Automated Attendance System Using OpenCV

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Abstract—Student Attendance mainframe structure is defined to manage the student's class attending files using the concept of face detection and recognition through open computer vision. The principle reason this system has been put forward is to improve the traditional attendance system of various universities to avoid the misuse of time and assets. The pointing-sides of automation world have forced an idea of switching from standard attendance to the digital system by using face detection and recognition methods. This is how the Student Attendance structure is being developed by introducing the dataset of an individual. The major reason of building this system is to improve the adaptability and performance of the attendance system procedure besides reducing the long term time load, work and disposables used. The main purpose of the Student Attendance markup structure is to perform, adding and manipulating attendance notes of an individual, automatic calculation on number of presentees and absentees based on subject and affability of the class and then generates the automated document or spreadsheet. This idea is completely based on general purpose language named as python through which we use the concept of open computer vision. For face detection system we used haarcascade and for face recognition, we used LBPH model; then the training of individual student happened and finally the system generates the spreadsheet which provides the no. of students present in classroom with an image or video capturing live.

Keywords: LBPH, OpenCV, Facial Analysis, KNN

I. INTRODUCTION

Upholding attendance is very essential in all the institutes for keeping check on the reliability in education. In depth of the institutions, student markup attendances are being standardly taken by creating the actual use of attendance file or notes issued by the departmental arch. The teacher takes the attendance manually by calling out each student's name to check whether he/she is present in the class or not. This procedure is boring, time killing and false as students often gives wrong calls for their absent classmates. This process also makes it harder to change the attendance of each and every student in a huge classroom. In this program, we created the design and used a variety of techniques like face exposure and understanding system to automatically detect the students in a class and mark their attendance by capturing his/her frames. Some biotech metric methods of assimilation can be increased perfectly, students normally had to wait for longer at a time they arrived the room for attendance. Face understanding is to choose owned to the non-invasive nature and familiarly as the people primarily recognize the other individual based on their facial features. This facial biometric structure basically consists of the enrolled procedure in which the major unique features of the individual face will be stored in the dataset after the procedure of detecting and understanding. The conventional standard techniques for analyzing the student participation in certain addressing are is to physically sign the attendance sheets in a PC framework for investigating them. This is dim, annoying and inclined to mistakes as students would sign for their missing classmates, making this strategy ineffective. Utilization of the face identification and acknowledgment framework in lieu of the customary strategies will give a faster and compelling technique for capturing understudy participation precisely while offering a secure, steady and strong restrictions of the framework records, where upon approving; one can get to them for any purpose like organization, guardians or even for the under captive studies themselves.

The main challenge faced by the banking industry is that a lot of illegal transactions takes place leading to a lot of money loss of the customer. Also big data helps in analyzing the account through which banks are able to know repaying capacity of the borrower. With the help of big data, banks can examine the information to track the customer's behavior in real time, which would help the industry with the requirements needed at any instant of time.
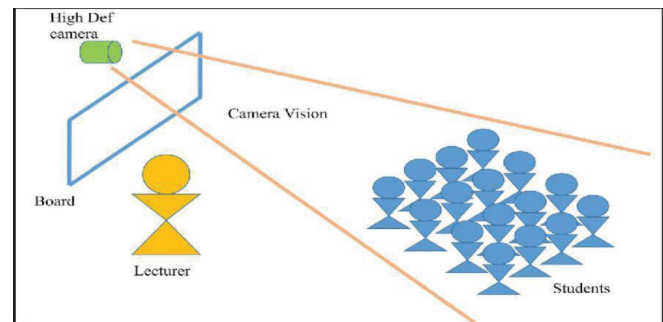

Fig. 1. Automated Attendence Using High Defined Camera [2]

II. LITERATURE REVIEW

DIGITAL IMAGE PROCEDUREING

Computerized picture methodology manages the supervision of advanced frames through a computed PC and the sublimely of sign and frameworks yet centered especially on the pictures. Plunge centers around building up a PC framework that will perform technique on a picture. After that picture analyzing proficient calculation and given a picture as a yield. Digital frame analyzing techniques are inspired by three majority applications essentially:

1. Improving the pictorial dataset for human decrement.

2. Image/Frame preparing for self-ruling machine application.

3. Efficient capacity and transactional.

Fig. 2. Digital Image Processing [2]

Item identification is rarely one of the PC advancements, which associated with the picture preparing and PC visionary and its cooperates with recognizing certain occasions of an article, for example, human images, building blocks, trees, vehicles, and so on. The improvement point of face identification calculation can be decided if there will be any faces in the frame or not. Face capturing is a first and most basic advancement for face acknowledgment, and it is generally utilized to differentiate faces in the frames. It is the piece of item understanding and can be use in numerous divisions.

