

# **GOVERNMENT POLYTECHNIC RATNAGIRI**



A Project Report On

**Topic: Face Recognition and Motion Detection Using AI.**

Submitted To

**“COMPUTER ENGINEERING DEPARTMENT”**

Under The Guidance Of

**G.D.PATNE**

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**THROUGH**

**GOVERNMENT POLYTECHNIC RATNAGIRI  
ACADEMIC YEAR 2021-22**



**MAHARASHTRA STATE  
BOARD OF TECHNICAL EDUCATION**

**Certificate**

This is to certify that **Mr.Sharad Baghel, Mr. Sahil Shivgan, Mr. Tejraj Jadhav, Mr. Sahil Wasta, Mr. Raj Joshi** from **Government Polytechnic Ratnagiri** (Code : 0013) having Enrollment No. **1900130045, 1900130046, 1900130202, 1900130203, 1900130207** has completed the **Report on Semester V Project Report** having title **“Face Recognition and Motion Detection using AI”** in the group consisting of **5** candidates under the guidance of faculty Guide.

**G.D.PATNE**  
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**HOD**

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## **Abstract:**

Now-a-days in 21<sup>st</sup> century where technologies have almost reached the peak, where the world can be an industrial and advanced place. From almost decades humans have been trying to develop a technological and future used applications which will eventually try to modify our living area to our work place and many other our daily chores. So, for now where world is digital for most of the daily to advanced works such as transactions to face scanning, etc. Therefore, let us consider face recognition and motion detection the problem statements were storing of data and analysis is much more of a crucial work. Now what does exactly face recognition and motion detection really mean?

The demand for reliable personal identification in computerized access control has resulted in an increased interest in biometrics to replace password and identification (ID) card. The password and ID card can be easily breached since the password can be divulged to an unauthorized user, and the ID card can be stolen by imposter. Thus, the emergence of biometrics has addressed the problems that plague the traditional verification methods. Biometric which make use of human features such as iris, retina, face, fingerprint, signature dynamics and speech can be used to verify a person's identify. The biometrics data have an edge over traditional security methods since they cannot be easily stolen shared. The face recognition system has the benefit of being a passive, non-intrusive system for verifying personal identify.

And, this face recognition can also link with motion detection where a person whose face is recognized will be detected by the system and if the personae is suspected doing inappropriate actions or his/her face biometrics is not clearly captured it will be useful to the core of this system where it can be used to easily suspect or take an action against it.

Here, this system which will be initialized by us will be comparatively cheaper to the system users and can be readily used software when a person can be in a situation where he/she really need this system like the offices, schools/colleges etc. For better security and advanced attendance method, etc. This system is totally based on AI where it will use the log files and store/capture (Biometrics) of faces of personae for future security purpose, for identifying the person whether he/she really belongs to this particular community.

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## **Chapter-1 Introduction and background of the Industry or User based Problem.**

- **Introduction:**

As Discussed above, that storing of data of a particular person through digital methods is an ease in today's world. We like to develop such a software named Face Recognition & Motion Detection which will recognize and detect the faces of a person, through their biometrics such as ears, eyes, lips, etc. This system will be readily available for the end users who can use it to see the person details which we will be storing in log files and these log files will further be stored in DVR/Hard Drive.

As this system is helpful in many other ways, there are wide number of applications where it can be used whether it's from local home security purpose to the vast range of public security.

Here, as the system has many such applications; So, let us consider one issue as the subject, thus we will just try to figure out the Student's Attendance through this system which will be more beneficial in today's age of education where now it also seems to be a digital intelligence. It's not like it can be used only for this merely purpose, the database in system can be updated precisely when the system is to be used in some other field/branch like office management, etc.

Our Software will contain the following things:

1. A Camera which will detect the motion of a person's (student's) face when a face appears to be in front of the Camera.
2. A Database (Student's Database) which will contain the data that is to be applicable to find the information about a particular person (student) feuded in it.
3. A Log file which will store all the person (student's) faces biometric information (Face ID, Enter/Exit Time).

4. A DVR/HardDrive to store the Log Files through which the person's (student's) each day record will be available to the end user (teacher) which will be applicable for their Use (Attendance Purpose).

5. Here, only the System Administrator can perform sort of operations like edit, delete, etc on the database, DVR/HardDrive & the End User of System can only have access to DVR/HardDrive for viewing the log files record.

- **Problem Definition:**

The problem of face recognition is all about face detection. This is a fact that seems quite bizarre to new researchers in this area. However, before face recognition is possible, one must be able to reliably find a face and its landmarks. This is essentially a segmentation problem and in practical systems, most of the effort goes into solving this task. In fact the actual recognition based on features extracted from these facial landmarks is only a minor last step.

