Deep Learning Based Suspicious Activity Detection in Mass Gathering using Haar Cascade Algorithm

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Abstract **- Human activity recognition from real-time video is an efficient area of research for image processing and computer vision. With visual employment, human activities can be viewed in sensitive and public areas such as bus stations, railway stations, airports, banks, shopping malls, schools and colleges, car parks, roads, etc. Preventing terrorism, theft, accidents and illegal parking, vandalism, fighting, chain exploitation, crime and other suspicious activities were done. It is very difficult to view public places on an ongoing basis, so there is a need for intelligent video surveillance that can monitor people's activities in real time and distinguish them from normal and unusual activities; and may issue a warning. This Project provides precautionary measures based on the use of suspicious activity that can be used on surveillance cameras. Real-time cameras are becoming increasingly popular and are widely distributed in homes, offices, and public areas. As the number of camera views increases, one camera operator is unable to control the entire monitoring process and is limited by human resources. Also, it is not possible for humans to ensure continuous monitoring at all times. The project proposes an Intelligent Surveillance System based on in-depth study that can alert a person's operator or relevant authority to take appropriate action by posting using the IMAP protocol (Internet Message Access Protocol) where suspicious activity, disrupt public order and unusual human behavior such as administration is detected other weapons such as a gun, knife or glass bottles, which can be very dangerous. In this project, in order to allow for real use of the system, we focus on reducing the number of false alarms. Our system therefore ensures public safety where many people gather to avoid unnecessary consequences.**

Index Terms **- Suspicious human activity recognition, computer vision, Internet Message Access Protocol (IMAP), mass gathering.**

INTRODUCTION

1.1 OVERVIEW

Finding suspicious objects in crowded places is very important as it can help protect us from many criminal activities. This can be by using video statistics. Video statistics can be used to identify a person, to identify work, count objects and people, etc. Suspicious activities are unnecessary activities performed by people in certain areas. Examples of such work include talking on a cell phone, using glass bottles in classrooms, etc. Such unwanted activities can be obtained by analyzing that person's wishes. This project deals with the discovery of suspicious activity through independent analysis of video inputs. First, the video must be converted to frames and saved. These structures must be considered to remove the noise independently. After moving forward, the area of interest should be removed behind it. This can be done by finding the edges of your favorites and removing them from the background. After the background is finished the image should be processed to remove the sounds in it. After the audio output function the face detection algorithm should be used to detect the image in the image. After that, the people in the picture should be identified. Once people have been identified, the work they have done must be done. This could be performed by relating the pattern to the database. If the work done by a person is found to be suspicious, the relevant senior officials must be warned and details of the people involved in the work must be sent to them. With visual employment, human activities can be viewed in sensitive and public areas such as bus stations, train stations, airports, banks, shopping malls, school and colleges, car parks, roads, etc. It is very difficult to view public places on an ongoing basis, so there is a need for smart video surveillance that can monitor human activities and classify them as normal and unusual activities; and may issue a warning.

1.2 OBJECTIVES

- To design an intelligent system for automatic detection of suspicious activity in public places, school and colleges.
- To enlarge the technique by improving algorithms for detection of real-time variations in the frame and to generate a warning in real time, if the detected activity is suspicious and respective information will be send to concerned person.
- To develop a smart surveillance system that can detect abnormal human activities automatically without the supervision of human beings, thereby reducing manual work.
- To alert the authorities whenever the alarming situation is detected.

2. RELATED WORKS

1. Elliott, D., "Intelligent video solution: A definition"
   In terms of the term, Elliott recently described the intelligent video system (IVS) as "any video surveillance solution that uses technology to automate, without human intervention, processing, management and / or action or as a result of stored or live video images".
2. Venetianer, P. L., Deng, H. L., "Performance evaluation of an intelligent video surveillance system—A case study"
   IVS plugs computer viewing technology into video devices such as cameras, encoders, routers, digital video recorders, network video recorders and other video management and storage devices.
3. Kushwaha, A., Sharma, C., Khare, M., Srivastava, R., Khare, A., "Automatic multiple human detection and tracking for visual surveillance system"
   In this work, the authors propose another process of discovering and tracking many human objects in the video. The solution includes separation based on factors such as Haar acquisition of an object and a trace particle filter. Depending on the test results, the proposed process has good performance in adverse light conditions, variations in materials, textures, size, clothing etc. It is handled by population variation.
4. Yilmaz A, Javed O, Shah M, "Object tracking: a survey"
   Object detection is made using non-tracking methods or tracking-based methods. A tracking method is used to track the object over time by finding its place in all video frames.
5. Foresti GL, Marcenaro L, Regazzoni CS, "Automatic detection and indexing of video event shots for surveillance applications"
   Foresti et al. has improved the content-based retrieval of video-event shots content that can be fun. Exciting events refer to potentially dangerous situations such as omissions. The system is rigid in partial or temporary fragmentation between moving objects due to a long-term memory algorithm that retains ownership of the object after emergence. The success rate for video discovery is 95% for low weight, 75% for medium weight and 33% for high difficulty and 71% for retrieving discarded items.

