Research Article

Face Recognition Attendence Management System

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Abstract

The goal of the project is to create a management system, the number of users based on face recognition, the recognition of the key image is used in a number of areas. The purpose of the organization is to show the facial features of the applicant's identity. On the face of the procedure is, in principle, a two-stage, more accurate, face recognition, and face recognition is a system used to manage the number of users who are able to carry out day to day activities, labeling, and analyzing involvement with a minimum of human intervention. User is not required to wait in queue as attendance of multiple people can be recorded at once by simultaneous recognition of faces of multiple people. According to current scenario of covid-19 we proposed this system for preventing infection due to contact and to maintain social distancing. In this project, by using OpenCV library facial recognition based attendance management system is developed the attendance results will be stored in the MySQL database.

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Introduction

The proposed system is designed for taking the attendance of the students or peoples and reduces the flaws of existing manual system. First the data of user is added manually by administrator. While doing so, system captures images of user. These images are dataset for recognition. The system is trained on this dataset. After that, when user comes in front of camera his face will be detected and compared with dataset. If matched with any face in dataset then ID and Name will be shown in real time, and attendance will be recorded in database as well as in excel sheet. In this system we are introducing two special modes for attendance recording. First one is normal mode i.e. multiple recognition mode, which is used for recording attendance of more than one user at the same time. And second is critical mode i.e. single recognition mode, which is used for recording attendance of single user at a time, which ensure that social distancing is followed in the campus. All rights regarding to system are given to admin only.

Ease of Use

A) Methodology

The proposed system is designed using these python modules: Opencv, numpy, pillow, Tkinter, openpyxl, os, MYSQL database etc. The major steps of the project are:

1. Face detection

2. Data gathering

3. Training dataset

4. Face recognition

B) Face detection

Recognition is the first and most important step of the face, and it is used in order to detect the face of the image. Here, we have been working on OpenCV for face detection, because of OpenCV-income, but also a coach, and is found.

How face detection works

First, the image is imported, it provides a place for a picture of the discovery, and then turns the image from RGB to gray scale, as the shades of gray are easy to spot faces on the planet. The next step, the image segmentation is used in order to detect contours or a segment of a multi-item, in the same image, as a group, and quickly fantinanın the subject and the people involved in the picture. The next step is, that the Haar algorithm, that is, to define a function such as this one. This algorithm is used to find out the location of a person's face into an

existing frame, or a picture. The rectangle will be drawn in the area of interest, and in which the person who found it.

Data gathering

Data gathering is the process of collecting many images of faces of user and storing it with particular id for that person. This collection of images of face of each user is called as Dataset. This is required for training the algorithm to recognise face.

How to gather data

Create a folder named training image to store these images. During recording of new user, 100 images or samples of face of user are recorded by taking snapshots through the camera. Face will detect as discussed above and then the image will be cropped according to coordinates, height and width provided by the face detector. This cropped image is then converted to its grayscale image and save it into 'Faces' folder with name as "User...jpg"

Training dataset

Find out in the above, so that the data is ready, and trained, and all of the user's full details. This work is done directly with the help of the special features of the OpenCV face recognizer, LBPH (LOCAL BINARY PATTERN, HISTOGRAM), which is included in the OpenCV package. The result will be in the excel file, the file will be saved in the selected folder.

How training is done

First each image in dataset is converted into array of pixel values. Such arrays are combined together. With those arrays as input, recogniser is trained. After training the data is stored in recogniser/trainer.yml file. This data will be used during face recognition.

Face recoginition

Face detection detects any face in image, if there is one. Face recognition on the other hand tells us whose face it is if that face is previously stored in dataset. In this project to mark an attendance image with face of user is captured if a person, such a person was in need and have trained in the past, it is the identifier that is going to be a prediction of a user ID, and an index that shows how safe these are out of the game.

How recoginition works

Before recognition, it is required to detect a face in the image captured by camera, using the haarCascade classifier. It can detect multiple faces in single image which means attendance

of multiple people at same time can be recorded. Having detected a face or faces the recogniser then predicts whose face it is by using data in training Data.yml file. This file is loaded at the start of recognition. The predict () method of LBPHFaceRecognizer inOpenCV, will take as a parameter a captured portion of the face to be analysed and will return its probable owner, indicating its id and how much confidence the recognizer is in relation it in these process. Please note that the confidence index will be returning to "zero" if it is deemed to have occurred by chance. Finally, if the identifier which can be used to predict that the meeting, we will put their name is taken from the database with the id of the recognizer. If the person is not a fit, from the time that an application for a card, "don't do this.

Prerequistes

Before you begin the formatting of articles, the first write and save the content as a separate text file. To understand the content and organizational changes prior to formatting. Please refer to the section (A)-(D), below, for more information on proofreading, spelling and grammar.

