Smart Attendance System Using LBPH

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ABSTRACT— The face recognition is a technique to identify or verify the face from the digital images. A human can quickly identify the faces without much effort. It is an effortless task for us, but it is a difficult task for a computer. The Algorithm used here is Local Binary Patterns Histogram (LBPH). Local Binary Pattern Histogram algorithm is a simple approach that labels the pixels of the image thresholding the neighborhood of each pixel.In this project, the Open CV based face recognitionapproachhasbeenproposed.Thismodelint egratesacamerathatcapturesaninputimage,analgorith mfordetectingfacefromaninputimage,encodingandi dentifyingtheface,markingtheattendance in a spreadsheet and converting it into PDF file. Thetrainingdatabaseiscreatedbytrainingthesystemwi ththefacesof the authorized students. The cropped images are then storedas a database with respective labels. The features are extractedusing LBPHalgorithm.

Keywords—LBPH,OpenCV,camera, attendance, biometric, facerecognition

I.   INTRODUCTION

Attendance maintenance is a significant function in all theinstitutions to monitor the performance of the students. Everyinstitute does this in its own way. Some of these institutes usethe old paper or file based systems and some have adoptedstrategiesofautomaticattendanceusingsomeb iometrictechniques. A facial recognition system is a computerizedbiometricsoftwarewhichissuitedfordet erminingorvalidating a person by performing comparison on patternsbased on their facial appearances. Face recognition systemshaveupgradedappreciablyintheirmanageme ntovertherecentyearsandthistechnologyisnowvastly usedforvariousobjectives like security and in commercial   operations. Facerecognitionisapowerfulfieldofresearchwhichisa computerbased digital technology. Face recognition for the intent ofmarking attendance is a resourceful application of attendancesystem. It is widely used in security systems and it can becompared with other biometrics such as fingerprint or eye irisrecognitionsystems.Asthenumberofstudentsinan educationalinstituteoremployeesatanorganizationin creases, the needs for lecturers or to the organization alsoincrease the complication of attendance   control.   This projectmaybehelpfulfortheexplanationofthesetypes ofproblems.The number of students present in a lecture hall is observed,each person is identified and then the information about thenumberof studentswhoarepresentImaintained.

II.   OVERVIEW

Facedetectionandidentificationprocessisa machine
learning   technique,by   learning   andextracting thephysicalcharacteristics of the human. Matching these features with thetested images can identify the   person   or   deny   those   people torecognize.Thereareseveralchallengingandvarying parametersinfacedetectionandidentificationlikeillu mination, different poses, change expressions, low-qualityinputimages, etc.
Thereareseveraldifferentperspectivesaboutfacedetec tion and recognition system; some of the projects onlyfocus on images with high resolution; some of them focus onlow resolutions. Recently researchers focus   on   the differentfrontalviewofimages,fromdifferentangles,d ifferentlightingilluminations, etc.
Traditionally,Facerecognitionsystemfollowsfourpri mary phases, listed follows; also the basic face recognitiondiagramisshowninFig.1.
a)   FaceDetection
b)   Preprocessing
c)   FeatureExtraction
d)   FeatureMatching

III. IMAGEPROCESSING

The facial recognition process can be split into two majorstages: processing which occurs before detection involvingface detection and alignment and later recognition is doneusing featureextractionand matchingsteps.

1. FACEDETECTION

The primary function of this step is to conclude whether thehumanfacesemergeinagivenimage,andwhatisthel ocationof these faces. The expected outputs of this step are patcheswhich containeach face in the input image. In order to get amorerobustandeasilydesignablefacerecognitionsys tem. Facealignmentisperformedtorationalisethescalesand orientation of these patches.

2. FEATUREEXTRACTION

Followingthefacedetectionsteptheextractionofhuma nfacepatchesfromimagesisdone.Afterthisstep,theco nversionofface patch is done into vector with fixed coordinates or a setoflandmarkpoints.

3. FACERECOGNITION

The last step after the representation of faces is to identifythem.Forautomaticrecognitionweneedtobuil dafacedatabase. Various images are taken foe each person and theirfeatures are extracted and stored in the database.Then whenan input image is fed the face detection and feature extractionisperformedanditsfeaturetoeachfaceclassi scomparedandstored inthedatabase.

IV. METHODOLOGY

1. LOCAL BINARY PATTERNS

HISTOGRAMSThismethodneedsthegrayscalepictu resfordealingwiththetrainingpart.Thisalgorithminco mparisontootheralgorithmsisnota holistic approach.