3. PROPOSED METHODOLOGY

The captured video will be pre-processed to extract the images from video. For this purpose, the video will be converted from 24 fps to 1fps (frames per second) such that each and every individual frame will be extracted from the video. Then the extracted image will be compared for detection of suspicious activity. This system uses HAAR cascade algorithm to detect the suspicious activity in the live streaming video which is captured through real-time camera. Keras, a google database is used to detect the activity by comparing the input video frames with the pre-stored images in database.

Advantages:

- This project can be used as a real-life application of the system, as it limits the number of false alarms.
- The implementation to control the situation, By using this system which will avoid danger that may happen before the emailed person can take any action.

4. SYSTEM MODULES

There are five modules in this system

- Video processing module

- Dataset comparing module
- Recognition module
- Speech synthesis-pyttsx3 module
- Alerting module

Video processing module: Video captured from the real-time camera will be processed to check the presence of human in the frame.

Dataset comparing module: In this module, the images will be compared with the pre-stored images in the Keras dataset for detection.

Recognition Module: This module will recognize the detected objects in the images by classifying them as gun , knife or drinks bottle to differentiate the kind of action, the human is involved.

Speech synthesis-pyttsx3 module: In this module, the voice alert will be generated on receiving the detection input to warn the human.

Alerting module: Detect abnormal human activities automatically without the supervision of human beings, this module has to detect the region of interest in the images and if the unusual behavior is detected means the information send to authorized person with help of IMAP.

4.1 ARCHITECTURE DESIGN

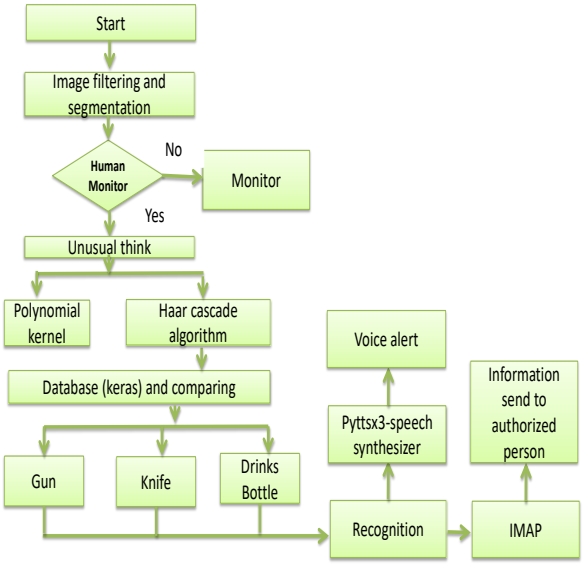


Fig. no: architecture Diagram for proposed system

5. ALGORITHM USED

5.1 HAAR CASCADE CLASSIFIER

Haar cascade classifiers based Detection of Objects is an operative technique discovered by Paul Viola and Michael Jones in their journal, "Rapid Object Detection using a Boosted Cascade of Simple Features". It employs artificial intelligence to perform the required function where cascade activity is trained from many negative and positive images. It is also used to find objects in other images.

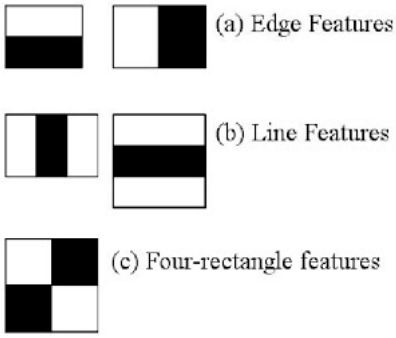
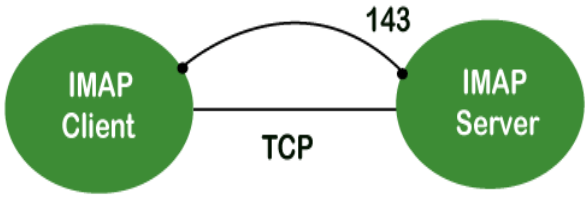


Fig no: HAAR cascade classifier

5.2 IMAP protocol

IMAP stands for Internet Message Access Protocol. It is a layer of application protocol utilized to get mails from the email server. They are the most commonly used protocols like POP3 to receive emails.

