

EFFICIENT SECURITY BASED STUDENT ANALYSIS ERP SYSTEM

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in Electronics and Communication Engineering

by

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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

CATEGORY -1 UNIVERSITY BY UGC

**Accredited with Grade "A++" by NAAC | 12B Status by UGC | Approved by AICTE
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **K.NIKHIL (40130099)** and **K.S.N.CHARAN (40130098)** who carried out the project entitled "**EFFICIENT SECURITY BASED STUDENT ANALYSIS ERP SYSTEM**" under my supervision from November - 2023 to April - 2024.

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DECLARATION

We, **K.NIKHIL**(Reg No: **40130099**) and **K.S.N.CHARAN**(Reg No: **40130098**) hereby declare that the Project Report entitled "**EFFICIENT SECURITY BASED STUDENT ANALYSIS ERP SYSTEM**" done by us under the guidance of **Dr.K.V.KARTHIKEYAN, M.E., Ph.D.**, Dept. of Electronics and Communication Engineering, **SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENNAI**, is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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We wish to express my thanks to all Teaching and Non-teaching staff members of the Department of Electronics and Communication Engineering who were helpful in many ways for the completion of the project.

ABSTRACT

In today's educational institutions, effective management of various administrative tasks is essential to maintain smooth operations. The Student ERP Gate Pass System is a comprehensive technological solution designed to streamline the process of issuing and managing gate passes in a campus environment. The proposed Student ERP Gate Pass System is an integral part of the enterprise resource planning (ERP) system of the institution. It includes a user-friendly web interface that allows students, faculty, and administrative staff to seamlessly request and manage gate passes. Each user, including students, parents and staff, has a unique profile with secure credentials. Two-factor authentication ensures the integrity of user accounts. From the parent portal, they can enter gate pass requests through the system and provide details such as purpose of visit, expected duration and destination. The system validates and records these requests for future reference. The system sends requests to users about the status of their requests to pass through the gate and informs them about the progress of the entire process. It reduces paperwork and administrative burdens, increases campus security by digitizing gate-passing processes, and provides students with a convenient and transparent way to request access for various purposes. In conclusion, the Student ERP Gate Pass System represents a significant advance in campus management technology. It automates the issuance and management of passes and contributes to improving efficiency, security and user experience in educational institutions.

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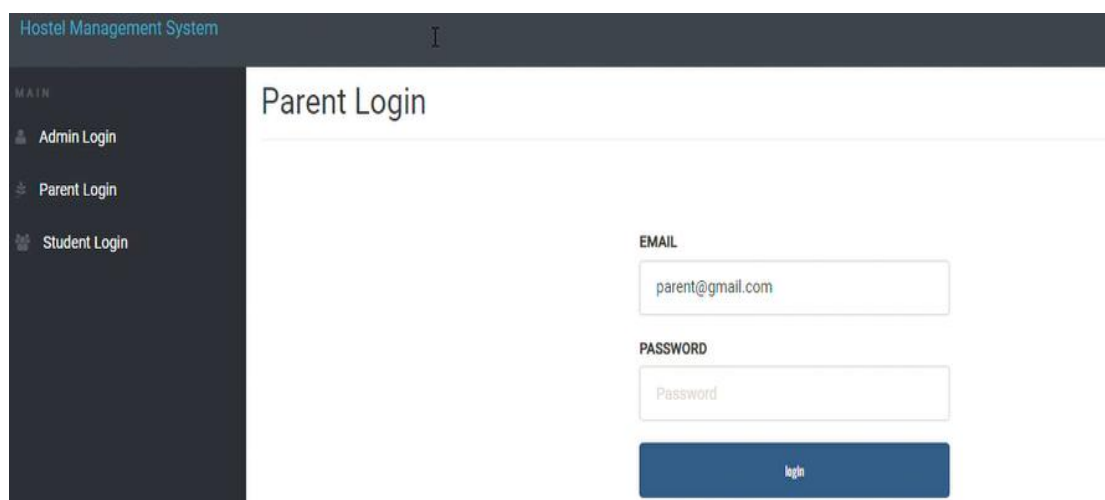
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CHAPTER 1

INTRODUCTION

In today's rapidly evolving educational landscape, ensuring the security and efficient management of student access to campus facilities has become a top priority for educational institutions. Traditional methods of issuing and monitoring student gate passes are often cumbersome, time-consuming, and prone to security breaches. To address these challenges, a modern and innovative solution has emerged: the Student Gate Pass Portal with Fingerprint and Face Recognition. This cutting-edge system leverages advanced biometric technologies such as fingerprint and face recognition to revolutionize the way educational institutions manage student access and security. By integrating these biometric features into a centralized gate pass portal, schools, colleges, and universities can enhance both the convenience and security of their campus access control. We have organized the portal working process in a systematic way through the parent portal via admin access and kept student login as a spectator. Admin login has full rights to decline the request more than twice that was generated in a month. All data from the admin will be sent to the exit gate check where the student will be recognized with biometric access and data-time reminder protocol will be followed to ensure their entry and exit to their governing staff. The Student Gate Pass Portal with Fingerprint and Face Recognition offers several key advantages:



The screenshot displays the 'Hostel Management System' interface. On the left is a dark sidebar with a 'MAIN' section containing three links: 'Admin Login', 'Parent Login', and 'Student Login', each preceded by a small icon. The main content area is titled 'Parent Login'. It features two input fields: 'EMAIL' with the placeholder 'parent@gmail.com' and 'PASSWORD' with the placeholder 'Password'. Below these fields is a blue 'login' button.

Figure 1.1 Student Gate Pass System GUI

1.1 ENHANCED SECURITY

Traditional gate pass systems relying on ID cards or physical passes are vulnerable to misuse or theft. By incorporating biometric authentication, this portal ensures that only authorized students gain access to campus facilities, drastically reducing the risk of unauthorized entry.

1.2 CONVENIENT ACCESS

Students no longer need to carry physical passes or cards, which can be lost or forgotten. With the use of their unique fingerprints and facial features, access to campus becomes seamless, eliminating the need for cumbersome gate pass checks.

1.3 REAL-TIME MONITORING

The portal provides real-time monitoring and tracking of student access, allowing educational institutions to keep a precise record of who enters and exits campus facilities. This information can be crucial for security audits, attendance tracking, and emergency response planning.

1.4 EFFICIENT MANAGEMENT

Administrative tasks related to gate pass issuance, renewal, and tracking become more efficient with the portal. It streamlines the process, reducing the administrative burden on staff and eliminating manual data entry errors.

1.5 ADAPTABILITY

The system can be easily integrated with existing campus security infrastructure and databases, making it a flexible solution for educational institutions of all sizes.

1.6 COST-EFFECTIVE

Over time, the implementation of biometric gate pass systems can lead to cost savings by reducing the need for physical pass production and replacement. The Student Gate Pass Portal with Fingerprint and Face Recognition represents a significant advancement in campus security and access control. It enhances security and offers convenience and efficiency for both students and educational institutions. As technology evolves, this solution is poised to become an integral part of modern

CHAPTER 2

LITERATURE REVIEW

2.1 LITERATURE SURVEY - 1

TITLE: Integration Protocol Student Academic Information to Campus RFID Gate Pass System

AUTHORS: Hendra Gunawan, and Evizal Abdul Kadir

YEAR: 2017

CONFERENCE NAME: IEEE – EECSI

INTRODUCTION:

Nowadays, security is a part consent of many institutions including academics for example in University campuses, some campuses have implemented automatic systems in campus areas to control visitors to enter the University for the staff and students, but the system is standalone with an introduced new gate pass. Most universities have to use Information Technology (IT) in applications for academic systems such as student information, registration, results information, etc. This paper discusses on integration of student information into the gate pass system then does not require a new card or pass for every student to enter the campus area. The gate pass system requires information to match to a database that allows entering to campus, normally a new database is created for the system. In this case, the University has a student and staff database including the lecturer, thus to be efficient the data in an existing database can be used, and integration using a protocol that gate pass system gives a command to the database as a request then verification of those data. Currently, the student database is stored in the server room a place far away from the gate pass system, in order to make transactions faster for visitors to enter a mini database is set up on site of the gate system, but periodic updating is required or every new update in the database. Results show, that the database stored in the student information system is more than 30,000 students, and transaction time is less than 1 second in average cycle time is 4.5 seconds for motorcycle lane and 7 seconds for car, which means time for visitors to access the gate pass system for entry campus is most reasonable.



Figure 2.1 Result LS1

CONCLUSION:

A gate pass system has been implemented in the Islamic University of Riau campus which has 4 gates in the campus area. Every gate system is interconnected to the campus student database for transaction verification and records any single transaction in or out of the campus area for security purposes. Initial testing of some of the delays and slow response of barrier gates happens due to traffic management in the system for verification of data because every gate goes to a single database system. Some evaluation and enhancement are done to improve system response time to a reasonable time when users tap their card until finish the transaction and the user is out of the gate area. Cycle time for every transaction of the barrier gate at the motorcycle lane is an average of 3-8 seconds and in the car lane is 5-10 seconds. Every gate consists of 4 motorcycle lanes and 2 car lanes in and out, with a total of 4 gates in the campus area is enough to serve student and staff vehicles every day without jam. Finally, systems are running well with more security for the campus area especially for motorcycle users.

