

A horizontal decorative bar with a teal segment on the left and an orange segment on the right.

SMART ATTENDANCE SYSTEM

Submitted in partial fulfillment of the degree of Bachelor of Technology
In
Computer Science and Engineering

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING & INFORMATION TECHNOLOGY
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Introduction

- Human Beings can distinguish and recognize a lot of things including faces. This ability helps us in remembering other people and identify emotions and empathize.
- Computer Vision helps machines achieve human like abilities like image recognition, etc.
- It is easy to install face recognition system in a large scale setting like Hospitals, Schools, Colleges, Airport, etc but the actual implementation is a bit challenging because the proposed system has to account for all possible appearance variations caused by change in illumination, facial features, variations in pose, image resolution, viewing distance, etc.
- Our attendance system is an upgrade to the existing system which involved maintaining a register (like in most of the schools) and / or centralised server but without any digital assistance (like the webkiosk in our college).



Problem Statement

The traditional System of maintaining attendance in some schools still uses Registers and is a slow procedure as compared to our proposed system. In most of the universities too, the webkiosk system is manual, i.e. the faculty announces the names of students one by one but as compared to schools attendance is still stored in a centralized database because of a huge database of student data.



Significance / Novelty of Proposed Solution

- Our Proposed system is robust, stable and Modular. It is highly manageable. New Functionality can be added easily. Code is readable so any developer in future can contribute to it if we open sourced the system.
- Our system has text to speech functionality which is a huge advantage for Visually Impaired Person. The system gives sound output with name/ID of the person who is recognized and marked present in the records.
- Our format of storing attendance is highly manageable and can be easily understood. The proposed system will store the attendance in the form of a table with columns like Serial No, Enrollment No, TimeStamp of Attendance, Subject Name, Class Type [Lecture,Tutorial, Lab...], Class Time [9am Friday, 11am Tuesday...] and Faculty Name.



Working Environment Conditions

Our Proposed System is suitable for a certain environment with certain conditions for it to work in a suitable manner. The environment shall be similar to what described below:

- The system's camera shall be mounted at a certain height so it is accessible to most of the people. Ideally the camera should be right at the same height of the face.
- For better model accuracy and getting a well trained model the distance between the camera and face should be less than 50cm.
- The room/environment should be well lit. The camera should be placed in such a way that it is not directly facing a light source or the Sun itself.
- People should remove Spectacles, caps, any other accessory while using the camera/system.



Experimental/Field Study

- HAAR CASCADE
- LBPH
- GTTS
- PLAYSOUND



Brief Description of Proposed Solution

- Our cam will capture the image of the student and convert it into 150 *150 dimension image, along with it will be changed to a grayscale image.
- Lbph algorithm will be used by us to store the computed value of all the 22500 pixels in the image.
- Confidence level of our algorithm is 85%
- A text to speech functionality is introduced in the system for better understanding and smooth conduct.
- Attendance folder is carefully designed for better comprehension of the system.



Comparison with Existing Approaches

- Face recognition can be done without any explicit action on the part of user.
- Other techniques are either expensive or can be foiled easily whereas facial recognition can be easily achieved using inexpensive cameras.
- It is non-intrusive and does not carry any health risk.



Literature Survey

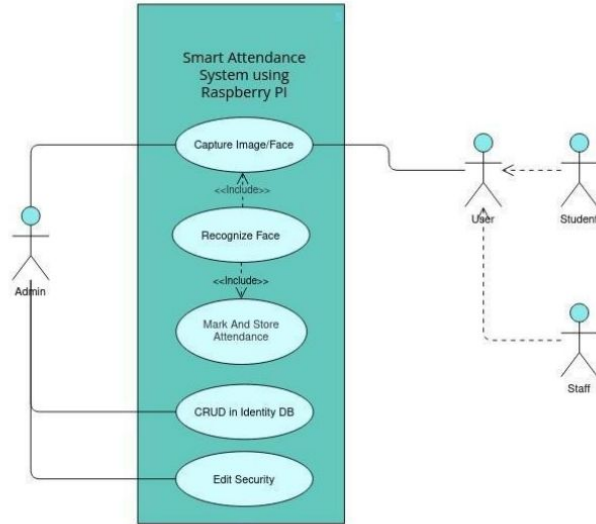
- Paper 1 - A Novel Technique to Detect Faces in a Group Photo
- Paper 2 - Face Recognition from Group Photograph
- Paper 3 - Two faces are better than one: Face Recognition in Group Photographs
- Paper 4 - Face Recognition Systems
- Paper 5 - Face Recognition with Local Binary Pattern
- Paper 6 - Face Recognition and Identification using Deep Learning Approach



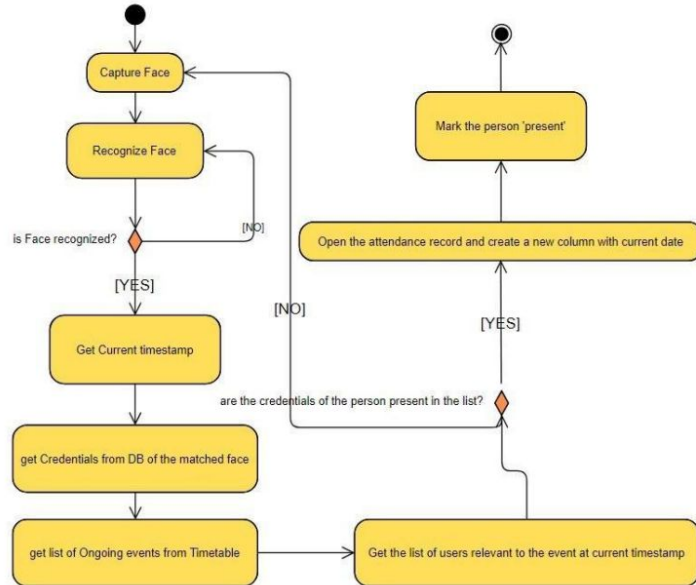
Literature Survey - Combined Summary

- From all the research paper studied , we found that lbph had the highest accuracy across 10,000+ images .
- Every paper used viola jones algorithm for facial detection in images.
- Also, one paper compared the different types of distances between histogram and chi square distance gave the best results.

