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SMART ATTENDANCE APPLICATION - 'SOLUTION TO PHOTO ATTACKS PROBLEM'

Abhay Mudgal, Naman Tyagi, Himanshu Sidhu, Anant Vats
Department of CSE
IMSEC, AKTU, Ghaziabad
Uttar Pradesh, India

***Abstract*— Face recognition is one of the most necessary application of image analysis and has gained significant attention. It has seen wider use in recent times on mobile solutions. Analysis within the field of automatic face platform and in different sorts of technology has been conducted since the 1960s, but it's generally used as an access management. This study is to propose an answer to the matter of security system and might be compared to different photograph attacks in face recognition system by finding pattern in eyes (closed or open) to differentiate system. Recently, it's conjointly became widespread as a difference between a true external body and a photograph.**

Keywords— **Face Recognition, Attendance, Photo attacks human - computer interaction, video police investigation.**

I. INTRODUCTION

An automatic face recognition system may be a technology capable of most recognition algorithms you discover of distinctive someone from a digital on the web and analysis paper bear photograph image or a video frame from a video supply. These strategies work rather well at recognizing area unit multiple strategies during which automatic face recognition faces on pictures, videos and video streams from system work, however normally, they work by digital cameras. It is also described as a Biometric Artificial Intelligence based application that can uniquely identify a person by analyzing patterns based on the person's facial textures and shape.
While initially a form of computer application, it has seen wider uses in recent times on mobile platforms and in other forms of technology, such as robotics. It is typically used as access control in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems. Recently, it has also become popular as a commercial identification and marketing tool.[6] Other applications include advanced human-computer interaction, video surveillance, automatic indexing of images, and video database, among others.

Almost all facial recognition algorithms you find on the internet and research papers bear photo attacks. These methods work really well at spotting faces on images, videos and video streams from webcam. However they can't distinguish between live faces and faces in a photo. This incapability to identify faces is due to the fact that these algorithms work on 2D frames.

Now let's imagine we would like to implement a facial recognition within the continuous movement of the pixel. The method would work well to tell apart between known faces and illustrious faces so that only authorized persons have access. Though, it would be easy for an ill-intentioned person to enter by only showing an authorized person's photo. This is where 3D detectors, identical to Apple's FaceID, enter the game. However what if we tend to don't have 3D detectors?
The remainder of the paper is organized as follows. Associated work is explained in section II. Methodology, Rule and Technique used are presented in section III. Graphical User Interface is given in section IV. Terminal remarks are given in section V and References in section VI.

II. ASSOCIATED WORK

There is a great variety in the way facial impressionism is interpreted for recognition by an automatic system. Currently a lot of different systems are under development, and which is adequate may depend on the application domain. A major difference in approach path is whether to represent the visual aspect of the face, or the geometry.
Moving object detection and tracking algorithms play an important role in the intelligent video surveillance system. This methodology aggregates the inter frame difference method with background subtraction which makes use of color, texture information and dual threshold to detect moving targets. This method includes background subtraction and optical flow methods. Background subtraction method to detect the moving object process involves first setting a threshold value for the variation in gray pixels and a second threshold value is set for the moving target in the whole image. If two threshold values are equivalent then the detection of the target is achieved with some flexibility to change in background. Optical flow method uses the instant velocity which is generated in the continuous

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movements of the pixels in the moving object. This algorithm has poor anti-noise functioning and computation is complicated with large hardware setup. Interframe subtraction used to find the difference between two adjacent frames to detect moving targets. It has poor connectivity and has strong environmental flexibility to some extent.

III. METHODOLOGY, ALGORITHM AND METHOD USED

DATASET:
The LeNet-5 model has been chosen, which has been trained on the *Closed Eyes Within The Wild (CEW)* dataset. It's a mixture of around 4800 eye images in size 24x24.

