****

**DEVELOPMENT OF SMART SCHOOL ENVIRONMENT & HOSTEL MONITORING SYSTEM**

**BY**

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# DECLARATION

I hereby declare/ascertain that this comprehensive report was compiled by me Nneji Ifeanyi Daniel (19/ENG02/077) and entails precisely what I have done working on my project. I withal declare that this report or its content has not been anteriorly submitted to this or any other institution of learning for the purport of consummating the requisites for the award of any degree. All citations and sources of information’s and research are pellucidly acknowledged by betokens of references.

**…………………….. ………………………**

Name and Signature Date

**CERTIFICATION**

This is to certify that this report was written by **Nneji Ifeanyi Daniel** with matriculation number **19/ENG02/077** of the department of Computer Engineering,Department of Computer and Electrical Engineering, College of Engineering, Afe Babalola University, Ado-Ekiti, Ekiti State, Nigeria; in partial fulfilment of the requirement for the award of Bachelor of Engineering (B. Eng.) Degree in Computer Engineering.

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Engr. Tony Date

**(Project Supervisor)**

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Dr. Femi Date

**(Head of Department)**

# DEDICATION

First, I dedicate this report to my Father in heaven, God Almighty for the opportunity and grace given to me to undergo this training and resume a new semester peacefully. To my wonderful parents Mr. and Mrs. Nneji for their tireless support and investment in my life, my aunt Patience Nneji and to all those who may consider this work relevant in the pursuit of academic excellence, I dedicate this piece of work.

# ACKNOWLEDGEMENT

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# ABSTRACT

In recent years, there has been an increased focus on developing smart school systems that can leverage technology to improve education outcomes. A smart school system is a comprehensive framework that integrates technology into every aspect of the education process, from administration to teaching and learning. This approach has the potential to transform the way education is delivered and create more effective, personalized learning experiences for students.

The "Smart School Environment" report focuses on the development and implementation of an advanced Learning Management System (LMS) and Hostel Monitoring System (HMS) in a school environment. The LMS is designed to enhance the learning experience of students by providing access to attendance records, lecture videos, course documents, and assignments. Lecturers can use the LMS to register students for their courses, record attendance using facial recognition, upload course documents and videos, and view attendance records. The LMS is a web application built with Flask.

The Learning Management System (LMS) mentioned in the Smart School Environment report was built using the Flask framework, which is a Python-based web framework used for developing web applications. Flask provides a lightweight and flexible approach to building web applications, making it an ideal choice for the LMS.

In addition to Flask, the LMS also utilizes several other technologies such as JavaScript, HTML, and CSS for front-end development. These technologies are used to design the user interface of the web application, making it more interactive and user-friendly.

For back-end development, the LMS uses PostgreSQL, an open-source relational database management system, to store and manage data. Flask-Login, a Flask extension, is used for user authentication and login functionality, while Flask-Admin is used for admin management, allowing the administrators to easily manage the LMS.

Finally, Flask-Mail is used for sending emails from the LMS, providing functionality such as password reset, new user registration, and course enrollment notifications to students and faculty members.

The HMS, on the other hand, is an AI and IoT-based desktop application used to monitor student activity in the hostel. The system uses YOLOv5 object classification methods for smoking detection and image classification methods combined with Raspberry Pi and camera for violence detection. The HMS helps to promote a safe and secure environment in the hostel, ensuring the safety of students.

# CHAPTER ONE

# INTRODUCTION

# Background of Study

The education sector has been rapidly evolving, and the traditional methods of teaching and learning are no longer sufficient to meet the needs of modern-day students. In recent years, the integration of technology in education has become increasingly popular, and various educational institutions have implemented e-learning systems to enhance the learning experience of students. The advent of Learning Management Systems (LMS) has further transformed the way students learn, enabling them to access course materials, submit assignments, and interact with their peers and instructors from anywhere and at any time.

Hostel monitoring systems (HMS) have also been increasingly adopted by schools to promote a safe and secure environment for students living on campus. With the increasing incidents of violence, smoking, and substance abuse, it has become essential to implement an efficient monitoring system to prevent and detect such activities.

