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Student Attendance System via Face Recognition

Niharika Mahajan[1], Rupal Manwatkar[2], Janvi Kolhe[3], Rakshita Suryavanshi[4], Samiksha Gourkar[5], Prof. Chandu Vaidya[6]
[1, 2, 3, 4, 5, 6]*Department of Computer Science Engineering, Rajiv Gandhi College of Engineering & Research, Nagpur India*

Abstract: ***When attendance is done manually, it takes a lot of effort and time. Student attendance is a part of educational institute which is most challenging part of the virtual platform. There was also a lot of proxy attendance due to lack of a good attendance system. The face is the most important part of human body which identifies a human. In this paper, we describe an efficient algorithm of haar cascade using an open-source image processing framework known as OpenCV. Therefore, in this paper, we work on an attendance system via a face detection algorithm in real-time using the frontal face recognition concept.***
Keywords: OpenCV, haar-cascade, face detection.

I. INTRODUCTION

Attendance is primary thing for both the teacher and student of an educational institute. Therefore it's very important to keep a record of the attendance. The problem arises when we think about the traditional process of taking attendance. Calling the name or roll number of the student for attendance is not only a problem of time consumption but also it needs energy. So an automatic attendance system can solve all of the above problems. There are some automatic attendance making systems which are currently used by many institutions. One such system is biometric technique. Although it is automatic and a step ahead of traditional methods it fails to meet the time constraint. The student has to wait in a queue for attendance, which is time-consuming. Student attendance project introduces an involuntary attendance marking system, devoid of any kind of interference with the normal teaching procedure. The system can be also implemented during exam sessions or in other activities where attendance is highly essential. This system eliminates classical student identification such as calling students by name, or checking their identification cards of the student, which can not only interfere with the teaching process, but also can be stressful for students during examination sessions.

II. PROBLEM STATEMENT

Design an automatic class attendance system using face detection software. The system detects the faces and marks the attendance accordingly. This system will prevent unnecessary wastage of time of classes that is usually wasted in the form of class roll calls.

III. AIM / OBJECTIVE

1) Reducing time wastage during conventional class attendance.
2) Utilizing the latest trends in machine vision to implement a feasible solution for the student attendance system.
3) Automating the whole process so that we have the digital environment
4) Preventing proxy roll calls as one to one attendance marking is possible only.

IV. PROPOSED WORK

A. *Architecture*

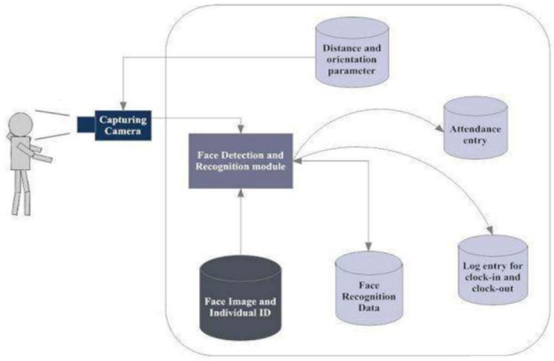


Figure 1 System Architecture

B. System Design

A thorough survey has revealed that various methods and combinations of these methods can be applied in development of a new face recognition system. Among the many possible approaches, we have decided to use a combination of knowledge-based methods for the face detection part and a neural network approach for the face recognition part. The purpose for selecting this is their smooth applicability and reliability issues. Face recognition system approach is given in Figure

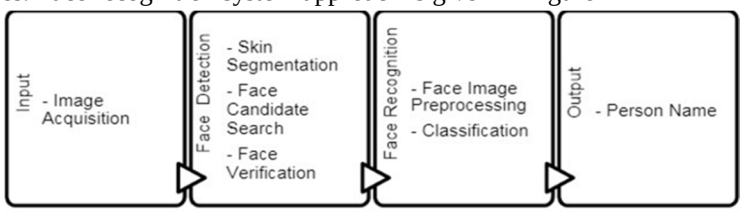


Figure 2 Face Recognition Approach

1) *Input Part:* In Input part image acquisition operation is performed. It is a prerequisite for the face recognition system. Live captured images are converted to digital data for performing image-processing computations. These captured images are sent to a face detection algorithm.
2) *Face Detection Part:* Face detection performs locating and extracting face image operations for face recognition systems. Face detection part algorithm is given in Figure given below. Our experiments reveal that skin segmentation, as a first step for face detection, reduces computational time for searching the whole image. While segmentation is applied, only segmented regions are searched whether the segment includes any face or not.