IMAP protocol also shadows the server / client technique. On one hand, we have an IMAP client, which is a computer-based process. On the other hand, we have an IMAP server, which is a process that also works on another computer. These computers are combined to each other via a network.



5.3 KERAS DATASETS

To allow people interested in machine learning to get off to a good start, Keras provide a wealth of databases within the framework (Keras, n.d.). This means we can start creating models without having to worry about details: we will only need a small amount of code to upload. The reason behind this is simple: getting data to work for you is a notorious bottle in machine

learning projects. Usually, the data is found in CSV sheets, traditional SQL databases, or worse - in Word documents or PDF files. We will need to scrape, clean, and store data on items such as Pandas dataframe, before using it on our machine learning model.

Our image after thresholding, will be as follows,

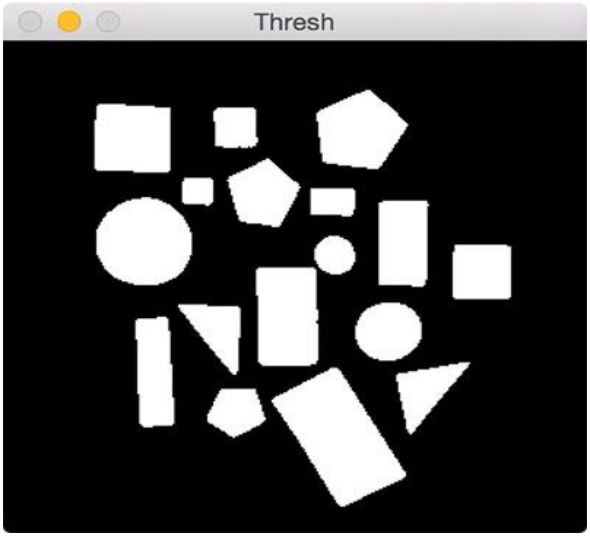


Fig no: Thresholding reveals the shapes in our image.

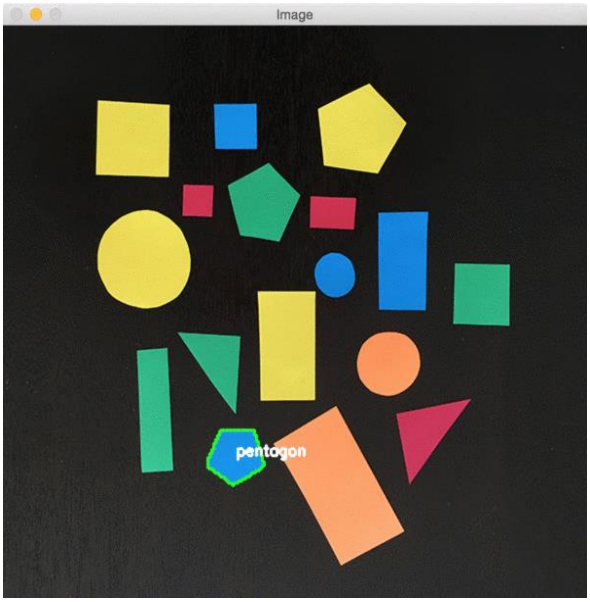


Fig.no : Performing shape detection with OpenCV.

6. SYSTEM SOFTWARE

6.1 QT DESIGNER:

It is the Qt tool to design and build GUIs (graphical user interfaces) with Widgets in Qt. We could build and modify the dialogs or windows according to our need in a WYSIWYG (what-you-see-is-what-you-get) way, and verify them utilizing various resolutions and styles.

