Face Recognition based Attendance System

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Abstract: - Gesture recognition and pattern recognition are advancing at an exponential rate in the passing years. Hand gesture recognition has been a great research area. Hand gesture recognition system provides us a natural, innovative user-friendly way of communication with the computers. Gesture recognition has a varied area of application including human-computer interaction, sign language, game playing etc. Hand gesture recognition have enormous in human-computer interaction and robotic machinery. Today interfaces between human and computer are mouse and keyboard but in near future hand and eye gestures would replace it. Through this application, we can count the number of fingers we are showing in front of the camera. Using computer vision technology this might not give very accurate results.

Key-Words*: -*Attendance system, Computer Vision, facial recognition, Human-Computer Interaction

1.   Introduction

This is project about Facial Recognition-Based Attendance monitoring system for educational institution. According to the previous attendance management system, the accuracy of the data collected is the biggest issue. This is because the attendance might not be recorded personally by the original person, in another word, the attendance of a particular person can be taken by a third party without the realization of the institution which violates the accuracy of the data. The most of the parents are very concerned to track their child's actual whereabouts to ensure their kid really attend the classes in college/school so this system will help to ensure that.

2.   Literature Review

Many researches has already been done on this topic and many researchers have published their own ideas on facial recognition based attendance system. These include Open CV only recognition which is not very accurate since it uses convex-hull method. A deep learning approach, in which a large amount of data set has been used to train models and face gesture detection.

2.1 Open CV

Open CV is a **Python open-source library**, which is used for computer vision in Artificial intelligence, Machine Learning, face recognition, etc. In Open CV, the CV is an abbreviation form of a computer vision, which is defined as a field of study that helps computers to understand the content of the digital images such as photographs and videos.

2.2 NUM PY

Since Python is arguably the most widely used language in machine learning, NumPy represents a critical core feature of an engineer's toolkit for neural networks and associated machine learning programs. By utilizing the library resource, programmers are able to order all of this higher-level analysis in a way that promotes efficiency. Other libraries and tools such as SciPy are also helpful toward this end, but NumPy specifically addresses the need for large multidimensional arrays and matrix numerical storage.

2.2 PANDAS

Pandas is an open-source library that is made mainly for working with relational or labeled data both easily and intuitively. It provides various data structures and operations for manipulating numerical data and time series. This library is built on top of the NumPy library. Pandas is fast and it has high performance & productivity for users.

2.3 TINKTER

Python offers multiple options for developing GUI (Graphical User Interface). Out of all the GUI methods, tkinter is the most commonly used method. It is a standard Python interface to the Tk GUI toolkit shipped with Python. Python with tinkter is the fastest and easiest way to create the GUI applications. Creating a GUI using tkinter is an easy task

2.4 Tensor Flow Architecture

Tensor Flow is an open source software library for high performance numerical computation. Its flexible architecture allows easy deployment of computation across a variety of platforms (CPUs, GPUs, TPUs), and from desktops to clusters of servers to mobile and edge devices. Originally developed by researchers and engineers from the Google Brain team within Google's AI organization, it comes with strong support for machine learning and deep learning and the flexible numerical computation core is used across many other scientific domains.
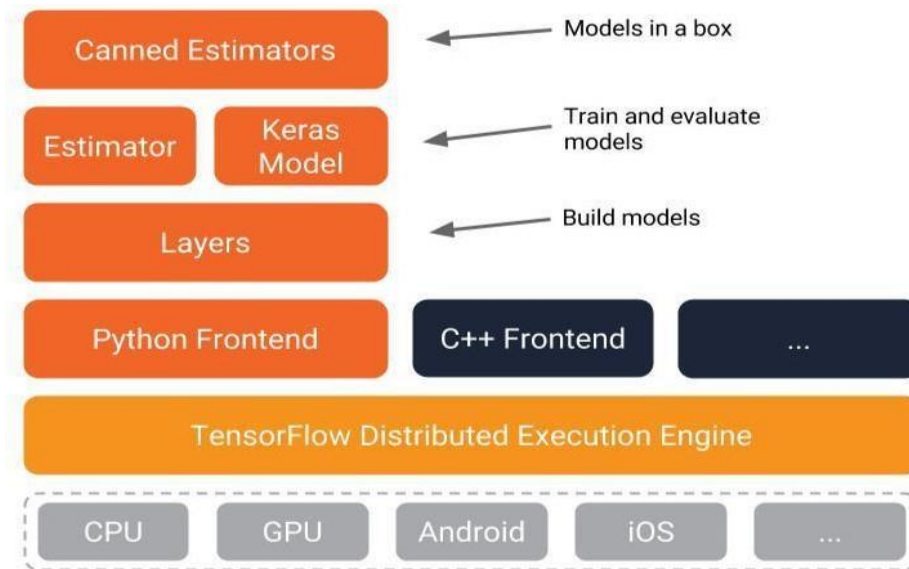
3. Methodology