2.2 LITERATURE SURVEY - 2

TITLE: Cloud ERP for Small and Medium Enterprises

AUTHORS: Shivam Desai, Tejaswara Rao Motamam, Vatsal Solanki, and Rupesh Mishra

YEAR: 2018

CONFERENCE NAME: IEEE – ICECA

INTRODUCTION:

The main ideology behind developing this system is to allow the distributors to do their daily task such as Accounting, Stock Maintenance, and Billing at a single point. The current situation in the market is Distributors are using different software to manage their work, e.g. Billing is done by one software and Accounting is done by another software. They have to learn and manage two different software to complete his/her work and even there is no compatibility between those software. Some kind of same details may need to be entered more than once which is a tedious job. Now, our cloud-based ERP system will help various distributors to manage their work smoothly. The various distributors can use the same ERP and as the whole system would be deployed on Cloud, different user's data will not interfere with each other.

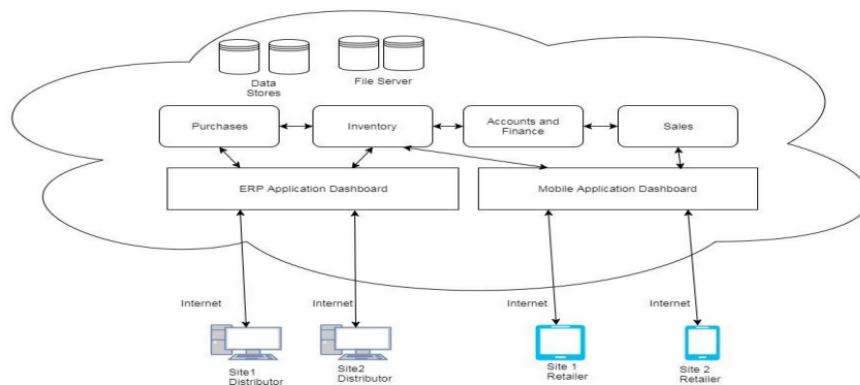


Figure 2.2 Result LS2

CONCLUSION:

Performing some research in the current market, we came to know about some requirements that distributors are facing such as failure in covering all outlets, entering data into different software for accounting and managing, checking stock availability, etc. Our project would fulfill their requirements as a result, solving the real-time problem. It is based on the idea that it could serve multiple small businesses on a single platform. The data generated from the ERPs of various distributors would serve as a pool of resources for many businesses. It would also help to smoothen the process of many business operations and further increase revenues generated by businesses. Methodologies for the implementation of cloud-based ERP were studied in detail by analyzing the strategies for the implementation of the project. Strategies

such as custom-made, vendors-specific, and consultant-specific have been tried to imbibe to get the best of them, providing ERP implementations faster but also increasing acceptance and satisfaction levels of the distributors. The Scope of cloud ERP regarding these small and medium enterprises in India is wide. Hence, summarizing the topic, this project would help to increase sales and make the Distributor's business processes more efficient. They would be able to do their daily jobs easily and at a faster rate.

2.3 LITERATURE SURVEY - 3

TITLE: Automation of Visitor Gate Pass Management System

AUTHORS: Gowtham T Sathishkumar, Lakshmiprasad, Arumugam P, and Prabhakara Rao G

YEAR: 2019

CONFERENCE NAME: IEEE – ICICICT

INTRODUCTION:

Nowadays, Radio Frequency Identification (RFID) cum Biometric based Access Control System (ACS) is gaining popularity for authenticating the employees of any organization, which ensures that only the employees are granted permission to get into the organizational complex. However, visitors from various organizations need to be granted entry into the complex, without which the organization does not function effectively as all the organizations invariably depend on other organizations/companies/firms for their growth. Contrary to this, most of the terrorist attacks are accessed, planned, and implemented through visitors. Thus it becomes highly essential to implement a highly effective method/system to ensure the genuineness of visitors to any organization. One such system, namely the Visitor Gate Pass Management System [VGPMs] is illustrated with its features.



Figure 2.3 Result LS3

CONCLUSION:

Even though VGPMS is meant for controlled access of visitors into any organization of interest, the requirement varies from organization to organization. Biometric-based VGPMS shall be developed to make the authentication of the visitors more secure as it ensures positive identification. Moreover, a photograph of the visitor is stored against the proof of identity he/she has produced. Introducing an offline face matching program with help identifying the same person with different proof of Identity.

2.4 LITERATURE SURVEY - 4

TITLE: An Automated University Gate Pass Monitoring System Using Deep Learning

AUTHORS: Patel Meghavi Kiribhai, and Evizal Jyotsna C

YEAR: 2021

CONFERENCE NAME: IEEE – ICCISC

INTRODUCTION:

Surveillance cameras are necessary to find and track a person in the technology world for various security purposes. The work aims to design an auto gate pass system using face recognition technology based on real-time video processing. Various photographs of the student at different environmental conditions have been collected and stored in the database. While exiting from the campus students need to show their faces in front of the camera and the proposed system recognizes the

student by comparing the details stored in the database. After recognizing a student, the next step is to fetch the student's record from the database and make the entry of a person into the register. Meanwhile, the automated system will send a notification to the respective student. To track the whole action, the system provides a graphical user interface (GUI), which helps to monitor all activities more easily.



Figure 2.4 Result LS4

CONCLUSION:

An automated gate pass entry is designed based on the face recognition of each student. The system has basic functions, such as inserting new student data, including a training sample and a test sample for the evaluation of the VGG16 model. The VGG16 model and the OpenCV library do the face recognition job. The VGG16 model has been evaluated with and without fine-tuning. The model's accuracy is 98.34%, and the model's loss is 1.60%. The framework uses the Twilio SMS API to send an entry message to the student. The system can recognize the student by capturing their entire face. The system fails if the student wears a mask and in the future, the system can be modified to recognize the students who wear a mask. Currently, the system provides notification to the students while exiting from the campus. In the future, it can be modified to send a notification to parents. The system can also incorporate sending notifications to the corresponding authority at the time of late entry to the campus. The face recognition part was also evaluated with another deep learning model such as the Deep Coupled ResNet model.

2.5 LITERATURE SURVEY - 5

TITLE: Multi-User Authentication Using Biometric Sensor Using Parallel Processing Algorithm for Attendance Monitoring

AUTHORS: Dr. Ramalingam M, Vinothkumar S, Dr. Varadhaganapathy, and Subha

YEAR: 2021

CONFERENCE NAME: IEEE – ICICT

INTRODUCTION:

Attendance monitoring of students in a classroom is a process that has been followed in the traditional manner of raising the names of every candidate and verifying their presence. Nowadays faculty members use roll numbers of the individual candidate to verify the presence of a candidate in a class. However, students are not genuine in this process. More number of proxy entries are made while reporting. This has to be monitored properly and also proxy entries need to be taken out. To solve this problem, a new methodology is proposed using a traditional biometric mechanism with fast processing. A fingerprint attendance system is used by many organizations to verify their presence for a day. Maintenance of Attendance is the key aspect in most of the organizations in today's world. Biometric is a well-known authenticated technology for identifying a person for a day in the organization. Other technologies exist in the market that help in identifying the person. Some of the technologies are RFID, NFC, and FACE Recognition. But, all the above technologies have their own disadvantages in terms of efficiency and duplication. To overcome this problem, a refined biometric technology is proposed which uniquely identifies the person and performs fast processing. A small handy device is used to mark attendance without the involvement of faculty members. The students can mark their attendance by using this device. Multiple Students can register their presence at a time over the device in the class. After attendance entry is made and it will be stored on an SD card. End of the day, the report can be downloaded from that device. This helps in avoiding proxy entries and also helps in the fast processing of traditional biometric technology.

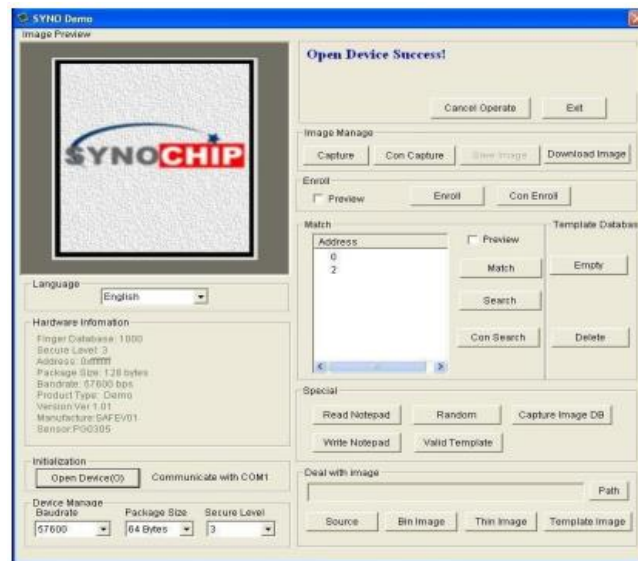


Figure 2.5 Result LS5

CONCLUSION:

This project work describes the design and implementation of a fingerprint recognition system using Raspberry PI 2. The main objective of the work is to design a Multiuser authentication using the biometric sensor. Multiple user fingerprints can be recognized for attendance monitoring at a time. It saves time as N input processing can be done parallel concerning the capacity of the processor. It successfully detects the fingerprint and is capable of making it match with local storage. Finally, all the registered student's attendance details are imported into the Excel sheet along with students register numbers with processing time.

CHAPTER 3

SOFTWARE REQUIREMENTS

3.1 ARDUINO IDE

The Arduino IDE (Integrated Development Environment) is a software application used for programming and developing projects with Arduino boards and compatible microcontrollers. Arduino is an open-source electronics platform that has gained popularity for its simplicity and accessibility, making it an excellent choice for beginners and experienced makers alike.



Figure 3.1 Arduino Official IDE

3.1.1 Key Features of Arduino Include:

1. **Code Editor:** The IDE provides a text editor where you can write and edit your Arduino sketches (programs). It includes features such as syntax highlighting, code auto-completion, and error checking to help you write code more efficiently.
2. **Compilation and Upload:** The IDE can compile your Arduino code into machine code that can be run on the microcontroller. It also allows you to upload the compiled code to your Arduino board using a USB connection.

