

Attendance System Using Face Recognition

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ABSTRACT

Authentication is one of the significant issues in the era of information system. Among other things, human face recognition is one of known techniques which can be used for user authentication. As an important branch of biometric verification, HFR (Human Face Recognition) has been widely used in many applications, such as video monitoring/surveillance system, human-computer interaction, door access control system and network security. Face Recognition begins with extracting the coordinates of features such as width of mouth, width of eyes, pupil, and compare the result with the measurements stored in the database and return the closest record (facial metrics). Nowadays, there are a lot of face recognition techniques and algorithms found and developed around the world. This system uses this face detection for attendance of students in a classroom. The traditional method of attendance requires more physical effort. It can be a little time consuming. Through this system, attendance can be handled without human intervention. Not only the attendance on a daily basis but a small report required to track student activity (total number of lectures attended and pertaining percentages can be displayed).

Keywords : Human Face Recognition, 3D face recognition, CMOS, Support Vector Machine, Independent Component Analysis, LDA, PCA

I. INTRODUCTION

A .Face Recognition

Facial recognition is a biometric software application capable of uniquely identifying or verifying a person by comparing and analyzing patterns based on the person's facial contours. Facial recognition is mostly used for security purposes, though there is increasing interest in other areas of use[1]. In fact, facial recognition technology has received significant attention as it has potential for a wide range of application related to law enforcement as well as other enterprises.

1. Traditional method

Some of the face recognition algorithm will analyze the relative position, size, and/or shape of the eyes, nose, cheekbones, and jaw[2][3]. These features are then used to search for other images with matching features. Other algorithms normalize a gallery of face images and then compress the face data, only saving the data in the image that is useful for face recognition. A probe image is then compared with the face data. One of the earliest successful systems is based on template matching techniques applied to a set of salient facial features, providing a sort of compressed face representation[4]. Recognition algorithms can be divided into two main approaches: geometric, which looks at distinguishing features, or photometric, which

II. METHODS AND MATERIAL

is a statistical approach that distills an image into values and compares the values with templates to eliminate variances[5][6]. Some classify these algorithms into two broad categories: holistic and feature-based models. The former attempts to recognize the face in its entirety while the feature-based subdivide into components such as according to features and analyze each as well as its spatial location with respect to other features.

2. 3-D approach:

Three-dimensional face recognition technique uses 3D sensors to capture information about the shape of a face. This information is then used to identify distinctive features on the surface of a face, such as the contour of the eye sockets, nose, and chin. One advantage of 3D face recognition is that it is not affected by changes in lighting like other techniques. It can also identify a face from a range of viewing angles, including a profile view. Three-dimensional data points from a face vastly improve the precision of face recognition. 3D research is enhanced by the development of sophisticated sensors that do a better job of capturing 3D face imagery. The sensors work by projecting structured light onto the face. Up to a dozen or more of these image sensors can be placed on the same CMOS chip—each sensor captures a different part of the spectrum.... Even a perfect 3D matching technique could be sensitive to expressions. For that goal a group at the Technion applied tools from metric geometry to treat expressions as isometries[8][9][10][11].

A new method is to introduce a way to capture a 3D picture by using three tracking cameras that point at different angles; one camera will be pointing at the front of the subject, second one to

In this paper, we present an approach for taking attendance with the help of cameras in a classroom

based on OpenCV. It will be done through a database which stores pictures in gray-scale and compares with the input given so as to give final results.

III. Literature Review

Some research papers regarding face recognition were studied by us. These included various techniques of face detection, how the AI component of the system can be applied that is what algorithm can be used for the training set, how these methods can be implemented in a feasible way, etc. Some of the papers which were more relevant to this are mentioned below.

Aishwarya Admane, Afrin Sheikh¹, Sneha Paunekar, Shruti Jawade, Shubhangi Wadbude, Prof. M. J. Sawarkar [11], in their work deal with the different deep learning or machine learning techniques requires or useful in face recognition. Those include basic four techniques which are Principle Component Analysis (PCA), Support Vector Machine (SVM) and Independent Component Analysis (ICA). The advantages and disadvantages are listed out. Accordingly the decision to use PCA was made considering the project genre. Machine learning play a crucial role in machine learning.