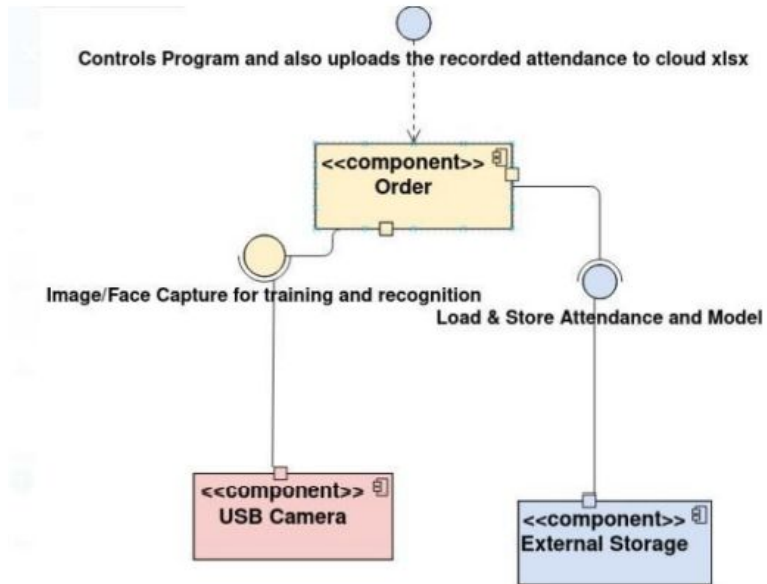
Solution Approach - Use Case Diagram



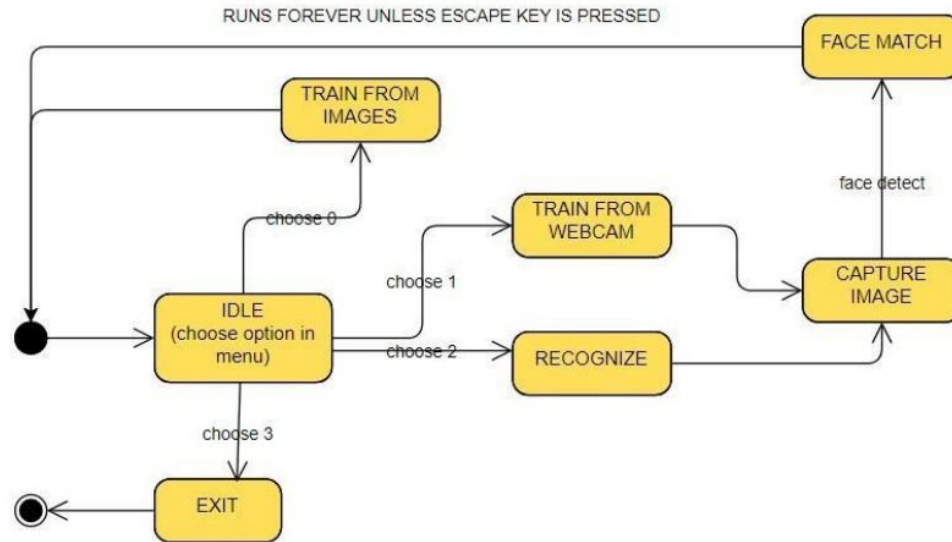
Solution Approach - Activity Diagram



Solution Approach - Component Diagram



Solution Approach - State Diagram





Solution Approach - Modules

- LBPH.PY - contains LBPH library code and related histogram functions
- MAIN.PY - controller code and also includes Google Text to Speech and Playsound
 - Load Model And Run Recognition - code for recognizer function and this also handles the csv records
- TRAIN.PY- contains functions for our model's training
 - Training From Saved Data
 - Training From Webcam



Time for Demonstration

Our code is also available on Github:

<https://github.com/rishxbhxxxh/smart-attendance-system-using-face-biometrics>



Issues

- We had firstly aimed to implement this project on a Raspberry Pi, but due to low memory, hardware, and voltage problems, the library opencv-contrib could not be installed in a feasible amount of time.
- The accuracy of the lbph model is 85%, but in the future we can switch to another algorithm if necessary and this will be very easy to do as our code is quite modular in nature.



Results and Future Scope

- So as we successfully demonstrated that our system can detect and recognize faces present in the database and act accordingly and it can also generate structured Attendance records each day in a separate file.
- Also Attendance of different classes are well segregated in groups each starting from Serial No. 1.
- The last entry in each group can be used to deduce the total strength of class.
- In the future we can integrate data handling and analysis functionality like Generating Reports both weekly and monthly.
- In short the possibilities are endless.



Thank You

Group-17

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