To store text and image files, one at a time until the text is properly formatted, and style. Do not use a hard character, and limit use of hard-repayment of a refund at the end of the abzasının. Do not add any kind of pagination anywhere in the article. The number of the text, the headings of the template will do that for you.

Terms

• User: The person whose attendance is to be recorded.

• Administrator: The person who will have privileges to   add, delete and update the information about user.

• Dataset: Directory with grayscale images of user's   face. These images will be recorded during registration.

For the purpose of face recognition a dataset containing number of images of faces of each staff is required. These images are recorded when administrator adds new record of user.and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

Tools used

This project is developed in python3.8 with the help of Pycharm IDE

Frontend: tkinter, a module in python.

Database: MYSQL

Libaries: OpenCV

Python Equations

Numpy Package

Tkinter , module in a python

Tkinter is the standard GUI module or a library for Python. Python when combined with Tkinter provides a fast and easy way to create GUI applications. Tkinter provides a powerful object-oriented interface to the Tk GUI toolkit.

Creating a GUI application using Tkinter is an easy task. All you need to do is perform the following steps −

- Import the *Tkinter* module.
- Create the GUI application main window.
- Add one or more of the above-mentioned widgets to the GUI application.
- Enter the main event loop to take action against each event triggered by the user.

MYSQL

MYSQL is a process library that implements a self-contained, serverless, zero-configuration, transactional SQL database engine. Code for oracle public, and are therefore free to use, for any purpose, commercial or personal. MYSQL is the most popular database software in the world, which is something we can count, including several high-profile projects.

How to be an internal SQL database engine. Unlike most other SQL databases, the MYSQL database is a separate process to the server. MYSQL reads and writes directly to ordinary files on a disk. A complete SQL database with multiple tables, statistics, triggers, and views, which are saved to the disk.

OPENCV-PYTHON

OpenCV-Python is the Python language is an API for OpenCV, which combines the best qualities of OpenCV C++ and Python API's. OpenCV-Python is a library of Python bindings, which are provided to the computer, in order to solve the problem with the view. Python is a general-purpose programming language which was created by Guido van Rossum, and quickly became very popular, mainly because of its simplicity and code readability. This allows the programmer to express the ideas, not the number of lines of code without reducing legibility.

Open CV applications area include:

- 2D and 3D feature toolkits
- Egomotion estimation
- Facial recognition process
- Gesture control recognition
- Human–computer communication(HCI)
- Phone robotics
- Motion commanding
- Object identification control
- Segmentation and recognition process
- Stereopsis stereo vision: depth perception from 2 cameras
- Structure from motion through (SFM)
- Motion tracking tool
- Augmented reality tool
- Boosting technology
- Decision tree learning path
- Gradient boosting trees function
- Expectation-maximization algorithm module
- k-nearest neighbor algorithm module
- Naive Bayes classifier tool
- Artificial neural networks command
- Random forest
- SVM

Operating System Support:

Of all the new and OpenCV to design and algorithms-on experience in the following desktop operating systems: Windows, Linux, macOS, FreeBSD, NetBSD, и OpenBSD. OpenCV runs on the following mobile operating systems: Android, iOS, Maemo, and BlackBerry 10. You can get to the official release from SourceForge, or get the latest GitHub sources. OpenCV uses CMake.

Modules used

cv2: OpenCv (Open Source Computer Vision) is a library of programming functions mainly aimed at realtime computer vision, it is used for image processing.

Numpy: Numpy is open source numerical python library, used for scientific computing and to perform number of mathematical operations on arrays. • Tkinter: Tkinter is the standard GUI library for python, it provides fast and easy way to create GUI application.

MYSQL: MYSQL is database software for local/client storage in application software.

OS: OS module provides functions for interacting with operating system. It comes under python's standard utility modules.

Openpyxl: Openpyxl is a python library used for reading and writing Excel file.

Pillow: Pillow is python imaging library. It adds support for opening, manipulating and saving many different image file format. The word "data" is plural, not singular.

General recommendation for facial recoginition

1. There is a facial recognition system that is, to a large extent depends on the quality of the facial image. The quality of the image at the time of registration is important because it affects the quality of the face model.

2. 32 of the pixels is the recommended minimum distance between the eyes, a face, a picture or a video of that in a reliable way to remove facial patterns. For better face detection performance, we recommend the 64 pixels or greater. Note that this distance must be native, not achieved by resizing an image.

3. Several of the photos, once you have signed up to use it, is to recommend the best quality in the face of the mall, which leads to improved recognition of the quality and reliability of the information. So, you have 100 photos for any of the user's face from the android

4. Registration may be required when you change your look, hair, or face, especially if you grow or shave your beard or mustache.