Siswanto, A. R. S., Nugroho, A. S., & Galinium, M [12], have described the design a system based on a face recognition system for student's attendance system using it. As discussed in the paper face recognition for an attendance system is based on two algorithms :- PCA and LDA. PCA(Principle Component Analysis) for easy and quick computation without the requirement of huge memory space unlike the old ways like correlation method and LDA(Linear Dimensionality Analysis) for reducing the dimensions of data storage thus the memory required that will put less pressure in terms of space and computation on a system being used for the same. Both the algorithms work in unison(LDA not overpowering PCA). To match the similarity, the Euclidean distances between

the database images and the images obtained by camera are compared so as to classify the student. For doing so first the user is classified as valid or invalid so as to mark attendance. The only issue is that every student will have to go in front of the camera to mark the attendance and it would not be possible if the student fails to do so.

Lu, J., & Plataniotis, K. N. [13] have specified the ways for conversion of the RGB images into a Gray Scale image for face recognition. Many learning-based face detection methods such as those using neural networks and AdaBoost techniques usually work on gray-scale images. Thus given a color input image, it has to be first converted to a grayscale image, J , which is then able to be fed to and processed by these face detection methods. This method is more efficient rather than the conventional methods.

R Rahim, T Afriliansyah, H Winata, D Nofriansyah, Ratnadewi and S Aryza[14] mentioned the usage of accessories and its effect on face recognition. To develop a good face recognition system and to have high accuracy is something that's hard to find. Human faces have diverse expressions and attribute changes such as eyeglasses, mustache, beard and others. Fisher Linear Discriminant (FLD) is a class-specific method that distinguishes facial image images into classes and also creates distance between classes and intra classes so as to produce better classification.

Jie Pan, Xue-Song Wang, AND yu-hyu cheng[15] have dealt with the availability of adequate training samples, many machine learning methods could yield high face recognition accuracy. However, under the circumstance of inadequate training samples, especially the extreme case of having only a single training sample, face recognition becomes challenging. How to deal with conflicting concerns of the small sample size and high dimensionality in one-sample face recognition is critical for its achievable recognition accuracy and feasibility in practice. Being

different from conventional methods for global face recognition based on generalization ability promotion and local face recognition depending on image segmentation, a single-sample face recognition algorithm based on Locality Preserving Projection (LPP) feature transfer is proposed here. First, transfer sources are screened to obtain the selective sample source using the whitened cosine similarity metric. Secondly, we project the vectors of source faces and target faces into feature sub-space by LPP respectively, and calculate the feature transfer matrix to approximate the mapping relationship on source faces and target faces in subspace. Then, the feature transfer matrix is used on training samples to transfer the original macro characteristics to target macro characteristics. Finally, the nearest neighbor classifier is used for face recognition. Our results based on popular databases FERET, ORL and Yale demonstrate the superiority of the proposed LPP feature transfer based one-sample face recognition algorithm when compared with popular single-sample face recognition algorithms such as (PC)2A and Block FLDA. This means less memory and more results.

Qingdong Du and Xiao Han[16] mentioned how With the deep learning in different areas of success, beyond the other methods, sets off a new wave of neural network development. The concept of deep learning originated from the artificial neural network, in essence, refers to a class of neural networks with intelligence, deep learning has been widely used in handwriting digital recognition, dimension simplification, speech recognition, image comprehension, machine translation, protein structure prediction and emotion recognition. In this paper, we focus on the research hotspots of face recognition based on depth learning in the field of biometrics, Combined with the relevant theory and methods of depth learning, face recognition technology, along the order of depth learning, based on the depth of learning face recognition, face recognition application to start research.

ChrisXiaoxuanL,XuanKan,BowenDu,ChanghaoChen,HongkaiWen,AndrewMarkham,NikiTrigoni,JohnA.S tankovic [17] state that Facial recognition is a key enabling component for emerging Internet of Things(IoT)services such as smart homes , responsive offices . Through the use of deep neural networks, facial recognition has achieved excellent performance . However, this is only possibly when trained with hundreds of images of each user in different viewing and lighting conditions. Clearly, this level of effort in enrolment and labelling is impossible for wide-spread deployment and adoption . Inspired by the fact that most people carry smart wireless devices with them ,e.g. smartphones, they propose to use this wireless identifier as a supervisory label. This allows us to curate a dataset of facial images that are unique to a certain domain e.g. a set of people in a particular office. This custom corpus can then be used to finetune existing pre-trained models e.g. Face Net. However, due to the vagaries of wireless propagation in buildings, the supervisory labels are noisy and weak

IV. Requirement Analysis

This Project requires a web camera with a long range. It requires a screen which displays the images captured. This software store students data that might be lost so there is need of safety needed. Only authorized user can access the software so that there will not be any misuse of the data. A high configuration system to install the software so that it works seamless. (3.2.2 hardware)

A. Functional requirement

- 1) The attendance will be taken by faculty.
- 2) The database requires student images which will be managed by the faculty (at intial stage and while making changes).
- 3) The attendance will be monitored by HOD and faculty.
- 4) The image captured must be of high resolution.

