Software Requirements Specification (SRS)

Title: Live Attendance System using Face Recognition

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1. INTRODUCTION

Every age has its scientific discoveries and inventions. But today's scientific advancements can impact globally in very short time. Such progress is made in the field of artificial intelligence. Keeping this in mind we are going to make an Artificial Intelligence based face recognition system that can have high impact on different organizations.

Attendance is prime important for both the teacher and student of an educational organization. So it is very important to keep record of the attendance. The problem arises when we think about the traditional process of taking attendance in class room. Calling name or roll number of the student for attendance is not only a problem of time consumption but also it needs energy. So an automatic attendance system can solve all above problems.

Uniqueness or independence of an individual is his face. By considering this fact our system will be super faster and accurate in marking attendance of individual student.

We are going to use face detection and recognition in this project. Face detection is used to locate the position of face region and face recognition is used for marking the attendance. The database will store faces of students when the face of the student matches with one of the face stored in the database then the attendance is recorded.

This system eliminates classical student identification such as calling name of the student. In addition, the students have to register in the database to be recognized. The enrolment can be done on the spot through the user-friendly interface.

1.1 Purpose :

The purpose of this system is to make process of attendance very faster and accurate. The old method for taking attendance is by calling the name or roll number of the student to record attendance. It was time consuming and less accurate process of marking attendance because as we know the data written in paper can be lost or can be less accurate because students often mark each other attendance proxy.

Consider that if a subject has 1-hour duration and have more than 50 students it takes 5 to 10 minutes to mark their attendance. For each teacher this waste of time can be utilized if we make it faster with automated system. To avoid this waste of time, a face recognition system can be used to record attendance with faster and accurate attendance marking.

1.2 Scope :

Our project will be used in Universities or Colleges for taking attendance using facial recognition.

We are setting up to design a system comprising of two modules. The first module (face detector) is a component, which is basically a camera application that captures student faces and stores them in a file using computer vision face detection algorithms and face extraction techniques. The second module is a desktop application that does face recognition of the

captured images (faces) in the file, marks the students register and then stores the results in a database for future analysis.

1.3 Flow chart:
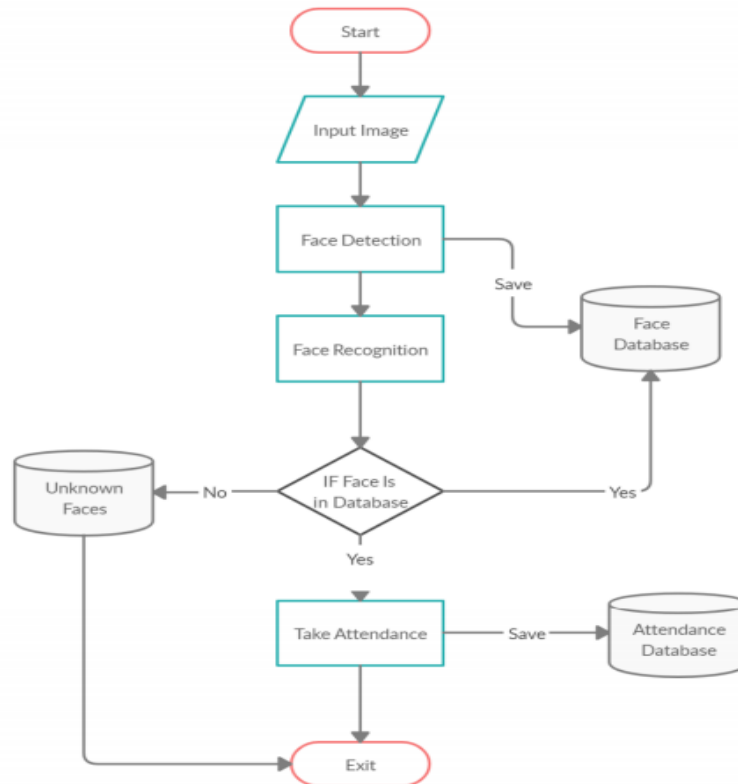
2. THE OVERALL DESCRIPTION

2.1 Product Perspective :

Face Recognition Attendance System consist of a PC with camera. The PC performs internal functions of the system like face detection and face recognition modules. System Uses information of all parts to record the student attendance. There are many applications in market for checking attendance. These technologies are usually embedded devices that have a camera and sensor, processing units, storage units and external interfaces.

