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INTELLIGENT MONITORING AND ALERT SYSTEM FOR GIRLS' HOSTELS

Abstract. The issue of security is a critical concern in today's world and ensuring the safety of individuals is a top priority. Girls' hostels face unique security challenges that require innovative solutions to address. The purpose of the research is to develop an innovative security system that will provide an enhanced level of protection to Girl's hostel residents while also streamlining the hostel's management operations. This study proposes an Intelligence Security System for Girls Hostels that combines the latest advancements in security technology with a user-friendly interface to provide enhanced protection for the residents. The proposed system utilizes fingerprint authentication as a password, allowing residents to enter and exit the hostel with ease and security. Upon entry, a notification is sent to the parents' registered cell phone number, providing them with peace of mind. The system also includes a comprehensive database that stores information about the students, their enrollment, and payments, enabling the efficient management of the hostel's operations.

The design of the system is based on the identification of the weaknesses of traditional security systems, incorporating user-friendly and Graphical User Interface-oriented features to make it more accessible to users. The computerization of the hostel's transactions and data storage will increase efficiency and provide valuable insights and reports that can help with decision-making. Overall, the Intelligence Security System for Girls Hostels aims to create a safe and secure environment for residents while also making the hostel's management tasks easier and more efficient.

Key words: Intelligence Security System, Fingerprint Authentication, Parental Notifications, Global System for Mobile Communications, Global Positioning System, Innovative Security System, Graphical User Interface-Oriented Features.

1 Introduction

Ensuring safety, especially in girls' hostels, is a critical concern in today's world. Girls' hostels face unique security challenges that need innovative solutions [1]. The Intelligence Security System for Girls Hostels is an innovative response to the growing need for enhanced security measures in these facilities [2]. The Intelligence Security System for Girls Hostels uses advanced security technology, including fingerprint authentication, for secure and convenient access [3]. It also features a comprehensive database that stores student information, enrollment, and payments, facilitating efficient hostel management. The Intelligence Security System for Girls Hostels aims to provide a safe environment for residents while enhancing hostel management. It leverages computerization for data storage and transaction processing, increasing efficiency and providing valuable insights for decision-making. It's an innovative, user-friendly solution addressing security concerns and operational efficiency in girls' hostels.

The safety and security of girls is a critical issue that involves protection from violence, abuse, exploitation, and discrimination. It encompasses ensuring physical safety, access to education and healthcare, and promoting gender equality. All stakeholders, including governments, communities, and individuals, have a role in this crucial task [4]. Hostel management has a responsibility to ensure the safety of girls. This includes implementing security measures like proper locks and systems, regular supervision, and staff training on issues like sexual harassment. Clear policies should be in place to handle incidents and provide support to affected residents. Cooperation with local authorities and community organizations is also crucial to create a safe environment. The "Intelligent Monitoring and Alert System for Girls' Hostels" is a technology-driven solution designed to streamline hostel management. It covers various operations like admission, fee payment, and report generation. Developed using languages like HyperText Markup Language, Cascading Style Sheets, Bootstrap, JavaScript, and Hypertext Preprocessor, and a Database Management System like Microsoft SQL

Server, it offers a user-friendly interface for easy record management. The software ensures security with authorized access and allows students to generate challans during hostel allotment.

Fingerprint authentication is a crucial feature of the Intelligence Security System for Girls Hostels. It uses unique fingerprints to verify identities, providing secure access control in girls' hostels. The system automatically monitors student movement, enhancing security. It also offers a user-friendly interface for record management and authorized access. The use of fingerprint authentication mitigates the risk of lost or stolen keys, thereby boosting hostel security [5].

The main objective of the study was to develop an innovative security system that will provide an enhanced level of protection to Girl's hostel residents.

The literature review of all papers highlights the importance and advancement of intelligent security systems in various fields. From residential environments to educational institutions, public transport, health care and even smart grids, these articles show the increasing demand for innovative and secure systems. The authors provide a comprehensive overview of the current state of smart security systems and discuss their strengths, weaknesses, and potential for future development.

The authors also emphasize the need for effective security systems that can protect individuals, property, and data from potential threats. This is particularly important in the context of women's safety and health care, where the safety and privacy of patients and their data is of utmost importance. The authors highlight the need for smart security systems that are reliable, user-friendly, and cost-effective.