A. PARAMETERS:
LBPHusesthefollowingparameters:

i. Radius:
Generally1issetasaradiusforthecircularlocalbinaryp attern whichdenotestheradiusaround thecentralpixel.

ii. Neighbours:
The number of sample points surrounding the central pixelwhichisgenerally8.Thecomputationalcostwilli ncreasewithincreaseinnumberof samplepoints.

iii. GridX:
Thenumberofcellsalongthehorizontaldirectionisrepr esentedasGridX.Withtheincreaseinnumberofcellsth egrid becomes finer which results in increase of dimensionalfeaturevector.

iv. GridY:
Thenumberofcellsalongtheverticaldirectionisrepres entedas Grid Y. With the increase in number of cells the gridbecomes finer which results in increase of dimensional featurevector.

B. ALGORITHMTRAINING:
For the training purpose of the dataset of the facial images ofthe people to berecognized along with the unique   ID isrequiredsothatthepresentedapproachwillutilizethe providedinformationforperceivinganinputimageand providing theoutput.Same imagesrequiresame ID.

C. COMPUTATIONOFTHEALGORITHM:
The intermediate image with improved facial characteristicswhich corresponds to the original image is created in the firststep.Basedontheparametersprovided,slidingwin dowtheoryisusedinordertoachieve so. Facialimageisconvertedintograyscale.A3x3pixelswi ndow is taken which can also be expressed as a 3x3 matrixwhich contains the intensity of each pixel (0-255). After thiswe consider the central value of the matrix which we take asthethreshold.Thisvaluedefinesthenewvaluesobtai nedfromthe8neighbours.Anewbinaryvalueissetforea chneighbourofthecentralvalue.Forthevaluesequalto orgreaterthanthethreshold value 1 will be the output otherwise 0 will be theoutput. Only binary values will be present in the matrix andthe concatenation is performed at each position to get newvalues at each position. Then the conversion of this binaryvalue into a decimal value is done which is made the centralvalue of the matrix. It is a pixel of the actual image. As theprocess is completed, we get a new image which serves as thebetter characteristicsofthe original image.

D. EXTRACTIONOFHISTOGRAM:
The image obtained in the previous step uses the Grid X andGrid Y parameters and the image is split into multiple grids.Basedon theimagethehistogramcan beextracted asbelow:
1. The image is in gray scale and each histogram will consistofonly256positions(0-255)whichsymbolisestheexistencesofeachpixel intensity.
2. After this each histogram is created and a new and

biggerhistogramisdone.Letussupposethattherea re8x8grids,thenthere will be 16.384 positions in total in the final histogram.Ultimately thehistogram signifies the features of the actualimage.

E. THEFACERECOGNITION:

The training of the algorithm is done.For finding the imagewhich is same as the input image, the two histograms arecomparedandtheimagecorrespondingtotheneares thistogram is returned.

ADVANTAGESOFUSINGLBPHALGORITHM :

1. Itisoneofthesimplestalgorithmsforfacerecogniti on.
2. Thelocalfeaturesoftheimagescanbecharacterize dbythisalgorithm.
3. Usingthisalgorithm,considerableresultscan beobtained.
4. OpenCVlibrary   isused toimplementLBPHalgorithm.

V.   SYSTEM DESIGN

VI. SOFTWARE DESCRIPTION

1.   OpenCV

Open CV (Open Source Computer Vision Library) is a opensource computer vision software library for the purpose ofmachinelearning.OpenCVwasdevelopedtoserveth epurpose of computer vision applications and to stimulate theusageofmachineperceptioninthecommerciallyvia bleproducts. Open CV is a BSD- licensed product which is easyfor the utilization and modification of the code. The librarycontains more than 2500 advanced algorithms including anextensive set of both typical and state-of-the-art computervisionandmachinelearningalgorithms.The sealgorithmscanbeemployedforthedetectionandreco gnitionoffaces,identification of objects, extraction

of 3 D models of objects,production of 3 D point clouds from stereo cameras, stitchingimages together for production of a high resolution image ofanentirescene,findingsimilarimagesfromanimage database, removing red eyes from images taken using flash,followingeyemovements,recognitionofscenery andestablishing markers to overlay it with intensified reality etc.It includes C++, Python, Java and MATLAB interfaces andsupports Windows, Linux, Android and Mac OS. Open CVmainlyinvolvesreal- timevisionapplicationstakingadvantageofMMXandSS Einstructionswhenavailable.Afull- featuredCUDAandOpenCLinterfacesarebeingprogr essivelydeveloped. There are over 500 algorithms and about 10 timesfunctionsthatformorbackthosealgorithms.Ope nCVis written inherently in C++ and has a template interface thatworksharmoniouslywithSTLcontainers.

