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Human Suspicious Activity Recognition

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Abstract: Surveillance security cameras are progressively being used for monitoring purposes in almost every area, especially watching people and their behaviour for safety purposes. In criminology, photos taken from such devices are typically used to determine who may be the individuals involved when an accident happens. Although this cameras use is essential for a post-crime response, real-time surveillance is required to serve as an early alert to deter or stop an incident before it arises. We developed and implemented an early warning system in this project that automatically identify people in a surveillance camera environment where no human movement happens in a specified time period and then utilized data from our database to identify whether or not the person is authenticated. If not, we will alert the approved person or people by text message and give their Android application a snap of the specific location. Using convolutional neural networks we train a feature extraction model for face recognition to get a strong recognition performance on the Chokepoint data set obtained utilizing surveillance cameras. The approach also gives the purpose of sending suspicious location images to an android app for that we are creating a mobile application using the Android language.

Keywords: Surveillance, security camera, monitoring, early warning, intelligence service, digital image processing.

1. INTRODUCTION

Video surveillance systems are fixed, utilized nearly For tracking intention these days everywhere, reviewing, then recording incidents which may happen Around allowing only other people to access a building to identify potentially suspicious offenders as early as possible and as defensive. Images from surveillance video cameras / closed-circuit television (CCTV) are utilized as valuable proof for identifying key individuals involved in the crime during criminal investigations. By principle, it would be a simple method for police officers and professional forensic experts to use CCTV images to recognize individuals involved in a crime scene and compare these captured face images to gallery images of suspects. It might be valid for specific cases, and inexpensive. The new age of globalization and the related big data, though, makes manual study unfeasible and thus drives hard towards more efficient automated systems capable of assisting researchers in their duties.

Through this project we develop an early warning system which is capable of recognizing the human motion by the methods of digital image processing which can be used for face recognition, edge detection etc.

Also the CCTV cameras detect the motion in today's scenario. The way it works is to compare sequential images from your film, and if enough of the pixels have changed between those frames, the camera program will assess something being moved and will give you an alert. But this would be unnecessary for those areas where we only need to detect the motion of human beings or to recognize whether a human is authenticated or not.

Since recent advancements in technology and machine learning models are being suggested, face recognition using a computer outperforms human output in the ability to recognize individuals using facial images in many cases. This also helps to simplify the recognition process by identifying face photos captured by surveillance cameras, which addresses a issue many existing surveillance systems have, i.e. they are mainly used as recording devices. So that when an accident happens, when an irregular activity occurs in the picture frames, cameras are utilized to examine after and not as part of an automated alert system. It is assumed that a modern surveillance system can conduct real-time analysis on the images it receives, and aren't just simple object detection and recognition. But also to perceive the actions of artifacts and alert security officials of any on-the-spot security violation, and thus avoid further risk.

We can also use the OPENCV- Python library for face recognition of human beings. We will be applying deep learning in two main steps to develop our OpenCV face recognition pipeline:

1- Apply face detection that detects but does not identify the existence and position of a face in an image.

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2- Extracting the vectors of the 128-d feature (called "embeddings"), which measure each face in an image.

If any face is detected then we take a snap of that particular video frame and upload it in our web server and forward it to the android application of the authorization. Similarly we also drop the text message to the registered phone number.

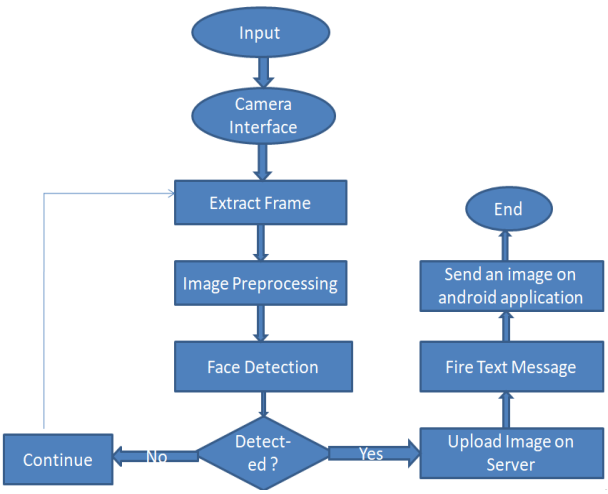
The contributions of this paper are:

a. An early warning system able to highlighting possible threats and hence avoiding, preventing or at least deducting the potential for disaster-induced attacks in those particular areas where no human motion occurs within a particular time duration.

b. Capturing a face image, and then uploading the image into the web server.

2. METHODOLOGY

Figure 1 indicates the overall approach for the current surveillance program Firstly, security cameras are being utilized to observe a field of interest whether it is a campus, military base, street, etc. The gathered images from these cameras are then fed to the "Face Detection" process that implement opencv python library methods to extract face images.



