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A VISUAL ATTENDANCE SYSTEM USING FACE RECOGNITION

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Abstract - *The attendance system was created to ensure the decorum and discipline of the school, colleges, and universities. There are a variety of traditional methods for recording student attendance in a class. The first is to call the roll number, and the second is to have pupils sign a sheet of paper next to their roll number. As a result, it was necessary to evolve this system in order for it to become more user friendly, less time-consuming, and efficient. This is a visual attendance system designed to help professors take attendance of the entire class without causing any disruption or wasting time. This visual attendance system can be used in any field that requires regular attendance. In addition, as the project objectives and the design criteria all met, it's greatest to say this project is an engineering solution for all university and colleges to track and manage the attendance.*

Key Words: **Attendance, face identification, Recognizer, OpenCV**

1. INTRODUCTION

Students' attendance is traditionally taken manually using an attendance sheet provided by a faculty member in class. Traditional systems were more prone to proxies, blunders, and errors. The more effective the attendance system, the higher the level of involvement and learning in class. Previously, we used tactics such as roll numbering, calling, and signing against a specific roll number. Furthermore, in a large classroom environment with distributed branches, it is extremely difficult to check whether or not authenticated students are replying one by one. Image processing has led to the development of facial recognition systems. Image processing is concerned with the extraction of necessary data from a digital image, and it plays a unique role in technological growth.

It is also feasible to detect if a student is sleeping or awake during a lecture, and it can be used to ensure a student's presence during exam sessions. The presence of students may be determined by capturing their faces on a high-definition monitor video streaming service, making it extremely dependable for the computer to recognise all of the pupils in the classroom. For feature detection, the system employs a variety of methods, including image contrasts, integral pictures, colour features, and a cascade classifier.

The system is evaluated in a variety of lighting settings, with diverse facial expressions, partial

faces (in densely filled classes), and beards and spectacles present or absent. In the majority of the cases studied, improved accuracy (almost 100 percent) is reached. Large data sets and complex features are required for face recognition in order to uniquely identify various persons by adjusting different obstacles such as illumination, stance, and age. Facial recognition technologies have improved significantly during the last few years. In the recent decade, there has been a tremendous advancement in the field of facial recognition. Most facial recognition systems now work effectively with only a few faces in the picture. Furthermore, these methods have been tested under regulated lighting settings, with good face positions and photos that are not fuzzy. The system that is proposed for face recognition in this paper for attendance system is able to recognize multiple faces in a frame without any control on illumination, position of face.

Computers may also be programmed to identify the individuality of faces, so we must programme or train the machine how to distinguish between faces based on their distinguishing characteristics. As seen below, facial recognition can be split into two categories:

1.) Verification

2.) Identification

Verification is a one-on-one matching process (match or no match). The tool may be used to lock and unlock systems, phones, and other electronic devices.

Identification is a technique for distinguishing an individual within a group of individuals, such as one out of N.

2. LITERATURE REVIEW

Hajar Filaliet. al. [1] compared four machine learning techniques that allow a machine to learn and execute tasks that are difficult to complete using more conventional algorithmic methods (Haar-AdaBoost, LBP-AdaBoost, GFSVM, GFNN). As a result of this research, we discovered that the detection time varies depending on the system. The Haar-AdaBoost approach remains the best of the four methods in terms of output rate.

E.Varadharaja and colleagues al [2] offered a way for automatic attendance based on face recognition. The device is made up of four parts. The first is Background Subtraction, which removes the image's background. The second component is face detection and cropping. In the photographs, only the faces are cropped and saved. The Eigenvalue approach is used to recognize images in the third stage.

Face Detection and Recognition Using Skin Color [3]. Face detection performance using skin color division and a thresholding skin colour model paired with the AdaBoost algorithm. Principal Component Analysis (PCA) and K-Nearest Neighbor (KNN) based categorization are used to extract the facial attributes. Morphological Operators were also applied to increase the face detection performance. There is no suitable face orientation, image illumination is poor, and the distance between the faces and the camera is variable in some photographs for which the expected results have not been achieved. Only a few photos with a significant level of orientation variation are correctly spotted and recognized. This results in a database recognition rate of roughly 96 percent.

Shireesha Chintalapati, M.V. Raghunadh, and colleagues [4] identified the various strategies for implementing a face recognition-based attendance monitoring system. There are two sections of the process. The face detection method is the first, and the face recognition method is the second. The ViolaJones face detection algorithm uses four important components to recognise faces: Haar features, integral graphics, Adaboost algorithm, and cascade function. Face recognition can be included using LBP (local

binary patterns). LBP is a tool for converting images into machine-readable forms like binary. To make the calculation more straightforward, The discovered image should be converted to greyscale until facial detection and identification can be performed. Face recognition takes a snapshot of an image (student dataset) and then searches for faces in the photos, which are then saved for future use.

The principal function is that the image's features make it simple to locate the image's boundaries or lines, or to select locations where the pixel intensities abruptly change. The haar feature moves from the top left to the bottom right of the image, looking for a specific characteristic that indicates edges traversing. Edge feature-based techniques have the advantage of integrating structural information by grouping pixels of face edge maps to line segments. After comparing the pixel computations, the next step was completed.

