iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VII **Month of publication:** July 2020

DOI: https://doi.org/10.22214/ijraset.2020.30309

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VII July 2020- Available at www.ijraset.com

Automatic Attendance System using Face Recognition

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Abstract: ***Automatic face recognition technologies have made many improvements within the changing world. We have find a real world solution for automatic student attendance system in a classroom using Real-Time Face Recognition. In order to reduce the human computation, our system are going to be recognizing human faces fast and precisely in images or videos that are being used for further face recognition. Here we use the opencv library dlib for face recognition. Further the label corresponding to the recognized image, which is the student name, is provided with attendance, else the system marks as absent.***
Keywords: Face Recognition, Smart Attendance, OpenCv, dlib, Real-Time

I. INTRODUCTION

Face recognition is one of the important image processing applications owing to its use in many fields. Identification of each individual in an organization for the purpose of attendance is one such application of face recognition. Maintenance and monitoring of attendance records plays a significant role in the analysis of performance of any organization. The purpose of developing automatic attendance management system is to replace the normal way as taking attendance manually by teacher to automatically update attendance using face recognition. Automated Attendance Management System performs the daily activities of attendance marking and analysis of collected data with reduced time and human intervention. The prevalent techniques and methodologies for detecting and recognizing face mostly fail to overcome issues like scaling, pose, illumination, variations, rotation, and occlusions. Here the system aims to overcome the faults of the existing systems and provides features such as detection of faces from image, extraction of the features, recognition of detected faces and analysis of student's attendance.
The project has two main parts:

A. Development of Face Recognition System.
B. Development of Attendance System

Face recognition is achieved using support vector machine and basic pipeline used for it is as follows:
1) Detects the faces from the image.
2) Analyses facial features.
3) Compares against features of trained faces and makes a prediction.
First we create a directory for raw images so that images from different people are in different subdirectories . The images should be formatted as jpg or png formats. Next pre-process the raw images. Here for the given input image , it will detect only the face part of the given image . Then extract the features of given image.
Then we are generating the 128 facial features of each and every input image and stores each 128 features with corresponding labels, which is the students name. Then we train Classification Model. After generating the face features, the system will classify all the faces. Support vector machines (SVMs) are a collection of supervised learning methods. Here we use it for classification. The benefits of support vector machines are very effective in high dimensional spaces, still effective in cases where number of dimensions is greater than the number of samples, uses a subset of training points within the decision function which is termed as support vectors.
The system provides an increased accuracy because of the use of a large number of features(128) of the face. Better accuracy is attained in results as the system takes into account the changes that occur within the face over the period of time. The system is tested for various conditions. We consider classroom attendance for the purpose of testing the accuracy of the system. The metric considered is that the percentage of the faces recognized per total number of tested faces of the same person. The system is tested under varying lighting conditions, various facial expressions, presence of partial faces such as in densely populated classrooms and presence or absence of beard and spectacles.

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II. OBJECTIVES OF PROPSED SYSTEM

The objectives of the project are given below:

A. Detection of face image amidst the other natural components like walls, backgrounds etc.
B. Extraction of characteristic features of a face, which are unique, useful for face recognition.
C. Detection of faces when other face characters such as beard, spectacles etc are present.
D. Effective recognition of unique faces among all the students in the classroom.
E. Automated update of attendance within the database without human intervention.

