Smart Surveillance System using IoT and RaspberryPi

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Abstract- In this paper, we are presenting a proposed system for Smart Surveillance model/techniques in which we are implementing facial monitoring system by embedded face detection and face tracking algorithm and it consists of three steps namely: facial detection, feature extraction and recognition by using Haar classifier. This paper proposes gesture based face tracking while using a USB camera, it exact position, where your face is located and not only this, it will follow and track your face within its prescribed limit.

Keywords: Haar Cascade, Face Detection Face recognition, face detection reorganization, Raspberry Pi, IoT.

I. INTRODUCTION

Nowadays people keep on moving around the world because of their job and for other reason. So monitoring about what happening in their home or office has become a must needed one today, there is a pressing need to design and develop technologies that can assist individual and safe living of people.

Face detection and tracking has been used for the purposes of surveillance, security, human computer interaction, etc. Various methods of face detection are reported in literature, they include Viola Jones, Haris corner, Principle component analysis, Haar classifier [1-2]. In this research, Haar classifier extracted from Viola Jones algorithm is used for the face detection. The Eigen features of the face for tracking its position are detected using OpenCV and Raspberry pi.

The face recognition algorithms used here is Principal Component Analysis (PCA). It involves a mathematical procedure that transforms a number of possibly correlated variables into a number of uncorrelated variables called principal components, related to the original variables by an orthogonal transformation [1]. The Eigen face approach helps reducing the size of the database required for recognition of a test image. The Eigen values calculated from the Eigen Vector covariance matrix are rejected or stored depending upon the threshold thus creating a face space [1, 3, and 4]. Calculating the weights and the Euclidean distance a comparison is held and match is found [4]. This conventional Eigen face Approach is incorporated in the ARM Cortex of Raspberry Pi for face recognition using face recognition modules in python code.

II. PREVIOUS WORK

In the previous work researchers considered head and shoulder of the object to detect the more appropriately its motion, since it is the most unvarying part of human body. The range of monitoring in this study is up to five meters hence, it is difficult to detect face at a long distance since the face will be small and blurry [5].

In the previous paper the researchers objective to detect the motion. In this project it used a Raspberry Pi Model B to connect the web camera to capture the footage sending an email on detection of motion.

The python script matches the last frame and the present frame of the live video, if there is any difference then the motion flag is set, triggering all the events [6].

III. PROPOSED METHODOLOGY

To develop an active surveillance camera that has the capability of identifying the context of the scene being monitored and able to give notification or alarm on event occurrence. In order to achieve this it's necessary to choose the hardware wisely.

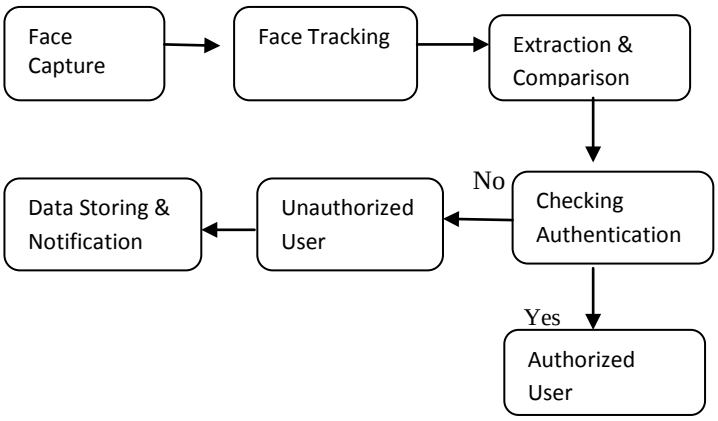

Fig.1 Flow of operation

The Functionality of this system is mainly categorized in following steps-

1. The first step is to have a good set of sample images of faces with multiple images for each individual.
2. The next step is to detect faces from the sample images and use them to train the face.
3. The last step is face recognizer using which we can recognize tagged face and identify the authorized user.

The identification and authentication technology operate Using the following stages

IV. SYSTEM MODEL

Hardware Design:

A. Raspberry Pi

The Raspberry Pi which is a single board minicomputer developed in UK. The Raspberry Pi3 Model B is used in this project. It is a high specification, minicomputer embedded on a chip having 802.11n Wi-Fi, Bluetooth 4.0 and a quad-core 64-bit ARM cortex A53 running at 1.2 GHz.

B. Block diagram:

The block diagram given in Fig. 2 represents the steps required for implementing the face recognition using Raspberry Pi and open CV. Each step is described in the following section.

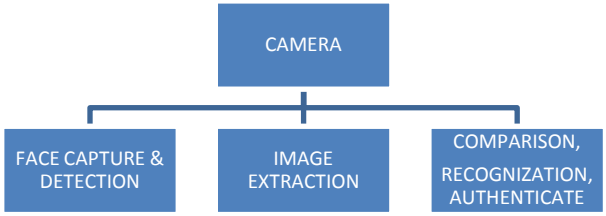

Fig. 2. Bulding Blocks of the System

Software Design:

To code for the Hardware setup, python language is used [7]. to access the editor Linux terminal is required. The Face detection and recognition part is carried out by Python Script. General System flowchart is shown in Figure 3.

