*i*Journals: International Journal of Software & Hardware Research in Engineering (IJSHRE)
ISSN-2347-4890
Volume 9 Issue 7 July 2021

A FACIAL FEATUREAS BASED STUDENT ATTENDANCE MANAGEMENT SYSTEM

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ABSTRACT

In this paper uniqueness of an individual face is the representation of one's identity. In this research the face of an independent student is used for the automatic attendance. Because, the attendance of student is important for college, universities and school. Face Recognition is a computer application that is capable of detecting, tracking, identifying or verifying human faces from an image or video captured using a digital camera. Although lot of progress has been made in domain of face detection and recognition for security, identification and attendance purpose, but still there are issues hindering the progress to reach or surpass human level accuracy. This research paper presents a new method using Local Binary Pattern (LBP) algorithm combined with advanced image processing techniques such as Contrast Adjustment, Bilateral Filter, Histogram Equalization and Image Blending to address some of the issues hampering face recognition accuracy so as to improve the LBP codes, thus improve the accuracy of the overall face recognition system. Our experiment results show that our method is very accurate, reliable and robust for face recognition system that can be practically implemented in real-life environment as an automatic attendance management system.

Keywords: Face detection, Face recognition, local binary pattern (LBP), and Student attendance system.

1. INTRODUCTION

The Attendance is prime important for both the teacher and student of an educational organization.

So it is very important to keep record of the attendance. The problem arises when we think about the traditional process of taking attendance in class room. Calling 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 above problems. There are some automatic attendances making system which are currently used by much

institution. One of such system is biometric technique and RFID system. Although it is automatic and a step ahead of traditional method it fails to meet the time constraint. The student has to wait in queue for giving attendance, which is time taking.

In this paper 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 teaching activities where attendance is highly essential. This system eliminates classical student identification such as calling name of the student, or checking respective identification cards of the student, which can not only interfere with the ongoing teaching process, but also can be stressful for students during examination sessions. Traditional student attendance marking technique is often facing a lot of trouble. The face recognition student attendance system emphasizes its simplicity by eliminating classical student attendance marking technique such as calling student names or checking respective identification cards. Apart from calling names, attendance sheet is passed around the classroom during the lecture sessions. The class especially the class with a large number of students might find it difficult to have the attendance sheet being passed around the class. Thus, face recognition student attendance system is proposed in order to replace the manual signing of the presence of students which are burdensome and causes students get distracted in order to sign for their attendance. Furthermore, the face recognition based automated student attendance system able to overcome the problem of fraudulent approach and lecturers do not have to count the number of students several times to ensure the presence of the students. Hence, there is a need to develop a real time operating student attendance system which means the identification process must be done within defined time constraints to prevent omission. The extracted features from facial images which represent the identity of the students have to be consistent towards a change in background, illumination, pose and expression. High accuracy and fast computation time will be the evaluation points of the performance.

In order to achieve better performance, the test images and training images of this proposed approach are limited to frontal and upright facial images that consist of a single face only. The test images and training images have to be captured by using the same device to ensure no quality difference.

2. ARCHITECTURE

To develop face recognition attendance system. Expected achievements in order to fulfil the objectives are:

- To detect the face segment from the video frame.
- To extract the useful features from the face detected.
- To classify the features in order to recognize the face detected.
- To record the attendance of the identified student.

The proposed automated attendance management system uses a face recognition algorithm. The distance between the face parts is first calculated and then to be stored in the system. The facial characters stored are to be compared with the real time image of the students. When the student enters the classroom the system starts identifying the faces of the students. The time for the period also gets started and the system now detects the faces and extracts the facial characters of the students. The extracted facial character will be compared with the database image. If the face of the student

is matched with the facial character stored in the database then the attendance timing for respective student gets started.