3. *Library Manager*: Arduino comes with a vast library of pre-written code and functions that you can easily incorporate into your projects. The IDE includes a Library Manager to help you find, install, and manage these libraries.

4. *Serial Monitor*: The IDE includes a built-in serial monitor tool that allows you to communicate with your Arduino board and view data sent and received over the serial port. This is useful for debugging and real-time data monitoring.

5. *Board Manager*: Arduino supports a variety of microcontroller boards, including the popular Arduino Uno, Arduino Mega, and many others. The Board Manager allows you to select and configure the specific board you are using.

6. *Integrated Examples*: The IDE includes a collection of example sketches to help you learn how to use various sensors, modules, and features of Arduino boards.

7. *Cross-Platform*: The Arduino IDE is available for multiple operating systems, including Windows, macOS, and Linux, making it accessible to a wide range of users.

8. *Extensibility*: You can extend the capabilities of the Arduino IDE by installing additional plugins and tools to support different microcontroller platforms or add features like debugging.

The Arduino IDE is a beginner-friendly environment that simplifies the process of writing code for microcontrollers. However, as of my last knowledge update in September 2021, there are also alternative IDEs and development environments available for Arduino, such as Platform, which offers more advanced features and integration with different microcontroller platforms. Please note that the Arduino ecosystem evolves over time, so it's a good idea to check the official Arduino website or other reliable sources for the most up-to-date information and software versions.

3.2 MySQL

MySQL is an open-source relational database management system (RDBMS) that is widely used for managing and storing structured data. It is one of the most popular database systems in the world and is commonly used for web applications,

content management systems, e-commerce platforms, and many other types of software.

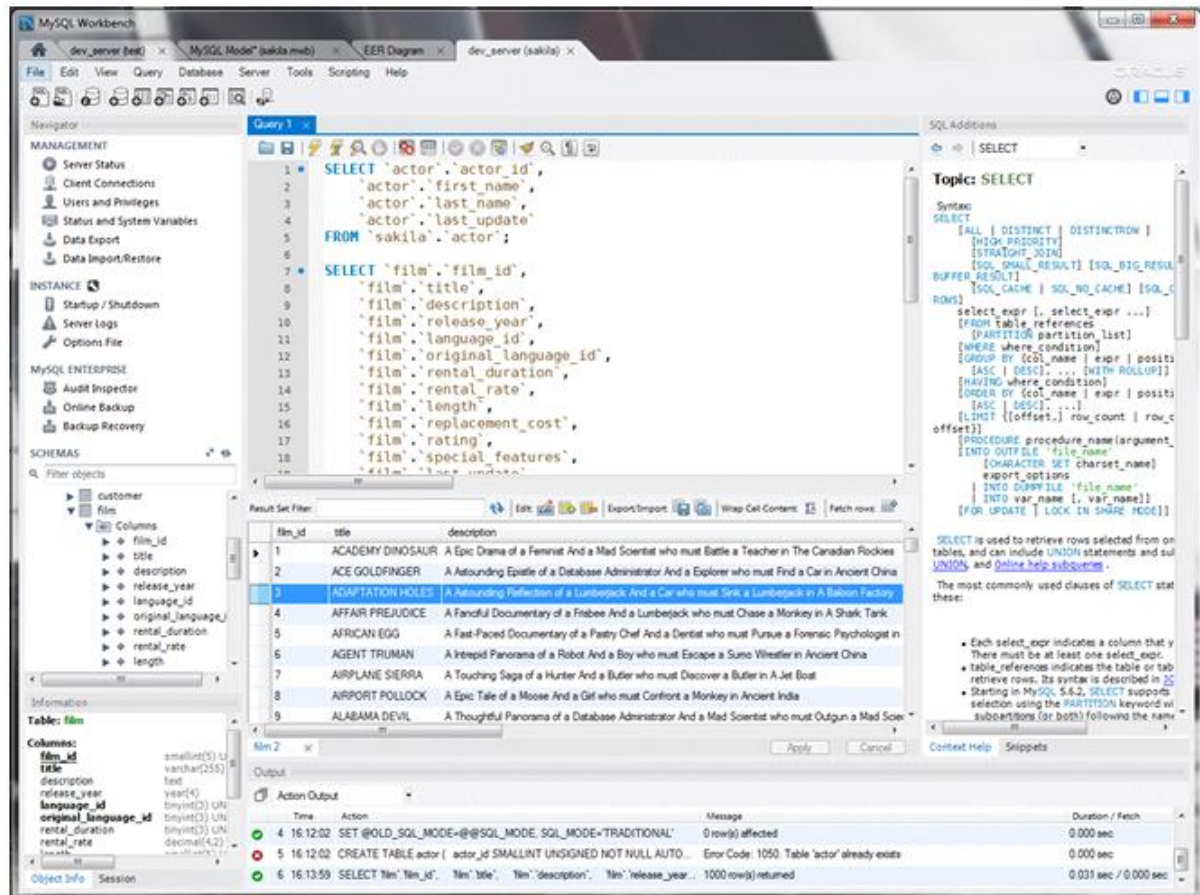


Figure 3.2 MySQL User Interface Window

3.2.1 Key features and aspects of MySQL:

1. **Relational Database:** MySQL is a relational database, which means it organizes data into tables with rows and columns. This allows for efficient querying and retrieval of data.
2. **Open Source:** MySQL is open-source software, which means it is free to use and has a large and active community of developers and users.
3. **Cross-Platform:** MySQL is available for various operating systems, including Windows, Linux, macOS, and more.
4. **Scalability:** MySQL can handle both small-scale and large-scale databases. It offers features like replication, clustering, and sharing for scaling horizontally and vertically.

5. *High Performance*: MySQL is known for its speed and performance, making it suitable for high-traffic websites and applications.
6. *Security*: It provides various security features, including user authentication, encryption, and access control, to protect your data.
7. *ACID Compliance*: MySQL follows the ACID (Atomicity, Consistency, Isolation, and Durability) properties, ensuring data integrity and reliability.
8. *SQL Support*: MySQL uses SQL (Structured Query Language) for querying and managing data. It supports a wide range of SQL commands and functions.
9. *Storage Engines*: MySQL supports multiple storage engines, including InnoDB, MyISAM, and more. Each engine has its own advantages and use cases.
10. *Community and Enterprise Editions*: MySQL comes in two editions: the Community Edition, which is free and open-source, and the Enterprise Edition, which offers additional features and support for a fee.
11. *Tools and Utilities*: MySQL provides various command-line tools and graphical user interfaces (GUIs) like phpMyAdmin for database administration.
12. *Replication*: MySQL supports replication, allowing you to create copies of your database for backup or load distribution.
13. *Partitioning*: It offers partitioning support, which allows you to divide large tables into smaller, more manageable pieces.
14. *Triggers and Stored Procedures*: MySQL supports triggers and stored procedures, allowing you to define custom actions and business logic within the database.
15. *High Availability*: MySQL can be configured for high availability setups using technologies like master-slave replication and clustering.

MySQL is commonly used with popular web development languages like PHP, Python, Java, and more, making it a versatile choice for building database-driven applications. It's important to note that there are other relational database systems available as well, such as PostgreSQL, Oracle Database, and Microsoft SQL Server, each with its own strengths and use cases. The choice of database system depends on the specific requirements of your project.

3.3 XAMPP SERVER

XAMPP is a popular open-source software package that provides a web server, a database server, and several other tools necessary for web development and testing. The name "XAMPP" stands for:

X - Stands for any of the four operating systems it is available for Windows, Linux, macOS, and Solaris.

A - Apache HTTP Server: A powerful web server software that serves web pages to users' browsers.

M - MySQL: A relational database management system (RDBMS) for storing and managing data.

P - PHP: A server-side scripting language for developing dynamic web applications.

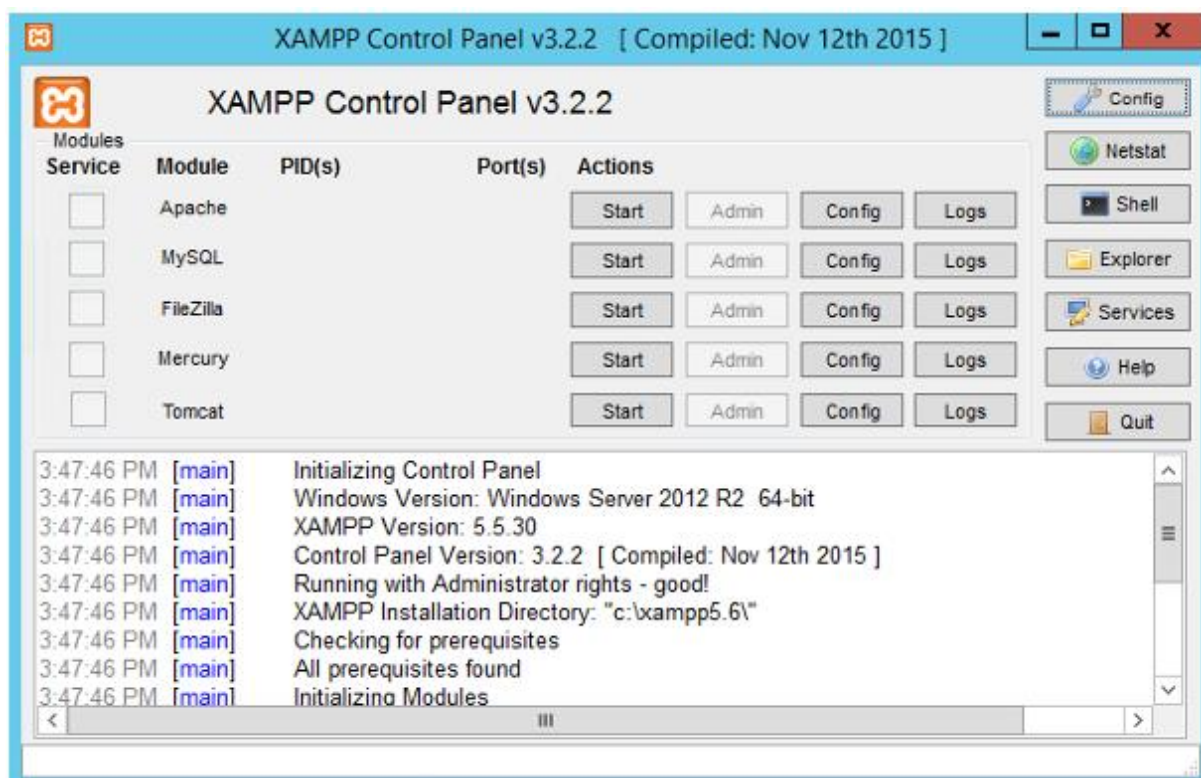


Figure 3.3 XAMPP Control Panel

XAMPP provides a convenient way for developers to set up a local web development environment on their own computers. This environment mimics the configuration of a production web server, allowing developers to test their websites

and web applications before deploying them to a live server. Some key features of XAMPP include:

Easy installation and setup: XAMPP provides a straightforward installation process, making it accessible to developers of all skill levels.

Cross-platform compatibility: XAMPP is available for multiple operating systems, ensuring that developers can use it on their preferred platform.

Pre-configured components: XAMPP comes with pre-configured versions of Apache, MySQL, PHP, and other tools, reducing the complexity of setting up a development environment.

Add-on modules: Developers can easily add additional modules and components to customize their XAMPP installation.

Typically, XAMPP is used for tasks like web development, content management system (CMS) development, testing web applications, and learning web technologies. However, it's important to note that XAMPP is primarily designed for development and testing purposes and is not recommended for hosting live websites or applications in a production environment due to security and performance considerations. In production, it's advisable to use dedicated web hosting and database servers.

3.4 PHP

PHP is a widely used, open-source scripting language that is especially suited for web development and can be embedded into HTML. It stands for "PHP: Hypertext Pre-processor." PHP is known for its ability to generate dynamic web pages and interact with databases, making it a popular choice for building websites and web applications.

3.4.1 Key Features and Characteristics of php Include:

Server-Side Scripting: PHP is executed on the server, meaning that the server processes the PHP code and sends the resulting HTML to the client's web browser. This allows for dynamic web page generation.

Embedding in HTML: PHP code can be embedded directly within HTML files using special tags like `<?php>`, allowing developers to mix PHP and HTML seamlessly.

Cross-Platform: PHP is cross-platform and can run on various operating systems, including Windows, macOS, Linux, and others.

Database Integration: PHP has extensive support for working with databases, including MySQL, PostgreSQL, SQLite, and more. This makes it a popular choice for building database-driven web applications.

Extensive Library Support: PHP has a vast ecosystem of libraries and frameworks that simplify common tasks such as authentication, session management, and file handling.

Open Source: PHP is open-source software, which means it is free to use, and its source code is available for modification and improvement by the community.

Large Community: PHP has a large and active community of developers, which means you can find a wealth of resources, documentation, and support online.

Security: PHP has made significant improvements in security over the years, but it's important for developers to follow best practices to ensure the security of their PHP applications.

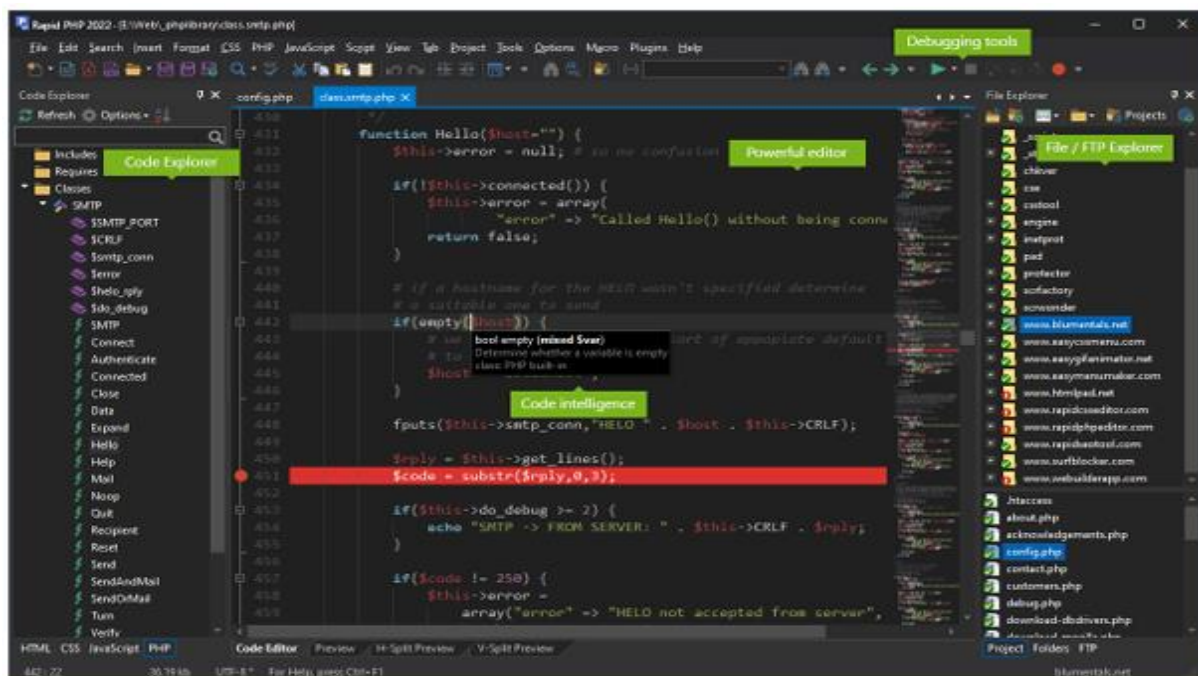


Figure 3.4 PHP Editor Window

Popular PHP frameworks and content management systems (CMS) include Laravel, Symfony, CodeIgniter, WordPress, and Drupal, among others. These

frameworks and CMS platforms provide pre-built functionality and tools to streamline web development. PHP has been widely used for building websites and web applications, but it's worth noting that the web development landscape has evolved, and there are other programming languages and technologies available as well, such as Python, Ruby, JavaScript, and various front-end and back-end frameworks. Developers often choose the technology stack that best suits the requirements of their projects.

CHAPTER 4

HARDWARE REQUIREMENT

4.1 Finger Print Sensor R307

The R307 Optical Fingerprint Reader Sensor Module. R307 fingerprint module is a fingerprint sensor with a TTL UART interface for direct connections to microcontroller UART or to PC through MAX232 / USB-Serial adapter. The user can store the fingerprint data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The FP module can directly interface with a 3.3 or 5v Microcontroller. A level converter (like MAX232) is required for interfacing with the PC serial port. Integrated image collecting and algorithm chip together, an All-in-one Fingerprint reader can conduct secondary development and can be embedded into a variety of end products. Users can conduct secondary development, which can be embedded into a variety of end products, such as access control, attendance, safety deposit boxes, and car door locks. Low power consumption, low cost, small size, excellent performance, Professional optical technology, precise module manufacturing techniques. Good image processing capabilities can successfully capture an image up to a resolution of 500 dpi Finger detection function.



Figure 4.1 R307 Finger Print Sensor Module

4.1.1 Pin Configurations

1. Red wire – 5V
2. Black wire – Ground
3. Yellow wire – Tx
4. Green wire – Rx

4.1.2 Features:

1. Integrated image collecting and algorithm chip together, all in one.
2. The fingerprint reader can conduct secondary development and can be embedded into a variety of end products.
3. Low power consumption, low cost, small size, excellent performance.
4. Professional optical technology, and precise module manufacturing techniques.
5. Good image processing capabilities can successfully capture an image up to a resolution of 500 dpi.

4.2 AVR Atmega 328P

The Arduino Uno Rev3 SMD is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip.

4.2.1 Additional Features Coming with R3 version are:

1. ATmega16U2 instead of 8U2 as a USB-to-Serial converter.
2. 1.0 pinout: added SDA and SCL pins for TWI communication placed near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board and the second one is a not connected pin that is reserved for future purposes.
3. Stronger RESET circuit.



Figure 4.2 AVR Atmega328P

4.3 12V DC ADAPTOR

The SMPS Power Adaptor – 12V/2A (Power supply) is a Switched-mode power supply (SMPS). This is an advanced power supply and better than conventional ones. If you want low losses and stable output also you don't want to make a rectifier, go for SMPS. we can use this SMPS Power Adaptor – 12V/2A to power up the Arduino UNO/Arduino MEGA, DC motors, LCD screens, DVD players, Hard Drives, Audio Gear, and most other digital devices use less than 2 Amperage. *This is a high-quality AC to DC Switching Power Adapter* which gives a clean regulated 12VDC output at up to 2A. These adapters work with 240VAC input, allowing them to work with household supplies. The barrel plug attached to these wall adapters is center-positive with a 2.1mm diameter. It is an AC 100~240V to DC 12V 2A Power Adapter/Buck Converter/Switching Power Supply/Transformer/Charger, Applied to the Charging equipment/Small table lamp/Router/TV Box/Mini TV, etc./tablet PC/ 2.5-inch mobile hard disk/mobile DVD/Power Tools etc.