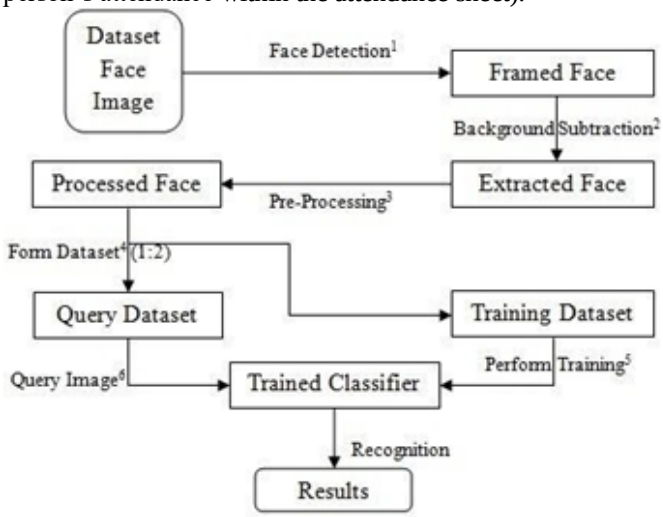
Face Detection:
Face detection is done using *face_locations()* method which could rely upon the appliance domain a Bar chart of homeward gradients (HOG) and Convolutional Neural Network (CNN). The (HOG) method is chosen.

Face Encoding:
Face Encoding is done using *face_encodings()* The inhumane frame distinction technique with background operate that may be pre-trained Convolutional Neural Network that makes use of color, texture neural network capable of secret writing a picture info and twin threshold to notice moving a vector of 128 features. This embedding vector should represent enough data to differentiate between two distinct persons.

Face Comparison:
Face Comparison is completed using *compare_faces()* method that computes the gap between two embedding vectors. It'll enable the algorithmic rule to recognize faces retrieved from a digital camera frame and compare its embedding vector with all encoded faces in our dataset. The closest vectors ought to match to an equivalent person.
Function used for sleuthing and identifying real faces takes arguments:

- model: our open/closed eyes classifier
- video_capture: a stream video
- face_detector: a Haar-cascade face classifier.
- open_eyes_detector: a Haar-cascade open eye classifier.
- left_eye_detector: a Haar-cascade left eye classifier.
- right_eye_detector: a Haar-cascade right eye classifier
- data: a wordbook of familiar encodings and known names
- eyes_detected: a wordbook containing for each name the eyes standing history.

ALGORITHM
The algorithmic rule works in real time through a digital camera and displays the person's name as long as they blinked. The program runs as follows:
1. Detection of faces in every frame that is generated by the digital camera.
2. Sight eyes in each detected face.
3. Sight if eyes square measure open or closed for every detected eye.
4. If at some moment it had been detected that the eyes were open then closed then open, we tend to resolve the person has blinked and the program exhibits its name (in that event our biometric authentication attendance system, can mark the person's attendance within the attendance sheet).



METHODS USED

Histogram of familiarised gradients(HOG):
The **bar graph of familiarized gradients (HOG)** may be a feature descriptor utilized in computer vision and image process with the intent of object detection. The technique enumerates occurrences of gradient orientation in localized parts of a picture. This technique is comparable to that of edge orientation histogram, scale-invariant feature remodel descriptors, and form contexts, however differs in that it is computed on a dense grid of uniformly spaced cells and uses overlapping native distinction normalization for improved accuracy.

A sampling technique is outlined for each picture element and its neighbors are recovered in an exceedingly intrinsical manner to form an occasional level vector. The sampling is completed for all trained pictures for each picture element within the image and therefore every picture element can have a connected low level feature vector. HOG options square measure native descriptors, and human options are created by computing the local direction of the gradient. Projected descriptors could describe well the sting information of humans; conjointly the tactic is strong to miniature variations and less offset. The gradient of the picture of (x, y) in a picture will be denoted in equation 1 and 2 as:

$$Gx(x, y) = H(x+1, y) - H(x-1, y) \quad (1)$$
$$Gx(x, y) = H(x, y+1) - H(x, y-1) \quad (2)$$

Where Gx (x, y) denotes the horizontal direction gradient of input image picture element, Gy (x, y) denotes the vertical method gradient and H(x, y) denotes the picture element values.

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Then the gradient magnitude and direction of (x, y) will be diagrammatical in equation three as:
$G(x,y) = sqrt(G^2x(x,y)+G^2 y(x,y))$
$\alpha(x,y) = \tan^{-1} [Gy(x,y)/Gx (x, y)]$

Steps to sight humans using HOG is as follows:

- Hog model is predicted on dominant edge orientations.
- Edge detection is then applied on the image.
- Within the third step the image is split into cells.
- Bar Graph of edge orientations are then compiled.

