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Design and Implementation of Security Management Using Haar Classifier With Call Alert and Live Video Streaming

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Abstract: **This paper concentrates on the security systems in banks, jewellery shops etc..We are concentrating on a method to accurately and rapidly detect faceswithin an image. This technique can be adapted to accurately detect facialfeatures. However, the area of the image being analyzed for a facial featureneeds to be regionalized to the location with the highest probability ofcontaining the feature. By regionalizing the detection area, false positives areeliminated and the speed of detection is increased due to the reduction of thearea examined. We have used advanced Rasberry Pi processor for the implementation.**

Index Terms— **Rasberry Pi, PIR sensor, OpenCV, HAAR**

I. INTRODUCTION

For a long time, traditional sensors like PIR sensors are used to detect the motion. These sensors which use IR rays to detect motion. But in our project major role is human motion detection. PIR sensor is not limited to detect a human body only, it will detect any motion, and it is limited to some distance only. So here we are using OpenCV (Open Source Computer Vision) library to detect the motion of a person through image processing, excluding the usage of traditional sensor for false detection of other object which can be used to monitor secured controlling at indoor bank lockers, financial office, hospital, master room, children room etc. Our embedded project consists of two cameras which will be connected to ARM11 architecture based Raspberry pi Board. One Camera will be configured for image processing library process, which will provide the frames for the OpenCV Program to detect the human. If any Human body is detected, the information will be processed by microcontroller and according action will be triggered. When motion detects immediately our system alerts the authorized persons by forwarding a call and by providing video streaming by the other camera connected.Video streaming is dissimilar to the traditional mode called "Play after download", the key point being the mode called "Play as received". The video streaming is done by sending video stream packets transmitted via TCP/IP. A specific IP address will be provided in order to view the video over the network [1-4].

In earlier human motion detection is done by passing IR (Infra Red) rays, but we are not depending on the IR rays. Instead of traditional sensors, IR rays, to overcome the disadvantage of other object detection through OpenCV image processing library and to display the human body on front end GUI by eliminating IR sensors. TTS through Raspberry pi- B+ model is easy to add to our program - just output a string to the speech function instead of the screen. We don't need an expensive/complicated LCD or monitor for our project - just use any old mp3 player loudspeaker or PC loudspeaker which you have probably got lying around or even an earphone[5-6]. In many I needed to stream a video of my desktop, camera, or whatever to a remote computer which has no client software to see my stream. In such a case, using Motion-JPEG streams is preferred because it needs no more than an internet browser.

II. PROPOSED SYSTEM

The proposed system block diagram has been shown in Figure 1.

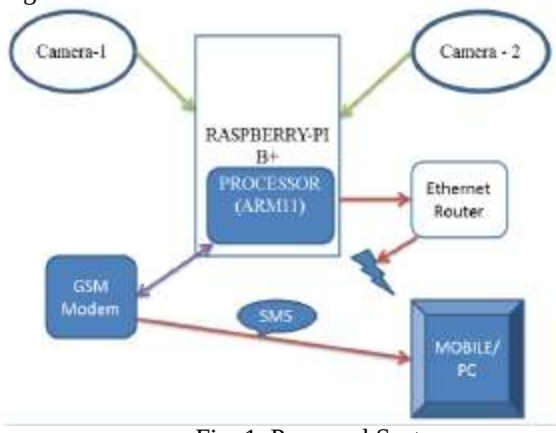

Fig. 1. Proposed System

OpenCV is an open source C++ library for image processing and computer vision originally developed by Intel and now supported by Willow Garage. It is free for both commercial and non-commercial use. Therefore it is not mandatory for your OpenCV applications to be open or free. It is a library of many inbuilt functions mainly aimed at real time image processing. Now it has several hundreds of image processing and computer vision algorithms which make developing advanced computer vision applications easy and efficient. If you are having any troubles with installing OpenCV or configure your Visual Studio IDE for OpenCV, please refer to Installing and Configuring with Visual Studio[7-9].

III. PROPOSED ALGORITHM

Haar-like features are digital image features used in object recognition. They owe their name to their intuitive similarity with Haar wavelets and were used in the first real-time human body detector.

Historically, working with only image intensities (i.e., the RGB pixel values at each and every pixel of image) made the task of feature calculation computationally expensive. A publication by Papageorgiou et al. discussed working with an alternate feature set based on Haar wavelets instead of the usual image intensities. Viola and Jones adapted the idea of using Haar wavelets and developed the so-called Haar-like features. A Haar-like feature considers adjacent rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums. This difference is then used to categorize subsections of an image. For example, let us say we have an image database with human bodies. It is a common observation that among all human bodies the region of the eyes is darker than the region of the cheeks. Therefore a common haar feature for human body detection is a set of two adjacent rectangles that lie above the eye and the cheek region. The position of these rectangles is defined relative to a detection-window that acts like a bounding box to the target object (the human body in this case)[10].