Before the attendance management system can work, there are a set of data needed to be input into the system which essentially consist of the individual's basic information which is their ID and their faces. The first procedure of portrait acquisition can be done by using the Raspberry Pi Camera to capture the faces of the individual. In this process the system will first detect the presence of a face in the captured image, if there are no face detected, the system will prompt the user to capture their face again until it meets certain number of portraits of the limited storage space in the raspberry pi because the total amount of students in the university is considered heavy. Then, the images will undergo several pre-processing procedures to obtain

After the images are being processed, they are stored into a file in a hierarchy manner. In this project, all the faces will be stored in a hierarchy manner under the'database' folder. When expanding through the database folder, there will consist of many sub-folders which each of them will represent an individual where a series of face portrait belonging to the same individual will be stored in that particular sub-folder. The sub-folders that represent each individual will be named upon the ID no. of that individual which is unique for every single individual in the institution.

3.1 Languages Used:

Python language is used in the system due to the following Characteristics:

Simple:

Python is a simple and minimalistic language. Reading a good Python program feels almost like reading English (but very strict English!). This pseudo code nature of Python is one of its greatest strengths. It allows you to concentrate on the solution to the problem rather than the syntax i.e. the language itself.

Free and Open Source:

Python is an example of a FLOSS (Free/Library and Open Source Software). In simple terms, you can freely distribute copies of this software, read the software's source code, make changes to it, use pieces of it in new free programs, and know that you know you can do these things.

Object Oriented:

Python supports procedure-oriented programming as well as object-oriented programming. In procedure-oriented languages, the program is built around procedures or functions which are nothing but reusable pieces of programs. In object-oriented languages, the program is built around objects which combine data and functionality.

Extensive Libraries:

XML-RPC, HTML, WAV files, cryptography, GUI (graphical user interfaces) using Tk, and also other system-dependent stuff. Remember, all this is always available wherever Python is installed. This is called the "batteries included" Philosophy of Python.

4 .FACE RECOGNITION METHODS

4.1 Traditional Face Recognition Algorithms:

During the 1990s holistic approaches were used for face recognition. Handcrafted local descriptors became popular

in the early 1920s, and then the local feature learning approaches were followed in the late 2000s. Nowadays algorithms

that are widely used and are implemented in OpenCV are as follows:

- **Eigen faces (1991)**
- **Local Binary Patterns Histograms (LBPH) (1996)**
- **Fisher faces (1997)**
- **Scale Invariant Feature Transform (SIFT) (1999)**
- **Speed Up Robust Features (SURF) (2006)**

Each method follows a different approach to extracting the image information and matching it with the input image. Fischer-faces and Eigen faces have almost similar approaches as well as SURF and SIFT.LBPH is a simple yet very efficient method but it's slow compared to modern days face -recognizers.

These algorithms are not faster compared to modern day's face-recognition algorithms. Traditional algorithms can't be trained only by taking a single picture of a person.