E. *System requirements*

Face recognition based attendance system is tested on the computer with following hardware and software specifications.

Table 1. Hardware and software specifications

category	requirement
Operating system	Windows 7,8,10
Hardware confriguation gpu	Amd radeon ,intel core i3,4gb ram ,1tb hdd
Databse	MYSQL
Camera resolution	640x480 and above 1080p
Frame rate	10fps and above

Implementation

Each user first needs to do registration. After registration, images of user's face will be captured by camera.

• Capturing the image data: The camera will be placed at the entrance of organization. The camera will capture images of user entering the organization.

• Face detection: Faces will be detected in the images captured by camera. If frontal face is visible in camera then that portion of image will be cropped and saved as new image in dataset folder.

• Training: For face recognition, training is required.   Training is done on dataset images.

• Attendance: For recording daily attendance, start recognition button needs to be clicked. Once the button is clicked, camera will start capturing images at the entrance. If face appears in image, then it will be compared with dataset and if match occurred, the name and Id will be shown for that user. Time at which face appeared will be recorded in database as well as excel sheet

A . It is for you to Learn and Practice The Learn () function, which implements the algorithm of PCA on the training set. They will learn() function is executed in a four-step process:

1. Downloading of information about education and training.

2. To be a remain involved, to find his subspace.

3. The project is the training of the lateral movement in the PCA subspace.

4. Please remember that all of the training data.

one. Value

Eu-russia PARTNERSHIP and cooperation agreement (pca) subspace is estimated by making the connection with the OpenCV functions to carry out the PARTNERSHIP and cooperation agreement, cvCalcEigen Object(). The rest of the doPCA () produces the output variables, which will have the effect of PCA as cvCalcEigenObjects () is returned.
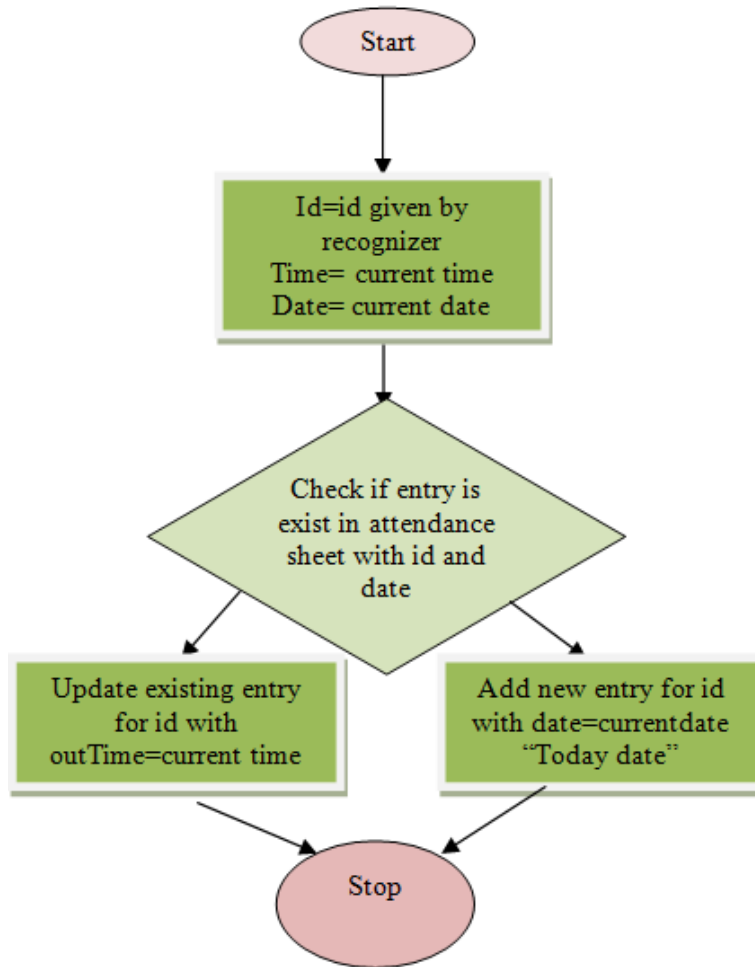
Figure 1. Flow chart for attendance recording process

Algorithm

The algorithm used in the system is Principal Component Analysis (PCA). Applications such as face recognition and image compression uses PCA algorithm.It is also used for finding data patterns .The following steps shows the process of PCA.

1. Mean center the data(optional)
2. Compute the covariance matrix of the dimensions. $C = AT (A)$
3. Find eigenvectors (V, E) of covariance matrix C.
4. Sort vigeon vectors in decreasing order of eigenvalues.
5. Project onto vigeon vectors in order.

NumPy Module

NumPy is a package that defines an array-and medium-sized objects, and the associated types of mathematical functions that work with it. It also provides simple routines for linear algebra and FFT, as well as the complex, random number generation. NumPy, which is a replacement for Numeric and Numarray.