There are two types of face detection problems:

1. The Illumination problem :-

The illumination problem is illustrated where the same face appears

differently due to the change in lighting. More specifically , the changes induced by illumination could be larger than the differences between individuals, causing induced systems based on comparing images to misclassify the identity of the input image. This has been experimentally observed in with a dataset of 25 individuals. We can also carry out some analysis. For example, the popular eigen-subspace projections used in many systems as features have been analyzed under illumination variation. The conclusions suggest that significant illumination changes cause dramatic changes in the projection coefficient vectors, and hence can seriously degrade the performance of subspace based methods.

## 2. The Pose problem :-

The pose problem is illustrated where the same face appears differently

due to changes in viewing condition. Moreover, when illumination variation also appears in the face images, the task of face recognition becomes even more difficult. An analysis and classification of various pose problems are performed using a reflectance model with varying albedo. Using such a model, the difficulty of the pose problem can be assessed and the efficacy of existing methods can be assessed and evaluated systematically.

For example, the pose problem has been divided into three categories

- 1) The simple case with small rotation angles.
- 2) The most commonly addressed case when there are a set of training image pairs (Frontal and rotated images)
- 3) The most difficult case when training image pairs are not available and illumination variations are presents.

## • **System Methodology of solving identified Problem:**

### **Face Recognition And Motion Detection Using AI :**

As a fundamental problem in image understanding literature, illumination problem is generally quite difficult and has been receiving consistent attentions. For face recognition, many good approaches have been proposed utilizing the domain knowledge, i.e. , all faces belong to one face class These approaches can be broadly divided into four types:

- 1)Heuristic methods including discarding the leading principal components.
- 2)Image comparison methods where various image representations and distance measures are applied.
- 3)Class-based methods where multiple images of one face under a fixed pose, but different lighting conditions are available.
- 4)Model-based approaches where 3D models are employed.



## **Chapter 2- Literature Survey for Problem Identification and Specification.**

- **Literature Review:**

### **Research Paper 1 -**

- **Author Name:**

1. Aju D

VIT University | VIT - Department of Information Security M.C.A, MTech., Ph.D.

2. Divyanshu Bhati

- **Publications:**

Imperial Journal of Interdisciplinary Research (IJIR)

Vol-3, Issue-9, 2017

ISSN: 2454-1362.

- **Title of Research Paper:**

Security System Using Motion Detection and Face Recognition.

- **Summary of Paper:**

The paper [1] discusses about the detection of motion in a monitored area by using the frame difference methods. The technique discussed in the paper is based upon the combination of two different frame differencing methods which are the Background subtraction method and Consecutive frame subtraction method. The technique is based upon the background images acquired from the previously captured frames. The current image is compared pixel by pixel to an image which is actually the mean of the background images taken. The motion is detected by analysing the difference in the pixel value of the current image with respect to the background images and the

difference in pixel values is then checked against a threshold value. If the difference is greater than the threshold value set by the user, it can be inferred that the motion is detected in the current camera frame else if the difference is less than the threshold, the current image is not detected with the presence of any motion and the system analyses the next image for motion. Finally the motion detection is indicated by an alarm or by using a graphical method. The technique is implemented using Matlab and the results obtained depicts that the methods leads to avoidance of false positive alarms but the amount of time required to train the system to avoid false alarms is very high which is a limitation to this technique. The improvement that can be done is to use machine learning algorithms which can help learn the system at a faster pace and the limitation to this system is overcome.

## **Research Paper 2 -**

- **Author Name:**

1. Ashwani Agarwal  
VIT University | VIT - Division of Software Systems
2. Himanshu Jain

- **Publications:**

Imperial Journal of Interdisciplinary Research (IJIR)  
Vol-3, Issue-9, 2017  
ISSN: 2454-1362.

- **Title of Research Paper:**

Security System Using Motion Detection and Face Recognition.

- **Summary of Paper:**

The paper [2] proposes computer vision techniques that can be used to design a visual surveillance home Imperial Journal of Interdisciplinary Research (IJIR) Vol-3, Issue-9,

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security system to protect against intrusions and theft. The paper discusses about using the combination of motion detection and face recognition techniques to build the system. The motion detection module uses frame difference methods to detect the presence of motion in the frame. The current frame is compared with the previous frames pixel wise. The difference in pixel values is noted and used to detect motion. If the difference is greater than 15 percent from a set threshold value, then it indicates that the motion has been detected and it triggers the face recognition module. The face recognition module uses the Eigen face recognition algorithm to recognize faces. The face detection module differentiates the intruders from the authorized users. A database of authorized users is provided by the owners of the property. If a person is detected and his face is not recognized in the authorized person's database, it indicates that the person can be an intruder or thief and alarm is triggered and an email is generated to notify the owners about the intrusion. The system is tested during day and night at various times and it was noted that the system is less responsive during night time to capture motion and the recognition rate is not high enough. Still the system is highly robust, reliable and efficient. The system can be improved by making the face recognition module less sensitive to variations in light intensity and increasing the recognition ratio.