In the detection phase of the Viola – Jones object detection framework, a window of the target size is moved over the input image, and for each subsection of the image the Haar-like feature is calculated. This difference is then compared to a learned threshold that separates non-objects from objects. Because such a Haar-like feature is only a weak learner or classifier (its detection quality is slightly better than random guessing) a large number of Haar-like features are necessary to describe an object with sufficient accuracy[11-12]. In the Viola – Jones object detection framework, the Haar-like features are therefore organized in something called a classifier cascade to form a strong learner or classifier.

The key advantage of a Haar-like feature over most other features is its calculation speed. Due to the use of integral images, a Haar-like feature of any size can be calculated in constant time (approximately 60 microprocessor instructions for a 2-rectangle feature)[13].

IV. RECTANGULAR HAAR-LIKE FEATURES

A simple rectangular Haar-like feature can be defined as the difference of the sum of pixels of areas inside the rectangle, which can be at any position and scale within the original image. This modified feature set is called 2-rectangle feature. Viola and Jones also defined 3-rectangle features and 4-rectangle features. The values indicate certain characteristics of a particular area of the image. Each feature type can indicate the existence (or absence) of certain characteristics in the image, such as edges or changes in texture. For example, a 2-rectangle feature can indicate where the border lies between a dark region and a light region[14]. Figure 2 shows the rectangular haar like features.

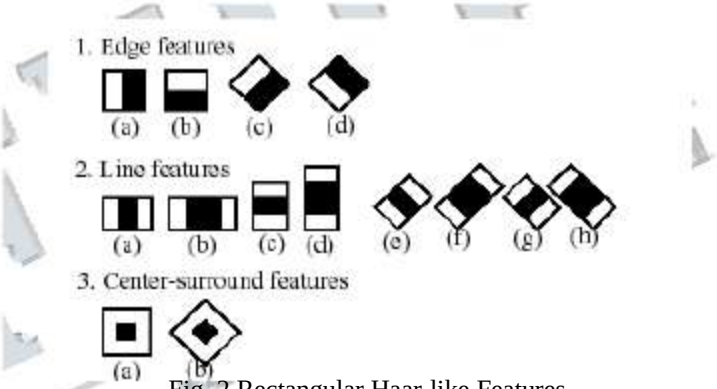

Fig. 2.Rectangular Haar-like Features

The Human detection algorithm looks for specific Haar features of a human body. When one of these features is found, the algorithm allows the face candidate to pass to the next stage of detection. A face candidate is a rectangular section of the original image called a sub-window. Generally these sub-windows have a fixed size (typically 24×24 pixels).The algorithm scans the entire image with this window and denotes each respective section a face candidate. Figure 3 shows the examples of haar features.

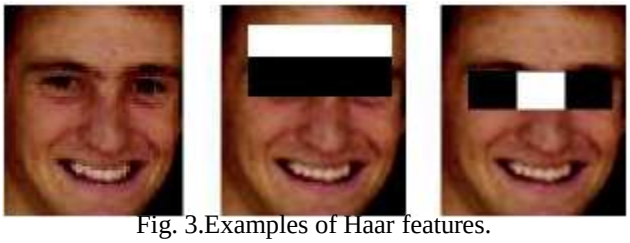

Fig. 3.Examples of Haar features.

The Raspberry Pi Model B and Model B+ figures are given below in figure 4. The complete flow chart of the system has been shown in figure 5.

Fig. 4.Raspberri Pi block diagram.

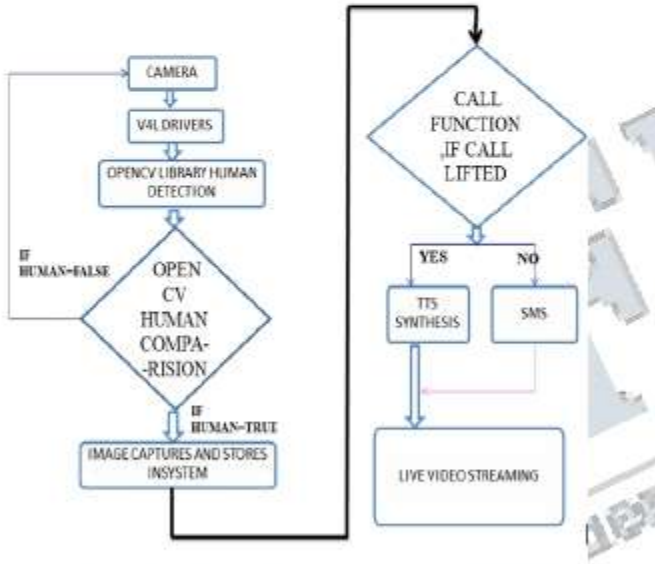

Fig. 5. Complete flow chart of the proposed system.

