Biometric : Facial Recognition

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Abstract*: In the digital age, facial recognition systems play an important role in almost every field. Facial recognition is he one of the most commonly used biometric authentication methods. It can be used for security, authentication, identification, and many other benefits. Although less accurate than iris and fingerprint recognition, it is widely used because it is a non-contact and non-invasive process. In addition, facial recognition systems can also be used for attendance management in schools, colleges, offices, etc. This system aims to build a classroom attendance system using the concept of facial recognition, as existing manual attendance systems are time and maintenance cumbersome. A representative may also be present. Therefore, the need for this system is increasing. This system consists of four phases: database creation, face recognition, face recognition, and presence update. The database is created using photos taken by students during class. Face detection and recognition are performed using the Haar cascade classifier and local binary pattern histogram algorithms, respectively. Faces are detected and recognized based on live streaming video of the classroom. A list of attendees will be mailed to each faculty member after the meeting*

Keywords: Face Recognition; Face Detection; Haar-Cascade classifier; Local Binary Pattern Histogram; attendance system

I. INTRODUCTION

A human face has unique physical shapes and features that can be used to identify or identify an individual. Face Recognition obtains the biometrics of this face. Different facial recognition methods measure facial biometrics. Face recognition has become a very important topic in recent years. Face recognition is effectively used in various applications such as security systems, authentication, access control, surveillance systems, smartphone unlocking, social network systems, etc. This Research was conducted to demonstrate how to detect student attendance using a Local Binary Pattern Histogram (LBPH) face recognizer. LBPH Face Recognizer is a pre-trained face recognition classifier. LBPH can perform face recognition with high accuracy when a sufficient dataset of faces to identify is available. The Facial Recognition Student Attendance System is a desktop application that uses digital images to identify and verify students. If the recognized face matches the stored image, attendance is complete and marked in the student's database. This system provides another easy way to register attendance.

Face Detection

Face recognition is the ability to identify human faces in digital images. This system identifies human faces present in images or videos. To determine whether a given image video contains a face, we need to define the general structure of a face. The human face has the same features as eyes, nose, forehead, mouth and chin. Therefore, the purpose of face detection is to determine the position and size of faces in an image. The faces found are used by the face detection algorithm.

Feature Extraction

This phase extracts features from the detected faces. LBPH computes an initial local binary pattern image and creates a histogram for face recognition. This will generate a template. A template is a set of data representing unique and distinguishing features of a recognized face.

Face Recognition

With face recognition, it is possible to uniquely identify and verify a person's face by comparing and analyzing biometrically authenticated faces. A facial recognition system is an application used to identify or verify individuals from digital images.

Importance of Facial Recognition System

The application of facial recognition systems is widespread. It is used in security systems, authentication systems, verification systems, surveillance systems, etc. We are subconsciously interacting with facial recognition systems. Many companies use facial recognition systems for authentication, verification and security. There are many possible uses for this system. Countries such as the US, UK, and Australia are now deploying facial recognition technology in various public spaces such as airports, coffee shops, shopping malls, industrial zones and government buildings. Large retailers like Alibaba are working to develop face-to-face payment technology. Workplaces use this technology to record arrival and departure times.

The employee's working hours are pending. Law enforcement agencies have installed cameras with facial recognition systems to identify criminals and search for missing persons. As facial recognition technology and facial recognition algorithms advance, they will be introduced into our society more and more.

Challenges of Facial Recognition System

Facial recognition systems have the potential to revolutionize the way businesses and governments interact with people. However, there are potential dangers lurking in this technology when used improperly. The potential for misuse of personal and confidential information is very real. Businesses and organizations should ensure proper management and proper security are in place before deploying this technology. Each time the technology scans a person's face, it stores that person's unique biometric data in a database. Depending on who owns the database and what security measures are in place to protect the database, information can be leaked, stolen, or misused without the individual's consent. Facial recognition systems aren't perfect. Data collected from humans are used to train the algorithm. If the data is scarce and the data to train the algorithm is diverse, the system may misidentify people. There were numerous instances where the system misidentified the gender and identity of dark-skinned individuals. This happened because there was a lack of data representing different people. [Four]

As new technologies advance, new types of crime emerge. Criminals can hack databases and access facial recognition data by tracking the movement, location and information of people without their consent. With facial recognition systems, criminals can cause serious damage. You may steal someone's sensitive personal information or identity in order to commit a crime. The use of facial recognition technology is promising. However, it should be handled with care. Any company considering adopting this technology should put in place a proper framework and commit to privacy protection. Successful implementation of this technology will allow you to reap the benefits of this technology.