## **Chapter-3 Proposed Detailed Methodology of Solving the identified problem with action plan.**

### **Face Recognition and Motion Detection Using AI:**

We like to develop such a software named Face Recognition & Motion Detection which will recognize and detect the faces of a person, through their biometrics such as ears, eyes, lips, etc. This system will be readily available for the end users who can use it to see the person details which we will be storing in log files and these log files will further be stored in DVR/Hard Drive.

As this system is helpful in many other ways, there are wide number of applications where it can be used whether it's from local home security purpose to the vast range of public security.

The proposed system has many such applications; So, let us consider one issue as the subject, thus we will just try to figure out the Student's Attendance through this system which will be more beneficial in today's age of education where now it also seems to be a digital intelligence. It's not like it can be used only for this merely purpose, the database in system can be updated precisely when the system is to be used in some other field/branch like office management, etc.

### **This Designed System that will manage:**

1. A Camera which will detect the motion of a person.
2. A Database which will contain the data.
3. A Log file which will store all the person faces biometric information.
4. A DVR/HardDrive to store the Log Files.

## **Admin Module:**

### **A. Admin Login:**

Admin will login by entering the username and password.

### **B. Home Page:**

Home page showing preview of faces capturing in camera will appear in different cameras.

### **C. Recording:**

This tab will show recordings captured in cameras.

### **D. Log Files:**

This will show logs saved in our system.

### **E. Database:**

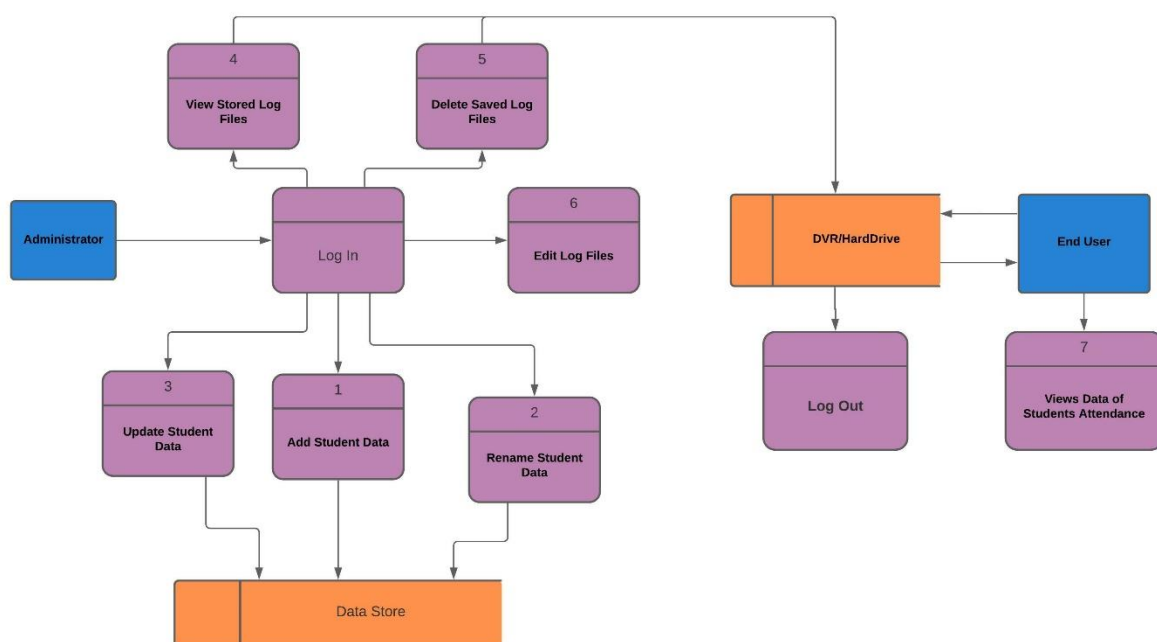
This will show every stored detailed data of every person.