The Smart School Environment report aims to combine these two technologies, the LMS and HMS, to create an advanced system that promotes efficient learning and ensures the safety of students. The LMS provides students with a platform to access course materials, submit assignments, and interact with their instructors, while the HMS monitors student activity in the hostel, detecting and preventing any unwanted behavior.

The development of the LMS and HMS was based on extensive research on the latest trends and best practices in the education and technology sectors. The design and implementation of the system were guided by several principles, including user-friendliness, efficiency, and security. The use of Flask, JavaScript, HTML, CSS, PostgreSQL, Flask-Login, Flask-Admin, and Flask-Mail ensured that the system was flexible, scalable, and easy to maintain.

## **1.2 Statement of the Problem**

The current education system lacks an efficient and comprehensive system to ensure the safety of students and provide easy access to course materials. Traditional methods of teaching and learning are no longer sufficient to meet the needs of modern-day students. The lack of an advanced Learning Management System (LMS) and Hostel Monitoring System (HMS) has resulted in several challenges, including a lack of easy access to course materials, reduced learning outcomes, and an inadequate monitoring system to ensure student safety.

The objective of the project is to develop an advanced LMS and HMS to address these challenges and provide a comprehensive solution to the problems faced by schools. The LMS will provide a platform for students to access course materials, submit assignments, and interact with their instructors, while the HMS will provide efficient monitoring systems to ensure the safety of students living on campus.

The project aims to create a user-friendly, efficient, and secure system that addresses the challenges faced by schools in implementing e-learning systems and hostel monitoring systems. By doing so, the project aims to contribute to the ongoing efforts to improve the quality of education and promote a safe and secure learning environment for students.

## **Aim and Objectives**

The aim of this project is to develop an advanced Learning Management System (LMS) and Hostel Monitoring System (HMS) that provides a comprehensive solution to the challenges faced by schools in ensuring the safety of students and providing easy access to course materials.

The specific objectives of the project are:

1. To design and develop an advanced LMS that allows students to access course materials, submit assignments, and interact with their instructors.
2. To develop an efficient monitoring system for the HMS that detects and prevents unwanted behavior in hostels, such as violence, smoking, and substance abuse.
3. To integrate facial recognition technology into the LMS to enable lecturers to record student attendance automatically and accurately.
4. To provide a secure and user-friendly platform that allows instructors to upload course materials, register students for their courses, and view attendance records.
5. To provide a comprehensive and efficient monitoring system that ensures the safety of students living on campus.
6. To integrate YOLOv5 object classification methods and image classification methods into the HMS to detect and prevent unwanted behavior in hostels.
7. To develop a desktop application for the HMS that enables administrators to monitor student activity in hostels and take appropriate action when necessary.
8. To test and evaluate the effectiveness of the LMS and HMS in enhancing the learning experience of students and promoting their safety and well-being.
9. To provide recommendations for future improvements and enhancements to the LMS and HMS based on feedback from users and stakeholders.

By achieving these objectives, the project aims to create an advanced LMS and HMS that provides a comprehensive and efficient solution to the challenges faced by schools in ensuring the safety of students and providing easy access to course materials. The project aims to contribute to the ongoing efforts to improve the quality of education and promote a safe and secure learning environment for students.

## **Justification**

The education sector has undergone significant changes over the past decade, with advancements in technology transforming the way students learn and interact with their instructors. As schools continue to adopt e-learning systems such as LMSs, there is a need to ensure that these systems are efficient, user-friendly, and secure.

Furthermore, the safety and well-being of students living on campus have become a significant concern for schools, with incidents of violence, smoking, and substance abuse on the rise. Traditional methods of monitoring student behavior in hostels are no longer effective, and schools require a comprehensive and efficient monitoring system to ensure the safety of their students.

The Smart School Environment project aims to develop an advanced Learning Management System (LMS) and Hostel Monitoring System (HMS) that addresses the challenges faced by schools in ensuring the safety of students and providing easy access to course materials.

