computational models to identify the faces, which are relatively easy and simple to implement. The model developed is simple, fast and accurate in constrained environments. In our project we have proposed a frame work for the face detection and recognition using the SMQT algorithm and split up snow classifier for rapid face detection and Principal component analysis for efficient face recognition. The main aim is to develop model for a particular face and distinguish it from a large number of stored faces with some real-time variations as well and if any motion occur in the restricted area means capture the image using the webcam and send it to the security officer mobile phone so that he can raise the alarm.

B. Problem Definition

To design and develop a smart security model which records and responds the human presence and alerts the security officer to take proper measures.

C. Objective

Objective of our project is to" Provide foolproof security" in restricted zones like banks, jewellery shops etc. There are many traditional technologies which provide security to restricted zones but these traditional technologies don't take quick action and are not foolproof. To give strong security solutions for restricted zones, which will have smart camera connected to cell phone by this one can take quick action without wasting time.

D. Scope of the Project

To build a robust security model for security system, which will have a smart camera and which will keep an eye over the restricted zone and notify the security officer in case it detects any unauthorized entry.

This application can be used by system officer to keep an eye on restricted area through their cell phone even when they are not physically present.

- He will be able to see the picture of the person who is coming to his room on mobile.
- He will be able to start alarm as soon as any unauthenticated person enters the room.
- He will be able to see the human face and know that who has entered that room.
- He can inform police.
- The picture that he will get will be human face, it will be not response to flying objects like curtains etc.

II. Existing System

In existing system the person uses the camera to record the activities happening in any restricted zone but he can't take quick action because he can see the record when he comes to that restricted zone

- Context level DFD
- Top level DFD

A. Context level DFD of the existing system

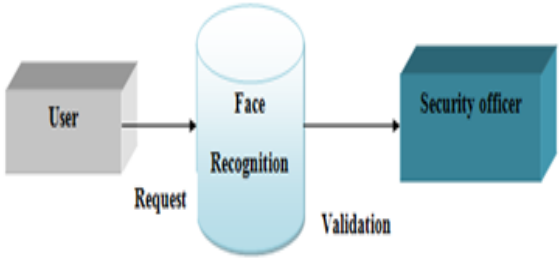

Fig.1: Context level DFD of the existing system

B. Top level DFD of the existing system

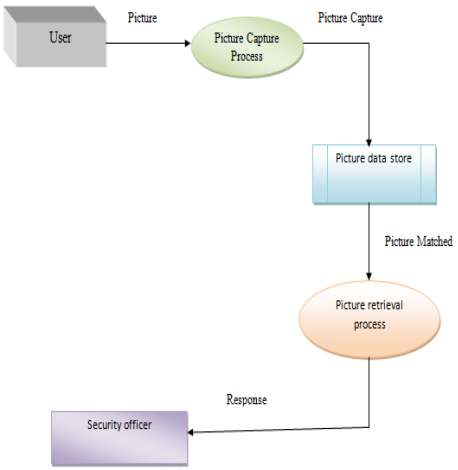

Fig. 2 Top level DFD of the existing system

III. Proposed System

The proposed system should provide facility to the user that if any person enters the restricted zone then camera detects the human face and captures it and sends that photo to the authorized person cell phone. So that authorized person can take any quick action.