2.   Pandas

Pandas is an open source Python package that caters diversetools for data analysis. The package contains various datastructuresthatcanbeusedformanydiversedatama nipulationtasks. It also includes a range of methods that can be invokedfor data analysis, which becomes feasible when working ondatascienceand machinelearningproblemsin Python.

3.   Idle

IDLEisPython'sIntegratedDevelopmentan dLearningEnvironment. IDLE is completely coded in Python, using thetkinter GUI toolkit. It works mostly uniformly on Windows,Unix and macOS. It has a Python shell window (interactiveinterpreter) with colorizing of error messages, code input andcodeoutput.Thereisamulti- windowtexteditorwithmultipleundo,Pythoncolorizi ng,smartindent,calltips,autocompletion,andotherfea tures.Searchingwithinanywindow,replacingwithine ditorwindowsandsearchingthroughmultiple files is possible. It also has configuration, browsersand other dialogsaswell.

4.   MicrosoftExcel

MicrosoftExcelisaspreadsheetprograminco rporatedinMicrosoft Office suite of applications. Spreadsheets prompttables of values arranged in rows and columns that can bemathematically manipulated using both basic and complexarithmetic functions and operations. Apart from   its

standardspreadsheetfeatures,ExcelalsoextendsprogrammingsupportviaMicrosoft's VisualBasicforApplications (VBA),thecapacity to access data from external sources via Microsoft'sDynamic Data Exchange (DDE) and extensive graphing andcharting abilities. Excel being electronic spreadsheet programcanbeusedtostore,organizeandmanipulatethedata.Electronicspreadsheetprogramswereformerly basedonpaper spreadsheets used for accounting purpose. The basiclayout of computerized spreadsheets is more or less same asthepaperones.Relateddatacanbestoredintables-whichareagroupofsmallrectangularboxesorcellsthat arestandardized intorowsandcolumns.
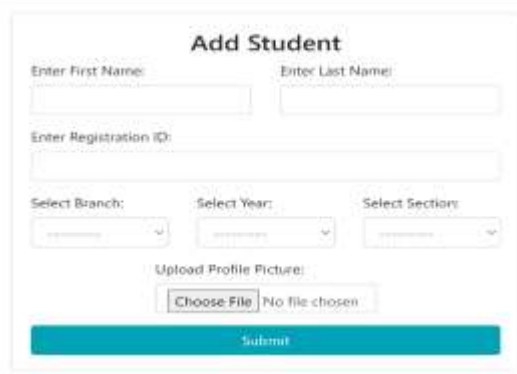
VII. MODULES
❖ Admin Module
❖ Student Module
❖ Attendance Module

MODULE 1 - Admin Module
• Admin Module – this module is used to register
User details, maintain users data & export reports.

SCREENSHOTS:
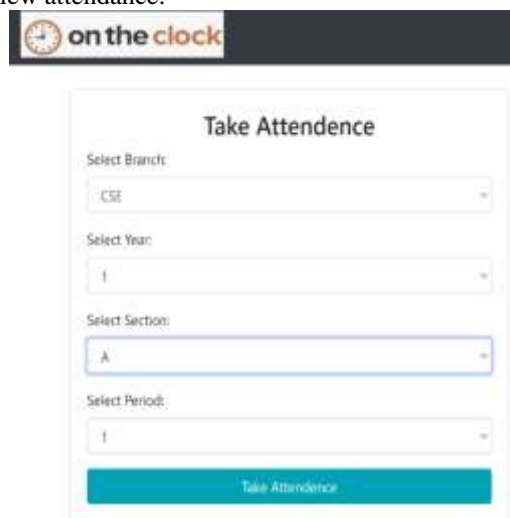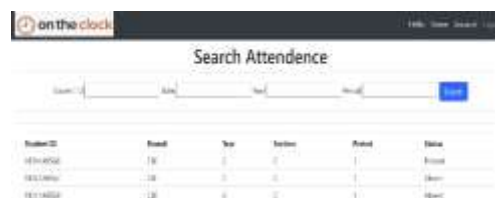
Module 2 – [Student Module]

• Student Module – this module is used to view attendance.

Module 3 – [Attendance Module]

• Attendance Module – this module is used to
Make attendance and send response via user E-mail.

VIII. CONCLUSION
ThispaperfeaturesthemostproductiveOpen CVfacerecognition method accessible for

Attendance Management.Thesystemhasbeenimplemented usingtheLBPHalgorithm.LBPHexcelsotheralgorithmsbyconfidencefactorof2-5andhas least noise interference.

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