A. Extract Frame

As I am using python programming language to build my prototype of this solution. I will show you how to extract and save frames from a video file in python. Steps are--

Step 1: Open the Video file or camera using cv2.VideoCapture()

Step 2: Read frame by frame

Step 3: Save each frame using cv2.imwrite()

Step 4: Release the VideoCapture and destroy all windows

B. Image Preprocessing

Image processing is any method of processing that an image or a collection of images, like photos, is an input. The performance of the image processing may be either an image or a set of features or parameters relevant to the image. Initially, import images using an optical system like a mirror, or render them using a computer-generated imagery. Manipulate or analyses, in certain manner, the images. This phase may involve Image Enhancement and Data Description, or the images are evaluated for guidelines that have never been seen by human eyes. The result could be a modification of image in certain way or a report based on a review. The digital image processing is utilized of a digital computer to process digital images utilizing an algorithm. As a specific category for digital signal processing, contains several benefits over analog image processing. It permits lots of broad variety of algorithms to be implemented to input data and can prevent complications including such sound build-up and distortion in processing. It can deliver both more complex results on basic tasks and the implementing approaches which would also be impossible by analog means. For example, to apply the affine matrix to an image, the image is transformed to a matrix where each entry corresponds to the pixel intensity at that position. The location of each pixel can then be represented as a vector denoting the coordinates of that pixel in the image, [j, n] where n and j are the column and row of the pixel in the image matrix. Which permits the coordinate to be multiplied by an affine-transformation matrix, that provide the location that the pixel value is replicated to the output image.

C. Face Detection

I did face detection using Haar cascades that is a machine-based learning method where a cascade function is trained with input data set. OpenCV now also includes many pre-trained facial, eye, smile, etc. classifiers. We'll use the face classifier today.

You can experiment with other classifiers as well.You need to download the trained classifier XML file (haarcascade_frontalface_default.xml), which is available in OpenCv's GitHub repository. Save it to your working location.

Let's see the code –

```
import cv2
# Load the cascade
face_cascade =
```

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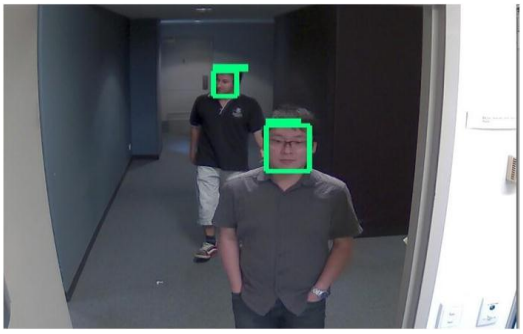
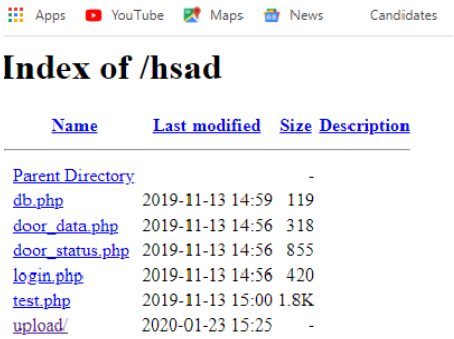
```
cv2.CascadeClassifier('haarcascade_frontalface_default.
xml')
# Read the input image
img = cv2.imread('test.jpg')
# Convert into grayscale
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
# Detect faces
faces = face_cascade.detectMultiScale(gray, 1.1, 4)
# Draw rectangle around the faces
for (x, y, w, h) in faces:
cv2.rectangle(img, (x, y), (x+w, y+h), (255, 0, 0), 2)
# Display the output
cv2.imshow('img', img)
cv2.waitKey()
```

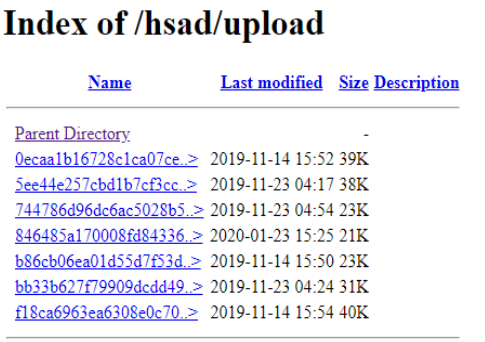
A few things to note:
1: The detection works only on grayscale images. So it is important to convert the color image to grayscale. (line 8)
2: detectMultiScale function (line 10) is used to detect the faces. It takes 3 arguments — the input image, scaleFactor and minNeighbours. scaleFactor specifies how much the image size is reduced with each scale. minNeighbours specifies how many neighbors each candidate rectangle should have to retain it. You can read about it in detail here. You may have to tweak these values to get the best results.
3: Faces contains a list of coordinates for the rectangular regions where faces were found. We use these coordinates to draw the rectangles in our image.
If the face of a human being is not covered by the CCTV camera then we can also detect any of the other parts of a human being.
If we detect the human in the extracted frame then we convert that frame into the string by using the BASE64 algorithm and upload it to the web server from which the android application is also connected.