How the Face Detection Works:-

There are numerous systems to recognize faces with the assistance of these strategies so we can differentiate faces with higher provisioning. These systems have practically same technique for Face understanding. Initially the pictures are imported by giving the dimensions of the picture. At that point the image is to be changed from RGB to Grayscale frame in light, in fact it can be anything, but it makes it difficult to recognize faces in the grayscales. The following stage is to utilize Haar-Like highlights calculation, which is propounded by Voila and Jones for face recognition. This calculation is utilized for finding the area of the human faces in an edge or picture. Every human face shares some general properties of the human face like the eyes are darker than its neighbour pixels and nose locale is more brilliant than eye area. The directions of x, y, w, h which makes a square shape confine the image to demonstrate the area of the face or we can say that to demonstrate the district of enthusiasm for the picture. After this, it can make a square shape enclose the territory of intrigue where it recognizes the face.

How Face Recognition Works:-

So as to see how the Face Recognition works, let us initially figure a thought of the idea of an element broadly in vector. Each Machine education calculation takes a given database as information and gained from this certain information collected. In calculation experiences the information and distinguishes designs of the information or data. There are numerous things in which we can take humans as an example:

Height/width of the particular faces.

*Height and width cannot be dependable since he picture could be rescaled to a smaller faces. Be that as it may, even in the wake of rescaling, what remains unaltered are the proportions – the given proportion of structure of the face to the certain width of the face that won't change.

Colors of the face.

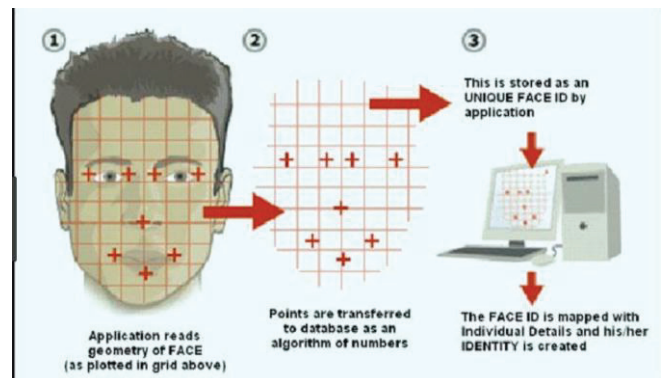*Width of different pieces of the appeared face like lips, nose, and so on.

Fig. 3. Facial Analysis [2]

III. METHODOLOGY

A. General Overview

As we all know that Python is the general programming language with limitless advantages and friendly syntax code. Python is the scripting programing language mainly it was first being used for system administration task and automation. Even also you can write your paper now in variety of notebooks and put then as a resource work. The main reason to opt python is its image processing capabilities as there are as many frameworks and definitely there is no shortfall of packages and libraries in it. Our project which is based on image processing for attendance system is especially integrated on open computer vision which provides tremendous power to the concept.

Some of the python packages/modules using in the project are:-

1. Numpy - library that contains scientific computing, path of multidimensional array object, linear algebra and Fourier transform.

2. Tkinter - python inbuilt library that creates interactive simple GUI apps, text, editors, games, etc.

3. OpenCV - library that contains high level understanding, automate task and recognition.

4. PIL - library used to manipulate images and python reflecting codes.

5. Pandas - library used to analyze data and value over specific axis.

In our project we are essentially using Pycharm IDE which is a software environment situation use to write other types of programs used tools like editor or a compiler. It proved to be a highly useful tool when code using various languages for multiple reasons and requirements which makes your life so much easier. There are many advantages of using Pycharm as an IDE as it is code insight, better readability, debugger, resource management, increased efficiency, collaboration and project management as well.
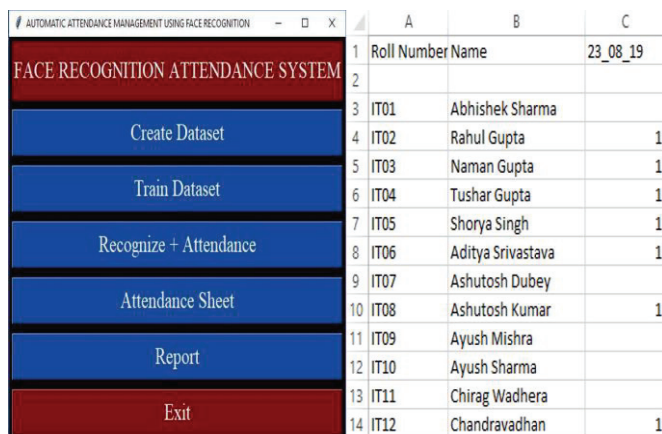
Fig. 4.   GUI & Spreadsheet