III.METHODOLOGY

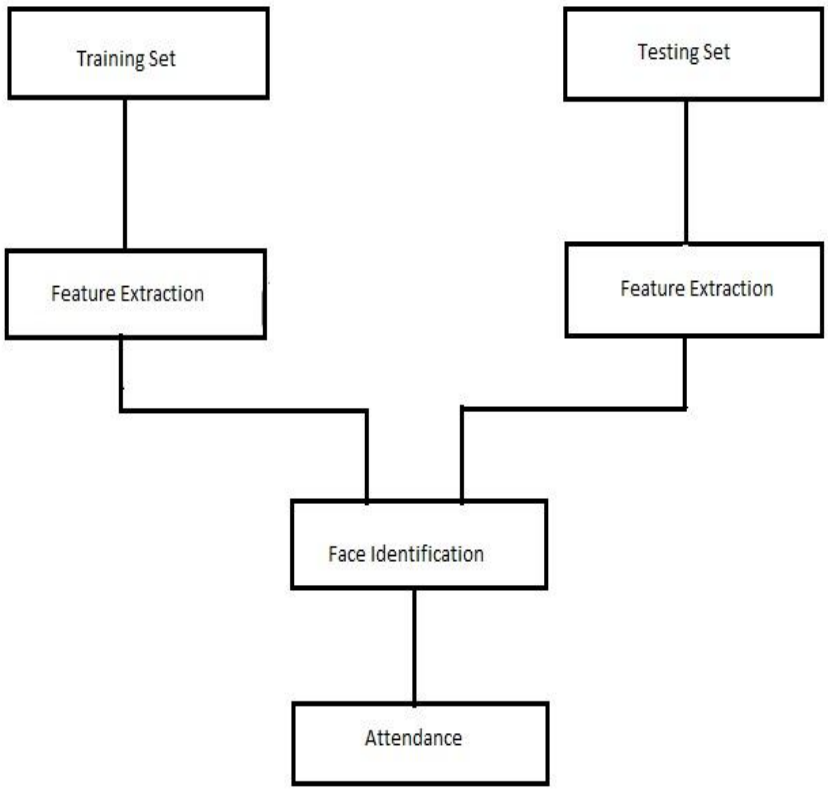
The task of the system is to detect and recognize each student and to store it in the database for his or her attendance. The face of the student needs to be captured in such a manner that all the feature of the student's faces needs to be detected, even the seating and the posture of the student need to be recognized. There is no need for teacher to manually take attendance of students in the class because the system records a video and through further processing steps the face is being recognized and therefore the attendance database is updated

IV. WORKING OF PROPOSED SYSTEM

A. Architecture

To build our face recognition system, steps needed are follows:

1) Perform face detection in training images
2) Extract face encoding from each face
3) Train a face recognition model on the encoding
4) Finally recognize faces in both image or video streams with OpenCv



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While we tend to used OpenCv to facilitate face recognition, OpenCv itself wasn't answerable for distinctive faces. The tasks involved are detection of faces, extraction of 128-dimensions face encodings, train a Support Vector Machine (SVM) on top of the encoding, recognition of faces in images. When we apply face detection, then which detects the presence and location of a face in an image. Then extract the 128-dimension feature vectors. After that SVM has been trained on the encodings. Our training dataset is created with images of each student. Face recognition API generate face encodings for the face found. In face encoding face will be represented using a set of 128 features of face. The system starts with processing the image for which we want to mark the attendance. The basic phase is the image capturing phase from which we start initializing our system by capturing images of the students. We capture an image from a camera. We take different frontal postures of individuals.

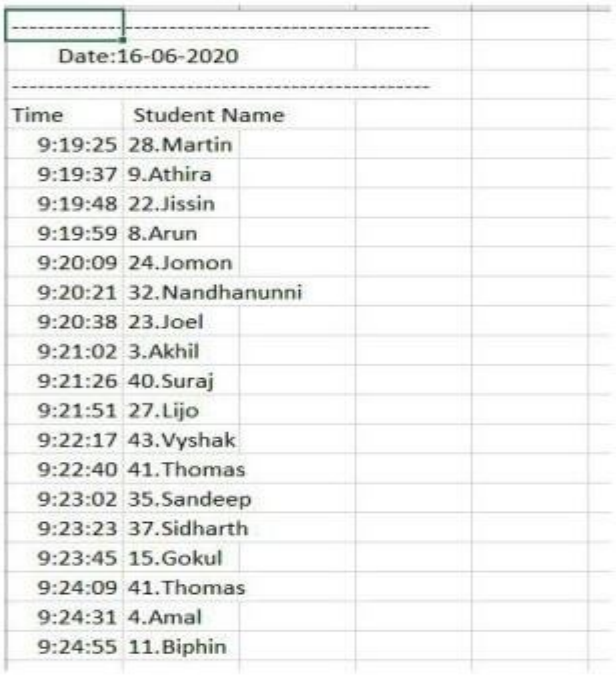
Fig. 2. Dataset

This is the training set in which every individual will be classified based on labels. This detects only faces and excludes every other parts because we are exploring the features of only faces. These detected faces are stored for further enquiry. Features are extracted in this extraction phase. The detected bounding boxes of faces are then queried to look for features extraction ie, encodings. Feature extraction is done for every detected faces. The feature which is already trained with every individual then compared with the features detected faces and if both features match then it is recognised. For finding the students name from the encoding, a basic machine learning classification algorithm is used i.e. simple linear Support Vector Machine (SVM) classification. Once, it recognizes the faces it is going to update in the student attendance database.