## **1.4 Scope of Study**

The Smart School Environment project aims to develop an advanced Learning Management System (LMS) and Hostel Monitoring System (HMS) that addresses the challenges faced by schools in ensuring the safety of students and providing easy access to course materials. The scope of the project includes the design, development, and implementation of the LMS and HMS.

The LMS will be a web application built using Flask and will provide a user-friendly interface for students to access course materials, submit assignments, and interact with their instructors. The LMS will be designed to incorporate features such as attendance recording using facial recognition, course registration, and document sharing. The system will also be integrated with a messaging system to facilitate communication between students and instructors.

The HMS will be a desktop application that will use artificial intelligence (AI) and Internet of Things (IoT) technology to monitor student activity in hostels. The system will incorporate features such as smoking detection using object classification methods, violence detection using image classification methods, and raspberry pi and camera. The HMS will be designed to provide real-time alerts to hostel staff in the event of any security concerns.

The scope of the project also includes the integration of the LMS and HMS, ensuring seamless communication between the two systems. The systems will be developed to comply with data privacy regulations, ensuring the security of student data and preventing unauthorized access.

The Smart School Environment project will be developed with a focus on usability, scalability, and flexibility, allowing for future expansion and customization. The project's scope does not include the deployment of the systems in schools, which will be the responsibility of the schools themselves.

## **1.5 Working Principles of Smart School Environment System**

The Smart School Environment project comprises two main systems, the Learning Management System (LMS) and Hostel Monitoring System (HMS). These systems work in conjunction with each other to provide a comprehensive solution to the challenges faced by schools in ensuring student safety and providing easy access to course materials.

The LMS is a web application built using Flask, JavaScript, HTML, CSS, and PostgreSQL. It is designed to provide students and instructors with a user-friendly interface for accessing course materials, submitting assignments, and interacting with each other. The LMS incorporates features such as attendance recording using facial recognition, course registration, document sharing, and a messaging system for communication between students and instructors. The LMS also incorporates Flask-Login and Flask-Admin for authentication and management of the application, respectively.

The HMS is a desktop application that uses artificial intelligence (AI) and Internet of Things (IoT) technology to monitor student activity in hostels. The system is designed to detect security concerns such as smoking and violence using object classification methods and image classification methods. The system uses a Raspberry Pi and a camera to capture images, which are processed using YOLOv5 object detection and OpenCV libraries. The system generates real-time alerts that are sent to hostel staff, who can take necessary action to ensure the safety of students.

The LMS and HMS systems are integrated to ensure seamless communication between the two systems. The systems communicate with each other through APIs, enabling the exchange of data and real-time alerts between the two systems. The LMS and HMS systems are designed to comply with data privacy regulations, ensuring the security of student data and preventing unauthorized access.

In summary, the Smart School Environment project works by providing a comprehensive solution to the challenges faced by schools in ensuring student safety and providing easy access to course materials. The LMS and HMS systems work in conjunction with each other, providing a user-friendly interface for students and instructors to access course materials, submit assignments, and interact with each other, while ensuring the safety of students through the use of AI and IoT technology.

## **1.6 Significance of Study**

The Smart School Environment project is a significant development in the education sector, as it addresses the challenges faced by schools in ensuring student safety and providing easy access to course materials. The project's significance lies in the following areas:

1. Enhanced Student Safety: The HMS system developed as part of the project uses AI and IoT technology to monitor student activity in hostels and detect security concerns such as smoking and violence. The system generates real-time alerts that enable hostel staff to take necessary action, enhancing student safety and reducing security risks.
2. Improved Learning Experience: The LMS system developed as part of the project provides students and instructors with a user-friendly interface for accessing course materials, submitting assignments, and interacting with each other. The system's features such as attendance recording using facial recognition and document sharing enhance the learning experience and reduce administrative burden.
3. Technological Advancement: The Smart School Environment project incorporates advanced technology such as AI, IoT, and facial recognition, demonstrating the potential of technology in the education sector. The project's development and implementation demonstrate the importance of embracing technology in the education sector and how it can be used to address challenges and improve the learning experience.
4. Compliance with Data Privacy Regulations: The LMS and HMS systems developed as part of the project are designed to comply with data privacy regulations, ensuring the security of student data and preventing unauthorized access. The project's compliance with data privacy regulations demonstrates the importance of data privacy and its relevance in the education sector.

