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Automated Video Surveillance to Detect Suspicious Human Activity

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Abstract: *In recent years, with the latest technological advancements, off-the-shelf cameras became vastly available, producing a huge amount of content that can be used in various application areas. Among them, visual surveillance receives a great deal of interest nowadays. Until recently, video surveillance was mainly a concern only for military or large-scale companies. However, increasing crime rate, especially in metropolitan cities, necessitates taking better precautions in security-sensitive areas, like country borders, airports or government offices, schools and colleges. Human face and human behavioural pattern play an important role in person identification. Visual information is a key source for such identifications. The proposed system aims to identify abnormal head motions, thereby prohibiting copying. It will also identify a student moving out of his place or swapping his position with another student or looking into another student's computer. We aim to develop a system that will identify the students who indulge in malpractices/suspicious activities during the course of an online examination. The system automatically detects suspicious activities and alerts administration.*

Keywords: *OpenCV; Suspicious Activity; Examination; Haar Features; face detection; AdaBoost;*

I. Introduction

Video Surveillance has proven to be a key factor in enhancing the public security in many countries around the world. In spite of advancements in image processing and machine vision techniques very less is applied to actual implementation of such surveillance systems. Traditional methods wherein stand alone cameras provide just live feed to the observer are still deployed at most of the places but the need of today's world is to add some intelligence to this systems.

Manual monitoring of students during exam through invigilators and manual monitoring through surveillance videos is performed throughout the world. Monitoring the activities of students during online exam is a very challenging task in terms of man power. Manual monitoring of examination halls may be prone to error during human supervision. So there is need an 'automatic suspicious activity detection system' will not only help in detecting suspicious activities but also helps in minimizing such activities. Moreover, the probability of error will be much lesser. So this project aims **"To develop a system to automatically detect suspicious activity during online examination."** This system will serve as a useful surveillance system for educational institutions.[2].

II. Scope of the project

This project implements a technology in which real time videos are analysed and are used for student activity analysis in an online examination, thus helping to classify whether the particular person's activity is suspicious or not. The goal of the project is to implement the system having following specifications:

- automatically identify abnormal head motions, thereby prohibiting copying i.e. one student looking into another student's computer.
- identify a student moving out of his place or swapping his position with another student.
- analyse the activities of students in an online examination and alert the educational institute's administration on account of any malpractices/suspicious activities.[1].

III. System Specifications

The system consists of the software developed running on the computer on which online examination is to be conducted. The Webcam is connected to the same computer. The software that is designed, runs in the background along with the online examination running on the frontline. For the online examination, the computers used are placed at an appropriate distance from each other such that during normal situation, only one student (who is expected) comes in front of the webcam. Other specifications are as follows:

1. The camera resolution is between 0.3MP to 2MP.
2. The image size captured by the camera is 640 X 640.

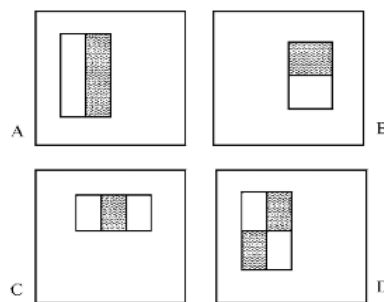
3. Input video frame rate is 30fps.
4. The lighting arrangement in the examination hall is sufficient so that camera is able to capture clear images.
5. A 2MP webcam is connected to the computer's usb port.
6. The camera is placed on the top of the computer monitor. i.e. it should be placed at some height to get proper facial images.
7. The camera is focused on the face of the person sitting next to it. For that, it is inclined at an angle of 20 degrees with the horizontal.
8. The image size captured by the camera is 640 X 640.
9. Input video frame rate is 30fps.
10. Platform: Microsoft Visual Studio2008, OpenCV2.4.2[3].

IV. Viola-Jones object detection algorithm in OpenCV

Paul Viola and Michael Jones presented a fast and robust method for face detection which is 15 times quicker than any technique at the time of release with 95% accuracy at around 17 fps. This work has three key contributions:

A. "Haar-Like" feature representation:

Figure 1 Haar-Like Classifiers



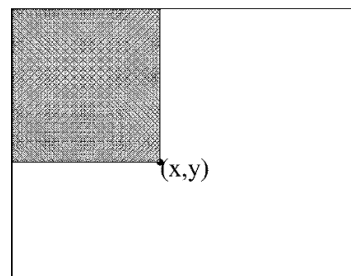
For their face detection framework Viola and Jones decided to use simple features based on pixel intensities rather than to use pixels directly. They motivated this choice by two main factors:

- Features can encode ad-hoc domain knowledge, which otherwise would be difficult to learn using limited training data.
- Features-based system operates must faster than a pixel-based system.

B. They introduced a new, efficient, method for features calculation, based on an "Integral image":

To enable an efficient computation of rectangle features, the authors presented an intermediate representation of an image, called an integral image.