The spreadsheet shown:

	A	B	C
1	Roll Number	Name	23_08_19
2			
3	IT01	Abhishek Sharma	
4	IT02	Rahul Gupta	1
5	IT03	Naman Gupta	1
6	IT04	Tushar Gupta	1
7	IT05	Shorya Singh	1
8	IT06	Aditya Srivastava	1
9	IT07	Ashutosh Dubey	
10	IT08	Ashutosh Kumar	1
11	IT09	Ayush Mishra	
12	IT10	Ayush Sharma	
13	IT11	Chirag Wadhera	
14	IT12	Chandravadhan	1

B.   Face Database

In automated attendance system, there are generally 3 methods to create customized dataset so that one can use face recognition and detection to acquire certain results for satisfying ones requirements, they are given as:-

Use open computer vision and webcam – In this method, you need a particular person to create and gather the certain datasets which is loaded in system using the computer vision library.

Capturing the frames from live video – This method is similar to earlier method but the different is that it create a live video of multiple individual from which it extracts certain data frame by frame loop in it.

Saving the acquire dataset or frames in our database – In this phase we don't need a physical appearance of an individual instead we use a public figure of strong online presence. We can download face API, programmatically download the image of faces from various different platform.
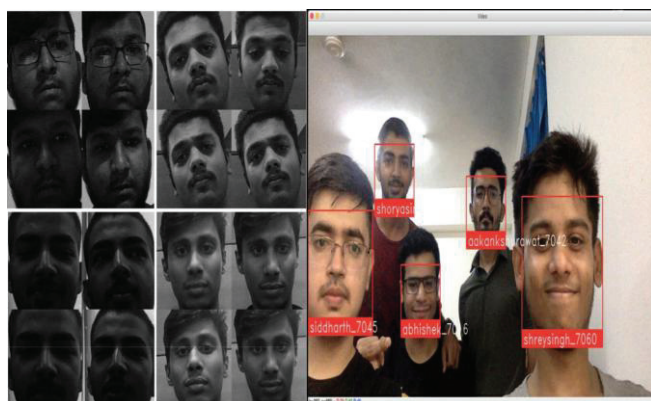

Fig. 5.   Capture dataset

C.   Face Detection Using HAARCASCADE

Haar-wavelet is the sequence of rescaling square shaped functions which is very identical to Fourier analysis. It was first inclined by Alfred Haar in 1909 and they were like convolutional neural networks for kernel's which provides the relevant features for face detection. Haar feature contains three face as edge features which can detect edges quite effectively and line features can detect lines quite effectively and the Four-rectangle feature. So there are white pixels and black pixels in real images, it consists of gray scale image in

which every single pixel has the value out of possession of 0 to 255.
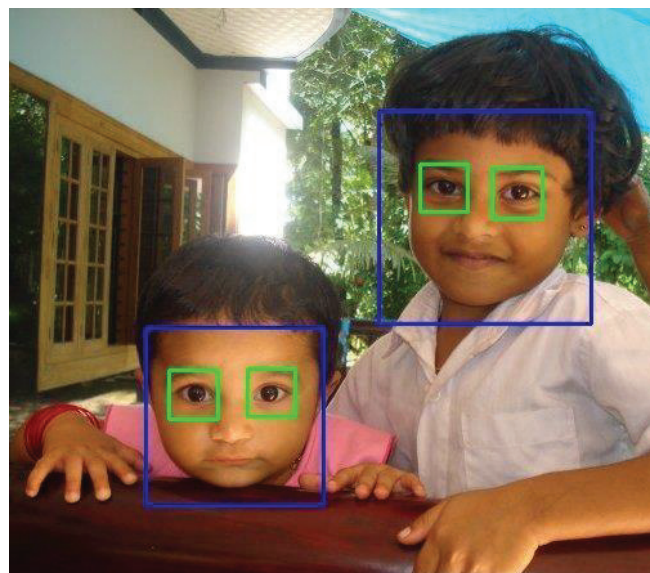

Fig. 6.   Face Detection Using HAARCASCADE [3]

For marking the attendance of individual students we use some pre-trained xml file names such as haarcascade_frontal_face.xml, haarcascade_eye.xml and haarcascade_profileface.xml which loads the input in a grayscale mode. After that we find the particular face or students face on webcam it will return to the positions of disclosed faces using the function Rectangle (x, y, w, h). Once we got these locations, we can now detect the multi scale function of student and can create roi gray or roi color faces which is able to create two frames in color as well as in gray scale by applying eye detection on the student face in the real time situation.