## Diagram:

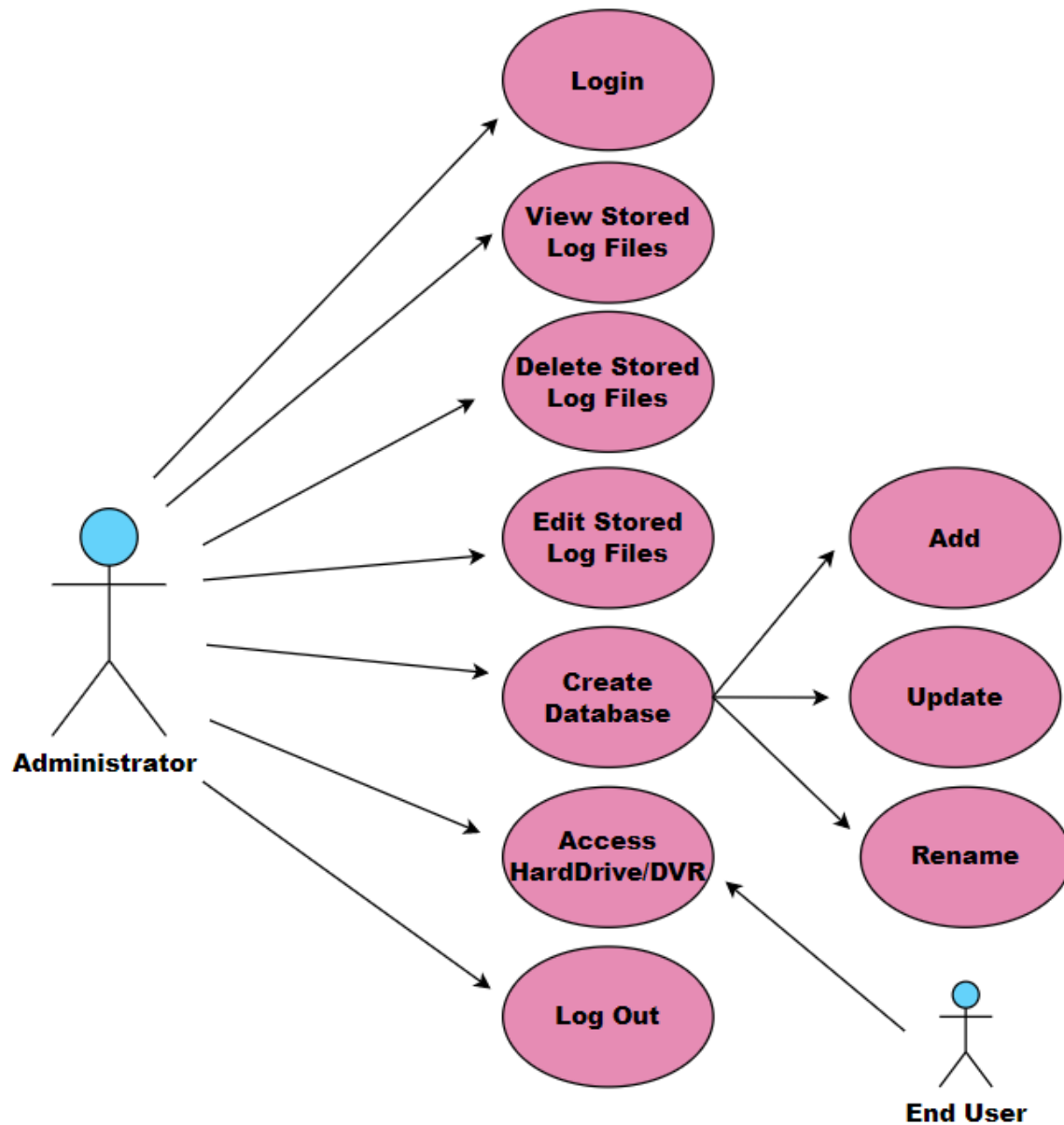
- DFD level 0 Diagram for Face Recognition and Motion Detection (ref: Attendance System)



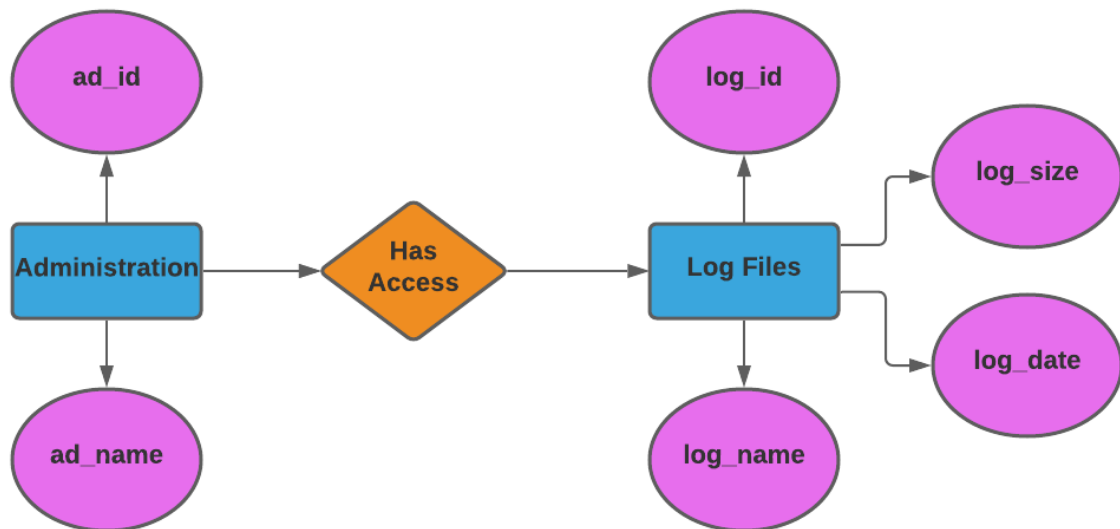
- DFD level 1 Diagram for Face Recognition and Motion Detection (ref: Attendance System)