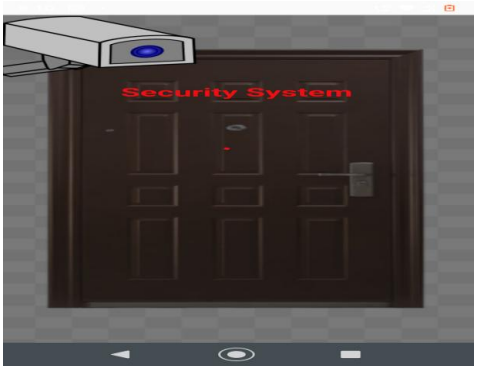
3. RESULT

As the experimental result of our project I have attached the snapshots(web services, android application) of my working project below which works properly.

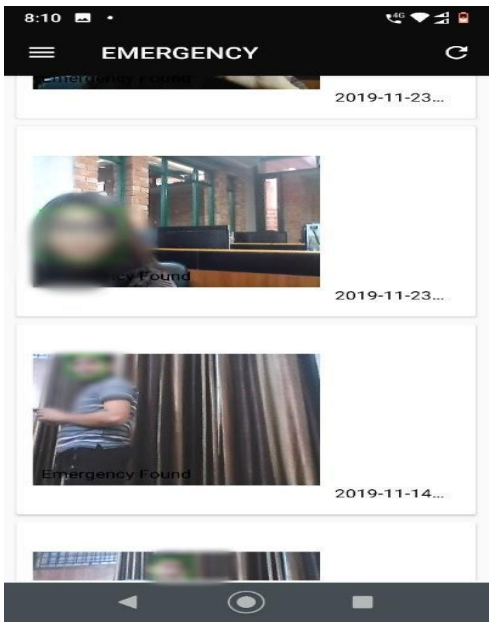








I blur the images due to privacy concerns.



4. DISCUSSION

Comprehension of human activity has become one of the most ongoing research subjects in computer vision. The type and amount of data every approach utilizes depend on the willingness of the underlying algorithm to handle heterogeneous and/or large-scale data. The initial step in creating a framework for the identification of human activities is to create an effective human activity database. The database can be used for training and research purposes. A systematic survey covering essential factors of databases for the identification of human activities. An adequate human activity data set is needed for the creation of a framework for the identification of human activity. This dataset must be adequately rich in a variety of human activities. In addition, the creation of a data set must be consistent with real-world scenarios. The quality of the input media that forms the data set is one of the most valuable aspects which must be taken into account. These input media may be static, animated or gray-scale images or video sequences. The ideal dataset for human activity must address the following issues: i). Complex backgrounds, ii). The input media will contain either still images and/or video clips, iii). Huge number of subjects performing an action, iv). Input media quality (resolution, grayscale or color), v). The amount of data must be adequate, vi). Photo shooting under partial occlusion of human structure, vii). Huge number of action classes, viii). Huge intraclass variations (i.e., variations in subjects' poses), and ix). Modifications in illuminations.

In addition to the enormous amount of research in this area, the generalization of the learning system is essential to modeling and interpreting human behaviors in the real world. Many other problems that relate to the capacity of the classification system to generalize under external conditions, such as differences in human attitudes and specific data acquisitions, remain accessible. The potential of human behavior and the classification system to mimic human capacity to identify human acts in real time is a future problem to be tackled.

5. CONCLUSION

Future research can also address low contrast circumstances, i.e. related color problems such as black bags and black backgrounds that lead to missed detections. Future enhancements can include the incorporation of depth and intensity signals in the form of 3D accumulation of evidence and occlusion analysis in detail. Spatial-temporal features could well be lengthened to 3-dimensional space for enhancement of abandoned object detection approaches for different complex environments. Threshold-based future research can enhance the accuracy of the surveillance system through adaptive or hysteresis thresholding approaches. Even several research were also designed from the various views captured through multiple cameras to detect forsaken objects. It can also be enhanced to integrate certain multiple views to infer details about abandoned objects. We will improve some algorithms of Human Activity Recognition to develop a fast and reliable system of recognizing any Human activity. We will also work on other biometric features to incorporate variation into the Human activity Recognition System. We will develop algorithms that can predict Human Activities with high certainty and efficiency to prevent criminal activities before occurring. Thus the Suspicious Human Activities can be detected using this system. Further, this system can be extended to detect and understand the activities of people in various scenarios.

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