D.   Face Recognition Using LBPH and KNN

Different approaches applied in project:-

LBPH - For face recognition, one of the best concepts is LBPH (Local Binary Pattern Histogram) in open computer vision. LBPH is used to compile the local structure of an image/frame with its neighbor frames of each pixel.

It takes a certain pixel as a center and threshold against other. If the quality of the pixels is greater than equal to the neighbor then it will give '1' else it will give 'null'. So with surrounding pixel combinations we get local binary figures or local codes.
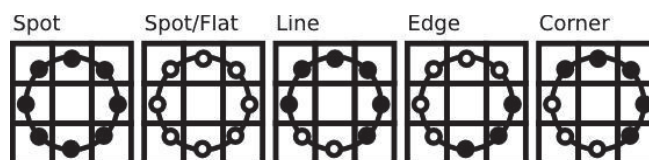

Fig. 7.   LOCAL REPRESENTATION FOR FACE FEATURES [7]

From our personal experience LBPH is somewhat better approach for face recognition than Eigen faces and Fisher faces which is used to treat data in terms of vector and provides high dimensional space frames which is either bad or non-identical but in LBPH it provides low dimension space which is identical and better for recognition. The concept of LBPH used in the attendance system is to

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recognize the face of whole classroom with 96% accuracy rate or to preserve some discriminant data to linear analysis which occurs in fisher's face algorithm. So in order to get good recognition rates we must needed at least 8(+-1) frames for each individual person and in our project we aim to obtain 20-30 frames per person to prevent the less recognition rate.

Fig. 8.   LBPH RECOGNITION [9]

KNN – K-Nearest Neighbor classifier is specific of the regression and classified recognition term in machine learning. The concept is similar to other face recognition but it is non-parametric, which means it could not make any assumptions on the basis of generated data other than what is known as the lazy learner or memory based learning. This approach is a way of finding similarity with the near vector representation of the objects and after then comparing those vectors with the apportion distance formula's like Euclidean distance. Majorly we use face recognition library with KNN algorithm, which provides 97.35% of accuracy rate and applicable in various social media networks like Facebook which is noticeably in this field, as 2 billion monthly users update/upload around 350 million photos which provides social media with infinite sources of acquiring dataset which was earlier announced by Mark Zuckerberg.
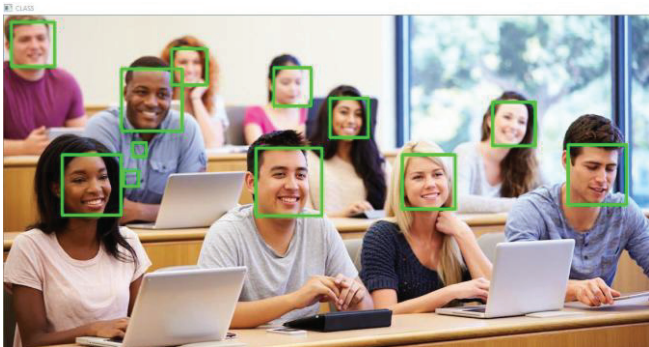

Fig. 9.   Face Recognition Using Knn [6]

E.   Alternative Ways for Face Recognition

TENSORFLOW – The substitute way of using face recognition is tensorflow in which we use the CNN algorithm which is convolution neural networks. It works on connecting patterns of neurons activated by biological processes. After that detection of face takes place using open computer vision in haarcascade with some xml documents. Then it converts the tensorflow model into tensorflow lite for object detection. In computerized attendance system we required to use tensorflow but we don't have external devices and high rated camera. Hence, this is the alternative way for face recognition for our project.
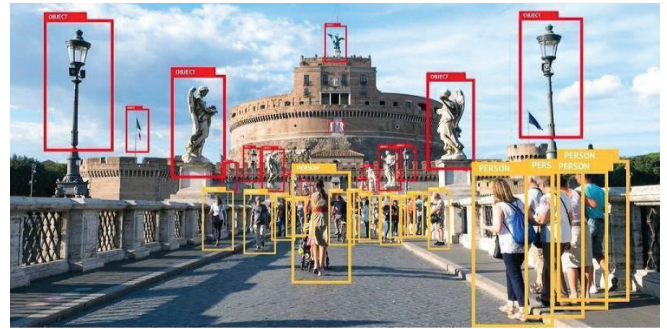

Fig. 10. Object Detection Bby Tensorflow [9]

MICROSOFT FACE API – Microsoft azure is a cloud computing service which provides cognitive services with variety of API's names as face, vision, smile, emotions, gender, age etc. The company assures that the face API provides 99% accuracy rate of the program using face recognition or dlib type libraries in it. The face API would build with different functions like to detect and recognize the human faces and would return rectangular faces of that particular location. The ability and reliability to process variety of human faces information is very different in technology scenarios. Examples situations like security, environmental user interface, management, application development, robotics etc.