B. Technologies involved are:

1) *OpenCv:* OpenCV or open source computer vision library is an image processing library created by Intel. Being a BSD licenced product, OpenCv makes it straightforward for all businesses to utilize and modify the code. OpenCv may be a library of programming functions primarily geared toward the period of time. The library is cross-platform and it's absolve to be used beneath the ASCII text file BSD license. the primary OpenCv version was 1.0. OpenCv is free beneath a BSD license and thus it's free for each tutorial and business use. It has C++, C, Python and Java interfaces and supports several OS like Windows, Linux, Mac OS, iOS and robot. once OpenCv was designed the most focus was period of time applications for process potency.

2) Support Vector Machine: In machine learning, support-vector machines (SVMs) are supervised learning models with associated learning algorithms. It analyse knowledge used for classification. Given a collection of coaching examples, every will be marked as happiness to at least one or the opposite of 2 classes, associate degree SVM coaching algorithmic rule builds a model that assigns new examples to at least one class or the choice, then creating it a non-probabilistic binary linear classifier, though strategies like Platt scaling exist to use SVM in a very probabilistic classification setting.



Date:16-06-2020

Time	Student Name
9:19:25	28.Martin
9:19:37	9.Athira
9:19:48	22.Jissin
9:19:59	8.Arun
9:20:09	24.Jomon
9:20:21	32.Nandhanunni
9:20:38	23.Joel
9:21:02	3.Akhil
9:21:26	40.Suraj
9:21:51	27.Lijo
9:22:17	43.Vyshak
9:22:40	41.Thomas
9:23:02	35.Sandeep
9:23:23	37.Sidharth
9:23:45	15.Gokul
9:24:09	41.Thomas
9:24:31	4.Amal
9:24:55	11.Biphin

Fig. 3. Attendance of students

An SVM model may perhaps be seen as a illustration of the examples as points in house, mapped so the samples of the separate classes ar divided by a spot that as wide as attainable. New examples are then can mapped into that very same house and so it's expected to belong to a class supported the aspect of the gap on that they fall. Additionally to playing linear classification, SVMs will expeditiously perform a non-linear classification mistreatment what's known as the kernel trick that might implicitly mapping their inputs into high-dimensional feature areas. Once knowledge are untagged, supervised learning isn't attainable, associate degreed an unsupervised learning approach is needed, that makes an attempt to look out natural bunch of the information to teams, and so map new knowledge to those fashioned teams. The support-vector bunch applies the statistics of support vectors, developed at intervals the support vector machines algorithmic rule, to categorise unlabelled knowledge, and is one altogether the foremost wide used bunch algorithms in industrial applications.

V. RELEVANCE

A. Keeping records of the classroom visuals can help in analysis of data
B. Automated
C. Economical
D. Effective
E. Keep extra time
F. Accuracy improved
G. Anywhere and anytime access

VI. APPLICATIONS

A. System deployed in larger areas like in a seminar hall where it helps in sensing the presence of many people.
B. Automation

VII. CONCLUSIONS

There may be different lighting conditions, varying seating arrangements and environments in various classrooms, such things need to be tested in live classroom. There may be students portraying various facial expressions, varying hair styles, beard, spectacles etc. All of these cases are considered and tested to obtain a high level of accuracy and efficiency. But because of covid-19 impact we were unable to get the classrooms to test with these situations. this technique is enforced for higher results concerning the management of group action and leaves. . The system will save time, reduce the amount of work the administration should do and will replace the stationery material with electronic apparatus and reduces the human resource required for the purpose. This system can even be used for various meetings or conference consisting of members who are known to be attending the meeting/conference. Hence a system with expected results has been developed but still there are some rooms for improvement.