This assortment of scholarly articles provides a comprehensive overview of intelligent security systems across a variety of sectors. Ibrahim [6] offers an in-depth look at intelligent video surveillance systems, discussing their design, implementation, and evaluation. Jadon [7] explores smart home security systems, their features, applications, and strategies for implementation. Bhati et al. [8] in their study reviews security systems for smart campuses, while Al-Ahmadi et al. [9] discusses various smart security systems, including their features and implementation strategies. In their study, Yerragolla et al. [10] conducted a research on intelligent security systems in residential settings. In addition, the study of Baig et al. [11] provides a comprehensive

overview of smart security systems, including those that utilize IoT technology, biometrics, and artificial intelligence, and discusses their benefits, limitations, and potential areas for future research. Moreover, Singh et al. [12] in their study offers an overview of various intelligent surveillance systems currently available, discussing their applications, benefits, and limitations, and suggesting directions for future research. Furthermore, the study of Priya et al. [13] reviews smart security systems designed specifically for women's safety. Al-Badshah et al. [14] delves into the topic of smart security systems designed specifically for educational institutions. It provides a comprehensive review of these systems, discussing their applications, benefits, and limitations, and also suggests potential directions for future research. On the other hand, Lu et al. [15] reviews smart security systems for healthcare, while the study of Sharma et al. [16] discusses smart security systems designed for smart grids. Finally, Paradkar et al. [17] conducts a systematic review of the literature on Intelligent Safety System for Women Security. The focus is on the design and implementation of these systems, offering valuable insights into the practical aspects of women security.

2 Design and Development

The methodology chosen for this research is Object Oriented Methodology (OOP). This approach recognizes that objects play a significant role in our lives, be it in nature, human-made entities, business, or everyday products. OOP aims to bring this perspective to the creation of computer software. It was first proposed in the late 1960s as a new way of developing software. This methodology requires the analyst to identify the objects in the system, understand their behavior and interactions, and determine their responsibilities and relationships.

The object-oriented analysis focuses on the examination of all objects in the system, their similarities, differences, and the manipulation needed to develop the system. The process of OOP begins with analyzing and observing the system to be developed, defining the requirements, and identifying the objects within the system such as students, administrators, computer systems, and online allocation systems. In essence, OOP involves identifying objects in a system and their interconnections, which serves as the basis for implementing the system.

The system environment for the Intelligence Security System for Girls Hostels is designed to ensure optimal performance and user experience. It is configured with both hardware and software components that are tailored to meet the system's requirements and ensure its smooth operation. The following table 1 and table 2 describes hardware and software components of system environment.

Table 1 – Hardware Configuration

Component	Specification
Processor	Pentium
RAM	4GB
Hard Disk	40GB
Monitor	15" Color Monitor
Mouse	Yes
Keyboard	Yes

Table 2 – Software Configuration

Component	Specification
Operating System	Windows7
Languages	HTML, CSS, Bootstrap, JavaScript, and PHP
Database	MySQL

The system will consist of a central database that will store all the information regarding the students and the hostel. The system will also have an authentication mechanism which will be used to verify the identity of the user. The authentication mechanism in this case will be the fingerprint recognition system. The system will also have a notification system that will notify the parents of the students whenever they enter or exit the hostel.

The flow of the system will be as follows: the user logs into the web application using their credentials and verifies their identity via a fingerprint scan. Upon successful verification, access to the hostel is granted and entry/exit times are logged. Parents receive notifications on their registered mobile number each time the user enters or exits the hostel. The application includes sections for student management and payment management, and a reporting section that generates various reports. The user logs out to ensure information security.

When a student enters or exits the hostel, they authenticate their identity via a fingerprint scanner. Upon successful verification, the system sends a notification to the parents about the student's arrival or departure. This process ensures secure and monitored access to the hostel.

The admin is key in setting up and managing the Girls Hostel security system. They handle the initial setup, student enrollment, and database updates. They also add parents' contact details for notifications. The admin sets up the fingerprint system at the hostel's access points and manages all information in the database, including generating reports. They maintain the system, ensure its functionality, and have the authority to modify student information as needed.

The "Intelligence Security System for Girls Hostel" is designed based on a client-server architecture, with the student as the client and a central database as the server. The server handles authentication and notifications. The system is implemented using programming languages like HTML, CSS, Bootstrap, JavaScript, PHP, and a database management system like MySQL. It incorporates devices such as a fingerprint scanner and a computer system for database management.

In the security system depicted in Figure 1, several components work together to create a secure environment. The core of the system is the microcontroller unit, which controls all operations. Secure access is ensured by the fingerprint scanner, while communication with the warden's PC is handled by the GSM module. Information is displayed and stored by the LCD and memory card, respectively. The keyboard facilitates data input, and time logging is done by the Real-Time Clock.

The process a student undergoes when entering or exiting a hostel, as showcased in Figure 2, involves a fingerprint scan for identity verification, followed by a parental notification. This systematic approach ensures a secure and transparent hostel management system.

As depicted in Figure 3, a flowchart of the login and access process for a girls' hostel security system web application. It begins with user login, followed by fingerprint authentication. Post-authentication, the system verifies hostel access and notifies parents. The application manages student information, transactions, and generates reports. The process ends with user logout, ensuring system and data security.