Time management systems, which are utilised at many universities, institutions, and schools, are another comparable system that uses biometrics (fingerprint recognition, RFID, and so on) to identify end users. These systems, on the other hand, raise new privacy concerns. These systems can potentially be damaged physically by their users. As a result, they will incur increased maintenance costs. The concept we offer denies anyone physical access to the automated system

3. METHODOLOGY

We will build a viable solution to our problem based on the literature survey, since we have thoroughly investigated many areas that are directly related to our project. In this section, we will present a method that will provide an overview of our project's approach and how it should be carried out. Because the prior effort was insufficient, we decided to build this project in the most viable and efficient manner possible. RetinaFace and Arcnet algorithms for face recognition and verification are the proposed face detection modules for this project.

1.) PROPOSED SYSTEM STRUCTURE

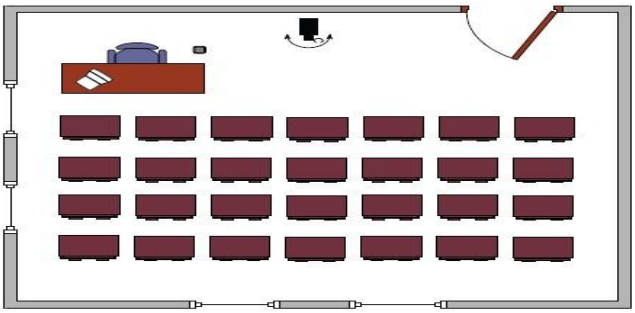

Figure 1: The proposed system.

2.) PROPOSED SYSTEM FLOWCHART

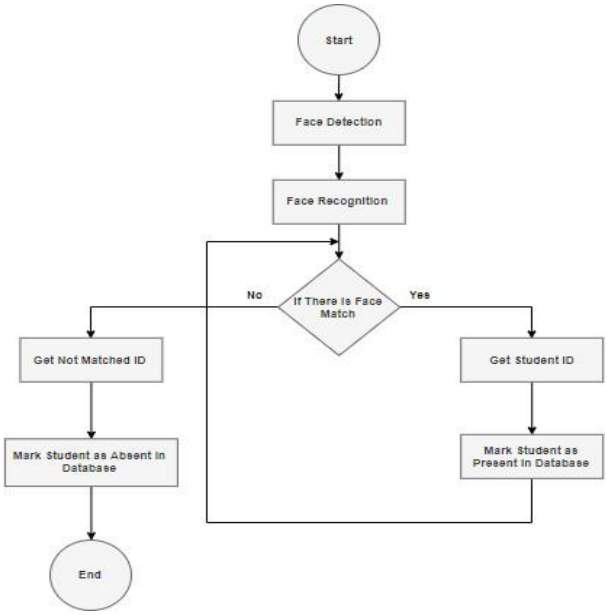

Fig 2: Flow chart of attendance taking

4. MODELS

RetinaFace- A deep convolutional network is used by RetinaFace. The Zeiler&Fergus [5] style networks and the more contemporary Inception [6] type networks are discussed. The most significant component of our method, given the model details and treating it as a black box, is end-to-end learning of the entire system. To do this, we use the triplet loss, which precisely represents our goals in face verification, recognition, and clustering. Specifically, we aim for an embedding f(x) from an image x into a feature space R d such that the squared distance between all faces of the same identity, regardless of imaging settings, is minimal, and the squared distance between two face pictures from different identities is big. RetinaFace learns a direct mapping from face images to a compact Euclidean space in which distances are directly proportional to a measure of face similarity. Tasks like face recognition, verification, and clustering may be easily implemented using traditional approaches with RetinaFace embeddings as feature vectors after this space has been created.

Arcface- ArcFace is a machine learning model that takes two face photos as input and outputs the distance between them to determine how similar they are. It may be used to recognise and search for faces. By replacing Softmax Loss with Angular Margin Loss, ArcFace provides a similarity learning method that allows distance metric learning to be solved in the classification challenge. The cosine distance, which is a method utilised by search engines and may be determined by the inner product of two normalised vectors, is used to calculate the distance between faces. If the two vectors are equal, θ and cosθ=1 will be returned. They *will be π/2 and cosθ=0 if they are orthogonal. As a result, it can be used as a comparison* measure.

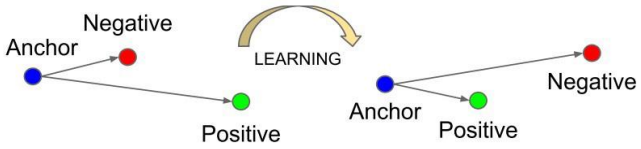

Figure 3. The Triplet Loss minimizes the distance between an *anchor* and a *positive*, both of which have the same identity, and maximizes the distance between the *anchor* and a *negative* of a different identity

5. WORKING

Firstly we create a database of students that we have to have to attendance , then taking the image of students present in the class using the RetinaFace algorithm[7] and identifying those images by using the Arcface algorithm[8]. This whole process is based on a web application and very helpful for organizations.

6. CONCLUSION

We choose the Automated Attendance Monitoring System project after considering the demands of society's day-to-day needs and wants. As technology advances, we are more likely to think outside the box and come up with a game-changing concept. Education is the most important thing that everyone should obtain because it provides the foundation for a better lifestyle and will undoubtedly improve a community's level of living. Our educational system is lacking in student involvement in schools, colleges, and universities.

7. FUTURE SCOPE

Face-to-face security systems are currently being used in sectors like identity protection and banking, although mostly in conjunction with other existing solutions like fingerprint or SMS verification. However, over the next year or two, we'll see large multinational corporations use increasingly sophisticated facial biometrics and AI-driven technology to improve their security capabilities and better protect customers from identity fraud and data loss.

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