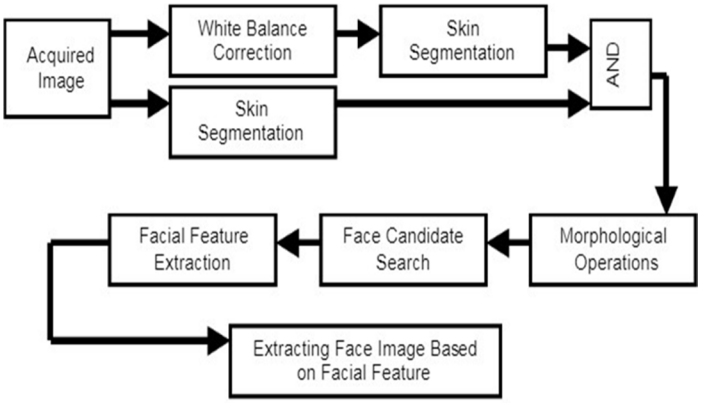


Figure 3 Algorithm of Face Detection Part

Due to this reason, skin segmentation is applied as a first step of detection. RGB (Red, Green, Blue) colour space is used to describe skin. White balance of images differs due to change in lighting conditions of the background while acquiring image. This situation creates non-skin objects that belong to skin objects.Therefore, white balance of the acquired image should be corrected before segmenting it [18]. Results of segmentation on the original image and white balance corrected image are given in Figure 4 and 5.

Figure 4 Example of taken/white balance corrected image and skin color segmentation (a.) Original Image (OI), b.)Segmentation on OI, c.)White Balance Correction on OI (WBI), d.) Segmentation on WBI)

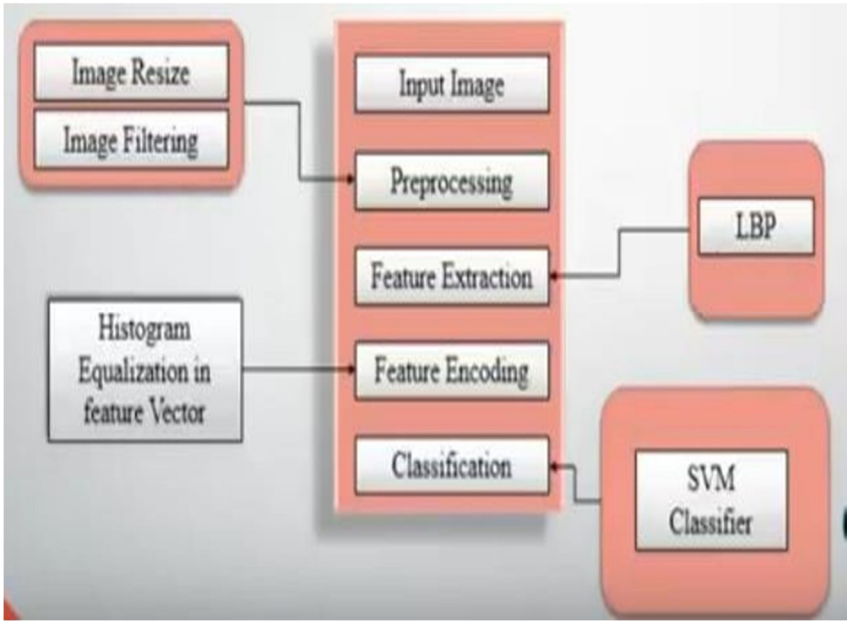
After "and operation" is applied on segmented images, some morphological operations are applied on the final skin image to search for a face candidate. Noisy small regions elimination, closing operations are performed. Then, face candidates are chosen with two conditions which are the ratio of bounding box of candidate and covering some gaps inside the candidate region. The ratio of bounding box should be lie between 0.3 and 1.5.

Figure 5 Results of Segmentation on Uncorrected (Left) and Corrected Image (Right)

Based on these conditions, face candidates are extracted from the input image with a modified bounding box from the original bounding box. The height of the bounding box is modified as 1.28 times bigger than width of the bounding box because chest and neck parts will be eliminated if the candidate includes them. This modification value has been determined experimentally. These face candidates will be sent to the facial feature extraction part to validate the candidates.

During final verification of candidate and face image extraction, facial feature extraction process is implemented. Facial features are one of the most significant features of the face. Facial features are eyebrows, eyes, mouth, nose, nose tip, cheek, etc. The property is used to extract the eyes and mouth which, two eyes and mouth generate an isosceles triangle, and distance between eye to eye and midpoint of eyes distance to mouth is equal [2]. Laplacian of Gaussian (LoG) filters and some other filtering operations are performed to extract facial features of face candidates.

V. METHODOLOGY FOR IMPLEMENTATION (FORMULATION/ALGORITHM)



We can group face recognition methods into three main groups. The following approaches are proposed:

1) *Template Matching:*- Patterns are represented by samples, models, pixels, curves, textures. The recognition function is usually a correlation or distance measure.
2) *Statistical Approach:*- Patterns are represented as features. The recognition function is a discriminant function.
3) *Neural Networks:*- The representation may vary. There is a network function at some point. Note that many algorithms, mostly current complex algorithms, may fall into more than one of these categories.