4.2 Deep Learning for Face Recognition:

Some of the widely used Deep Learning-based Face Recognition systems are as follows:

- Deep Face
- **Deep ID** series of systems
- VGGFace
- Face Net

Face recognizers generally take face images and find the important points such as the corner of the mouth, an eyebrow, eyes, nose, lips, etc. Coordinates of these points are called facial-features points, there are such 66 points. In this way, a different technique for finding feature points give different results.
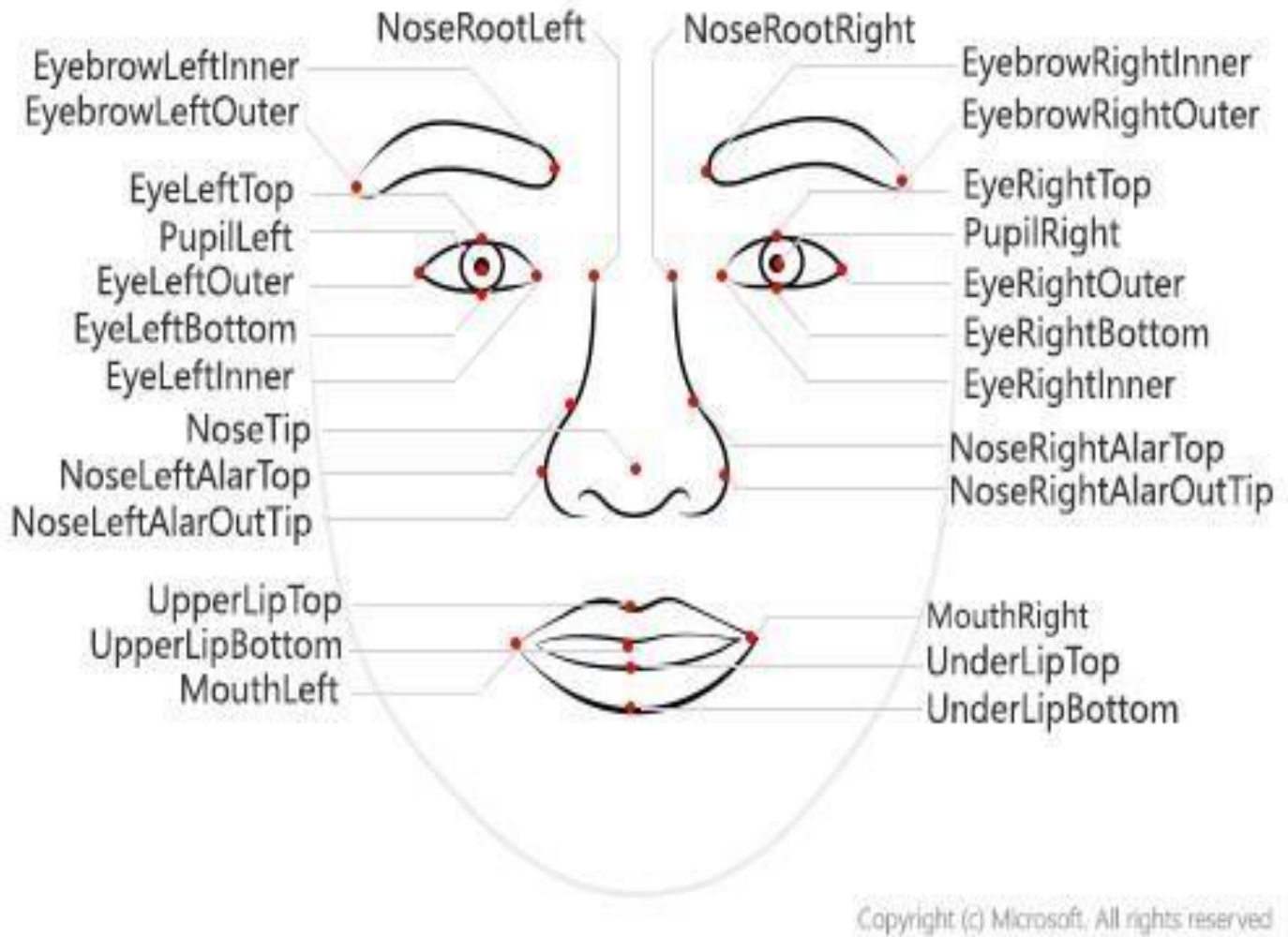
5 .CONCLUSION

Thus, the aim of this paper is to capture the video of the students, convert it into frames, and relate it with the database to ensure their presence or absence, mark attendance to the particular student to maintain the record. The Automated Classroom Attendance System helps in increasing the accuracy and speed ultimately achieve the high-precision real-time attendance to meet the need for automatic classroom evaluation.

Acknowledgment

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