# CHAPTER TWO

# LITERATURE REVIEW

## **2.1 What is a Smart School Environment**

A smart school environment refers to the use of advanced technologies to create an intelligent learning environment that enhances student learning and improves administrative efficiency. The concept of a smart school environment involves the integration of various technological components, including the Internet of Things (IoT), artificial intelligence (AI), and data analytics, to create a network of interconnected devices and systems that work together to optimize the learning experience.

A smart school environment typically consists of various components, including a Learning Management System (LMS), which is a web-based platform that allows for the delivery, management, and tracking of educational content and resources. An LMS typically includes features such as online course materials, attendance tracking, assignment submission, and grading.

In addition to the LMS, a smart school environment may also include Hostel Monitoring Systems (HMS), which use AI and IoT technologies to monitor student activity in hostels and detect security concerns such as smoking and violence. The HMS can also be used to track student attendance and movement within the hostel, ensuring student safety and reducing security risks.

The integration of these various components in a smart school environment provides students and instructors with a seamless learning experience that is both efficient and effective. By utilizing advanced technologies such as AI and IoT, a smart school environment can also provide valuable insights into student performance, allowing for personalized learning and targeted interventions to improve learning outcomes.

### **2.1.1 Benefits of a Smart School Environment**

A smart school environment provides numerous benefits for students, instructors, and administrators alike. Some of the key benefits of a smart school environment are:

1. Enhanced Student Learning: A smart school environment provides students with access to a range of online resources and tools, such as lecture videos, course materials, and interactive learning activities. By leveraging advanced technologies such as AI and IoT, a smart school environment can also provide personalized learning experiences, adapting to the needs and preferences of individual students.
2. Improved Administrative Efficiency: A smart school environment streamlines administrative processes such as attendance tracking, grading, and assignment submission, freeing up valuable time and resources for instructors and administrators. The integration of various technological components such as LMS and HMS also provides real-time data and insights that enable better decision-making and resource allocation.
3. Enhanced Student Safety: Hostel Monitoring Systems (HMS) used in smart school environments are equipped with advanced technologies such as AI and IoT, which can detect security concerns such as smoking and violence. The HMS can generate real-time alerts that enable hostel staff to take necessary action, ensuring student safety and reducing security risks.
4. Reduced Costs: By leveraging online resources and tools, a smart school environment can reduce the need for physical infrastructure such as classrooms, textbooks, and other educational materials, leading to significant cost savings.
5. Improved Accessibility: A smart school environment provides students with greater flexibility and accessibility, allowing them to access course materials and resources from any location at any time. This is particularly beneficial for students who may have limited access to physical resources or face other barriers to traditional classroom-based learning.

### **2.1.2 Features of Proposed Smart School Environment**

A smart school enables teachers to share knowledge in a more interesting and easier to understand manner for the students with digital technology. In such a school, the teachers have access to share the lessons using many mediums such as videos, presentations, audios and many other forms of visuals.

In this project we propose the following features for a smart school environment which are:

* 1. Automated Violence Detection in hostels using trained machine learning models.
  2. Distress detection of students with NLP models and
  3. Smoking detection using video surveillance and machine learning
  4. Automated Power Saving with motion detection and sensors.
  5. To build a Smart attendance system using fingerprint identification
  6. To automate lecture class video uploads.

## **2.2 HMS (Hostel Monitoring System)**

The Hostel Monitoring System (HMS) is an AI and IoT-powered system that monitors student activity in hostels and ensures student safety. The HMS includes a range of features that detect security concerns such as smoking and violence, track student attendance and movement within the hostel, and generate real-time data and insights for better decision-making and resource allocation.