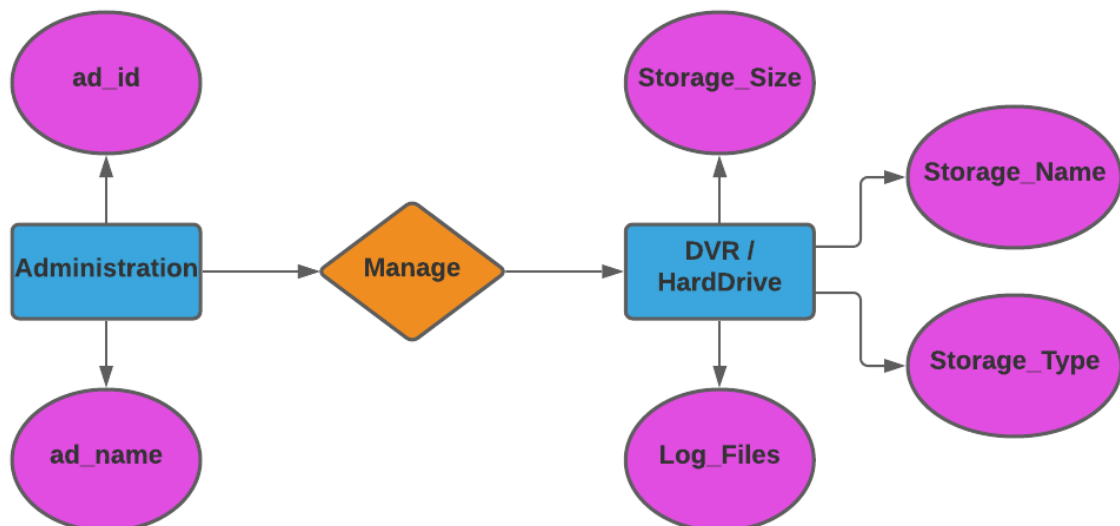
- **Use Case Diagram for Face Recognition and Motion Detection (ref: Attendance System)**