- Context level DFD diagrams
- Top level DFD diagrams

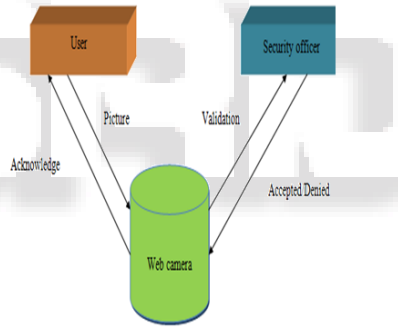

Fig. 3: Context level DFD diagrams

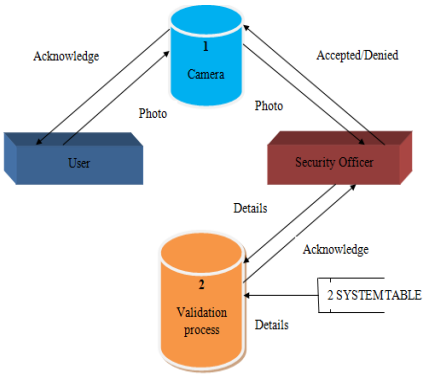

Fig. 4: Top level DFD diagram of the proposed system

IV. System Design

Our project is designed in terms of three modules. These three modules are,

- Webcam module
- Server and system module

– Cell phone module

A. Design Details

1) Webcam Module
- This module contains the following steps
- Installing the web camera software
- Setting the camera in correct place
- Capturing the picture when the motion is detected
- Notify server about motion detection

2) Server module
- This module contains the following steps
- Receive and store the picture
- Sending a message to cell phone of security officer

Raise the alarm when its required

3) Cell phone module
- This modules contains the following steps
- Configure cell phone with GPRS setting and Gnu box
- Connection with the cell phone GPRS
- Validate the picture
- Forward raise alarm request

B. Flow Diagram

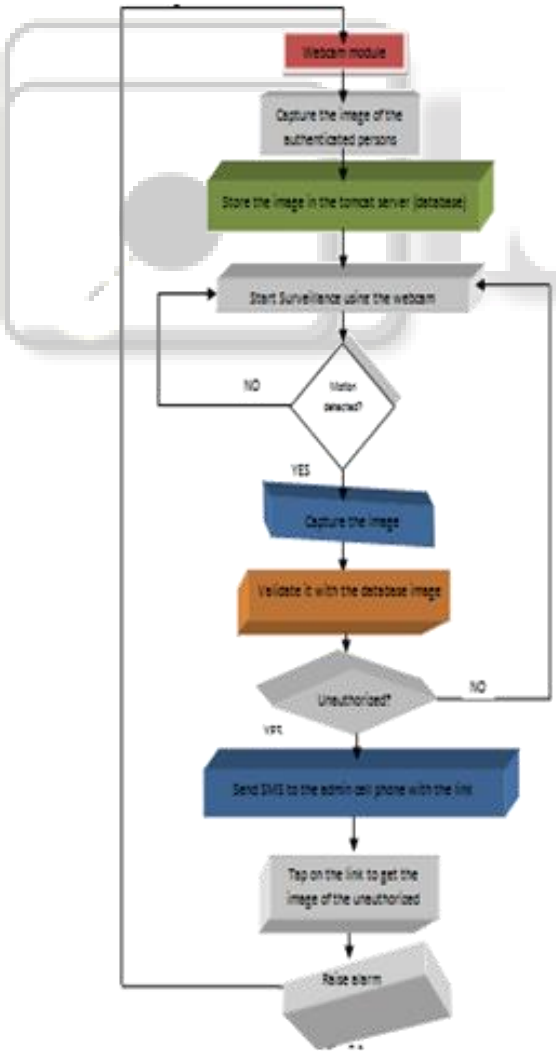

Fig. 5: Flow Diagram

C. Module Diagram

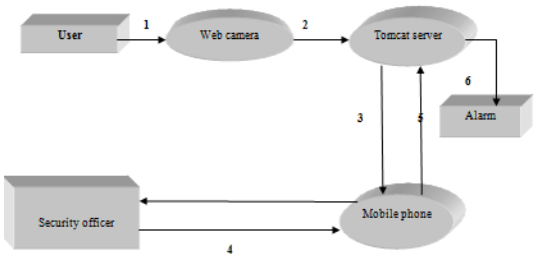

Fig. 6: Module Diagram

Steps

- When the motion is detected by the web camera. Webcam captures the picture.
- Captured picture is stored is the tomcat server.
- From the tomcat server the picture is sent to the mobile phone of security officer.
- He will validate the picture, if the captured picture is of unauthenticated person.
- Then the security officer will request for alarm and request is sent to tomcat server.
- Now, the tomcat server will forward that request to the system and System starts alarm.

V. IMPLEMENTATION

This project is implemented in 3 phases using Matlab, Java RMI and Swing etc
Those are Webcam module, server module and cell phone module.