V. RESULTS

Fig. 6. Shows the hardware used to implement the system.Figure 7 shows tha application software which is used for the live video streaming.

Fig. 6.Hardware for the implementation.

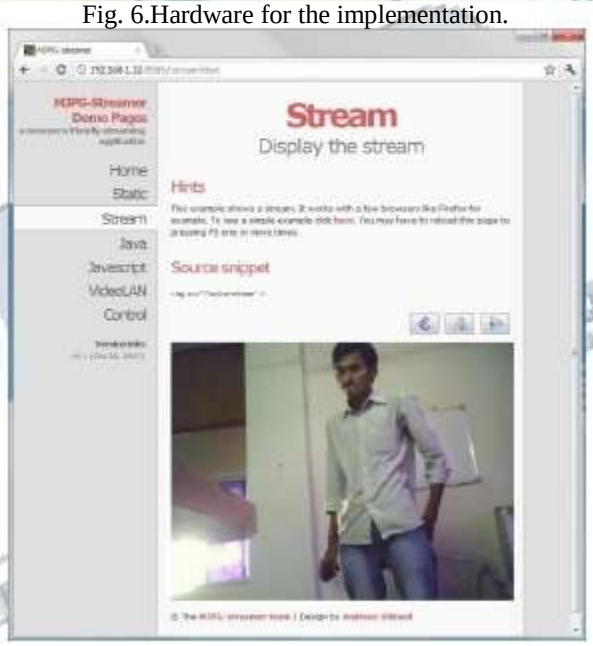

Fig. 7. Live video streaming diagram

CONCLUSION

Traditionally, for motion detection I-R based sensors like PIR (Pyro electric infra- red) sensors are used, but now we are using OpenCV image processing library detects the human body instead of detecting other object.Without interfacing voice module, voice transmission is done through composite video, audio port mounted on the Raspberry pi B+. In this project we selected embedded platform instead of PC to implement surveillance system with its advantages of low power consumption, Raspberry Pi B+ uses 1.21 Watts with just a keyboard dongle, 1.89 Watts for the old model B. The difference is 0.68 Watts might not sound like a lot, but 36% less power is consumed. Small volume, Size of Model B+ is 85.0 x 56.0 mm x 17mm and Weight is 40g. Compared to CPU(Central Processing Unit), Raspberry Pi Model B+ is Low cost, such as Raspberry pi B+ is almost 2 times lesser in cost when compared to CPU and also provides extra features like

HDMI(High Definition Multimedia Interface) port etc. High mobility, Where as Raspberry Pi Model B+ is a credit-card sized computer board with peripherals like keyboard, mouse, display, PSU and MicroSD card with installed OS are added in MicroSD card If any human entry is detected then it captures a particular image through Camera module and then call is forwarded to the predefined number, if call is lifted then TTS is appended to alert the user about the detection, if the not attempted the call then an SMS is send, also user can view the Live video streaming by the IP address and port number provided through MJPEG streamer algorithm.

REFERENCES

[1] Chongwen Wang, Sch. of Software, Beijing Inst. of Technol., Beijing, China Meiji Tian,"Passenger Flow Direction Detection for public Transportation Based on video" , 2010. Multimedia Communications (Mediacom), 2010 International conference Page(s):198 - 201

[2] De La Torre, **"**Automatic learning of appearance face models**"** F. Recognition, Analysis, and Tracking of Faces and Gestures in Real-Time Systems, 2001. Proceedings. IEEE ICCV Workshop, Page(s): 32 – 39.

[3] Kumar, S.Reddy, V.Prakash, P.Aparna, "Fast Response Search and Rescue Robot, Assisted Low Power WSN Net for Navigation and Detection", India Educators' Conference (TIIEC), Texas Instruments, 2013,Page(s): 12 – 17.

[4] Tao Yang, Quan Pan, Li, S.Z. Yongmei Cheng, Chunhui Zhao, "Real-time head tracking system with an active camera", 2004. Fifth World Congress Vol. 3, Page(s): 1910 – 1914.

[5] "Yashawanth Kanethkar," Let us C++ "2nd Edition, BPB Publications", 2003.

[6] http://blog.miguelgrinberg.com/post/stream-video-from-the-raspberry-pi-camera-to-web-browsers-even-on-ios-and-android.

[7] http://coding-robin.de/2013/07/22/train-your-own-OpenCV-haar-classifier.html

[8] http://note.sonots.com/SciSoftware/haartraining.html.

[9] http://en.wikipedia.org/wiki/Qt_(software)

[10] http://v4l.videotechnology.com/

[11] http://www.festvox.org/flite/

[12] www.festvox.org/flite/doc/flite_7.html

[13] http://wiki.openwrt.org/doc/howto/webcam

[14] http://en.wikipedia.org/wiki/Motion_JPE