VI. SOFTWARE / HARDWARE REQUIREMENTS

A. Hardware Requirements

4 GB RAM (Minimum)
HDD Less than GB.
Dual Core processor.
CDROM (installation only). VGA resolution monitor.

B. Software Requirements

Pycharm IDE
Windows 7 or above
Python 3

VII. APPLICATIONS

A Large application in institute attendance system where multiple attendances are carried out for different classes/seminars. The attendance will be less time consuming and reduce manual errors.
b. Large application of computer vision in the field of Communication, Biomedical, Automatic Product Inspection.

VIII. CONCLUSION

The objective of system is to build an effective student attendance system via face recognition. The proposed system will be able to mark the attendance using face. First it will detect faces via webcam and then it will recognize the faces. After recognition, it will mark the attendance of the recognized student and update the attendance record.

IX. ACKNOWLEDGEMENT

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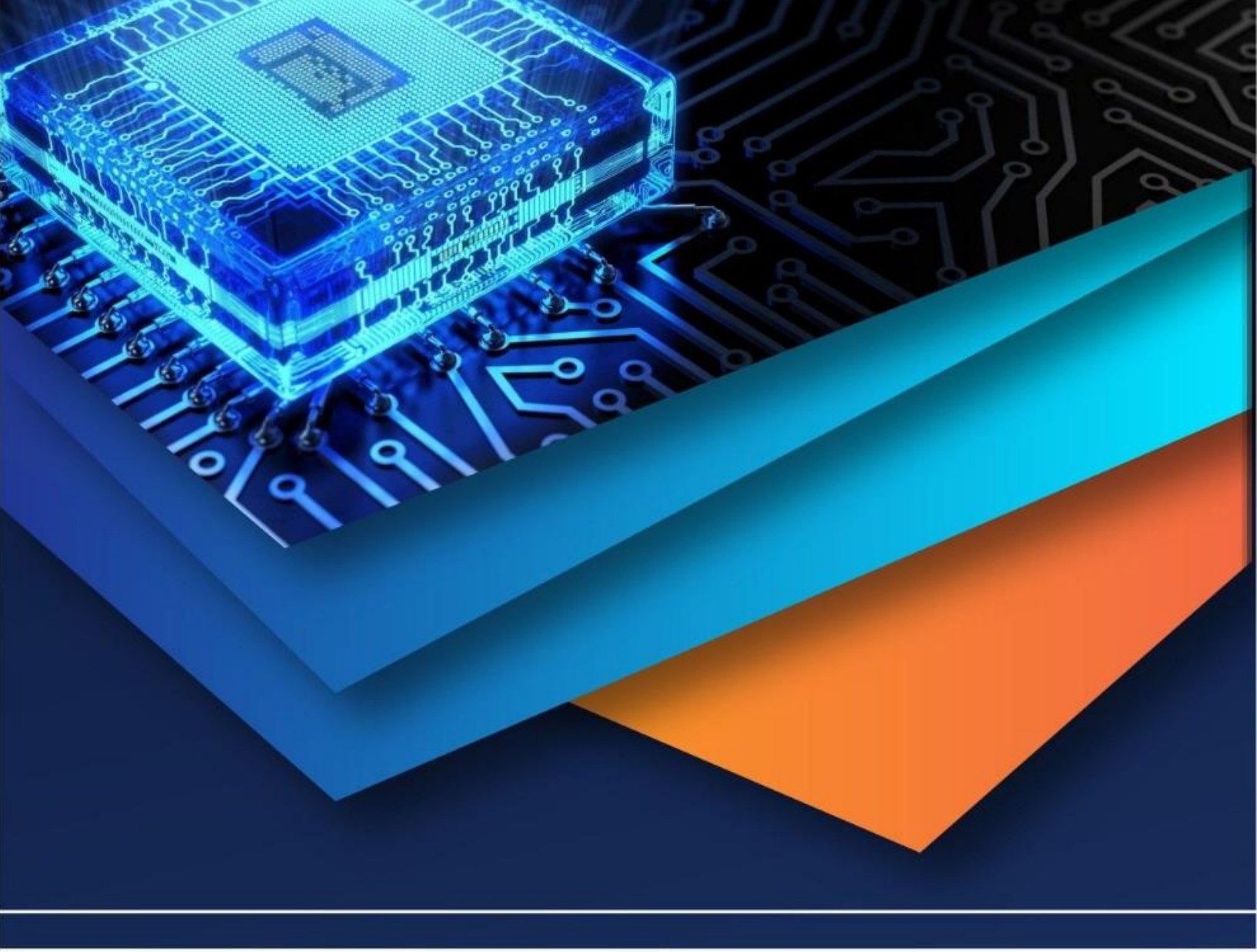

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