Attendance Management System Using Computer Vision

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ABSTRACT: ***Student involvement in academics is a significant issue in many educational institutions. Handling attendance papers manually in busy classes takes a long time. This article describes and evaluates an automatic student attendance system that may be utilized in closed classrooms that uses a PC to take photos of the classroom. Mobile automated classroom attendance management system based on facial recognition that does not need any additional equipment. The face recognition system was built using the Euclidean-based filtering technique and evaluated using three distinct face recognition algorithms. Teachers, students, and parents are all given three different mobile applications to use on their cell phones to track and execute the attendance process in real time. Several face identification algorithms based on learnt and handmade features are tested using a methodology that takes into consideration the number of pictures per person included in the gallery. Author utilized two deep learning techniques, Hear Cascading and Local Binary Trend Histogram (LBPH), with just one enrollment picture per participant reaching approximately 95% accuracy. We think that our face recognition-based automated student attendance system will save time for both instructors and students while also reducing false attendance.***

KEYWORDS: ***Attendance, Monitoring System, Classroom Attendance, Face Recognition, Python.***

1. INTRODUCTION

Implementing an unobtrusive machine vision-based classroom attendance management system is one of the major challenges in a smart learning environment. The purpose of this article is to present an unobtrusive facial recognition-based smart classroom attendance management system that uses a camera to record students' faces. The proposed system uses the Haar Cascade method for face recognition, and the model is trained using the Local Binary Pattern Histogram (LBPH) technique for student identification. Taking attendance in a classroom is often a manual process. Teachers must call students by their roll number every period and record present and absent attendance on the attendance sheet. This procedure consumes precious class time for both students and instructors, and it may sometimes lead to phony attendance. It's a time-consuming procedure for instructors, and processing and maintaining attendance records is difficult[1].

The suggested technique for tracking attendance uses facial recognition, with the face being the most important component. This method circumvents the problems that arise with traditional classroom attendance. As a consequence, automated classroom attendance produces consistent results and ensures that attendance is recorded in the database. Every company has its own method for keeping track of attendance. Some individuals still take attendance manually, while others have moved to biometrics. The traditional method makes it difficult to examine pupils one by one in a large classroom. In addition, the physical labour needed to calculate the attendance % becomes a substantial job. Radio Frequency Identification (RFID) is a technique for utilizing radio waves to identify big groups of people. It's simple and fast to use, and it allows you to control access without using your hands. However, it has been observed that it may be abused[2].

Facial recognition-based mobile automated classroom attendance management system that does not need any extra equipment. The Euclidean-based filtering method was used to create the face recognition system, which was tested using three different face recognition algorithms. Teachers, students, and parents are each given three separate mobile apps to use on their smartphones in order to monitor and execute the attendance process in real time. Ankara University students put the suggested method to the test, and the results were outstanding. The technology eliminates the need for new infrastructure and enables users to access data at any time and from any location. Smart gadgets for tracking attendance in the classroom are very user-friendly. The software may be used in real time by teachers and parents. With continually increasing Internet connection speed, large and high-quality images may now be transmitted to the server. Furthermore, cloud computing capacity is always growing. The suggested system's accuracy rating will improve as a consequence of these technical advancements[3].

The process of defining a system's configuration, components, interfaces, and data in order to meet specified requirements. When it comes to product development, systems philosophy is referred to as systems programming. Another option would be to install a camera at the entrance to the classroom that would detect each person's face as they arrived. In this case, the face detector would have to perform much less work, but there would only be one chance to get a decent image. A frontal camera may capture as many photos as required

in the midst of the classroom. The gadget is physically connected to the networks of institutions in Southeast Europe. In order for the system to function, each classroom must have at least one internet-connected computer. This computer connects to the LMS server, which is where the pictures are transmitted after they've been taken. Figure 1 shows the layout of System Architecture. In the middle of the classroom, a frontal camera can take as many pictures as needed[4].