5) After taking the images of student the cluster of images should be created auomatically.

1) Hardware :-

- i) Minimum 4 GB Ram and i3 processer are required.
- ii) Camera with wide angle.
- iii) Camera with High definition recording.
- iv) Operating device should have enough space to stored thousands of images .

2) Software:-

- i) Open cv should be installed in operating device.
- ii) Python should be installed in operating device
- iii) Operating software must be windows.
- iv) Pythons library such as numpy,tkinter,pandas must be installed.
- v) Microsoft excel.

B.Non-functional requirement:-

- 1) Safety requirement :- Humans are error prone ,but negative effect of common error should be limited e.g. users should realize that a given command can delete data .
- 2)Software quality :- The quality of the system is maintained in such a way that it can be very user friendly .
- 3)Performance requirement :- The performance of our software is at its best when password management ,regular database archiving ,virus protection is done.

V. Design

The process for this system will be capturing of images through camera and then matching the pre fed set to mark att73endance. It can also monitor the attendance over a period and generate a report accordingly. Both teachers and authorized students will have access to make necessary changes. Students may access the data set to inform about the changes required. These steps can be showed in a form of a use case diagram as follows

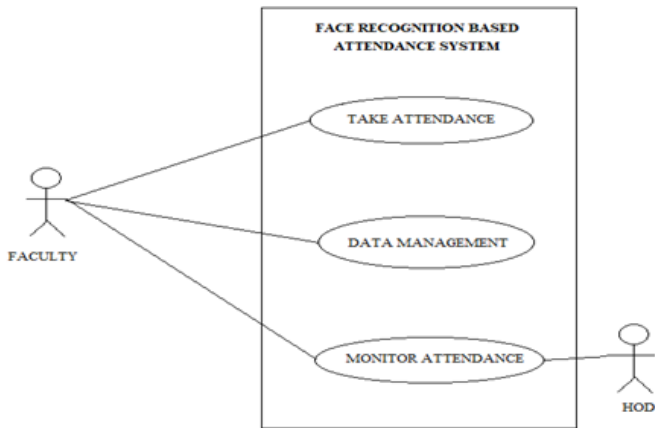


Fig.1. Use case diagram for Attendance system using face recognition

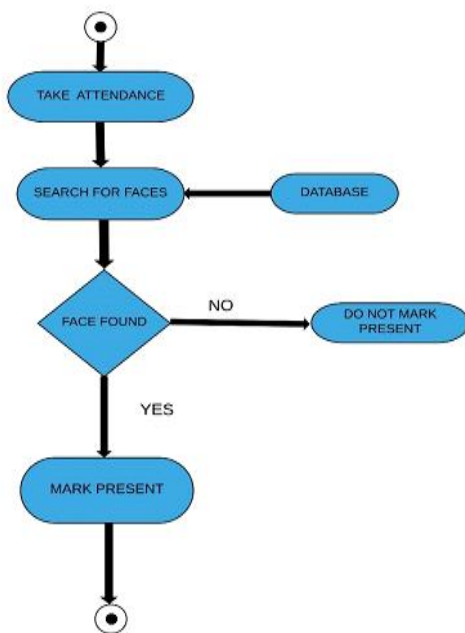


Fig.2. Activity diagram for Attendance system using face recognition



Fig.3. Block Diagram

Step 1: Create a database of student images (tentative). This database will contain images used for training the system in identification of a student through images.

Step 2: Using the database, the code is implemented till it produces near to accurate results so that it can be implemented further.

Step 3: Add student images to the data base while actual execution of the project. These images include different angles for a subtle accuracy. It also includes different accessories like spectacles, cap, etc.