II. ANALYSIS AND FEASIBILITY STUDY

Literature Review

The Viola-Jones algorithm is used to detect faces. A camera is installed in the classroom to scan the structure of the student's face. Detected faces are extracted for further processing. 20 student photos are stored in the database as data records. These records are used to compare biometric data with detected faces for facial recognition. Face recognition is done using LBPH. LBPH forms face descriptors by extracting image histograms and concatenating them to segment the image into local regions. This model focuses on how facial recognition and radio frequency identification (RFID) are combined to recognize and count authorized students entering and exiting a classroom. The system maintains a genuine record of each enrolled student. We also store the data of all students enrolled in a particular subject in an attendance book and provide the necessary information as and when required. The distance between the probe image biometric data and the trained image is calculated. If the calculated distance is less than the threshold, the probe image is recognized. Once the name is recognized, it will be updated in the Excel spreadsheet.

During attendance, the system automatically records class attendance by capturing an image of each participant's eye, recognizing their iris, and searching for matches in a created database. The prototype was web-based

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Functional Requirements

The system has different functions for administrators and teachers. Administrators have higher privileges than teachers. Their functions are described below.

Management Module

Administrators have the highest authority of all because they are responsible for designing the system. Register teachers as administrators and assign them unique IDs. It is your responsibility to take student photos and add them to the database. Administrators can view and update student and teacher details. You can also view the attendance report. Figure 1 shows a use case for administrators.

Non-Functional Requirements

Non-functional requirements are properties or attributes of the system that are necessary for the system to work properly. These requirements are listed below.

To avoid trouble, the system must perform the process accurately and accurately.

The system should be easy to change for updates. Any detected errors or bugs should be easy to fix.

The system must be secure and protect student privacy.

The system should be easy to understand and use.

Operations must be performed quickly.

Feasibility Analysis

A feasibility study evaluates the likelihood of a project's success. Approved objectivity is therefore an important factor in the credibility of research for potential investors and credit agencies. . Therefore, an objective and unbiased approach must be taken to provide information on which to base decisions. Here are the three main feasibility studies required for the Research.

- Operational Feasibility
- Technical Feasibility
- Economic Feasibility

Proposed System

All students in the class must register by entering the required data. Those images are then captured and stored in a dataset. During each session, faces are recognized from live streaming video of the classroom. Recognized faces are compared to images in the dataset. If there is a match, the presence of each student is recorded. At the end of each session, a list of absentees will be mailed to the relevant instructor supervising the session.

Created: Student photos are taken with webcams. Multiple images of a single student are taken with different gestures and angles. these pictures
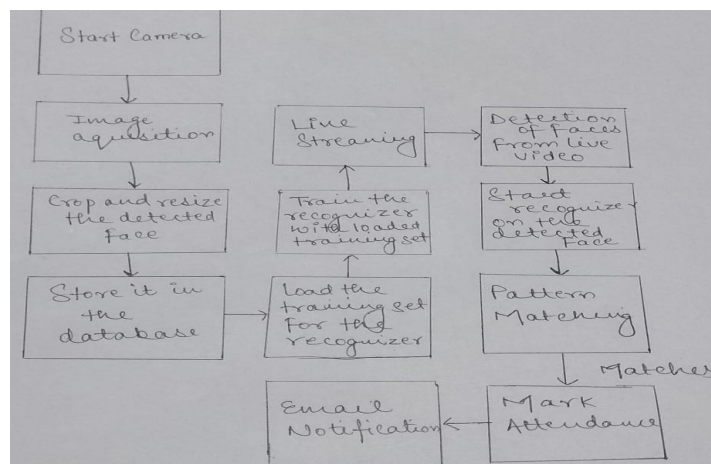
Typically this process can be divided into four stages,