- **E-R Diagram between Administrator and DVR / Hard-Drive:**

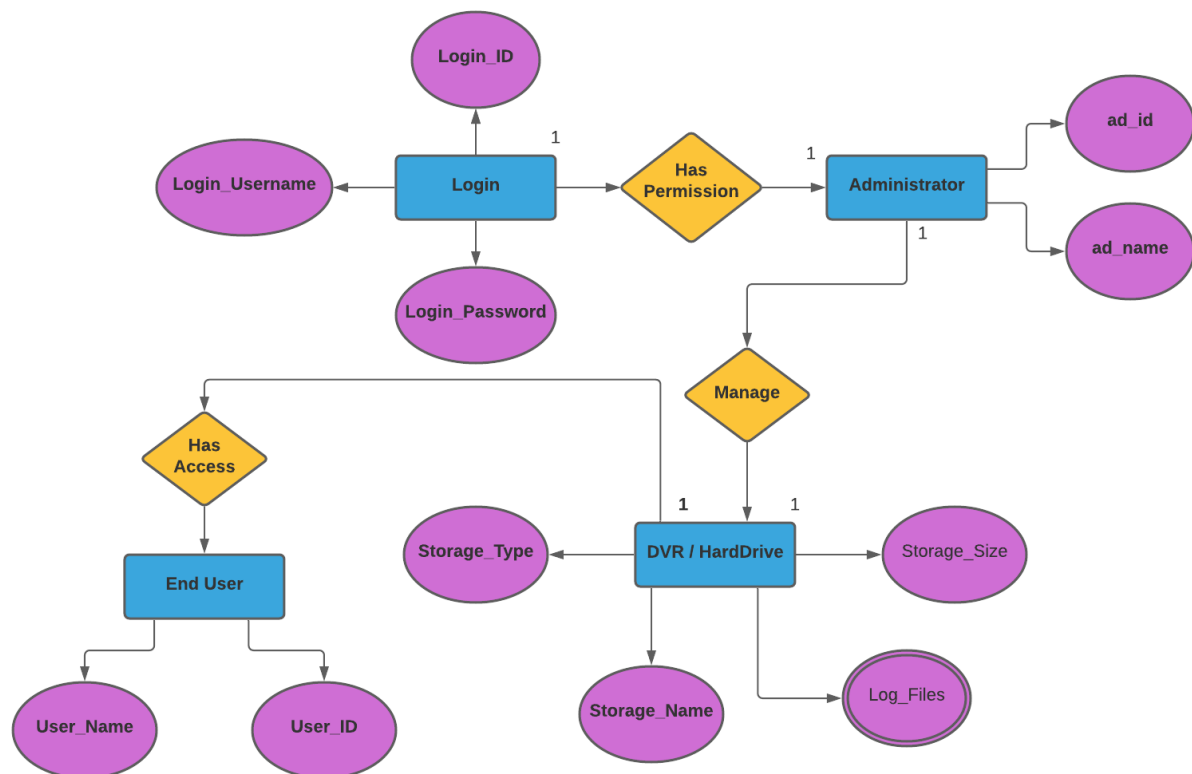


- **E-R Diagram between Administrator and DVR / Hard-Drive:**

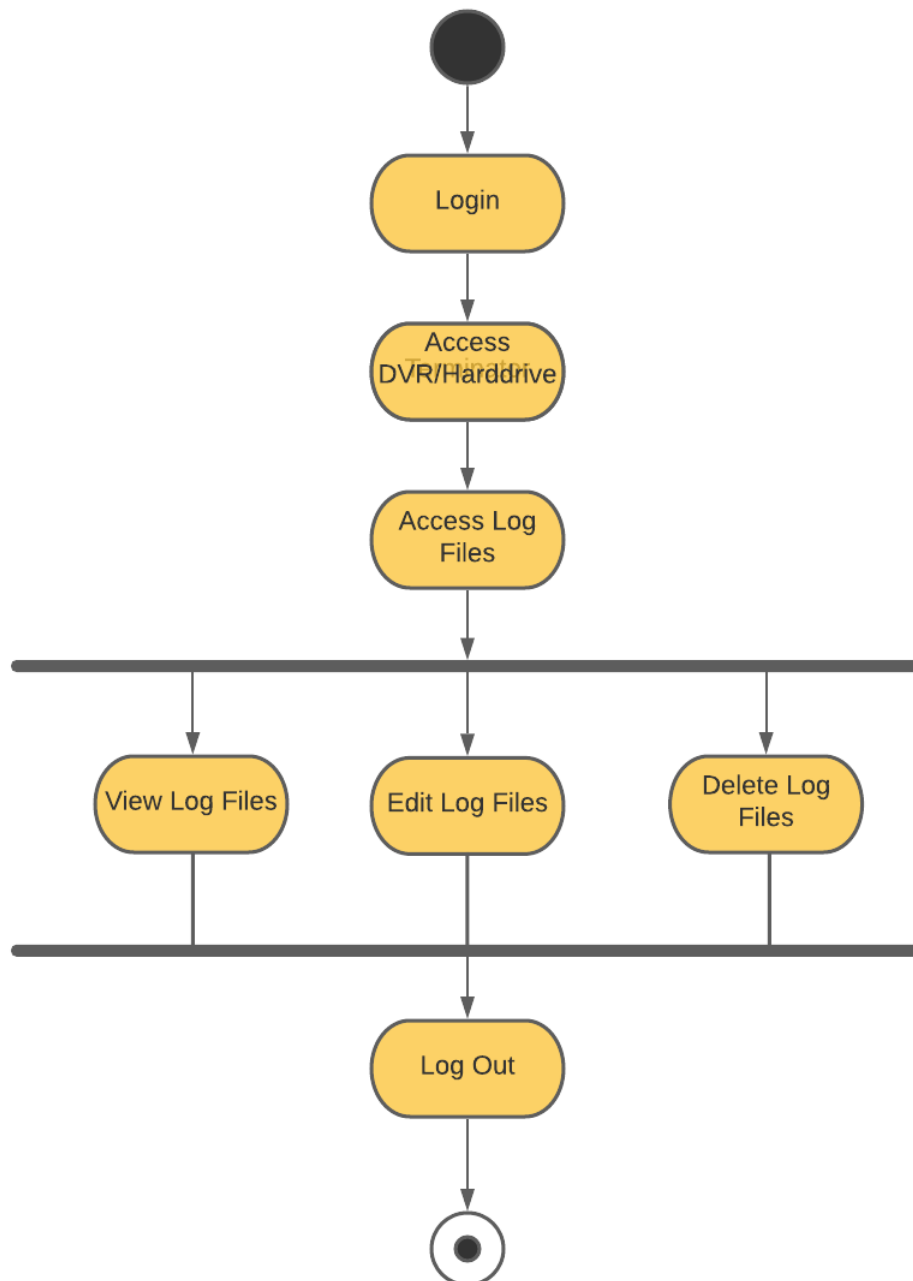