However, our product approaches group action taking mechanism in an exceedingly totally different manner. In alternative devices users typically ought to do one thing to form themselves to be known by the system, as an example closing up their faces to device etc. Our system can perform the method effortlessly and dynamically. Our system is not an embedded system. It works on Windows. The camera is a separate device that is connected to server computer. Software run in a computer that has an operating system.

2.2 Product functions :

2.2.1 Face Detection Module
The job of this module is taking photos from the connected camera and after processing coming images, the system will try to find faces from the images. After finding faces, the system will try to send the related images to server hard disk and database system. This info will be used by the 'face recognition' module of the system. Also face detection module will identify the place of each face in the classrooms for making a healthier conclusion about next image coming from the camera.

2.2.2 Face Recognition Module
Face recognition module is used for recognize students in the classrooms then process the Attendance operation. When images from the face detection module is transferred to database module and they are ready to be used, face recognition module will use these image and facial information to try to find a match with student images from the database. If a match is found between image info and database record, then this student is checked as present in the classroom.

2.2.3   System Interfaces
The camera must be connected to system and video driver is installed. Camera can send image and video information to the computer system. Computer can send commands to camera to turn off or turn on etc. Computer takes info to perform related operations about 'Attendance Checking' process System will connect to MS SQL database for storing data.

2.2.4   Interfaces

- GUI interfaces for desktop.
- The interface is quite simple and user friendly.
- Event driven interface.
- Software Interfaces : Microsoft Visual Studio and OpenCV library , MySql

- Hardware Interfaces : A standalone computer with active camera must be positioned in the classroom to obtain the snapshots, Secondary memory to store all the images and database.

- Communications Interfaces : The system will only use standard ports of pc for communication with camera and other parts of system.

2.2.5 Database and File Management Module

Database module will be used for storing text and image information coming from user interface and cameras. This will save the database info like student numbers, names, student's facial information, student's attendance information, course information.

- External and Client Based Functions of System:

These functions are the functions that are used by admin of the system and takes information from the system.

- Student Matching Function:

In this function will match student face with the related face image of students. This function is a verification function that verifies the student and the actual data taken from the cameras. Also the teacher can enter the names and numbers of students for better reporting.

2.3 User characteristics:

There are mainly two type of users such as lecturer and admin. The admin will be a technical person who can fix any problem related to the system or software and he can also take data from system. The lecturer will know the basic operational procedure to run the system. Lecturer don't need to have technical details. But lecturer must know how to run system and check attendance.

2.4 Assumptions and Dependencies

Assumptions :
The detector module should crop every human face from the input image and not to crop other areas. So it was assumed that the detector will be very accurate in cropping just and all the human faces from the uploaded image and save it for further recognition.

The recognition module has to be very accurate in recognizing that is comparing the detected image with the images fetched from the database. So it was assumed that the recognition module will correctly recognize all the faces from the uploaded image so that a correct attendance sheet is produced.

Dependecies :

Our System use OPENCV and some built in libraries. Our System also uses webcam preferably for clearly detecting and recognizing the faces. It also considers various factors such as varying light conditions, accessories on face and changing environments.

3. SPECIFIC REQUIREMENT

3.1 External Interfaces

3.1.1 Login and registration

- Registration takes username(string or text) password(string or text) and recovery pin(string or text) as input and after registration this provide output as take user to login page.
- Login takes username(string or text) and password(string or text) as input and takes user into the application.

3.1.2 Face Detection

- This module takes image from camera and detect faces students store detected face in local drive in .BMP format.
- It also store name of students in text file in the same order as it's storing images of student.

3.1.3 Face Recognition
- This module will take an image of detected faces captured from camera and then it will compare the faces of that image with the images stored in training set on local disk.
- The image will be in .BMP format.

3.2 Face Detection and Recognition

- This module will have a GUI interface used to train system by taking 5 or more pictures of each student.
- It will show an imagebox and a button to start camera
- The Main menu will take student name, Year, Term and subject as input for only registering one time
- The main menu have a present button to mark the attendance of detected face in camera.
- The main menu will also have delete, update and close buttons to alter the information.

