EMBEDDED SYSTEMS
(CIE-408)

Class Attendance
"Face Detection and Recognition"

Team Members:

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Introduction

Embedded systems are involved in each modern device to do various functions from receiving signals and processing it to making different decisions based on the received input until outputting the required action. The process of taking different action based on input requires Software and Hardware specifications. Recently many smartphone companies like Apple and Samsung and smart television companies like LG use Face Recognition technology to make user life much easier and more securitable. Based on face recognition we can take different actions according to the recognized person, this action requires both software and hardware layers. We plan to use raspberry pi as a general purpose computer that can be embedded in many machines for different purposes, we will use it to do face detection and recognition for our team members, then take an action based on the recognized member. In this project we apply the face detection and recognition in real-life applications which is the class attendance. After recognizing the name of the student, the name will be uploaded in excel sheet and mailed to the TA instead of manual regular attendance.

Literature review

Our project is not the first of its kind, there are similar projects from which we have taken inspiration. A paper came out from Andhra University, India in 2018 as an electronics and communication engineering student graduation project [6]. The project was a fully functional system taking class attendance through a camera attached to a Raspberry-Pi, the software used was mainly an open source computer vision library called OpenCV as well as other libraries such as LBPH face recognizer, Haar classifier and Numpy. The whole system was connected to the teacher's computer.

Another similar project was also an indian graduation project from Francis Xavier Engineering College [7]. This project is quite strange as it is intended to detect enemy faces and also to be a minesweeper robot at the same time, using Arduino ATmega328 on a robot, an Android phone as a camera, a bluetooth module and a metal detector. The face detection part.

The Project Plan

Milestone one: prepare the material,install the required software in raspberry pi.

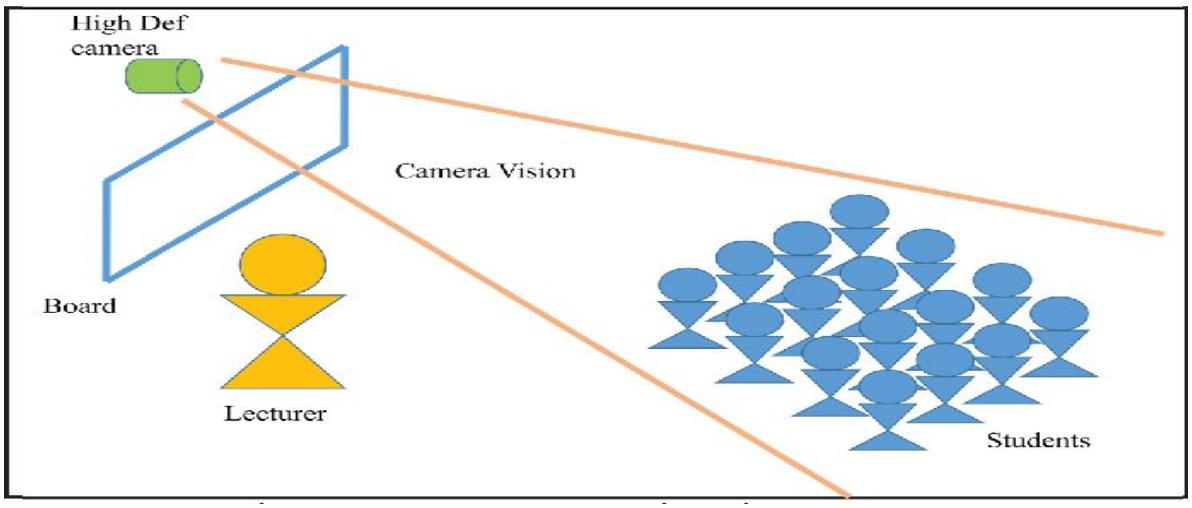
Milestone Two:run Face Detection and Recognition in raspberry pi

Milestone Three:upload the name in excel sheet and mailed it to the TA .

Components List

Name	Photo	Description
raspberry pi		**credit-card sized computer** that plugs into a computer monitor.
camera		Camera used for detection of faces .

Class Attendance using Face Recognition:



Approach

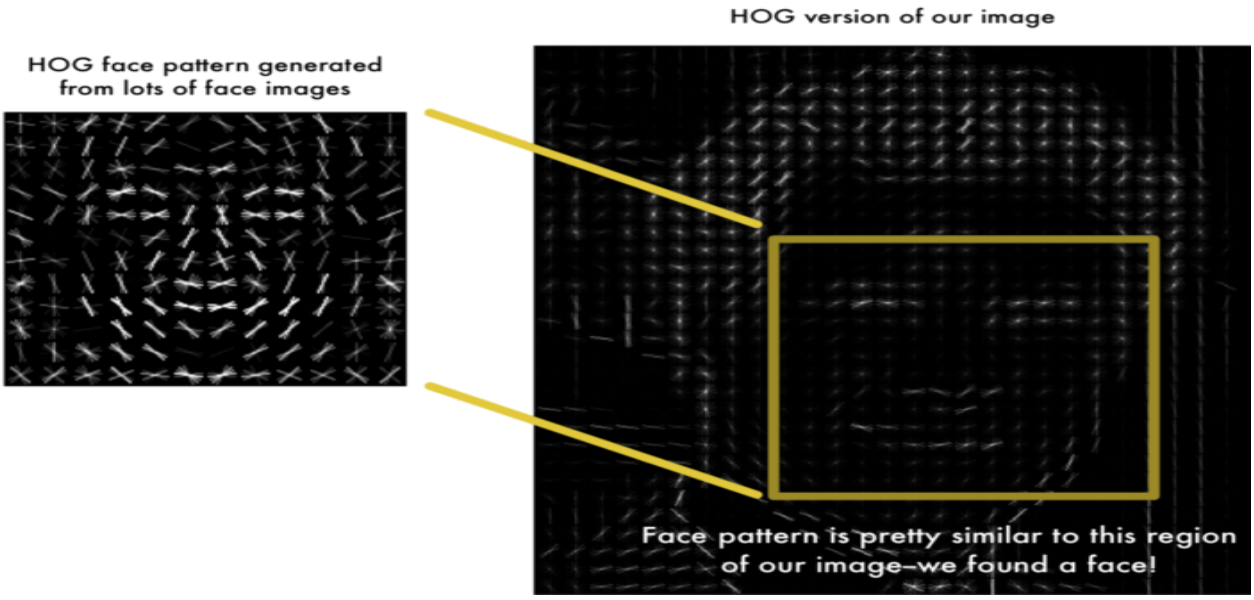
First, look at a picture and find all the faces in it

Second, focus on each face and be able to understand that even if a face is turned in a weird direction or in bad lighting, it is still the same person.

Third, be able to pick out unique features of the face that you can use to tell it apart from other people— like how big the eyes are, how long the face is, etc.

Finally, compare the unique features of that face to all the people you already know to determine the person's name.

Step 1: Finding all the Faces



Step 2: Encoding Faces

We need a way to extract a few basic measurements from each face. Then we could measure our unknown face the same way and find the known face with the closest measurements. For example, we might measure the size of each ear, the spacing between the eyes, the length of the nose, etc.

Challenges

1- Student Dataset

2- Model Accuracy

Deep Learning for Feature Recognition

Researchers have discovered that the most accurate approach is to let the computer figure out the measurements to collect itself. Deep learning does a better job than humans at figuring out which parts of a face are important to measure.

The solution is to train a **Deep Convolutional Neural Network**

Training

we are going to train it to generate 128 measurements for each face.The training process works by looking at 3 face images at a time:

1. Load a training face image of a known person
2. Load another picture of the same known person
3. Load a picture of a totally different person

Retraining

We uploaded a few images of team members then retrained the model and after generating 128 measurements for each face , we started to get the match between this vector and the new one who is getting from the video life stream -This will be found in the file face_recognize.py - .

Steps for Running the model

First, add a member by running the next line :

$ dataset.py

Second, write the new name , then take the snapshot you need.

Third, Train the model .

Start the training :

Run the next command:

$python3 face_recognize.py

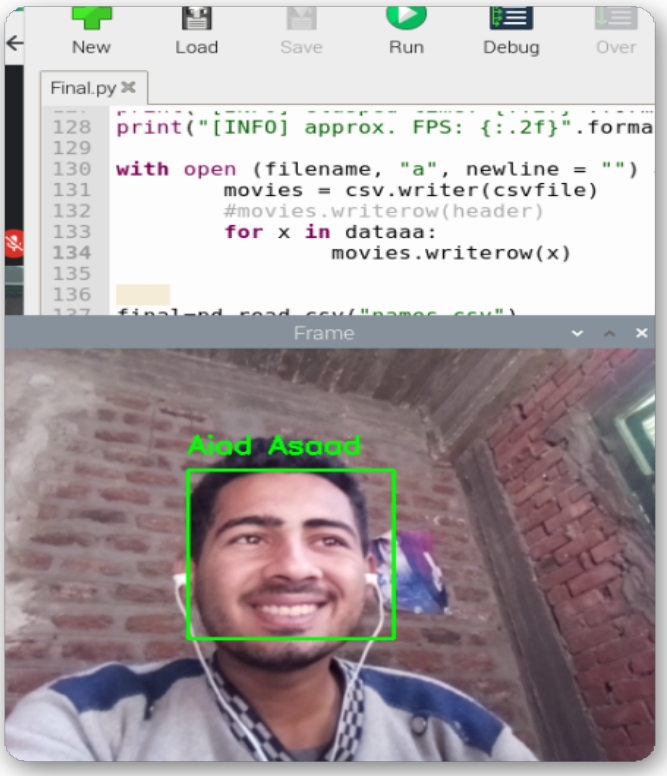
Test the new model :