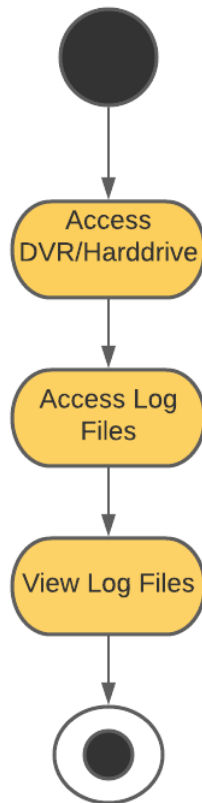
- **E-R Diagram of Overall System:**



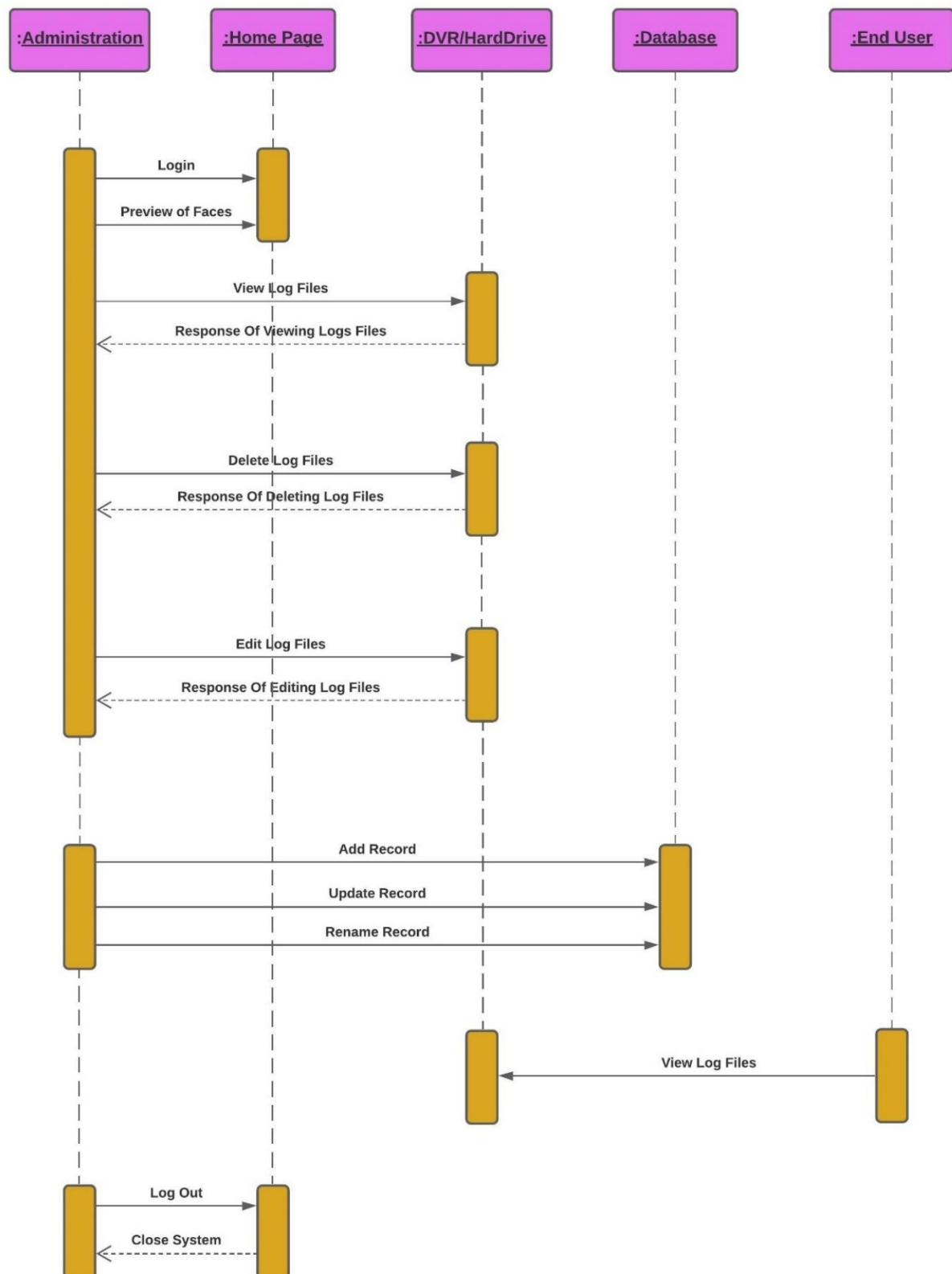
- **Activity Diagram for Administrator in System:**