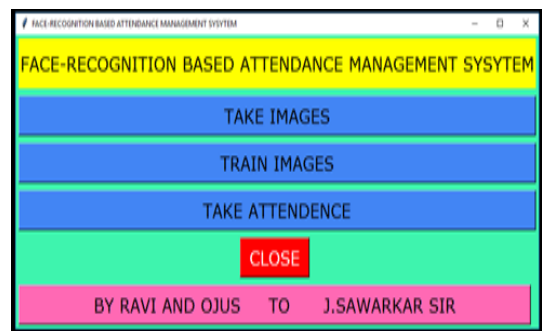
Step 4: Take the attendance using camera of a higher resolution so that each individual is identified correctly.

Step 5: Attendance of a student gets marked by matching with the database images.

Step 6: Individual attendance of students is calculated and displayed.

VI. DESIGN IMPLEMENTATION

A look like home page is loaded ,where we can see many buttons such as take images ,train images ,take attendance ,close .when we click on the take images button ,a screen with camera opens where it takes the images of the students and store them in database. we click on train images it makes cluster of images and group them .During attendance the images of students are recognized.[18]. This is the basic popup after running the code. It has three options which include image capturing for data set, training the data set and actual implementation which is marking attendance.



The above image shows that how the images of the students are stored in database .Every image has a name associated with it eg user1,user2 etc and a number is also associated which represents the roll number of the student, so finally the text with image looklike user1.4 it represents that the name of the person in the image is user1 and its roll number id 4.

The below images is use case diagram for face recognition based attendance system. Where we can clearly see that only the faculty is provided with the authority to take the attendance. Student can update their database by help of faculty.

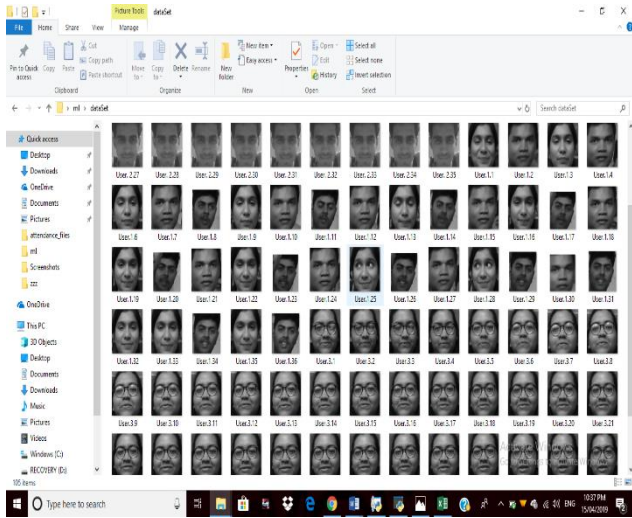


Fig.5. fig.5.Actual Database

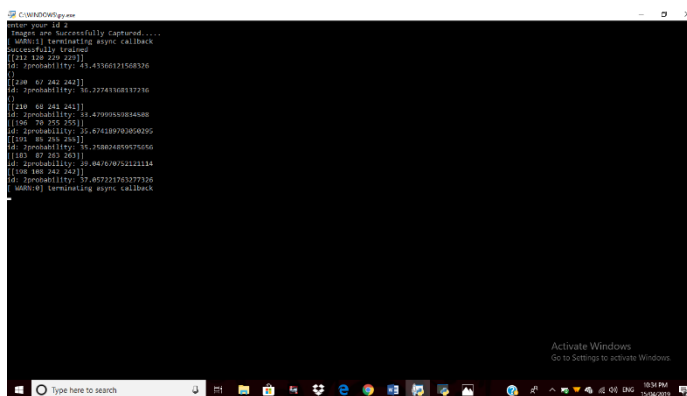


Fig.6.Terminal

VII. Technology used

A.OPEN CV :- OpenCV is a library of programming functions mainly aimed at real-time computer vision.Originally developed by Intel, it was later supported by Willow Garage then Itseez (which was later acquired by Intel). The library is cross-platform and free for use under the open-source BSD license.

OpenCV runs on the following desktop operating systems: Windows, Linux, macOS, FreeBSD, NetBSD, OpenBSD. OpenCV runs on the following mobile

operating systems: Android, iOS, Maemo, BlackBerry 10.The user can get official releases from SourceForge or take the latest sources from GitHub. OpenCV uses CMake.OpenCV is written in C++ and its primary interface is in C++, but it still retains a less comprehensive though extensive older C interface. There are bindings in Python, Java.

B.PYTHON :- 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. 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++.