Convolution Neural Networks(CNN):

Due to the evolution of convolutional neural networks, the accomplishments made in many contests are becoming ameliorated, creating it the concentrated example of analysis. So, to enhance the coaching performance of the forward BP algorithm, an economical technique is to change the number of learning parameters. This could be done by convolution of the abstraction relationship of the neural network. Convolutional neural network, the network structure is planned, it minimizes the input data pre-processing. Within the structure of convolution neural networks, the computer data is input from the initial input layer, through every layer process, and then into the another hierarchy, every layer contains a convolution kernel to search the essential data characteristics. The antecedently mentioned apparent features like translation, rotation and therefore the like would be extracted by this method.

Convolution neural network basic structure:

Neural networks could be divided into two sorts, biological neural networks and artificial neural networks. Here primarily introduces artificial neural networks. A man-made neural network may be a information model that processes information computationally and is related to the structure of the junction connections within the brain. Neural networks contains of many somatic cells; the output of the previous neuron can be used as the input of the later somatic cell. This unit is also referred to as Supply regression model. When many neurons are coupled along, and once they were stratified, the structure will currently be referred to as a neural network model. Figure One demonstrates a neural network with hidden layers.

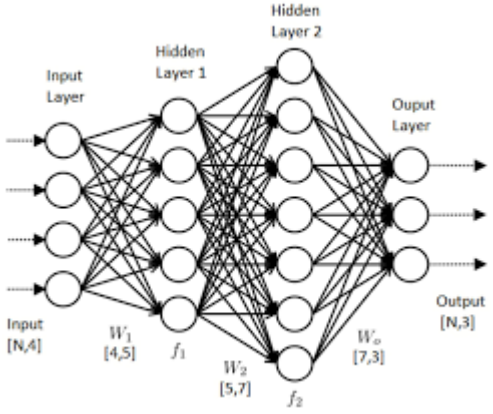

Figure One: Neural Networks

CNN Model Construction and Training:

At present CNN is that typical design of neural networks divided into the subsequent categories: LeNet5, AlexNet, ZF Net, GooLeNet, and VGGNet, the subsequent LeNet5 design for detailed analysis. LeNet5 is a CNN classic structure that existed historically, and it's primarily utilised in the recognition of written fonts. It consists of seven layers of structure, excluding the input layer, each of the other has coaching parameters, and every layer contains a relative majority of Feature Maps, we are able to pull out the input features through a convolution kernel. And each feature consists of multiple neurons. The image below shows the design of LeNet5:

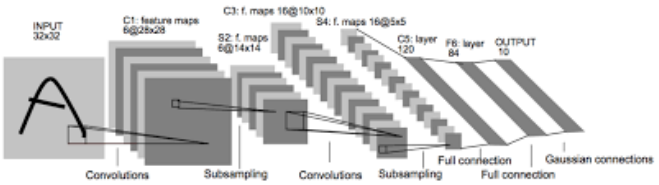

Figure: LeNet5 structure diagram

For the detection and recognition of faces we have to install the face_recognition library that can offer very helpful deep learning ways to search out and identify faces in a picture specially, the face_locations, face_encodings and compare_faces functions are the three most useful.

The *face_locations()* technique will identify faces using two techniques*:* Bar chart of destined Gradients (HoG) and Convolutional Neural Network (CNN). Due to the timeline the *HoG* technique was chosen. The face_encodings function is a pre-trained Convolutional Neural Network ready to cypher associate an image into a vector of 128 options. The embedding vector ought to represent adequate data to differentiate between two distinct persons.

Finally, the compare_faces() technique calculates the distance between two embedding vectors. It will grant the algorithmic program to acknowledge faces extracted from a digital camera frame and compare its embedding vector with all encoded faces in our dataset. The closest vectors ought to represent the identical person.

IV. GUI

The Graphical User Interface is developed via the Tkinter library of python3.Tkinter is a Python binding to the Tk graphical user intreface toolkit. It's the quality Python interface to the Tk GUI toolkit, and is Python's actual normal graphical user interface. Tkinter is enclosed with normal Linux, Microsoft Windows and Mac OS X installs of Python.The name *Tkinter* comes from the Tk *interface*.Tkinter is free software package free beneath a Python license.