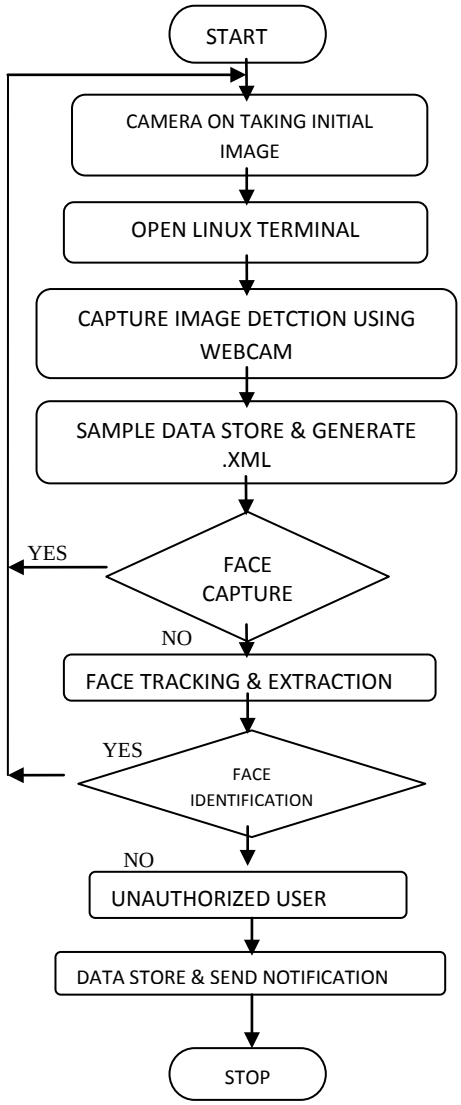

Fig. 3. General System Flowchart

V. EXPERIMENTAL RESULTS

Figures show the difference and the actual output of the project. In Fig 4.1 takes the capture the face using Haar cascade classifier. Fig4.2 shows the positive samples of the faces that detected. Fig4.3 The last step is face recognizer using to recognize tagged face to identify the authorized user.

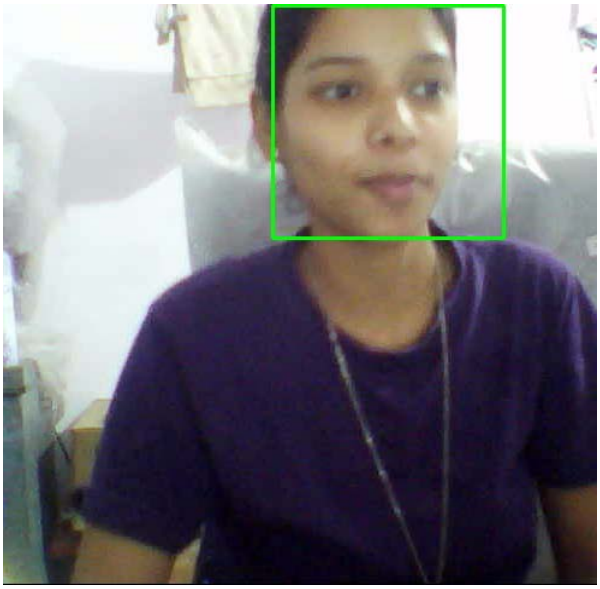

Fig4.1. General System Flowchart

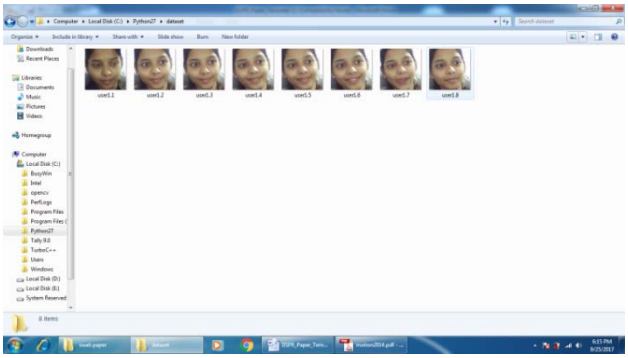

Fig4.2. General System Flowchart

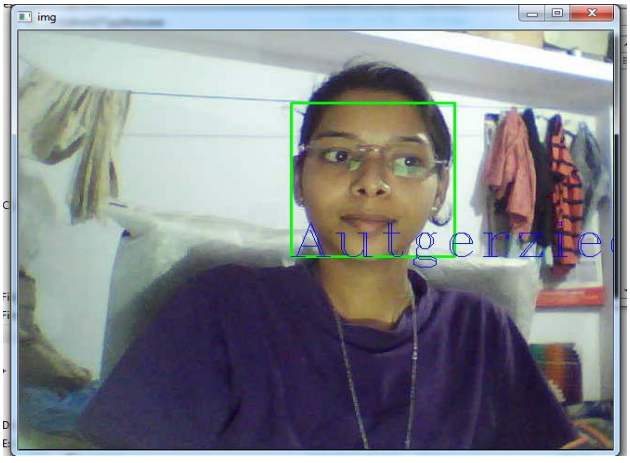

Fig4.3. General System Flowchart

VI. CONCLUSION

The main aim was to develop an active surveillance camera that has the capability to identify between an authenticated user and unauthorised one, which is achieved successfully and further advancement to be addressed subsequently.

VII. REFERENCES

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