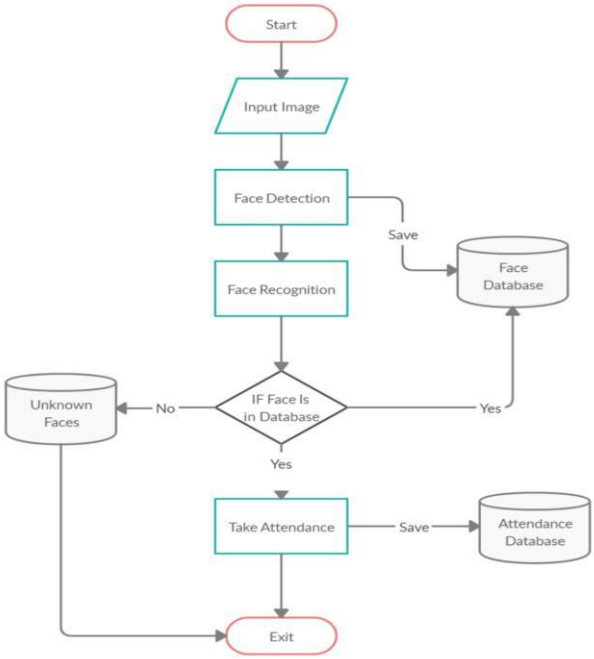

Figure. 1 Flow Chart

3. DESIGN REQUIREMENTS

OpenCV:

OpenCV is library where there are lots of image processing functions are available. This is very useful library for image processing. Even one can get expected outcome without writing a single code. The library is cross-platform and free for use under the open-source BSD license. Includes IDE (Pycharm & VSCode), Webcam for (Video and Photo)

PYTHON

Python is a high-level scripting language which can be used for a wide variety of text processing, system administration and internet-related tasks. Unlike many similar languages, its core language is very small and easy to master, while allowing the addition of modules to perform a virtually limitless variety of tasks. Python is a true object-oriented language, and is available on a wide variety of platforms. There's even a python interpreter written entirely in Java, further enhancing python's position as an excellent solution for internet-based problem.

4. FACE RECOGNITION USING LBPH ALGORITHM

Face Detection: it has the objective of finding the faces (location and size) in an image and probably extract them to be used by the face recognition algorithm. Face Recognition: with the facial images already extracted, cropped, resized and usually converted to greyscale, the face recognition algorithm is responsible for finding characteristics which best describe the image.

The face recognition systems can operate basically in two modes:

- Verification or authentication of a facial image: It basically compares the input facial image with the facial image related to the user which is requiring the authentication. It is basically a 1x1 comparison.
- Identification or facial recognition: It basically compares the input facial image with all facial images from a dataset with the aim to find the user that matches that face. It is basically a 1xN comparison.

Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighbourhood of each pixel and considers the result as a binary number.

5. LBPH ALGORITHUM WORKS IN FOLLOWING STEPS

Local binary pattern is the visual descriptor used in the classification in computer vision and as well as one of the most powerful features for visual classification. Visual driver labels pixels of image by approaching the neighborhood of each and every pixel and examine the result as binary number. The pixels should be in circle or clockwise in direction. If the centers value is greater to neighbors value will written as 0 or write 1, it generates the binary number. Then compute the histogram over the cell over the cell, of the frequency of each number occurring. It is also possible to analyze images in typical real-time settings.

1. Training the Algorithm

First, we need to train the algorithm. To do so, we need to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of the person) for each image, so the algorithm will use this information to recognize an input image and give you an output. Images of the same person must have the same ID. With the training set already constructed, let's see the LBPH computational steps. The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters radius and neighbours. The image below shows this procedure:

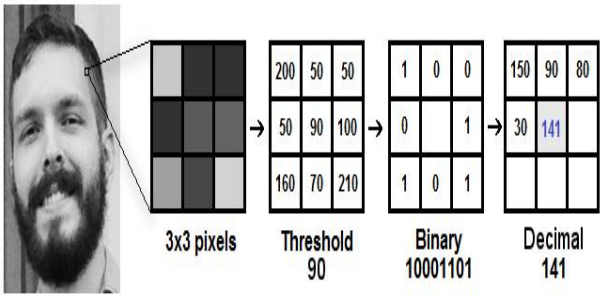

Fig: 2 LBP Operations

Extracting the Histograms, using the image generated in the last step, we can use the Grid X and Grid Y parameters to divide the image into multiple grids

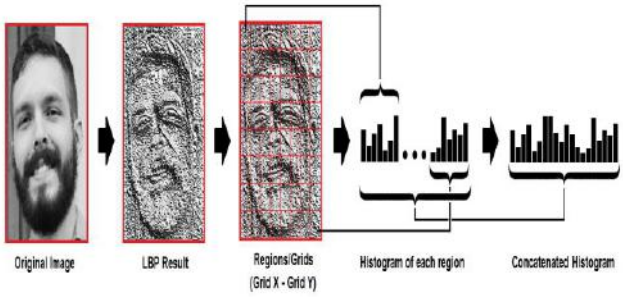

Figure No. 3 Extraction Histograms

Based on the image above, we can extract the histogram of each region have an image in greyscale, each histogram (from each grid) will contain only 256 positions (0~255) representing the occurrences of each pixel intensity. Then, we need to concatenate each histogram to create a new and bigger histogram. Supposing we have 8x8 grids, we will have 8x8x256=16.384 positions in the final histogram. The final histogram represents the characteristics of the image original image. Performing the face recognition for that the algorithm is already trained. Each histogram created is used to represent each image from the training dataset. So, given an input image, we perform the steps again for this new image and creates a histogram which represents the image. So to find the image that matches the input image we

just need to compare two histograms and return the image with the closest histogram. We use various approaches to compare the histograms (calculate the distance between two histograms), for example: Euclidean distance, chi-square, absolute value, etc. In this example, we can use the Euclidean distance (which is quite known) based on the following formula:

$$D = \sqrt{\sum_{i=1}^{n}(hist1_i - hist2_i)^2}$$

2. OPENCV-PYTHON

OpenCV-Python is a library of Python bindings designed to solve computer vision problems. This gives us two advantages: first, the code is as fast as the original C/C++ code (since it is the actual C++ code working in background) and second, it easier to code in Python than C/C++. OpenCV-Python is a Python wrapper for the original OpenCV C++ implementation. OpenCV-Python makes use of Numpy, which is a highly optimized library for numerical operations with a MATLAB-style syntax. All the OpenCV array structures are converted to and from Numpy arrays. This also makes it easier to integrate with other libraries that use Numpy such as SciPy and Matplotlib.

3. PILLOW MODULE

Python Imaging Library (abbreviated as PIL) (in newer versions known as Pillow) is a free and open-source additional library for the Python programming language that adds support for opening, manipulating, and saving many different image file formats. It is available for Windows, Mac OS X and Linux. Pillow offers several standard procedures for image manipulation.

4. PANDAS MODULE

Python was majorly used for data munging and preparation. It had very little contribution towards data analysis. Pandas solved this problem. Using Pandas, we can accomplish five typical steps in the processing and analysis of data, regardless of the origin of data — load, prepare, manipulate, model, and analyze. Python with Pandas is used in a wide range of fields including academic and commercial domains including finance, economics, Statistics, analytics, etc.

5. SHUTIL MODULE

Shutil module in Python provides many functions of high-level operations on files and collections of files. It comes under Python's standard utility modules. This module helps in automating process of copying and removal of files and directories.

6. CONCULTION

In this paper, we proposed a complete framework for accurate human face based identification attendance management system. This project has been made in an effort to simplify and quicken the attendance system and reduce unwanted hassles. In light of the covid-19 pandemic we have strived to create a safe and apt attendance system that minimises contact or possibility of contamination that are liable in other automatic systems like fingerprint scanner.

7. REFERENCES

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