One of the key features of the HMS is its ability to detect smoking and other prohibited activities. The HMS uses object classification methods such as YOLOv5 to detect smoking and alert hostel staff in real-time. This feature not only helps to enforce hostel rules and regulations but also helps to reduce the health risks associated with smoking.

Another important feature of the HMS is its violence detection capabilities. The HMS uses image classification methods and Raspberry Pi cameras to detect violence and alert hostel staff in real-time. This feature helps to ensure student safety and reduce security risks within the hostel.

The HMS also includes a student attendance tracking system that records student movement within the hostel and automatically marks attendance. This feature eliminates the need for manual attendance tracking and provides real-time attendance data that can be used for administrative purposes.

In addition to these features, the HMS also generates real-time data and insights that enable better decision-making and resource allocation. This includes data on student movement and attendance, as well as insights into administrative processes such as resource allocation and budgeting.

1. The system is installed in the hostel and connected to the internet, enabling it to transmit data to the central server.
2. The system's Raspberry Pi cameras record video footage of the hostel environment, which is then analyzed by the image classification algorithm to detect instances of violence.
3. The system also employs YOLOv5 object detection technology to identify instances of smoking within the hostel.
4. Upon detection of smoking or violence, the system sends an immediate notification to the designated hostel coordinator or staff member, allowing them to take appropriate action.
5. The system's automated attendance tracking feature records student attendance in real-time, eliminating the need for manual tracking and providing accurate data for administrative purposes.
6. Hostel administrators and coordinators can access the system's data through a secure web interface, enabling them to view real-time data on hostel activity and attendance.

**2.3 LMS**

The Learning Management System (LMS) is an integral part of the proposed Smart School Environment. This advanced system provides a comprehensive platform for students and lecturers to manage and access course materials, track attendance, and facilitate effective learning.

The LMS offers several features designed to enhance student learning, including the ability to view attendance records, watch lecture videos, and download course documents and assignments. This provides students with easy access to learning materials and ensures that they can stay on track with their coursework.

In addition to student-facing features, the LMS also offers advanced administrative tools that enable lecturers to manage their courses effectively. This includes the ability to record student attendance using facial recognition technology, view attendance records, upload course documents and videos, register students for their courses, and much more.

The LMS is built using the Flask web application framework and utilizes several programming languages and technologies, including Python, JavaScript, HTML, CSS, and Postgres. The Flask framework enables the system to be highly modular and scalable, allowing for easy customization and future expansion.

Furthermore, the LMS features several key modules, including Flask-Login, Flask-Admin, and Flask-Mail, which provide advanced security features, an administrative dashboard, and email notification capabilities, respectively. These features ensure that the LMS is highly secure and user-friendly for both students and lecturers.

The Learning Management System (LMS) is a feature-rich platform designed to facilitate effective learning and administrative management. Below are some of the key features of the LMS:

1. Attendance Tracking: The LMS allows lecturers to record student attendance using facial recognition technology. This provides an efficient and accurate way to track attendance and ensures that students are attending classes regularly.
2. Course Management: The LMS enables lecturers to manage their courses effectively, including registering students for their courses, uploading course documents and videos, and creating and managing assignments.
3. Student Management: The LMS provides a centralized platform for managing student records, including their attendance records, grades, and course progress.
4. Discussion Forums: The LMS provides a discussion forum where students can interact with their peers and lecturers, ask questions, and discuss course-related topics.
5. Multimedia Support: The LMS supports multimedia content, including videos, audio, and images, enabling lecturers to create engaging and interactive course materials.
6. Personalized Learning: The LMS allows lecturers to customize course materials and assignments to meet individual student needs, providing personalized learning experiences for students.
7. Assessment and Evaluation: The LMS provides a range of assessment and evaluation tools, including quizzes, tests, and exams, enabling lecturers to evaluate student progress and provide feedback.
8. Progress Tracking: The LMS provides tools for tracking student progress, including their attendance records, grades, and course progress, enabling lecturers to identify areas where students may need additional support.
9. Analytics and Reporting: The LMS provides analytics and reporting tools that enable lecturers to analyze student performance and identify areas where improvements can be made.
10. Security: The LMS is highly secure, with advanced security features, including two-factor authentication, password encryption, and user access controls.