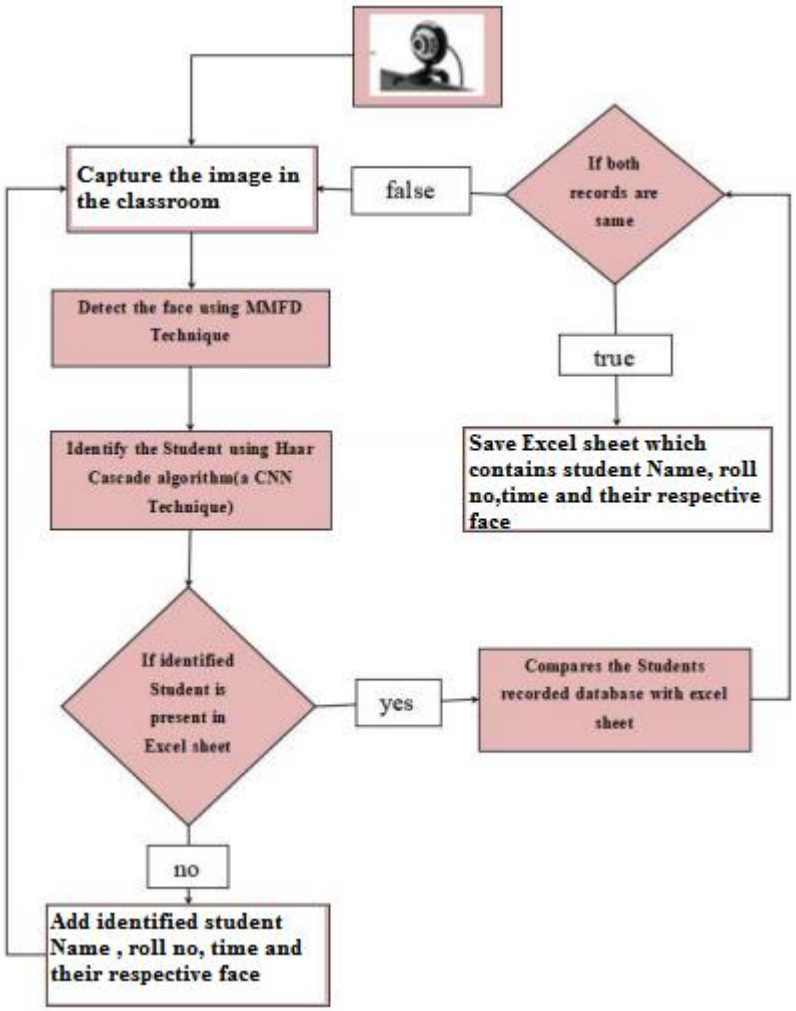

Figure 1: The layout of System Architecture. In the middle of the classroom, a frontal camera can take as many pictures as needed.

Face identification and recognition-based automated attendance control system. Face identification is done using Viola-Jones methods, while facial recognition is done with a partial facial reconnaissance technique that does not need synchronization. When a student is properly identified, the attendance in the excel sheet is updated instantly[5]. By eliminating human calls, labelling, and access to administration websites, the proposed system improves the efficacy of existing attendance control programs. After that, the gross HR image is sent to two different branches: a fine SR encoder and an approximation network that extracts image characteristics and analyses hot pictures and mapping. Both the picture and preceding data are submitted to a competent decoder in order to retrieve the HR file. In addition, we suggest embedding Face Super Resolution's generative opposing network in FSRNet to create realistic faces. Face SR's novel appraisal parameters are two related characteristics, face orientation and parsing, which solve the visual perception inconsistency with traditional metrics. FSRNet and FSRGAN are both numerically and qualitatively advanced in the field of extremely LR face SR, according to extensive testing[6].

1.1 Tool Information:

1.1.1 Python:

Python is a high-level programming language that is interactive, object-oriented, and general-purpose. Python source code is available under the GNU General Public License (GPL). This course provides a thorough understanding of the Python programming language. Python is one of the most widely used programming languages[7].

The following goals are achieved:

- Website creation (server-side)
- Software creation
- Mathematic
- Scripting for the operating system.

Python may be used to create mobile applications on a server. Python may be used to create workflows when combined with other programs. Python is capable of connecting to database systems. It's also capable of reading and editing files. Python is a programming language that can handle large amounts of data and conduct complicated computations. Python is also utilized for fast prototype and production-ready application development. Python may be run on a variety of operating systems (Windows, Mac, Linux, Raspberry Pi, etc.). Python has a syntax that is quite close to English. Python's syntax enables programmers to create programs in less lines than most other languages[8].