VIII. CONCLUSION

Through implementation of this system, the time and effort required for the attendance carried out at schools, colleges and universities can be reduced. Also the manual efforts required for the same are reduced. The calculation of the attendance can also be carried out using this system. The human errors can be minimized if the system is properly used. Human intervention is reduced which leads to less mistakes and less amount of tedious work. Since face recognition is used for marking attendance, through a stationary camera which will scan the whole classroom, no extra efforts are required for the same.

IX. FUTURE SCOPE

A. More cameras ,more efficiency:
If the number of cameras used is increased then the overall efficiency of the model can be improved. It will

give more good results as compared to a single installed camera.[19]

B. Data set can be increased:

The data set can be made more robust by adding images wearing some accessories or ornaments or a changed appearance so as to improve efficiency. It will require more memory space. But if efficiently managed may give improved results.[19]

C. New features can be added:

Some organization specific features or graphs or graphical study and display can be added for more user friendly system.

X. REFERENCES

- [1]. Techopedia.com, "What is Facial Recognition? - Techopedia", 2018
- [2]. Anometrics, "Face Recognition Applications" Archived from the original on 2008-07-13 Retrieved 2008-06-04.
- [3]. Zhang, Jian, Yan, Ke, He, Zhen-Yu, and Xu, Yong "A Collaborative Linear Discriminative Representation Classification Method for Face Recognition", 2014, International Conference on Artificial Intelligence and Software Engineering (AISE2014) Lancaster, PA: DEStech Publications
- [4]. Consumer Reports, "Facial Recognition: Who's Tracking You in Public?", 2016
- [5]. Bramer, Max, "Artificial Intelligence in Theory and Practice: IFIP 19th World Computer Congress", 2006, Santiago Springer Science+Business Media
- [6]. de Leeuw, Karl Bergstra, "The History of Information Security: A Comprehensive Handbook", pp264-265 ISBN 9780444516084.
- [7]. ScienceDaily, "Mugspot Can Find A Face In The Crowd -- Face-Recognition Software Prepares To Go To Work In The Streets", 1997.
- [8]. Williams, Mark, "Better Face-Recognition Software", 2008
- [9]. RKimmel and GSapiro, "The Mathematics of Face Recognition", 2007, SIAM News "Face Homepage" nist.gov.
- [10]. Crawford, Mark, "Facial recognition progress report", 2011 SPIE Newsroom ishwarya Admane, Afrin Sheikh, Sneha Paunikar, Shruti Jawade, Shubhangi Wadbude, ProfMJSawarkar, Z, "A Review on Different Face Recognition Techniques", 2019, International Journal of scientific research in Computer science, Engineering and Information Technology
- [11]. Siswanto, ARS., Nugroho, AS., & Galinium, M., "Implementation of face recognition algorithm for biometrics based time attendance system", 2014, International Conference on ICT For Smart Society (ICISS)
- [12]. Lu, J., & Plataniotis, KN. "Conversion from color to gray-scale images for face detection", 2009, IEEE Computer Society Conference on Computer Vision and Pattern Recognition
- [13]. R Rahim, "Research of Face Recognition with Fisher Linear Discriminant", 2018, IOP MaterSciEng300 012037
- [14]. Pa RIbrahim and ZMZin, "Study of automated face recognition system for office door access control application", 2011, ProcIEEE IntConfCommunicationSoftwareNetwork.
- [15]. ChrisXiao, xuanLu, Xuan Kan, Bowmen Deu, Changhao chen, Hongkai Wen, Andrew Markhem, Niki Trigoni, Jon A Stankovic, "Autonomous Learning for Face Recognition in the Wild via Ambient Wireless Cues", 2019, Proceedings of the 2019 World Wide Web Conference (WWW), San Francisco, CA, USA. ACM, New York, NY, USA.
- [16]. Face recognition with Python (<https://realpython.com/face-recognition-with-python>)
- [17]. Chaitanya P, Smitha Bhat, Sneha R, Swati K.S, "Automatic student attendance system using

face recognition”,2016, Karnataka State Council for Science and Technology (KSCST), Bangalore

Cite this article as :

Ojus Arora, Ravi Purohit , Hemashree Samant, Dr. Archana Gulati, "Attendance System Using Face Recognition ", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 6 Issue 2, pp. 164-171, March-April 2020. Available at doi : <https://doi.org/10.32628/CSEIT206243>
Journal URL : <http://ijsrcseit.com/CSEIT206243>