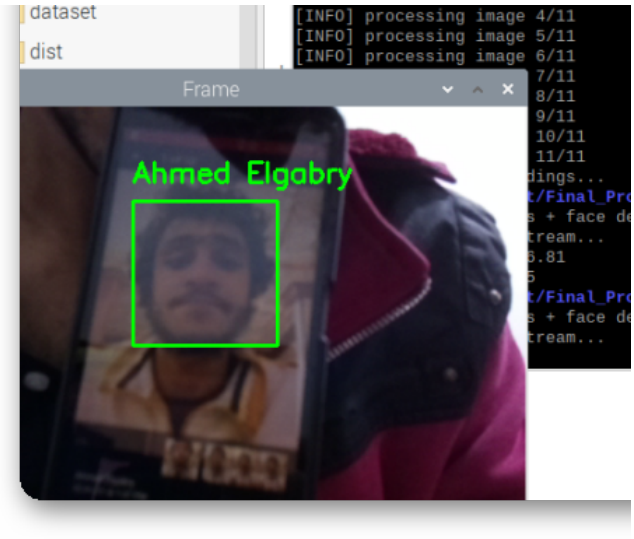
Run the next command:

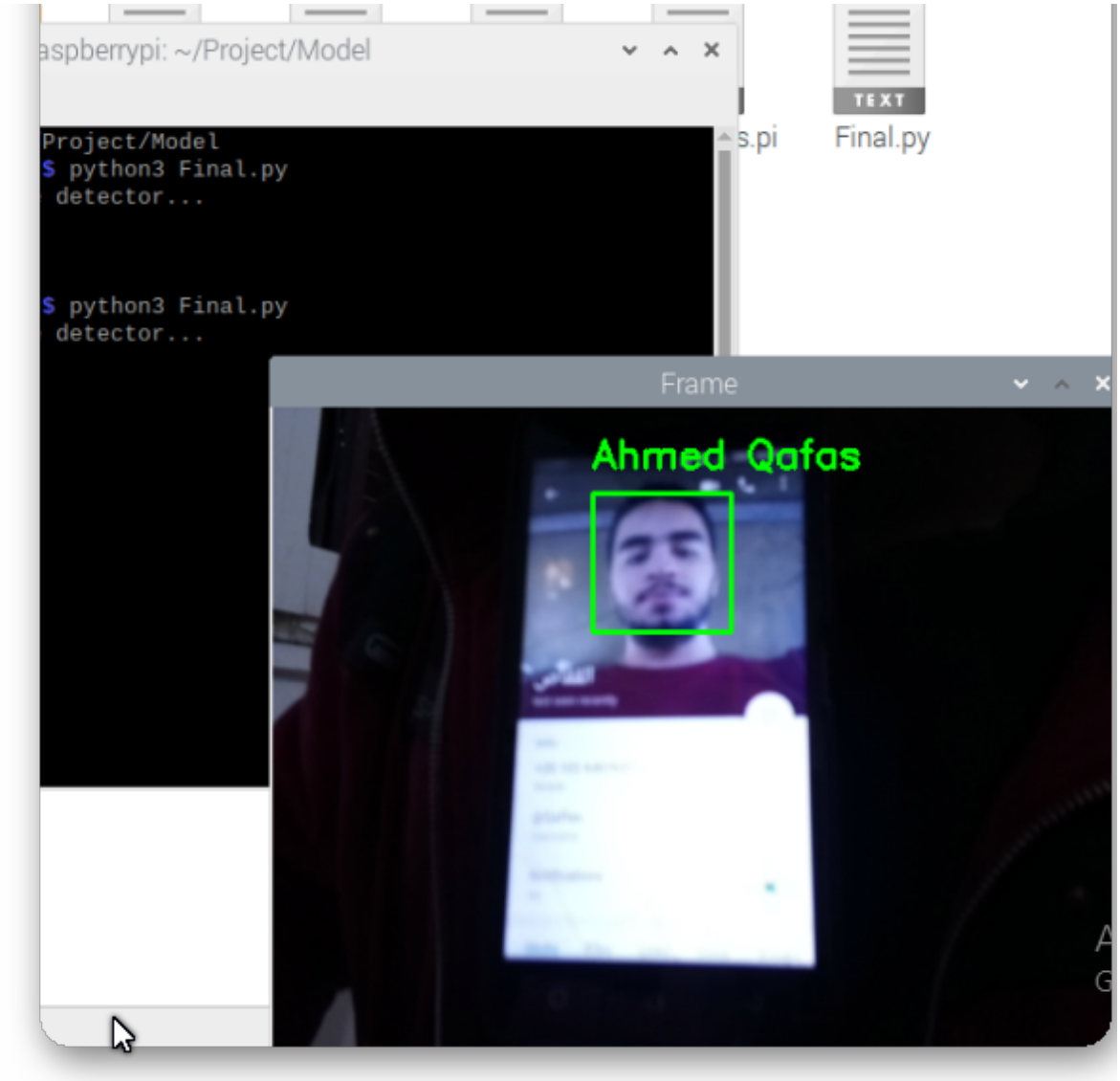
$python3 Final.py

+

Result of recognized faces







After the recognition part , the name of the person will be uploaded in a csv file and mailed to the TA .