As with most another modern Tk bindings, Tkinter is introduced as a Python wrapper around an entire Tcl interpreter integrated within the Python interpreter. Tkinter calls are remodeled into Tcl commands which are dropped at this embedded interpreter, thus making it possible to combine

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Python and Tcl in a very single application. There are four phases for making a widget

1. Create: Create it inside a frame.

2. Configure: Change the widgets attributes.

3. Pack: Pack it into position thus it become visible.

4. Bind: Bind it to a perform or event.

These are typically focused and therefore the place may vary.

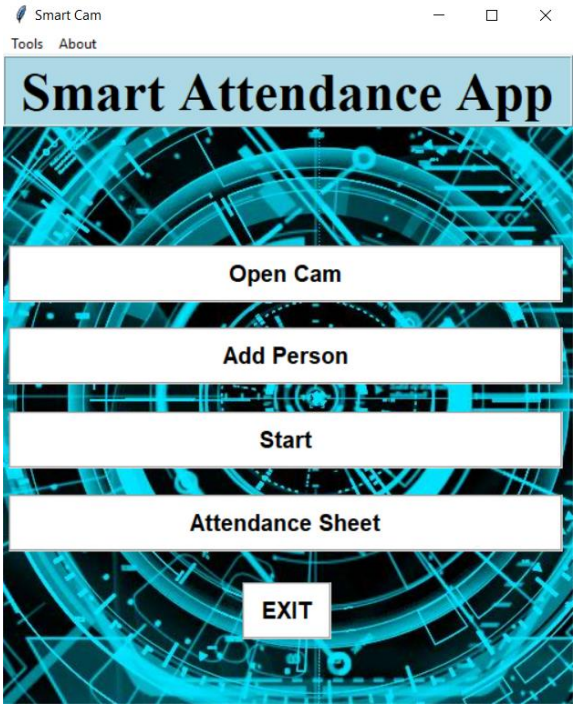

Figure: Graphical User Interface of Application

Adding Person:

A new person is add by clicking on the 'Add Person' button within the Graphical User Interface then writing the name of the person within the provided text box. The system after taking the name reveal the camera

and take four initial pictures of that person's face and store them within the faces directory. Each time a new person is added the system mechanically reveal the camera and takes four pictures of that person on that the additional algorithmic program is applied.

The system once taking the person name stores solely the rectangular region of the face within the faces directory and therefore the remaining part of the image is ignored. Each face image is kept with its id. For eg. User_{Person name}_i.jpg , wherever i is that id of image and i=1,2,3 and 4.

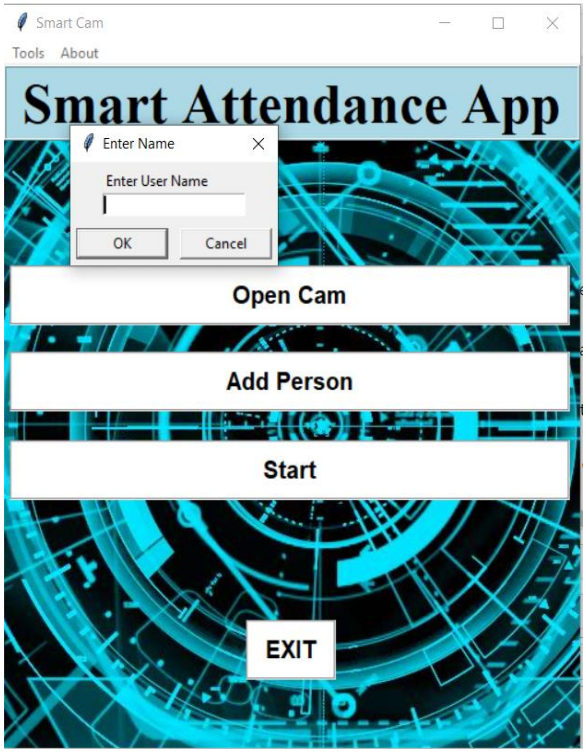

Figure: Adding new person

FACE LIVENESS DETECTION:

We nearly have all the parts to line up our "real"-face recognition algorithmic program. We tend to simply want a path to observe faces and eyes in period of time. We used openCV pre-trained Haar-cascade classifier to execute these chores.