IV.   RESULT

Applying this project in the real world we can achieve a lot of things such as getting attendance done by the faculty with no proxy, which in turn could help in saving time. This will be beneficial in every university in which there is a problem with attendance. Through this students would not be able to mark attendance for their friends and vice versa. This will be beneficial for faculty as well, as this will definitely save their time and they will not have to get a head count of students present just to crosscheck whether proxy attendance has been marked by any of students or not. This project will develop the ecosystem of the schools and universities, so the technology is going to revolve around us. This software provides some future scope to develop a device in each and every class and the developer can provide an application for attendance system for specific university with the specified subject. This software when exposed to the real world can make a difference in attendance of students and help in time management or reliability among the professors to teach with no attendance marking problems or to carry registers. This software solves the real world issue with schools and universities.

V.   CONCLUSION

It tends to be assumed that the strong, secure, quick and a productive stable class participation used to execute frameworks have been created supplanted the normal and erratic framework. This face discovery becomes the acknowledgment framework with the free clock, diminished the measurement of work that is done by the organization and supplants the stationary substantial at the present being used for officially existent electronic hardware. There is no further requirement for the certain equipment for establishing the groundwork as its just use a personal computer, a digital camera and for alternate use webcam. The camera assumed to a critical work in the working of the plan subsequently the

picture qualitatively and execution of the cameras continuously position must be tried particularly if the specific framework is worked from the live camera feeds.

Automated Attendance System has been imagined to diminish the downsides in the customary manual frameworks occurring in schools and universities. This participation framework exhibits the utilization of picture handling strategies in homeroom. This framework can simply help in the participation framework, yet additionally improve the altruism of an organization and avoid the wastages of time and paper majorly.

VI. FUTURE SCOPE

We are just setting up to structure of a bigger groundwork including two specific modules. The main module face locator is the portable part, which is fundamentally a digital camera application that catches under knowledge faces or stores them in a document utilizes personal computer vision face discovery calculation and frame extraction strategy. The subsequent modules is a work done area application that frame acknowledgment of the caught certain pictures of faces in the record, denotes the understudies register and after that store the outcomes in a datasets for future examination.

Through this software, no student will be able to give or mark fake attendance for his/her friends. Since there will be proper attendance marked on excel sheet and thus it will also save the time of faculty in universities where they are having a lot more work to do rather than wasting their time in taking attendance of the students present in the class. The other improvement we made is to connect the project to a server and link it with the parent email id thereafter we can give the monthly attendance report of the student to their parents via email for the student's progress.

REFERENCES

[1] Wagh, P., Thakare, R., Chaudhari, J. and Patil, S., October. "Attendance system based on face recognition using eigen face and PCA algorithms" International Conference on Green Computing and Internet of Things (ICGCIoT) (pp. 303-308). IEEE, 2015

[2] https://www.tutorialspoint.com/dip/images/introduction_image.jpg

[3] https://docs.opencv.org/3.4.1/face.jpg

[4] Ahonen, Timo, et al. "Recognition of blurred faces using local phase quantization." Pattern Recognition, ICPR19th International Conference on. IEEE, 2016.

[5] https://medium.com/beesightsoft/build-your-own-face-recognition-using-face-recognition-library-and-k-nearest-neighbors-classifier-611ffc973d4b

[6] https://towardsdatascience.com/face-recognition-how-lbph-works-90ec258c3d6b

[7] https://miro.medium.com/max/667/1*J16_DKuSrnAH3WDdqwKeNA.png

[8] S. Moore and R. Bowden, "Local binary patterns for multi-view facial expression recognition". Computer Vision and Image Understanding, pp. 541-558, 2017

[9] Kar, Nirmalya, Mrinal Kanti Debbarma, Ashim Saha, and Dwijen Rudra Pal. "Study of implementing automated attendance system using face recognition technique." International Journal of computer and communication engineering 1, no. 2 (2012): 100.