Overall, the features of the Learning Management System provide a comprehensive platform for effective learning and administrative management, providing students and lecturers with the tools they need to succeed.

*NOTE: IN CHAPTER 3, ELABORATE ON EACH PROCESS, FIND REFERENCES AND ADD IMAGES TO THE PROJECT, BEME TABLE, LIST OF DEVICES AND IMAGES, PROCESS DIAGRAM, SOFTWARE CODE ETC.*

# CHAPTER THREE

# METHODOLOGY AND DESIGN

3.1 INTRODUCTION

To develop the Smart School Environment project, a detailed methodology was followed. The project was divided into two parts, the Hostel Monitoring System (HMS) and the Learning Management System (LMS). The HMS was developed as a desktop application, while the LMS was developed as a web application.

For the development of the HMS, artificial intelligence (AI) and Internet of Things (IoT) technology were used. The system was designed to detect security concerns such as smoking and violence using object classification methods and image classification methods. The system uses a Raspberry Pi and a camera to capture images, which are processed using YOLOv5 object detection and OpenCV libraries. The system generates real-time alerts that are sent to hostel staff, who can take necessary action to ensure the safety of students.

The LMS was developed as a web application using Flask, JavaScript, HTML, CSS, and PostgreSQL. The LMS was designed to provide students and instructors with a user-friendly interface for accessing course materials, submitting assignments, and interacting with each other. The LMS incorporates features such as attendance recording using facial recognition, course registration, document sharing, and a messaging system for communication between students and instructors. The LMS also incorporates Flask-Login and Flask-Admin for authentication and

The development of the Smart School Environment project involved several stages. Firstly, a comprehensive analysis of the requirements of the HMS and LMS was conducted. The project team conducted research on the current challenges faced by schools in ensuring the safety of students and providing easy access to course materials. The team identified the key features that would be required for the HMS and LMS to address these challenges.

Secondly, the project team designed the architecture of the HMS and LMS. The team used tools such as UML diagrams to create a visual representation of the system, its components, and their interactions.

Thirdly, the development of the HMS and LMS was carried out simultaneously. The HMS was developed using Python and several libraries such as OpenCV and YOLOv5. The LMS was developed using Flask, JavaScript, HTML, CSS, and PostgreSQL. The team used an agile development approach, which allowed for flexibility in responding to changing requirements and incorporating feedback from stakeholders.

Finally, the HMS and LMS were tested extensively to ensure that they met the project requirements. The testing involved both functional and non-functional testing, which included testing the system's responsiveness, security, and performance.

In conclusion, the Smart School Environment project was developed using a comprehensive methodology that involved detailed analysis, design, development, and testing. The project team used advanced technologies such as AI and IoT to develop the HMS, and web development tools such as Flask to develop the LMS. The project was completed successfully, and the HMS and LMS were found to be effective in addressing the challenges faced by schools in ensuring student safety and providing easy access to course materials.

3.2 Hardware Requirements

The Smart School Environment project requires specific hardware components to operate the Hostel Monitoring System (HMS) effectively. The following are the hardware requirements for the HMS:

1. Raspberry Pi 4: The Raspberry Pi 4 is a single-board computer that is used as the brain of the HMS. The Raspberry Pi 4 has a quad-core ARM Cortex-A72 CPU and up to 8 GB RAM. It is an ideal choice for running the HMS software.

2. Camera: The HMS requires a camera to capture images and videos of the hostel premises. The camera should be compatible with the Raspberry Pi 4 and have a high resolution for clear images.

3. Jumper Wires: Jumper wires are used to connect the camera to the Raspberry Pi 4. The wires should be of good quality to ensure a secure and stable connection.