3.2.1 Update Records

- This menu will be used to update student record including name, year, subject and attendance status
- It will also show a picture box and an update button.

3.2.2 Display Record

- This module will be used to display the information of student including their attendance status.
- It will also have a search bar to search student in list.

3.3 Functions

3.3.1 Main Functions of Application

- The system shall be able to Take image from camera.
- The system shall be able to Store image in (Bitmap bmp) on local disk.
- The system shall be able to detect and recognize the students.

- The system shall be able to mark attendance of present students.

3.3.2 Functional Requirements
- The system must distinguish between authorized and unauthorized persons
- System can detect students faces.
- System can recognize students faces.
- Attendance will be automatically marked if face matches with particular face of student in database.
- Lecturer will be able to manage student records which includes attendance update, selecting lecture and duration of each lecturer or course.
- System must be attached to webcam and face recognition should be smooth.
- The information must be entered and managed properly.
- Lecturer can mark the attendance manually if system does not recognize some student.
- The lecturer will also be able to mark absent of students manually.
- The system will store records to database after taking attendance.

3.4 Performance Requirements

3.4.1 Static numerical requirements for desktop application
- User can terminate application any moment.
- Only one user can use this application simultaneously its offline application.
- It is recommended to have a Graphic card of 4GB GTX 660 or more for higher performance
- The System CPU frequency must be 3.0 or above.
- A high quality HD camera is recommended for better accuracy and performance.

3.4.2 Logical Database Requirement :

Our system has three entities, Admin, Professor and student. Admin and professor entity consist of two attributes username and password. Student Entity consist of two attribute roll no and name. The relationship between those entities are described as.

· The relationship between professor and student is many to many.
· The relationship between admin and professor is one to many.
· The relationship between admin and student is one to many.

First Normal Form :
- A relation is in first normal form if and only if the domain of each attribute contains atomic values.
- The current database tables are already in first normal form.

Second Normal Form:
- In second normal form we remove partial dependency and make fully functional dependency.

- The partial dependency is when some attributes of relation does not depend upon primary key.

Our tables are already in second normal form.

Third Normal Form:
- In 3rd normal form we remove transitive dependency. A transitive dependency is when a non key attribute depends upon another non key attributes. Our all tables are already in third normal form.

3.4.3 Design Constraints

The system will use web camera connected to PC.

3.4.4 Standards Compliance
- The system should allow the user to rollback the incorrect attendance.
- The system must prevent access of unauthorized users.

4. SOFTWARE SYSTEM ATTRIBUTES

4.1 Reliability

- The system will be able to keep database safe even if the system stop working.
- The system will avoid crashes.

4.2 Availability
- The application will be available 24/7, the usage will depend upon institution schedule.

4.3 Security
- The system will be secure from unauthorized access.
- The authorized teachers will have their username and password to login.

4.4 Maintainability
- The maintainance of the system will be done time to time after every 3 months.

4.5 Portability
- The application will only work on windows
- The application is portable and can be used in other windows pc.

5.ORGANIZING THE SPECIFIC REQUIREMENTS

5.1 System Mode
- The interface depends upon camera if there is no camera device attached to system then the face detection and recognition module will not work.
- The system also need proper configuration of database path.

5.2 User Class
The teacher can only login and mark attendance

- The Admin can view,modify or update database and train application.
- The students are not allowed to use the application