Figure 4.3 DC Adaptor

4.3.1 Features:

1. PWM design, ensures the stability and high efficiency of power supply.
2. Anti-jamming, passed EMC test, wave less than 20MV.
3. Efficiency above 80%, exothermic less than 25 degree
4. Function: with overvoltage protection, short-circuit protection, overload protection
5. Non-waterproof
6. Constant voltage output, assumes a stable power supply for LED lighting to reach a long lifetime and reduce LED light decay.

4.4 MFRC522 READER

The MFRC522 RFID reader enables our proposed model to interact with RFID tags. It communicates via SPI interface, making it compatible with various Arduino boards. With its integrated circuitry, it can read and write to RFID tags within close proximity. Through Arduino libraries, developers can easily interface with the MFRC522, simplifying RFID integration into projects such as access control, inventory management, and more. Its compact size and low power consumption make it suitable for embedded systems. By leveraging the Arduino platform's flexibility, the MFRC522 RFID reader enhances the capabilities of projects requiring RFID functionality in a cost-effective and accessible manner.

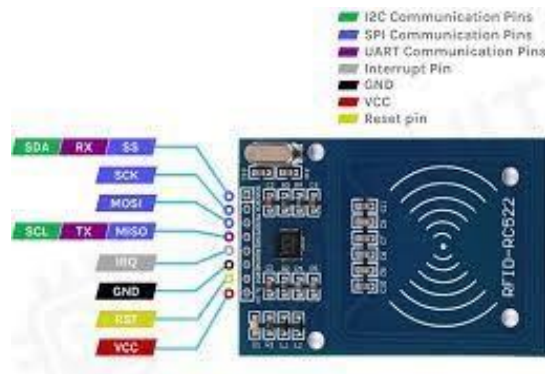


Figure 4.4 MFRC522 Reader

4.5 RFID TAGS

RFID (Radio Frequency Identification) tags readers with our Microcontroller unit (Atmega328P) to enable easy identification and tracking of objects. Using an RFID reader module connected to an Arduino board, users can scan RFID tags within close proximity. The reader emits radio waves, which activate the RFID tags, allowing the Arduino to detect and read their unique identification numbers. This data can then be processed and utilized for various applications such as inventory management, access control, and asset tracking. With its simplicity and versatility, Arduino-based RFID systems offer an affordable and efficient solution for implementing RFID technology in diverse projects.



Figure 4.5 MFRC522 RFID Tags

4.6 PIEZO ELECTRIC BUZZER

Piezo electric buzzer is connected to our master control to check the gate pass indication both via finger print / Passive RFID tags. Here we used direct 5V piezo electric buzzer to indicate the master controller since it is less power consuming and

can be driven without external power. It also serves us as an indicator to scan with the next person. Access denied info will need a module like this rather using Dashboard indications. Voltage Input – 5V / 60mA

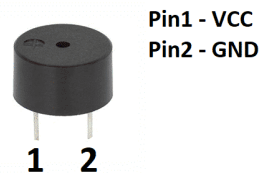


Figure 4.6 Piezo Electric Buzzer

4.7 PCF8574A I2C DRIVER

This serves as an I2C interface module to print our data using less pins. Normal LCD will take around 10 Pins of a controller to print the data. We have used this I2C with Shift register module helps us to drive the LCD smooth and access over 2 pins. This operation is only being possible via <LiquidCrystal I2C.h> to activate the internal communication with I2C wires. It works with 5V and 600mA of current to drive the LCD with contrast control pin.

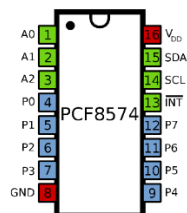


Figure 4.7 PCF8574A

4.8 LCD 16X02

We have used Alpha Numerical Displays to print the data over the Dashboard. The data we collect over our master control unit will preprocess the outputs and drop as print cases over the dashboard display. With this we can get to know whether a person is authorized or denied. These kind of Low power consuming LCD are used to get access update as well as user guide. We have used I2C driver to print the data quick and save our pins of our microcontroller unit.

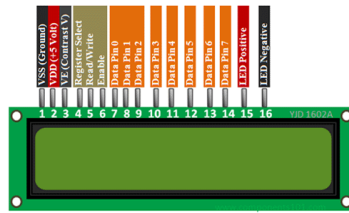


Figure 4.8 LCD 16x02

4.9 SERVO MOTOR

We have used SG90 to indicate our working model output with real-time prototype. It is used as an indication for access approval by activating between 0-180 and 180-0. We have used 8 Bit PWM channel via our master control to active the action. Since these are high power consuming we have used external hardware to power up. Its operational voltage is 5V and 600mA of power so we have used UBEC 7805 to regulate the voltage from 12V - 5V with standard 1Ah of steady current

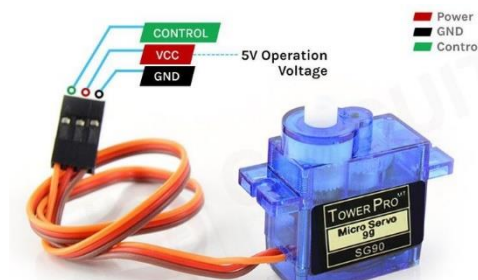


Figure 4.9 SG 90 Servo Motor

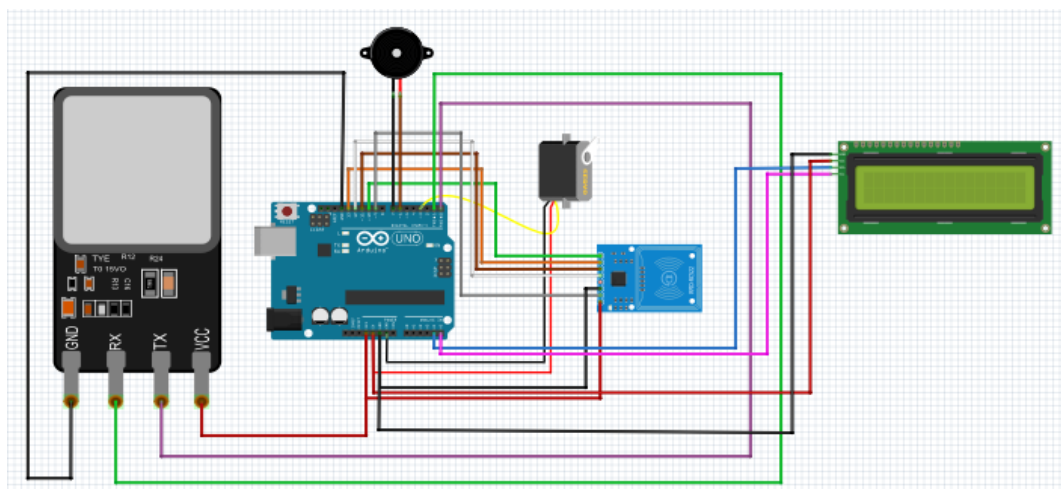


Figure 4.10 Circuit Diagram

CHAPTER 5

DESCRIPTION OF PROPOSED MODEL

5.1 METHODOLOGY:

A Student Gate Pass Management System is a software application or system designed to efficiently manage and track the issuance and usage of gate passes for students in an educational institution. This system helps ensure the security of the campus and the safety of students while allowing for controlled access to the premises. Here are the key components and features of our proposed model

Working Methodology:

The Student Gate Pass ERP system facilitates seamless gate pass requests from parents' logins, ensuring efficient management of student movements within the educational institution. Through the user-friendly interface, parents can conveniently initiate gate pass requests for their wards, streamlining the process and enhancing parental involvement. Upon logging in to the ERP portal, parents are greeted with a dedicated section for gate pass requests. Here, they can provide essential details such as the reason for the gate pass, date and time of departure, expected return time, and any additional notes or permissions required.

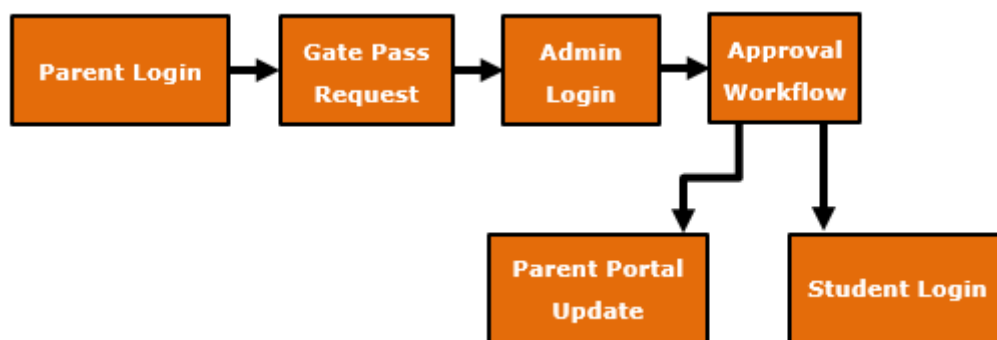


Figure 5.1 Block Diagram Phase – I

The system prioritizes security and accountability by recording the requester's information and validating it against the student database. Once the request is submitted, designated administrators receive instant notifications, enabling prompt review and approval. Administrators can assess the request details, ensuring compliance with institution policies and safety protocols. They can also communicate

with parents directly through the platform for any clarifications or additional information. With the gate pass ERP system, the entire process is digitized, eliminating paperwork and reducing administrative burdens. It enhances transparency and communication between parents, students, and school authorities while ensuring the safety and security of students during off-campus activities.