The objective is to search out associate an open-closed-open eye model at some part. We tend to train a Convolutional Neural Network to classify whether or not an eye fixed is closed or open. The chosen model is the LeNet-5 that has been trained on the *Closed Eyes In The Wild (CEW)* dataset. It combines of around 4800 eye images in size 24x24.

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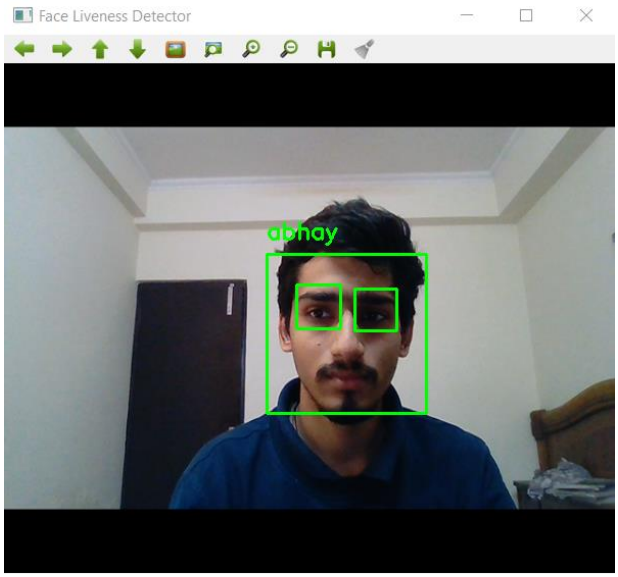

Figure : Face Physiological Properly Detection & Recognition

While examining the model, we tend to achieve ninetyfour percent accuracy. Each time we try to observe an eye fixed, we tend to predict its position exploitation using our model, and we keep the track of the eyes standing for evwery person. Consequently, it becomes genuinely simple to find an eye fixed blinking status that makes an attempt to search out a closed-open-closed pattern within the eye's standing history.

ATTENDANCE SHEET:

Attendance sheet can be generated by clicking the 'Attendance Sheet' button accessible within the graphical user interface.
Attendance sheet is associate surpass file saved with the 'attendances sheet/today's date' format and contains the name of the person column and gift column with the values 'Yes'.

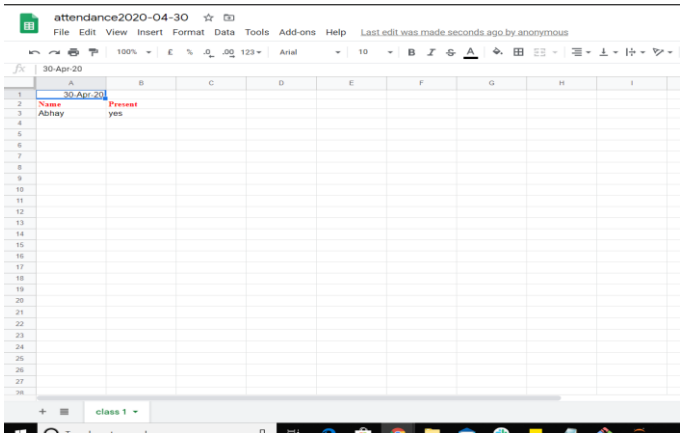

Figure: Attendance Sheet

V. CONCLUSION

In the study we tend to examine how can we resolve the matter of image attacks within the system. In this we tend to train a program for a 3D face recognition rather than a 2D face recognition.
Nowadays there are solely 2D recognition that let users bypass the protection very simply by solely taking a photograph of any person to gain access. So, we implemented a 3D face recognition system during which there is a blink detection that can only be passed by the physical presence of the user solely.
For the aim we tend to use Barchart of Destined Gradients (HOG) that is employed as a feature descriptor employed in pc vision for the aim of object detection. We tend to train the program in such a way that it detects the closed eyes. Within the Wild dataset easily; once this step is cleared by person then solely his presence would be marked in a vary database. Doing thus we tend to additionally got associate accuracy of ninety four percent.
We expect that the data provided may be used additionally for the study.

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