Example demonstrating NumPy:

```
From numpy  module import *

From PIL import Image process

ar = ones((100,100),(float32))

ar = ar * 100 for i in range(0,100):

ar[i,:] = 100 + (i * 1.5)

im = Image.fromarray(ar,"F")
```

Face detection and extraction

The openCAM_CB() function is called in order to turn on the camera in order to capture an image.When ExtractFace in order to make use of the front-page, [2], the nature of the vedio. The ExtractFace () Using the haarcascade OpenCV method is to download the face.xml(haarcascade files) as a classifier.The output of the classifier, which is the binary form, results in a "1" if the string is found, and "0" otherwise.For the face, that is cut off in a photo black and white the 50x50 pixels, which is done in the "Add a face" button at the face-recognition module.
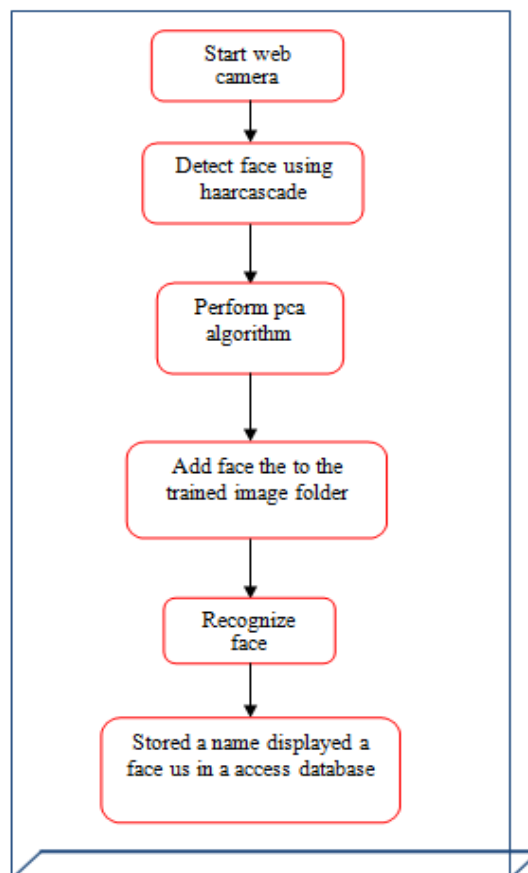

Figure 2. proccess involves in a system

Special modes

We are proposing Attendance Management System Using Face Recognition with two special modes aremultiple recognition mode and single recognition mode. Admin who handle the system have all the rights such as selection of mode for attendance, registration of new user, deleting entry of any user, updating any users information, keep the record of daily attendance etc.

Multiple Recognition Mode (Normal mode) In multiple recognition mode more than one user can be recognized at the same time and attendance of multiple users will be recorded. Due to this mode of recognition time will be saved and attendance will be recorded with current time and date.

Result of system

Figure 3. home page of system

GUI of home page

Home page is designed with the tkinter module of the python. In which first is window is label with the tittle of face recognition attendance management system.

1. Enter enrollment button
   - In which you enter your enrollment number to take images.
2. Enter name
   - In which you enter your name to train the images
3. Clear button
   - The clear button is assingn to clear the fields of enter enrollment and enter name.
4. Take images
   - Take images of yours with a minimum of 200 images and frames.
5. Train images

- Train images are capture while taking images and putting save into the trainned image folder

6. Automatic attendance

- Automatic attendance is taking your atteandance automatically...

Excel sheet

Excel sheet is design for storing the attendance with date . time, and subject . Excel sheet is taking the data automatically and manually also with the correct data.
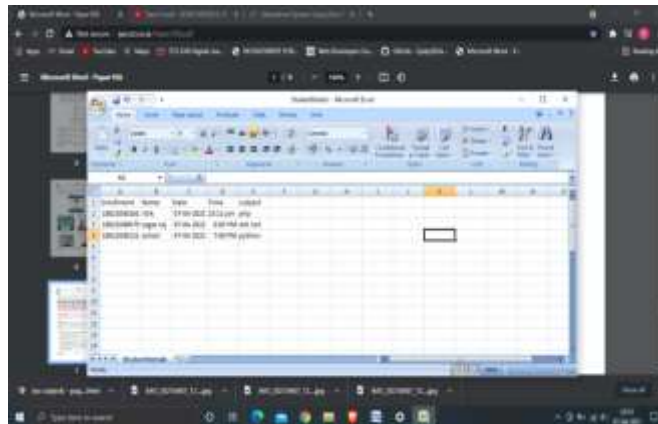

Figure 4. Excel sheet of storing data

Figure 5. Face recoginition of taking attendance

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