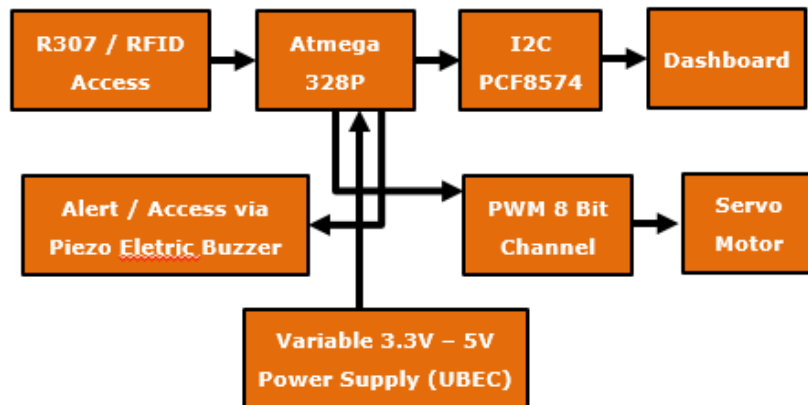


Figure 5.2 Block Diagram Phase – II

The Student Gate Pass ERP system facilitates seamless gate pass requests from parents' logins, ensuring efficient management of student movements within the educational institution. Through the user-friendly interface, parents can conveniently initiate gate pass requests for their wards, streamlining the process and enhancing parental involvement. Upon logging in to the ERP portal, parents are greeted with a dedicated section for gate pass requests. Here, they can provide essential details such as the reason for the gate pass, date and time of departure, expected return time, and any additional notes or permissions required. The system prioritizes security and accountability by recording the requester's information and validating it against the student database. Once the request is submitted, designated administrators receive instant notifications, enabling prompt review and approval. Administrators can assess the request details, ensuring compliance with institution policies and safety protocols. They can also communicate with parents directly through the platform for any clarifications or additional information. With the gate pass ERP system, the entire process is digitized, eliminating paperwork and reducing administrative burdens. It enhances transparency and communication between parents, students, and school authorities while ensuring the safety and security of students during off-campus activities.

The student gate pass system integrates ERP gate pass requests with pre-enrolled face recognition and fingerprint verification for two-step authentication. Students initiate gate pass requests through ERP, which are confirmed via face recognition and fingerprint scans for enhanced security. In case of emergencies, RFID tags serve as bypass mechanisms for swift access. This multi-layered authentication ensures streamlined access control while prioritizing security and efficiency.

Face recognition gate pass entry using OpenCV involves capturing images of individuals at the gate, processing them using OpenCV's face detection algorithms to identify faces, then matching them against a database of authorized individuals. If a match is found, access is granted; otherwise, entry is denied. This system enhances security by automating gate access based on facial recognition, ensuring only authorized personnel can enter.

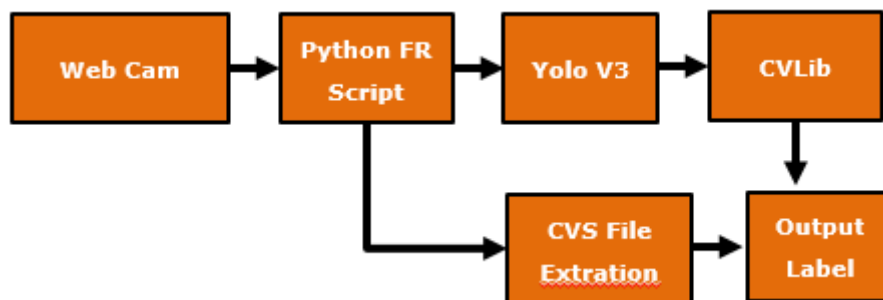


Figure 5.3 Block Diagram Phase – III

5.2 CONSTRAINTS OF SYSTEM:

Designing an efficient security-based Student Analysis ERP (Enterprise Resource Planning) system involves considering various constraints to ensure data integrity, confidentiality, and availability. Here are some key constraints to consider:

1. ***Data Encryption*:** All data stored in the system, including student records, grades, and personal information, should be encrypted both at rest and in transit to prevent unauthorized access.
2. ***Access Control*:** Implement strict access controls based on roles and responsibilities. Ensure that only authorized personnel have access to sensitive student data, and implement multi-factor authentication for added security.

3. ***Audit Trails*:** Implement logging and auditing mechanisms to track all user activities within the system. This helps in monitoring for suspicious behavior and provides accountability.
4. ***Compliance Regulations*:** Ensure that the system complies with relevant data protection regulations such as GDPR (General Data Protection Regulation) or FERPA (Family Educational Rights and Privacy Act) depending on the jurisdiction.
5. ***Regular Security Audits*:** Conduct regular security audits and vulnerability assessments to identify and mitigate potential security risks proactively.
6. ***Secure Development Practices*:** Adhere to secure coding practices during the development phase to minimize the likelihood of vulnerabilities such as SQL injection or cross-site scripting attacks.

5.3 TRADE OFF:

Creating an efficient security-based Student Analysis ERP system often involves trade-offs between various factors. Here are some common trade-offs:

1. **Security vs. Usability:** Implementing stringent security measures such as complex authentication processes or frequent password changes may enhance security but can also reduce usability and hinder user experience. Finding the right balance between security and usability is crucial to ensure that users can access and utilize the system efficiently without compromising security.
2. **Performance vs. Security:** Implementing robust encryption and access control mechanisms can sometimes impact system performance. For example, encrypting large volumes of data or enforcing strict access controls may introduce latency or increase processing overhead. Balancing performance requirements with security measures is essential to maintain system efficiency.
3. **Cost vs. Security:** Enhancing security often requires investment in technology, personnel, and ongoing maintenance. There may be trade-offs between allocating resources to bolster security measures and other competing priorities, such as system scalability or feature development. Organizations must weigh the cost of security measures against the potential risks and consequences of security breaches.

4. Data Accessibility vs. Privacy: Balancing data accessibility for authorized users with protecting student privacy can be challenging. While providing comprehensive access controls and encryption safeguards student data, it may also restrict legitimate users from accessing information they need for academic or administrative purposes. Striking a balance between data accessibility and privacy protection is essential to meet regulatory requirements and user expectations.

5.4 STANDARDS

The IEEE (Institute of Electrical and Electronics Engineers) provides a range of standards relevant to developing an efficient security-based Student Analysis ERP system. Here are some key IEEE standards that can guide the development and implementation of such a system:

1. IEEE 802.1X: This standard specifies port-based network access control, which can be used to ensure that only authorized devices and users can access the network infrastructure of the ERP system. Implementing IEEE 802.1X can enhance network security and prevent unauthorized access.
2. IEEE 802.11i (WPA2): For wireless networks used within the ERP system, IEEE 802.11i, commonly known as WPA2 (Wi-Fi Protected Access 2), provides robust security mechanisms for authentication and encryption. Adhering to this standard helps protect wireless communication against eavesdropping and unauthorized access.
3. IEEE 1547: If the ERP system incorporates distributed energy resources (DERs) or renewable energy systems, IEEE 1547 provides guidelines for interconnecting these resources with the electrical grid while ensuring safety, reliability, and cybersecurity.
4. IEEE 1622: This standard addresses cybersecurity for intelligent electronic devices (IEDs) used in power systems, such as meters, sensors, and controllers. If the ERP system includes components that interact with power infrastructure, IEEE 1622 can provide guidance on securing these devices against cyber threats.

CHAPTER 6

RESULTS AND ANALYSIS

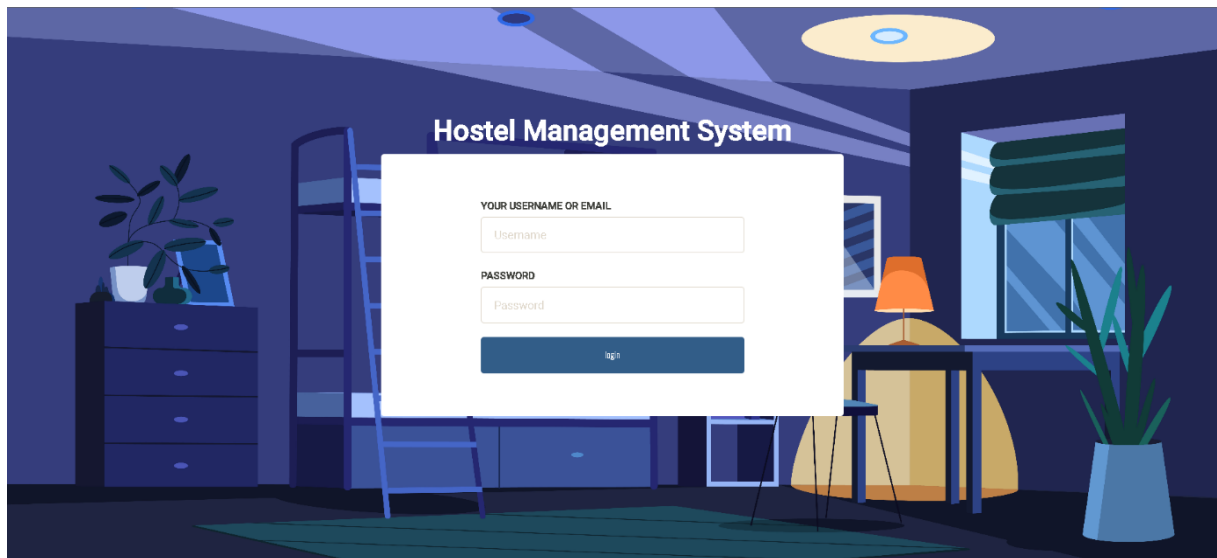


Figure 6.1 Admin Login Interface

The admin login provides access to a comprehensive system designed to facilitate administrative tasks within an educational institution or similar organization. Through this interface, administrators can manage a range of crucial functions. This includes overseeing and updating their own account details for security and communication purposes. Additionally, administrators have access to a detailed database of student information, enabling them to maintain accurate records of personal details. They can efficiently manage student-related tasks such as enrolling them and for institutions with hostel facilities, the admin login allows for the effective management of hostel rooms, including allocation and occupancy tracking.