Figure 2 Integral Image



The value of integral image at location $x; y$ is defined by the sum of the pixels from the original image above and to the left of location $x; y$ inclusively (see Figure 4.5.2.1). Formally,

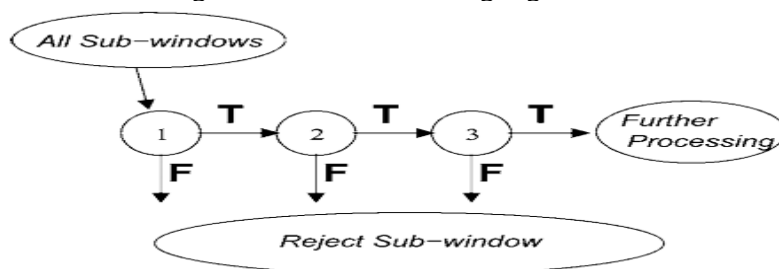
$$P(x, y) = \sum_{x' \leq x, y' \leq y} p(x', y').$$

C. They introduced a method for aggressive features selection, based on AdaBoost learning algorithm:

We can assume that a very small number of the extracted features can be used to form an effective classifier for face detection. Thus, the main challenge is to find these distinctive features. By drawing an

analogy between weak classifiers and features, Viola and Jones decided to use AdaBoost algorithm for aggressive selection of a small number of good features, which nevertheless have significant variety.

Figure 3 AdaBoost Learning Algorithm



V. Activity Classification

The detected faces by the above algorithm are tracked and according to different conditions, alert is given to the administrator.

The rules for defining the activity are as follows:

A. Normal Activity:

In case of following conditions, no alert is given by the system as these are the normal activities in the online examination:

1. In the frame, there is only one student who is allowed to sit in front of that computer.
2. The student is not looking into another student's computer or he is not looking back i.e. orientation of his head is within the allowed limit.

B. Suspicious Activity:

In case of following conditions, alert is given by the system as these are the normal activities in the online examination:

1. There is no-one in front of the computer i.e. student is absent or he has moved out of his place.
2. There are more than one faces in front of the camera. i.e. some other student has moved out of his place and looking into the specified student's computer or taking his help.
3. The head orientation of the student sitting in front of the camera is more than the allowed limit. i.e. student is taking help of another student.
4. The alert to the administrator of the examination is in the form of the beep sound coming from the computer.

VI. Results

Figure 4 Screenshot of Normal Activity Of The Student

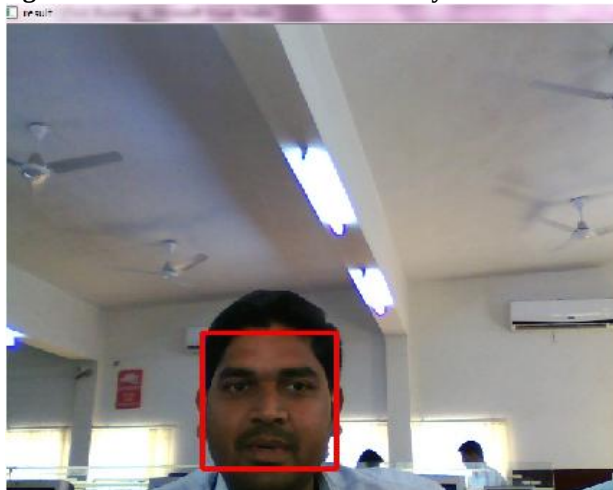
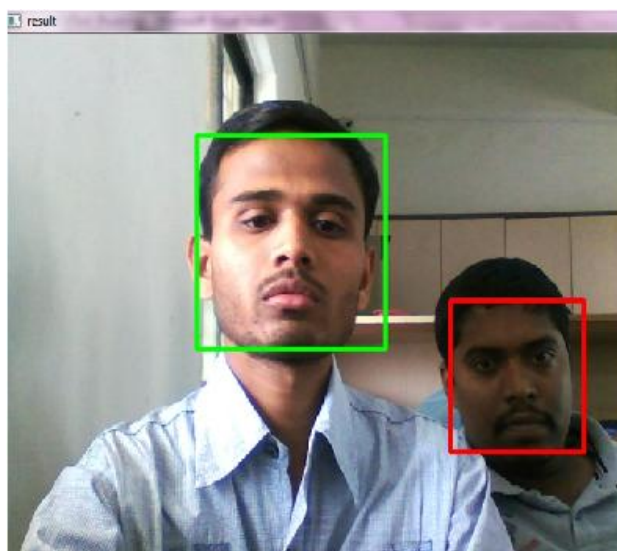


Figure 5 Screenshot of Suspicious Activity Of The Student



VII. Conclusion

It can be concluded that The proposed system can be very useful for the monitoring of students during online examination. It can be very useful to reduce the burden on the exam administrators. This system can play important role in current world of online education. So, this system -"**To develop a system to automatically detect suspicious activity during online examination.**" can serve as a useful surveillance system for educational institutions.

VIII. References

- [1] Paul Viola, Michael J. Jones, "Robust Real-Time Face Detection", International Journal of Computer Vision 57(2), 137–154, 2004.
- [2] Localization via Shape Statistics By M.C. Burl, T.K. Leung, and, P. Perona, Face localization via shape statistics. Int. Workshop on Automatic Face and Gesture Recognition, Zurich, June 1995.
- [3] OpenCV Tutorial 2.4.2.
- [4] Learning OpenCV by Gary Bradski and Adrian Kaehler Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- [5] Paul Viola and Michael J. Jones. Rapid Object Detection using a Boosted Cascade of Simple Features. IEEE CVPR, 2001. http://research.microsoft.com/enus/um/people/viola/Pubs/Detect/violaJones_CVPR2001.pdf.
- [6] Learning OpenCV by Gary Bradski and Adrian Kaehler Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.

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