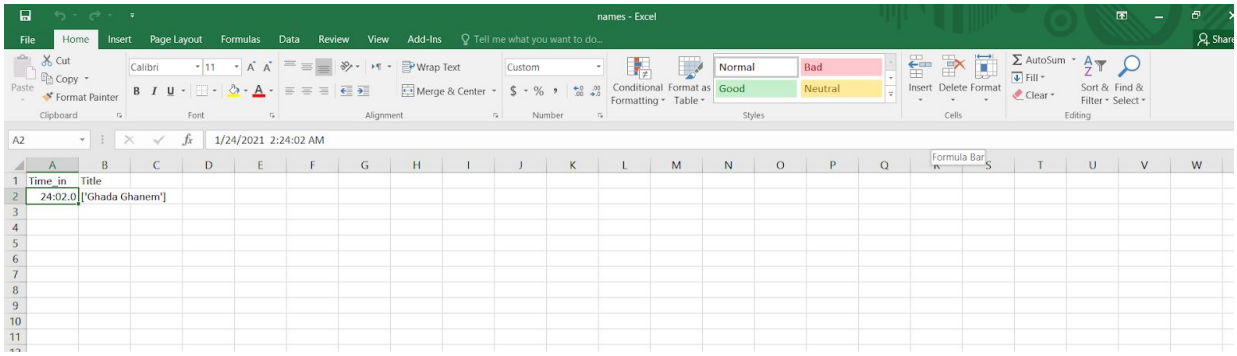
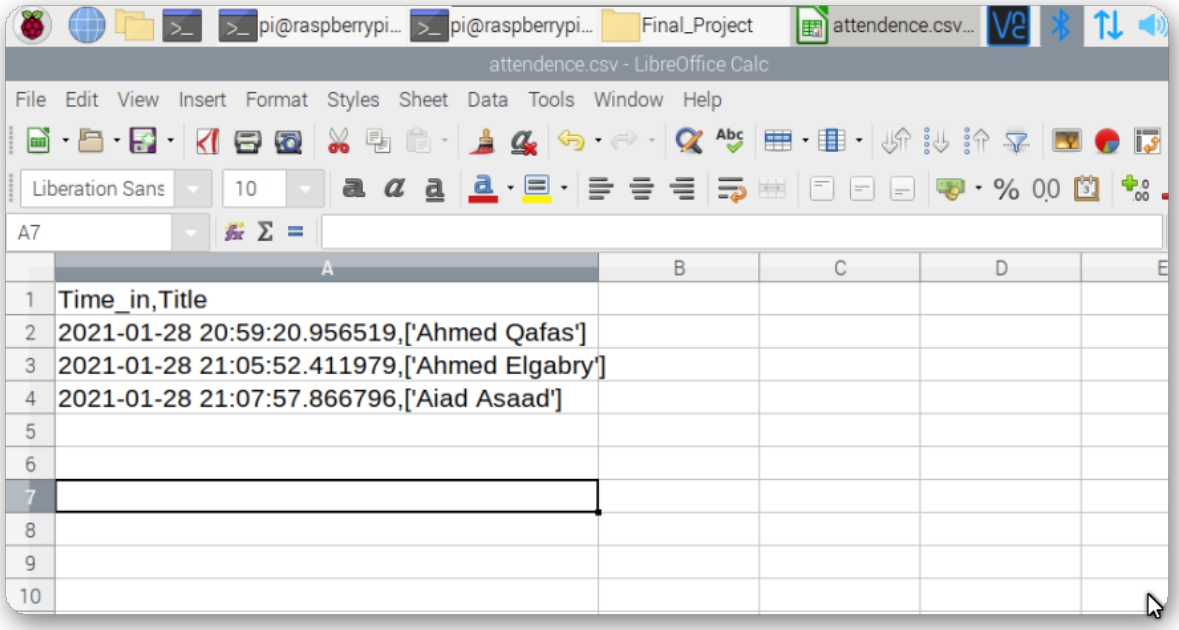


Fig. Screenshot of uploaded name after one of recognition faces trials .



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