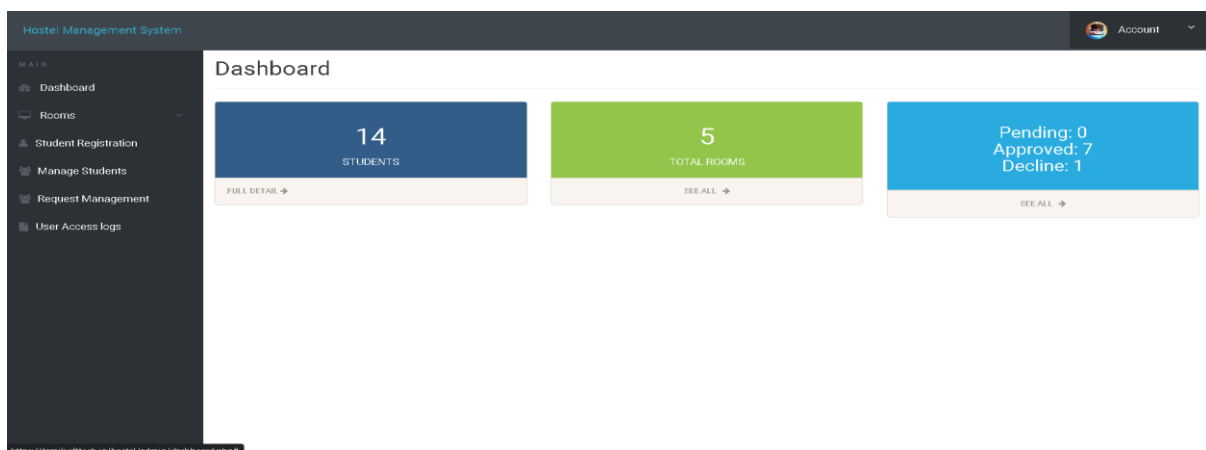


Figure 6.2 Admin Dashboard

Furthermore, administrators can review and respond to leave requests submitted by parents on behalf of students, ensuring that these requests are handled promptly and in accordance with established policies as shown in Fig 6.2. Overall, the admin login serves as a centralized hub for overseeing and managing various aspects of student-related activities, promoting organizational efficiency and effective administration within the institution.

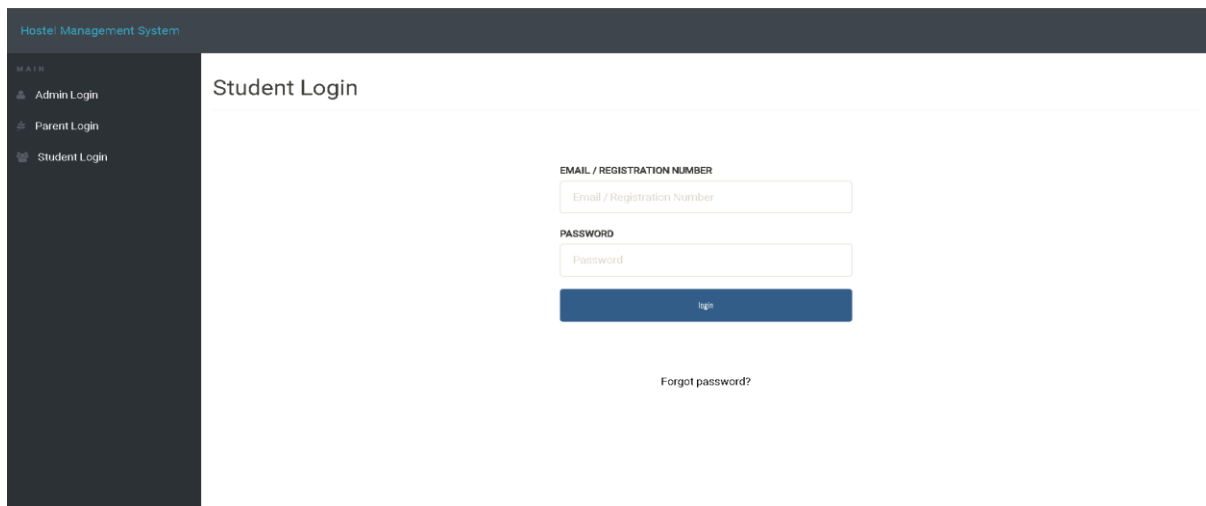
The image shows a web application interface for a 'Hostel Management System'. On the left is a dark sidebar with a 'MAIN' section containing three links: 'Admin Login', 'Parent Login', and 'Student Login'. The 'Student Login' link is highlighted. The main content area is titled 'Student Login' and contains a login form. The form has two input fields: the first is labeled 'EMAIL / REGISTRATION NUMBER' with a placeholder 'Email / Registration Number'; the second is labeled 'PASSWORD' with a placeholder 'Password'. Below these fields is a blue 'login' button. At the bottom of the form area is a link that says 'Forgot password?'.

Figure 6.3 Student Login Interface

. The student login offers a comprehensive platform tailored to the needs of students within an educational institution or similar environment. Through this interface, students gain access to a range of features designed to enhance their academic experience. One key aspect is the availability of student details, providing access to personal information and other relevant data as shown in Fig 6.4. For students residing in hostel accommodations, the login provides access to hostel room details, facilitating management of occupancy and related information. Furthermore, the student login allows for password management, enabling students to update and modify their login credentials for improved security and privacy. Overall, the student login serves as a centralized hub for accessing vital information and resources essential for academic success and campus life.

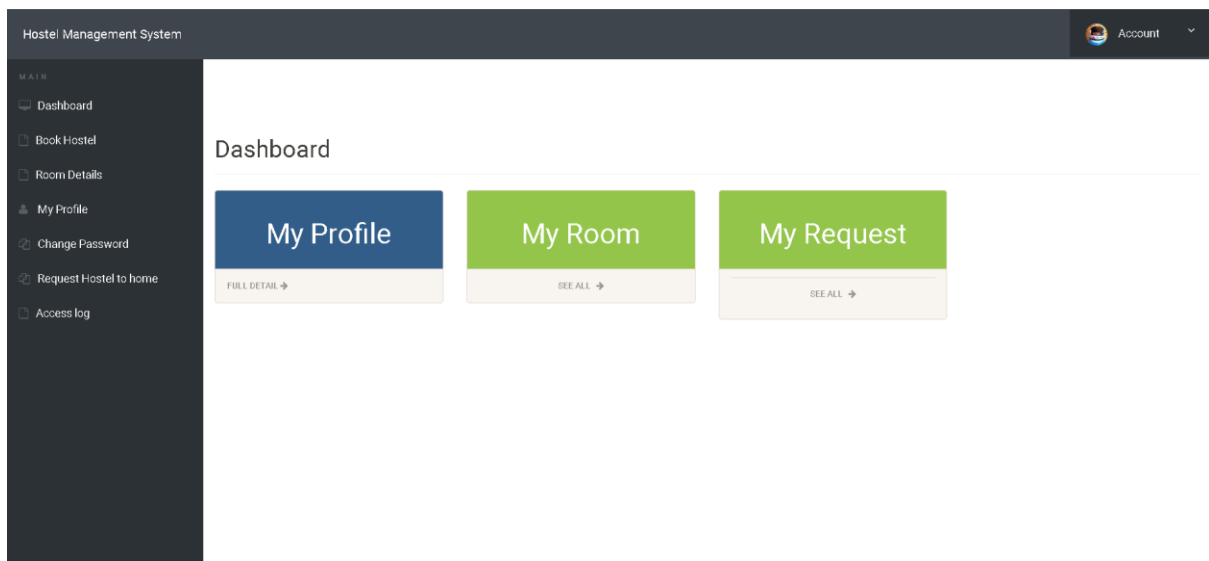


Figure 6.4 Student Dashboard

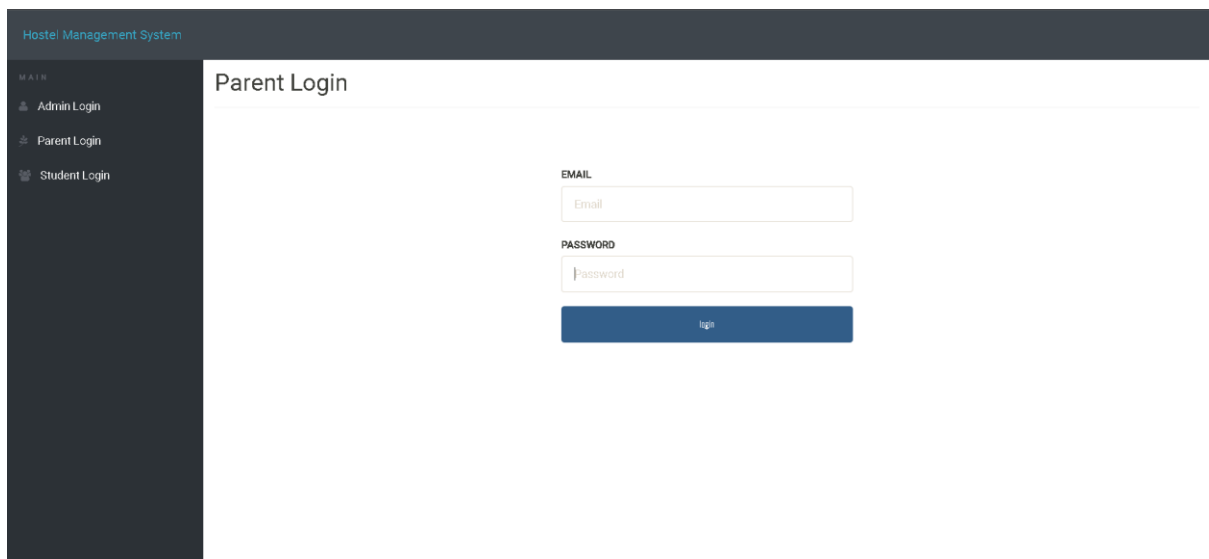


Figure 6.5 Parent Login Interface

The parent login offers a user-friendly platform tailored to cater to the needs of parents within an educational institution or similar setting. Through this interface, parents can conveniently access and manage their personal details, ensuring accurate and up-to-date information is maintained within the system as shown in Fig 6.6. A key feature of the parent login is the ability to submit leave requests on behalf of their children directly to the administration. This streamlined process allows parents to provide necessary

details regarding the reason for the leave and any pertinent scheduling information. Moreover, the parent login enables easy password management, allowing parents to update and modify their login credentials as needed for enhanced security and privacy. By providing these functionalities, the parent login enhances communication between parents and the institution, fostering a collaborative environment conducive to the well-being and academic success of students