- Dataset: undergo pre treatment. Images are cropped to obtain regions of interest (ROI) that are further used in the recognition process. The next step is to resize the cropped image to a specific pixel position. These images are then converted from RGB images to grayscale images. These images are saved in a folder with the student's name.
- Face Detection : Here face recognition is performed using the Haar-Cascade Classifier with OpenCV. The Hair Cascade algorithm must be trained to recognize human faces before it can be used for face detection. This is called feature extraction.
- Face Recognition : The face recognition process can be divided into three steps: training data preparation, face recognition training, and prediction. Here, the training data are the images present in the dataset. They are assigned the integer designation of the student to which they belong. These images are used for facial recognition. The facial recognition used in this system is a local binary pattern histogram. First, get a list of local binary patterns (LBPs) for the entire face. These LBPs are converted to decimal and a histogram of all these decimal values is created. Ultimately, a histogram is created for each image in the training data. Then, during the recognition process, a histogram of the recognized face is computed, compared to the already computed histogram, and the best matching label associated with the student to which the face belongs is returned.
- Attendance Update : After the facial recognition process, the recognized faces are marked as present in an Excel spreadsheet, the remaining faces are marked as absent, and a list of absentees is sent to each department. Teachers update the monthly attendance list at the end of each month.

III. METHODS AND MATERIALS

Tools and Technologies

This section describes the tools and techniques used in the Research. The focus of this Research was primarily Python programming and its libraries

- Python : Python is a high-level, object-oriented programming language. Written as Python 0.9.0 by Guido van Rossum in 1991. It was created as a successor to the ABC programming language. Python 2.0 was released on his October 16th, 2000 and added many features such as list comprehensions and a garbage collection system. On December 3rd, 2008, Python 3.0 was released. Python is a very popular programming language and can be used for many purposes. It is widely used for web development, software development, mathematics and data analysis, system scripting, etc. Python is a versatile programming language that runs on various platforms such as Windows, Linux, Mac, and Raspberry Pie. Python is more popular than other programming languages due to its simple syntax. Its syntax makes programs easier to understand and allows you to write code in fewer lines. Runs on an interpreted system. Therefore, the code can be executed immediately after being written.
- This work uses Python for web development. This Research showed how to use Python to build efficient and reliable web applications. This Research uses various Python frameworks and libraries.
- Pycharm : PyCharm is a hybrid platform developed by JetBrains as an IDE for Python. It is widely used for Python application development. Some of the Unicorn organizations such as Twitter, Facebook, Amazon and Pinterest use his PyCharm as their Python IDE. Two versions of him are supported: v2.x and v3.x. PyCharm can run on Windows, Linux, or Mac OS. In addition, it contains modules and packages that help programmers develop software using Python in a short amount of time and with minimal effort. Additionally, it can be customized to meet the needs of developers. PyCharm has a wealth of modules, packages, and tools to speed up your Python development and significantly reduce the overhead of running it at the same time. Moreover, PyCharm can be customized to suit your development needs and personal preferences. It was first opened to the public in February 2010.

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IV. RESULTS

It was a small Research, so there weren't too many issues with the data structure or implementation. However, since these tools and technologies were new to the author, it took a lot of effort to research and research the various technologies required. This caused delays in the development of the Research.

Despite delays and difficulties, the authors were able to integrate these tools and technologies and complete the Research. However, the success rate of face recognition was not as high as expected. Success rate was determined by camera quality, lighting, and sufficient datasets in the database. The successful rate of face recognition improved when these factors were properly managed.

The effort to learn and research LBPH, Django, and other tools and technologies was well worth it. The research and implementation process was arduous, but it got interesting when the Research started showing some results. This Research gave the author first-hand experience working on Researchs with his Django, which he found to be simpler and more scalable.

V. CONCLUSION

The purpose of the Research was to build a facial recognition system to verify the presence of students. The concept of facial recognition and her LBPH is detailed in this study. His web development with Django is also discussed, followed by an example implementation and explanation.

The outcome of the Research was a successful prototype of a facial recognition system that allows administrators to create teacher accounts and add students and their information to the database. Teachers can log into the system and monitor student attendance. The camera recognizes the student's face and records their attendance in a database. Teachers and administrators could see student attendance reports.

Overall, this Research successfully demonstrated how to implement LBPH in her Django to create a web application. Once implemented, it can be used to record student attendance and track attendance records. This Research may be further developed in the future by adding more features for students and teachers. You can also add features such as assignments, results, and grades.

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