- **Activity Diagram for End User in System:**



- Sequence Diagram of Overall System:



- **The System is developed based on following languages:**

### **1. HTML: as Front End:**

HTML stands for Hyper Text Markup Language. It is used to design web pages using markup language. HTML is the combination of Hypertext and Markup language. Hypertext defines the link between the web pages. Markup language is used to define the text document within tag which defines the structure of web pages. This language is used to annotate (make notes for the computer) text so that a machine can understand it and manipulate text accordingly. Most markup languages (e.g. HTML) are human readable. Language uses tags to define what manipulation has to be done on the text. HTML is a markup language used by the browser to manipulate text, images and other content, in order to display it in the required format. HTML was created by Tim Berners-Lee in 1991.

### **2. SQL: as Database Language:**

**SQL** also known as Structured Query Language is a domain-specific language used in programming and designed for managing data held in a relational database management system (RDBMS), or for stream processing in a relational data stream management system (RDSMS). It is particularly useful in handling structured data, i.e., data incorporating relations among entities and variables. SQL offers two main advantages over older read–write APIs such as ISAM or VSAM. Firstly, it introduced the concept of accessing many records with one single command. Secondly, it eliminates the need to specify how to reach a record, e.g., with or without an index.

Originally based upon relational algebra and tuple relational calculus, SQL consists of many types of statements, which may be informally classed as sublanguages, commonly: a data query language (DQL), a data definition language (DDL), a data control language (DCL), and a data manipulation language (DML). The scope of SQL includes data query, data manipulation (insert, update and delete), data definition (schema creation and modification), and data access control. Although SQL is essentially a declarative language (4GL), it also includes procedural elements.

### 3. Python: as Back End:

**Python** is an interpreted high-level general-purpose programming language. Its design philosophy emphasizes code readability with its use of significant indentation. Its language constructs as well as its object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects.

Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly, procedural), object-oriented and functional programming. It is often described as a "batteries included" language due to its comprehensive standard library.

Guido van Rossum began working on Python in the late 1980s, as a successor to the ABC programming language, and first released it in 1991 as Python 0.9.0.[34] Python 2.0 was released in 2000 and introduced new features, such as list comprehensions and a cycle-detecting garbage collection system (in addition to reference counting). Python 3.0 was released in 2008 and was a major revision of the language that is not completely backward-compatible. Python 2 was discontinued with version 2.7.18 in 2020. Python consistently ranks as one of the most popular programming languages.

### 4. JavaScript for Validating and Scripting:

**JavaScript** often abbreviated **JS**, is a programming language that is one of the core technologies of the World Wide Web, alongside HTML and CSS. Over 97% of websites use JavaScript on the client side for web page behaviour,[ often incorporating third-party libraries. All major web browsers have a dedicated JavaScript engine to execute the code on the user's device.

JavaScript is a high-level, often just-in-time compiled language that conforms to the ECMAScript standard. It has dynamic typing, prototype-based object-orientation, and first-class functions. It is multi-paradigm, supporting event-driven, functional, and imperative programming styles. It has application programming interfaces (APIs) for working with text, dates, regular expressions, standard data structures, and the Document Object Model (DOM).

- **Implementation:**

We developed a software to analyse record of person data in the form of their biometric that represents his / her identity. We have developed the system such that, it will automatically will create log files by scanning the person's face and detecting it which can contain its his / her record, which will in return reduce time consumption of analysis of data manually. For these we used HTML, SQL and Python. After admin logins into system, data is been fetched dynamically through system itself through the assigned property. For here, log file has been parsed using HTML or PHP. We hope to accelerate the analysis by developing the analysis system. It provides assistance to teachers and administrator to track record of each student, subject and department by using various techniques if this system is used as an attendance system.

- **Future Scope:**

This particular project as concluded is very useful in today's world, we can use it to recognise faces of person and detect motion accurately. Now, we have created this system which can be used in our college to mark the attendance of students through their digital biometrics.

This project can be further edited and it can be used in various fields like hospital, office environment by scanning the person faces and obtain a list of their person info, qualification and details of that person.

- **Conclusion:**

The goal of the system is achieved and difficulties are solved. The project is built such that it is user friendly. Analysis of the System shows record of individual faces detected and final preview is displayed depending on what the system has captured. The project can be easily used in school or colleges or work place. It reduces time which required for manual work. This system helps to calculate result fast so it optimizes the manpower.

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