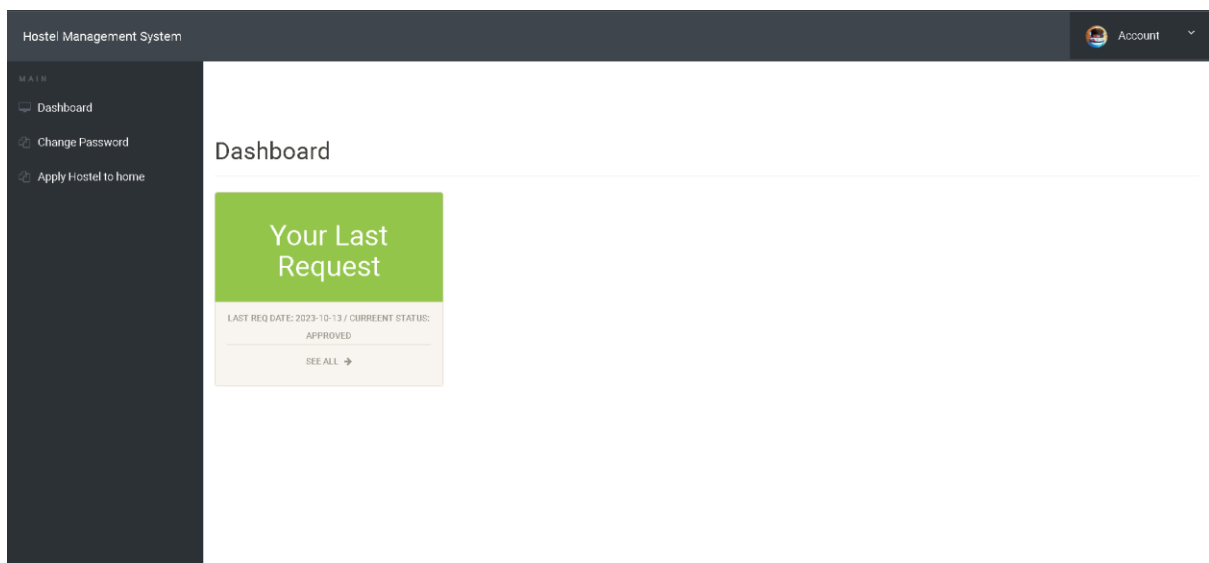


Figure 6.6 Parent Dashboard

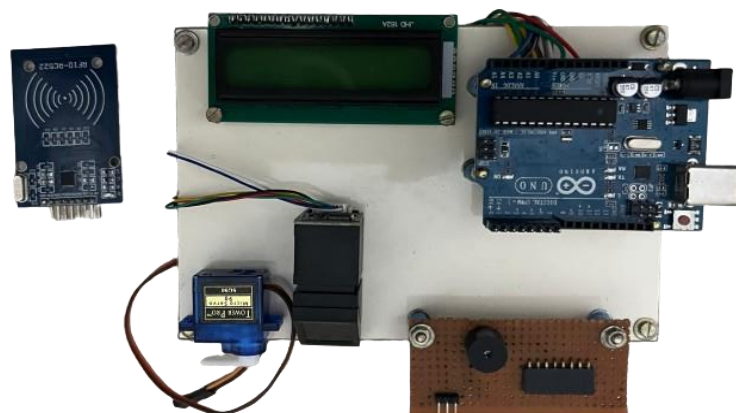


Figure 6.7 Hardware Module

CHAPTER 7

CONCLUSION AND FUTURE WORK

7.1 CONCLUSION

A Student Gate Pass ERP system with fingerprint and facial recognition technology has the potential to revolutionize campus security and access management. By continuously improving and expanding its capabilities, educational institutions can provide a safe and efficient environment for their students and staff. However, it's essential to remain mindful of privacy concerns and invest in ongoing research and development to stay at the forefront of technology. The implementation of a Student Gate Pass ERP system with fingerprint and facial recognition technology has the potential to significantly enhance security and efficiency in educational institutions. This system offers several advantages:

- 1. Enhanced Security:** By incorporating biometric authentication through fingerprint and facial recognition, the system ensures that only authorized individuals gain access to the campus or specific areas within it. This reduces the risk of unauthorized entry and enhances overall security.
- 2. Streamlined Access:** The ERP system simplifies the process of managing and issuing gate passes for students. It eliminates the need for physical passes and manual verification, saving time and resources.
- 3. Attendance Tracking:** The system can also be used for tracking student attendance. As students enter and exit the campus, their attendance is automatically recorded, reducing the chances of proxy attendance and ensuring accurate attendance data.
- 4. Real-time Monitoring:** Administrators can monitor the movement of students in real-time through the ERP system, providing better control over campus security and resource allocation.
- 5. Data Integrity:** Biometric data such as fingerprints and facial recognition are difficult to forge or manipulate, ensuring the integrity of the authentication process.

7.2 FUTURE WORK

While the Student Gate Pass ERP with fingerprint and facial recognition technology is a promising solution, there are several avenues for future work and improvements:

1. Integration with Student Information Systems: To further enhance efficiency, the system can be integrated with the institution's Student Information System (SIS). This integration would provide a seamless flow of data between the gate pass system and the academic records, enabling better monitoring and analytics.

2. Mobile Application: Developing a mobile application for students and staff can allow them to request gate passes, check attendance, and receive notifications related to campus entry. This would enhance user convenience.

3. Machine Learning Enhancements: Leveraging machine learning algorithms can improve the accuracy of facial recognition and fingerprint matching, reducing false positives and false negatives.

4. Multi-factor Authentication: Consider implementing multi-factor authentication for even greater security. This could involve combining biometrics with RFID cards or PINs to ensure the highest level of identity verification.

5. Privacy Considerations: Address privacy concerns by implementing strict data protection measures and obtaining consent from individuals for the collection and use of biometric data.

6. Scalability: Ensure that the system can scale to accommodate the growing number of students and staff, as well as future technological advancements.

7. User Training: Provide training to users, including students, staff, and security personnel, to ensure they are familiar with the system and can use it effectively.

REFERENCES

- [1] Desai. S, Motamarri. T. R, Solanki. V and Mishra. R, "Cloud ERP for Small and Medium Enterprises," 2018 Second International Conference on Electronics, Communication and Aerospace Technology (ICECA), Coimbatore, 2018, pp. 1-3.
- [2] Gunawan .H and Kadir. E.A, "Integration protocol student academic information to campus RFID gate pass system," 2017 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI), Yogyakarta, Indonesia, 2017, pp. 1-6.
- [3] Gowtham. I, Sathishkumar. T, Lakshmiprasad. S, Arumugam. P and Rao. G.P, "Automation of Visitor Gate Pass Management System," 2019 2nd International Conference on Intelligent Computing, Instrumentation and Control Technologies (ICICT), Kannur, India, 2019.
- [4] Keerthi. Y, Sneha. A, Manasa. P.V and Neelima. N, "Enhanced Biometric Attendance Management System using IoT & Cloud," 2022 International Conference on Electronics and Renewable Systems (ICEARS), Tuticorin, India, 2022, pp. 1-7.
- [5] Kiritbhai. P.M and J. C, "An Automated University Gate Pass Monitoring System Using Deep Learning," 2021 International Conference on Communication, Control and Information Sciences (ICCISc), Idukki, India, 2021, pp. 1-6.
- [6] Li. J, "Application of Computer Internet Technology and Cloud Computing in the Intelligent Information Management Database of Students," 2022 IEEE International Conference on Electrical Engineering, Big Data and Algorithms (EEBDA), Changchun, China, 2022, pp. 924-930.
- [7] Ramalingam. M, Vinothkumar. S, Varadhaganapathy. S and Subha. S, "Multi-User Authentication Using Biometric Sensor Using Parallel Processing Algorithm for Attendance Monitoring," 2021 6th International Conference on Inventive Computation Technologies (ICICT), Coimbatore, India, 2021, pp. 84-89.

- [8] Vandana. R.P, Venugopala. P.S and Ashwini. B, "Neural Network based Biometric Attendance System," 2021 IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), Nitte, India, 2021, pp. 84-87.
- [9] Xiang. X, Xue. T and Jing. Z, "The Design of College Students' Ideological Dynamic Visualization Management Information System under the Background of Big Data," 2020 International Conference on Computers, Information Processing and Advanced Education (CIPAE), Ottawa, ON, Canada, 2020, pp. 302-305.