5.3 Objects
- Teacher
- Admin

5.4 Feature
- The system uses an external camera to capture images that will further processed in face detection and recognition module.
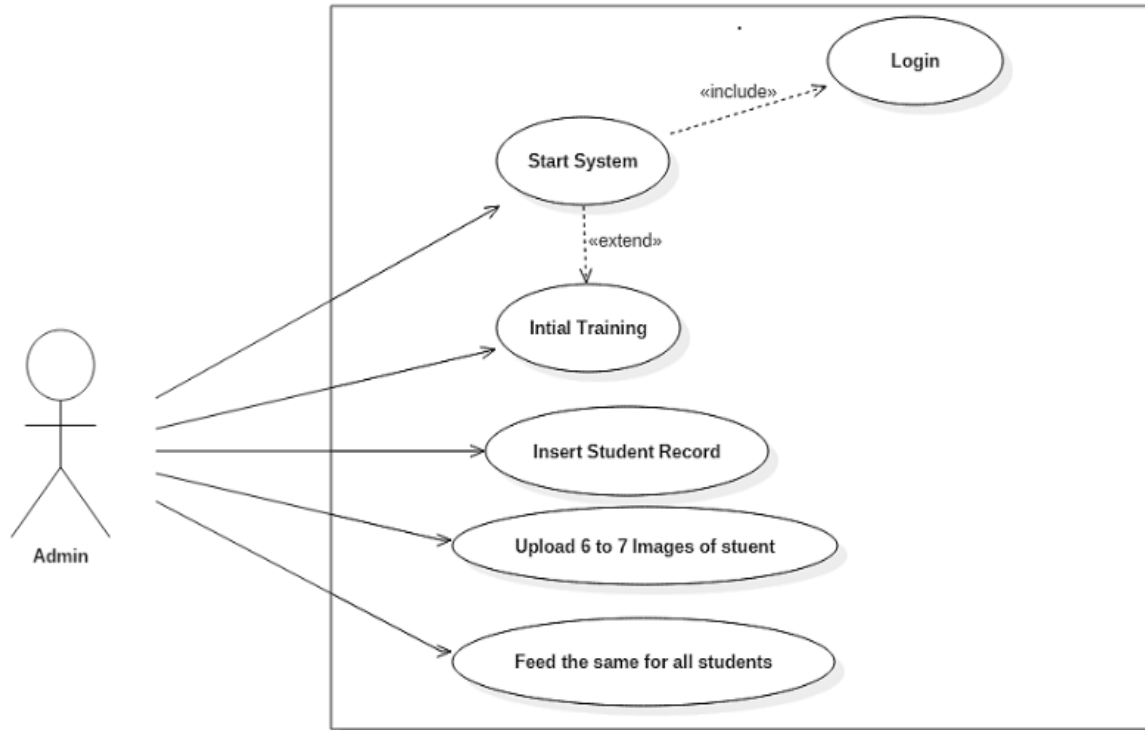
5.5 Response
- The face detection function will detect the faces of multiple students at a time
- The Face recognition function will also recognize the faces of multiple students at a time and then mark their attendance.

5.6 Use Case

Use case represents the interaction between user and system, it only shows what system will do. Include means some function must be performing and extend means show new form if previous operation is successfully completed.

Use Case Name:	FRAS 1
Actors:	Admin
Description:	This use case describes how Admin log into the system.
Triggering events:	Admin enter his username and password.
Steps Performed (Main Path):	1-System requires users to enter username/password. 2-Users enter username/password. 3-System validate entered username/password. 4-The use case ends successfully.
Preconditions:	1. System installed on pc. 2. Admin must be authorized.
Post-conditions:	Log in is successfully.
Alternate:	If the Admin don't fill information correctly, the log in fails.

Use Case Name:	FRAS 2
Actors:	Professor
Description:	This use case describes how Professor log into the system.
Triggering events:	Professor enter his username and password.
Steps Performed (Main Path):	1-System requires users to enter username/password. 2-Users enter username/password. 3-System validate entered username/password. 4-The use case ends successfully.
Preconditions:	1. System installed on pc. 2. Professor must be authorized.
Post-conditions:	Log in is successfully.
Alternate:	If the Professor don't fill information correctly, the log in fails.

Three are many notations, methods, and automated support tools available to aid in the documentation of requirements. For the most part, their usefulness is a function of organization. For example, when organizing by mode, finite state machines or state charts may prove helpful; when organizing by object, object-oriented analysis may prove helpful; when organizing by feature, stimulus-response sequences may prove helpful; when organizing by functional hierarchy, data flow diagrams and data dictionaries may prove helpful.

In any of the outlines below, those sections called "Functional Requirement" may be described in native language, in pseudocode, in a system definition language, or in four subsections titled: Introduction, Inputs, Processing, Outputs.

REFERENCES

[1]. Bejoy Peter's Public Speech of Artificial Intelligence.
[2]. Distinguishing identical twins using face recognition by P. Jonathon Philips
[3]. Turk, M. and Pentland, A. (1991a). Eigenfaces for recognition. Journal of Cognitive Neuroscience, 3(1), 71-86