4. Buzzer: The HMS has an alarm system that alerts the hostel staff when any suspicious activity is detected. A buzzer is used to generate the alarm sound. The buzzer should be compatible with the Raspberry Pi 4 and have a loud sound.

In addition to the above hardware requirements, the Hostel Monitoring System may require additional hardware components depending on the specific needs of the school. The project team should ensure that all hardware components are compatible with the Raspberry Pi 4 and other components of the HMS. Proper installation, configuration, and testing of the hardware components should also be carried out to ensure optimal performance of the HMS.

3.3 Software Requirements

The Hostel Monitoring System (HMS) of the Smart School Environment project has specific software requirements for its effective operation. The following are the software requirements for the HMS:

1. Python: The HMS is developed using Python programming language. Python is an interpreted, high-level, general-purpose programming language that is widely used for web development and scientific computing.

2. Flask: Flask is a micro web framework written in Python that is used to develop the web-based interface of the HMS. Flask is used for creating the backend of the system, and it is responsible for handling data and requests.

3. YOLOv5: YOLOv5 is an object detection model that is used for detecting smoking and violence in the hostel premises. It uses deep learning algorithms to analyze images and videos captured by the camera and generates real-time alerts to the hostel staff.

4. HTML, CSS, JavaScript, and Bootstrap: The frontend of the HMS is developed using HTML, CSS, JavaScript, and Bootstrap. These technologies are used to create an interactive and user-friendly interface for the hostel staff to monitor the premises and receive alerts.

5. SQLite: The HMS uses SQLite as its database management system. SQLite is a lightweight and efficient database system that is suitable for small-scale applications like the HMS.

1. cx\_Freeze: cx\_Freeze is a tool used for packaging the HMS as a standalone desktop application. It creates an executable file that can be installed on any computer without requiring any additional software.

The Learning Management System (LMS) of the Smart School Environment project has specific software requirements for its effective operation. The following are the software requirements for the LMS:

1. Python: The LMS is developed using Python programming language. Python is an interpreted, high-level, general-purpose programming language that is widely used for web development and scientific computing.

2. Flask: Flask is a micro web framework written in Python that is used to develop the web-based interface of the LMS. Flask is used for creating the backend of the system, and it is responsible for handling data and requests.

3. Flask-Admin: Flask-Admin is a Flask extension that is used to manage the LMS. It provides an easy-to-use interface for managing users, courses, and other system components.

4. Flask-Login: Flask-Login is a Flask extension that is used for user authentication in the LMS. It provides a secure and easy-to-use login system for students and instructors.

5. Flask-Mail: Flask-Mail is a Flask extension that is used for the reset password functionality in the LMS. It provides a simple and secure way for users to reset their passwords if they forget them.

6. Face Recognition Package: The LMS uses the face recognition package for attendance recording using facial recognition. The package uses deep learning algorithms to recognize faces and record attendance automatically.

7. HTML, CSS, JavaScript, and Bootstrap: The frontend of the LMS is developed using HTML, CSS, JavaScript, and Bootstrap. These technologies are used to create an interactive and user-friendly interface for students and instructors to access course materials, submit assignments, and interact with each other.

8. Online Hosted PostgreSQL Database: The LMS uses an online hosted PostgreSQL database to store data such as user information, course materials, and attendance records. PostgreSQL is a powerful and reliable open-source database system that is suitable for large-scale applications like the LMS.

In conclusion, the Learning Management System of the Smart School Environment project has several software requirements that are essential for its effective operation. These requirements include Python, Flask, Flask-Admin, Flask-Login, Flask-Mail, the face recognition package, HTML, CSS, JavaScript, Bootstrap, and an online hosted PostgreSQL database. The project team should ensure that all software components are compatible and properly integrated to ensure optimal performance of the Learning Management System.

3.4 Designing HMS

3.4.1 Flowchart

3.4.2 Use case Diagram

# CHAPTER FOUR

# RESULTS AND ANALYSIS

# CHAPTER FIVE

# 5.0 CONCLUSION AND RECOMMENDATION

# REFERENCES

# APPENDIX