Python is an interpreter language, which means that code may be run just after its written. As a consequence, prototyping is very easy. Python supports three approaches: procedural, object-oriented, and modular. Python is a high-level programming language that focuses on objects and interacts with them. Python's goal is to be a script that is genuinely readable. Instead of punctuation, it utilizes English keywords and fewer syntactic forms than most languages.

- *Python interpreter:*

Python is processed by the interpreter at runtime. Compiling software is required before it can be executed. This is comparable to programming languages like as Hypertext Preprocessor and Practical Extraction, as well as report languages[9].

- *Interactive Python:*

You may sit at a Python prompt and communicate directly with the interpreter to create your programs.

- *Object-Oriented Python:*

Python supports the Object-Oriented programming paradigm, which wraps code in objects.

- *Python as a Beginner's Language:*

Python is a great language for new programmers since it enables them to create a wide range of programs, from simple text processing to web browsers and games.

1.2 Capturing Images:

A camera will be used to record all of the pupils as part of the proposed system. From these recorded image frames, the Haar Cascade method is utilized to identify the students' faces.

1.3 Recognition of Faces:

Instead of using sub-sampling, this method optimizes across all sub-windows. This method is also better at detecting all kinds of faces, such as frontal, slanted up/right/left/down, and obstructed faces. Figure 2 shows sample of face detection.

Figure 2: Samples of detected faces in different angles. This technique is useful in the identification of all kinds of faces, including the dorsal, the right, the left and the overshadowed.

1.4 Training Phase:

The number of students detected is determined by how the students are seated in the classroom. The proposed face detection technique has the highest accuracy rate for detecting all faces present. Using a face recognition algorithm, it was possible to recognise the students from the identified faces. Using more pictures of each student in the training process will increase the accuracy of student identification[10].

1.5 Algorithms:

1.5.1 Haar Cascade Classifier:

Here the author are going to deal with facial recognition. The algorithm involves a huge number of positive (faces) and negative images in order to train the classification system (images without faces). We ought to delete functionality from it afterwards. For this purpose, haar characteristics are used as seen in the picture below. They're very next to our fresh kernel. The pixel number below the white rectangle is removed from the total pixel of each function under the black rectangle Figure 3 shows the different features of Haar Cascade.

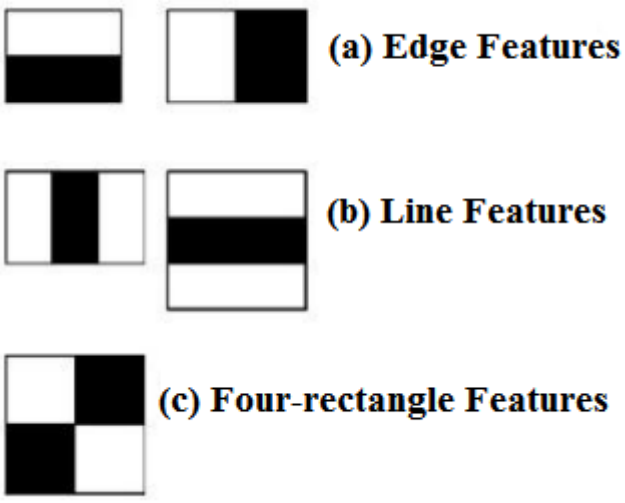

Figure 3: Different Features of Haar Cascade.The integral image is used to solve the problem.

To measure a large number of features, all possible sizes and positions of each kernel are now used. For each feature measurement we must locate the number of pixels under black and white rectangles. To solve the dilemma, they used the whole image. It reduces calculations for a particular pixel to a four pixel process, regardless of the size of the image. The overwhelming majority of features, however, we estimate. In the below diagram, the top row shows two solid characteristics. The skin above the eye appears to be often darker than the nose and cheeks area. The second chosen feature is the black eyes than the nose's bridge. However, applying the same windows on the cheeks or somewhere else makes no sense Figure 4 shows the focused features.