A. Webcam Module

Implementation details are as follows

1) First we need a interface called VFM to connect Matlab and Webcam. (download VFM from http://www.cmp.uea.ac.uk/~fuzz/vfm/default.html)
2) Write a program using Matlab to detect a face. Here in this program captured picture is read as array using Matlab command "imread" and this image is converted into grayscale image. Then detected picture is shown in red square box. This captured picture is stored in Tomcat server using "imwrite" command

```
X= imread('test01.jpg); %read the image to memory;
        Img = x; %store x in img variable

        imwrite(img,'C:\tomcat\webapps\examples\home\te
st1.    jpg', 'jpg');
      x = rgb2gray(x); %convert RGB to gray scale image
        output = facefind(x); % detect face
      plotbox(output); % show detection in red square
```

B. Server Module

Implementation details are as follows:

1) Tomcat server stores a copy of image captured and send it cell phone using Sms_Server.
2) With a picture some warning message is send to cell phone and create one button
3) Using swing to forward raise alarm request to system

4) Create an rmi program to raise alarm. Here system is server function which raises alarm when client cell phone is requested to raise.

C. Cell phone Module

Implementation details are as follows:

1) Cell phone should be GPRS enabled.
2) Receive the message and validate the picture
3) If the picture is of unauthenticated person then security officer should forward the raise alarm to system. This is done by using java rmi function.

VI. RESULTS

we need to open the matlab tool and after opening the tool we need to type menu in the command window the matlab menu GUI get opened as shown in the fig 7 .

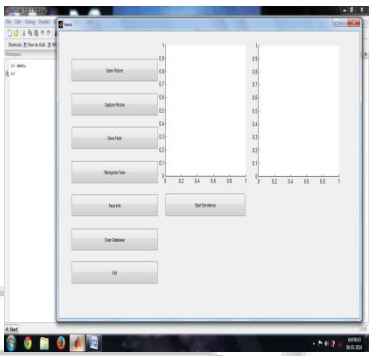

Fig. 7: matlab menu GUI

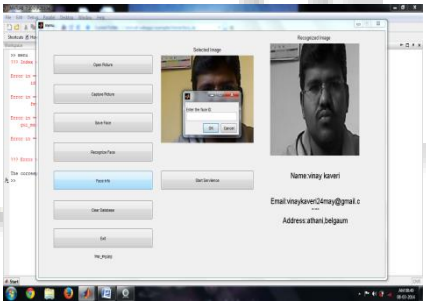

Fig. 8: start_tomcat

After this we need to run the two bath files start and start_tomcat and later in the matlab GUI menu we need to press the button start surveillance for the real time surveillance(fig 8),if any unauthorized person enter in the restricted zone then the webcam capture the picture of the human face and send it to the cellphone of the security officer and then he can raise the alarm as shown in the fig 10.

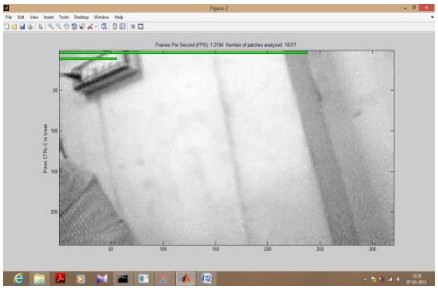

Fig. 9: capture the picture

Fig. 10: raise the alarm

VII. CONCLUSION AND FUTURE SCOPE

We have implemented a JAVA (J2EE) and MATLAB based project. This is a intelligent security system that is capable of recognizing face from the video frame. It becomes active only when it detects a human face in the area. It detects the face and sends message to the administrator mobile and he can take necessary action without being there at the spot itself if he finds an unauthorized user. We have also taken care of the fact that the system does not get activated by movement of some non-living things, for example curtains.

This paper can be implemented using various new face detection techniques. Popular recognition algorithms include PrincipaComponentAnalysis using eigenfaces, Linea rDiscriminate Analysis, Elastic Bunch Graph Matching using the Fisherface algorithm, the Hidden Markovmodel,the MultilinearSubspaceLearning using tenso r representation, and the neuronal motivated dynamic link matching.

Our system can also be part of some other robust security system that can be implemented for large organization.

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