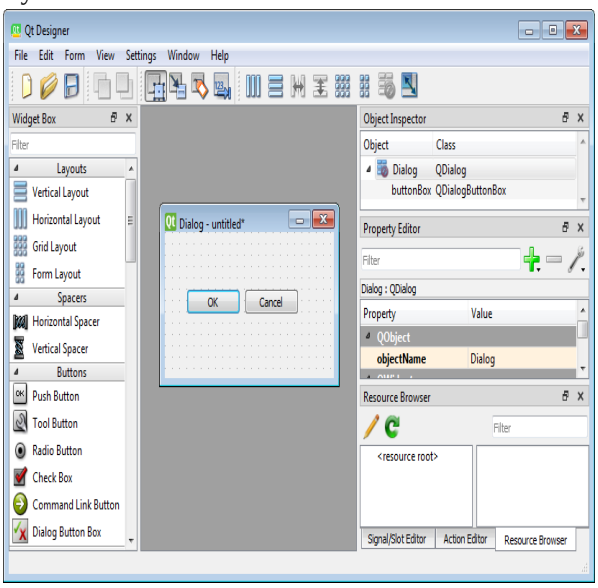


Fig. no: Qt Designer

Forms and Widgets build with Qt Designer combines with code that is programmed seamlessly, utilizing Qt's signals and slots approach, thus we could easily allot action to elements of graphics. Furthermore, features like custom plugging and widget promotion permit us to utilize components of our own in Qt Designer.

6.2 LANGUAGE USED-PYTHON

The system utilizes Python programming language with Google's Tensorflow Machine Learning Library to build and deploy the CNN. Python is a popular programming language.

It is used for:

- web development (server-side),
- software development,
- mathematics,
- System scripting.

APPLICATIONS

- It could be used on a server to create web applications.
- It could connect to systems of database.
- It could be utilized to manage huge data and do complicated calculations.
- It could be used for rapid prototyping, or for production-ready software development.

7. RESULTS

Thus the detection of suspicious activity in public gathering was performed with high efficiency and precision and all the expected outputs were successfully implemented which is represented as follows,

Fig.no: : First Window

Fig.no: : First window (Staff Login Page)

Fig.no: : Bottle detected and bounding boxes drawn around the detected object along with the confidence

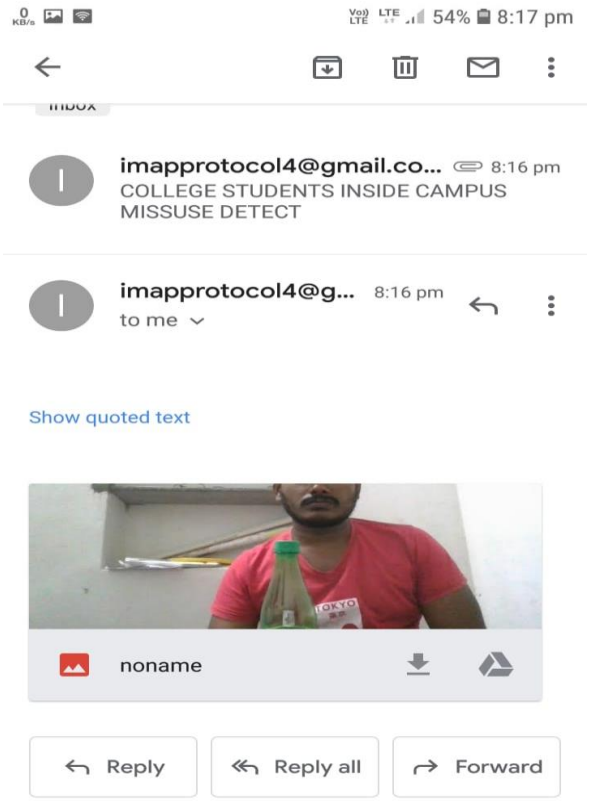


Fig.no: : Alert mail sent to the user through IMAP protocol

8. CONCLUSION

We implemented Suspicious Human activity Recognition Surveillance System, which will be useful in detecting and recognizing abnormal activities in educational institutions. Human supervisors are error prone, and their efficiency is affected by fatigue, sickness and any other factor. We analyzed various approaches for detection of nose, hand, face, eyes and recognition for the purpose of Human tracking in Crowded Scenes and Videos. We also study several algorithms of feature extraction, Feature Matching, and Human Activity Recognition to build a fast and also a robust system to detect and recognize unusual activities in schools and colleges. We will improve some algorithms of Human Activity Recognition to develop fast and reliable system of recognizing any Human activity. We will develop algorithms that can predict Human Activities with high certainty and efficiency to detect and prevent criminal activities before occurring in educational institutions. Thus our system helps in ensuring safe environment and the public places etc.

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