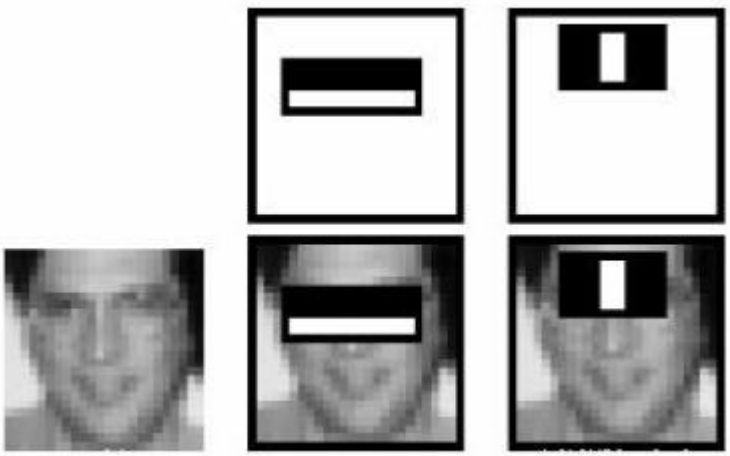

Figure 4: Focusing the Features. After each grouping, the weights of erroneous images are raised.

We do this by adding each function to all of the training pictures. It finds the best threshold for each function to identify the faces as positive or negative. Mistakes or errors will undoubtedly occur. We choose the lowest error rate functions that guarantee the reliable identification of images on the face and non-face. It isn't that easy technology. Any image at the beginning is assigned the same weight. The weights of incorrect images are increased after each grouping. Following this, it follows the same protocol. Error rates at new thresholds are calculated. New weights are also available. The procedure is replicated until the desired accuracy or error rates have been achieved or the appropriate number of functions have been found.

The final classification results in a weighted sum of these poor classifiers. It is considered weak, since it cannot recognize the image by itself, but it renders a strong classifier when combined with others. Also 200 features, according to the report, provide 95 percent accuracy in detection. About 6000 features were included in their final configuration. (Consider reducing the number of features from 160000+ to 6000.) The non-face area of an image makes up the majority of the image. It is thus better to have a straightforward tool to see if a window is not a facet. Don't care about processing it, if not, just drag it backwards. Focus on positions that can be a face, instead. This enables us to take longer to test potential areas. They developed the concept of a waterfall of classifiers. They are broken up into stages of classifiers and added one by one instead of adding all 6000 features in a single window. (In the majority of cases, even fewer features in the first few stages.) If the first inspection fails a slot, it should be removed. The other functions are not considered. Apply the second phase and resume the operation until the feature passes. A facial area is a window that crosses all layers. The detector was composed of over 6000 characteristics and 38 stages, with the first five stages including 1, 10, 25, 25 and 50 characteristics. (Adaboost has acquired the two best features in the picture above.) According to the reviewers, 10 out of more than 6,000 features of each sub window are evaluated on average.

2. DISCUSSION

This method is server-based due to the processor-intensive nature of the face detection algorithm. Detecting a face is basically an object detection operation, with the face as the object of interest. Face detection algorithms can be hindered by a number of factors, including face pose, size, location, rotation, light, image colours, and so on. When attempting to recognise (recognise) a face, the same issues arise, along with a few other stumbling blocks that will be addressed shortly. Face recognition from still images with multiple faces can be broken down into several stages. Many face recognition algorithms will identify a face precisely. (or any other spec).There are various face detection algorithms that can detect a face (or some other unique object) in an image. Since most students in the framework presented here face the camera in the front, we decided to use the HAAR classifier for face detection. Intel's Free CV library is used to implement this classifier. The classifier works by using positive and negative face images to train a model. A positive image is one that includes the entity that needs to be detected, in this case a face

3. CONCLUSION

In this paper, we suggest a deep automatic learning attendance framework which can be used with the aid of a camera in crowded classrooms. . When attempting to recognise (recognise) a face, the same issues arise, along with a few other stumbling blocks that will be addressed shortly. In our research, we used Haar Cascade technology and the LBPH algorithm, both focused on deep learning characteristics, and with just one enrollment face picture per subject we were able to achieve the highest accuracy. We assume that both teachers and students

can save time by using our facial recognition automatic student attendance system while avoiding false participation. We can use more advanced algorithms based on reduced dimensionality to verify the spatial accuracy of the participants.

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