VIII. SCOPE FOR FUTURE WORK

A. It will more be improved to get higher accuracy levels.

B. Further, 2 or additional information science cameras is utilized and every image are processed severally. The results of these will be incorporate to get higher results and accuracy in denser lecture rooms.

IX. ACKNOWLEDGMENT

The authors would like to thank all who were involved directly or indirectly in the data collection, experiment conduction, and analysis stage of the project.

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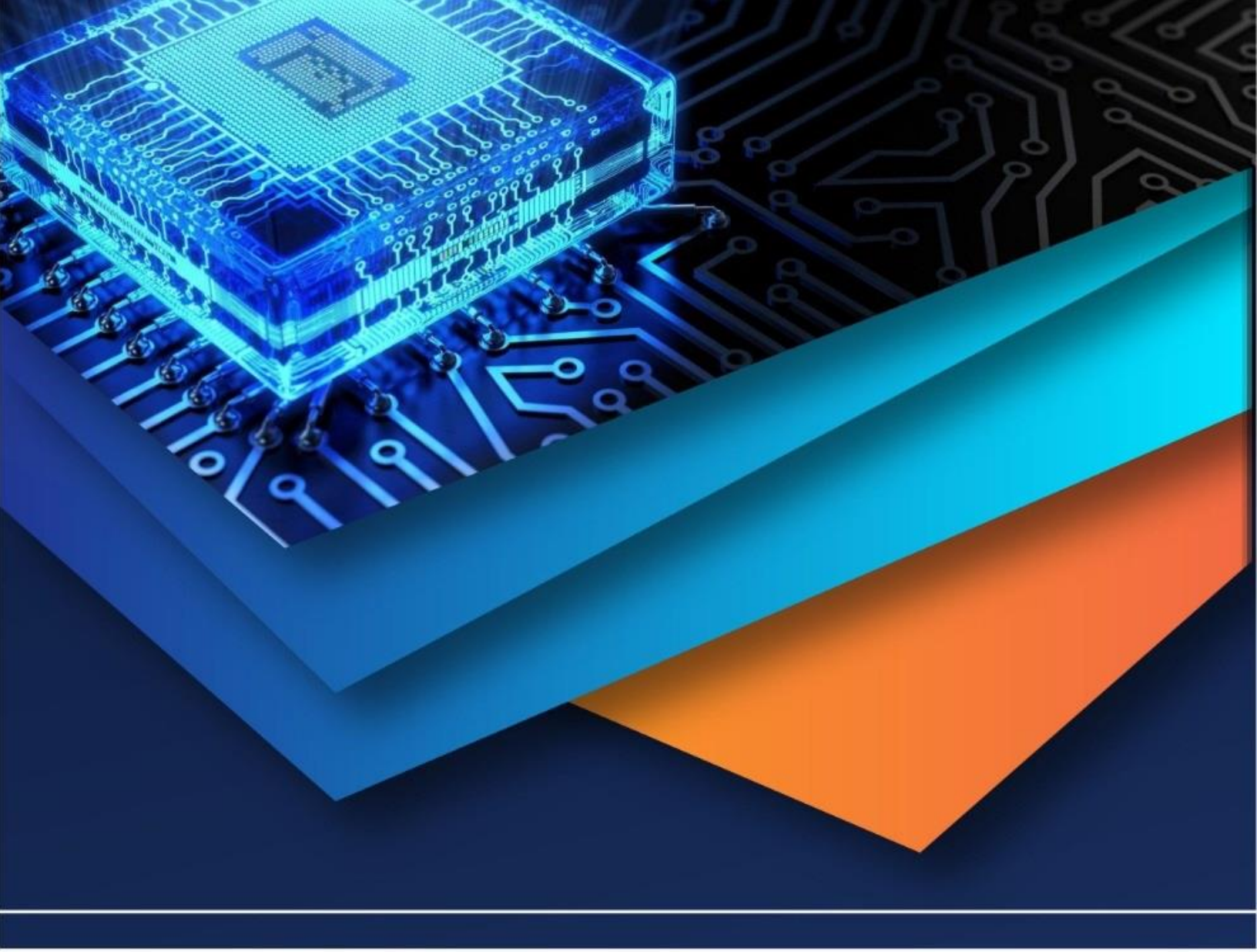

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