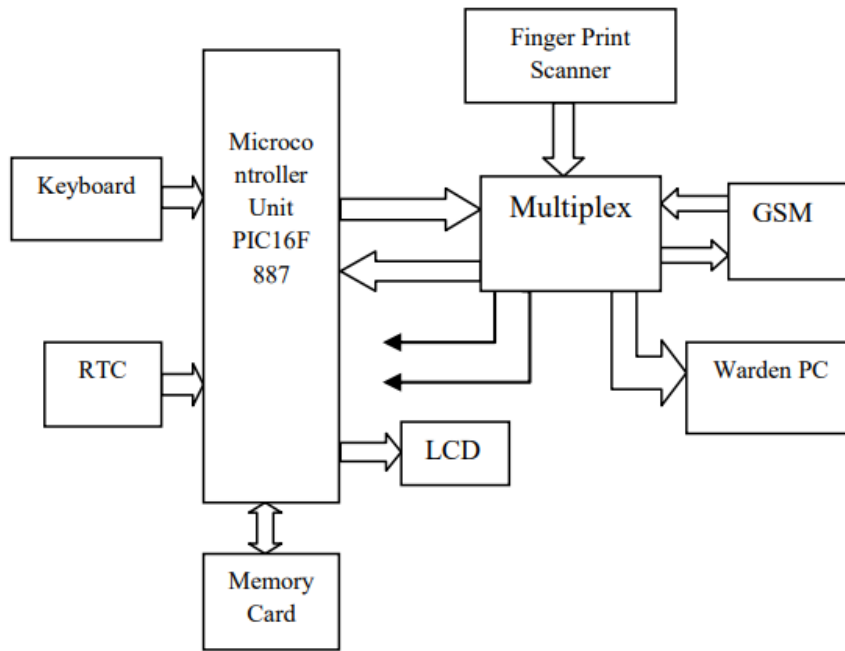


Figure 1 – Block diagram Fingerprint Security Module System [1]

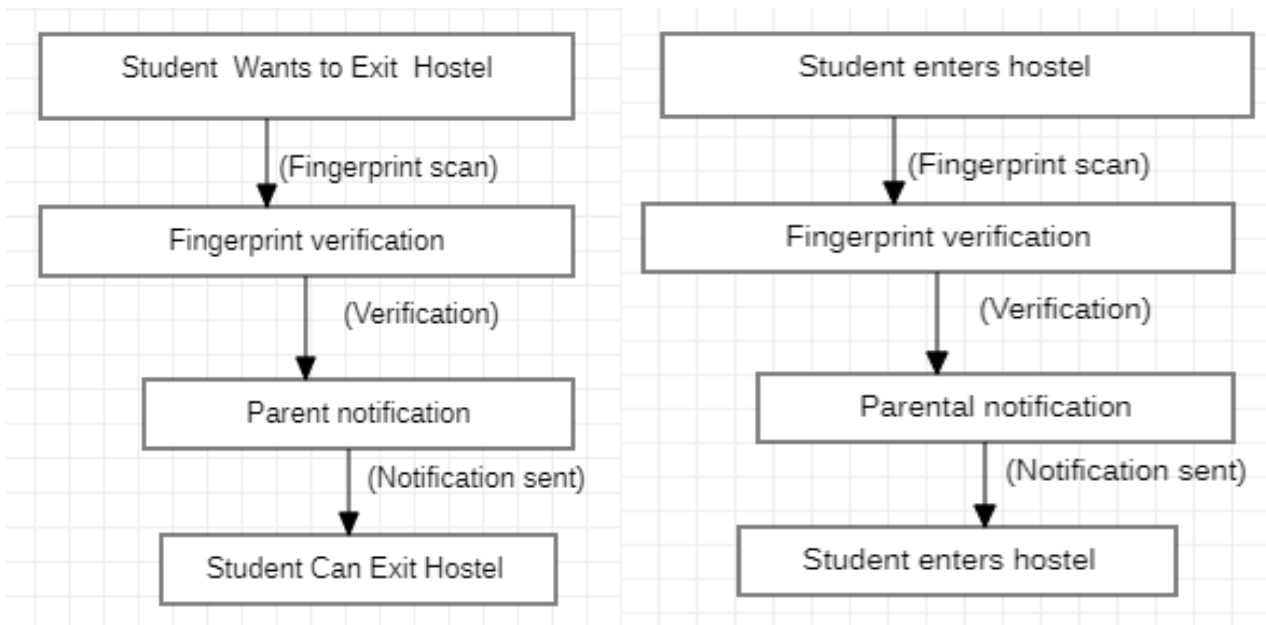


Figure 2 – Flow diagram Fingerprint System

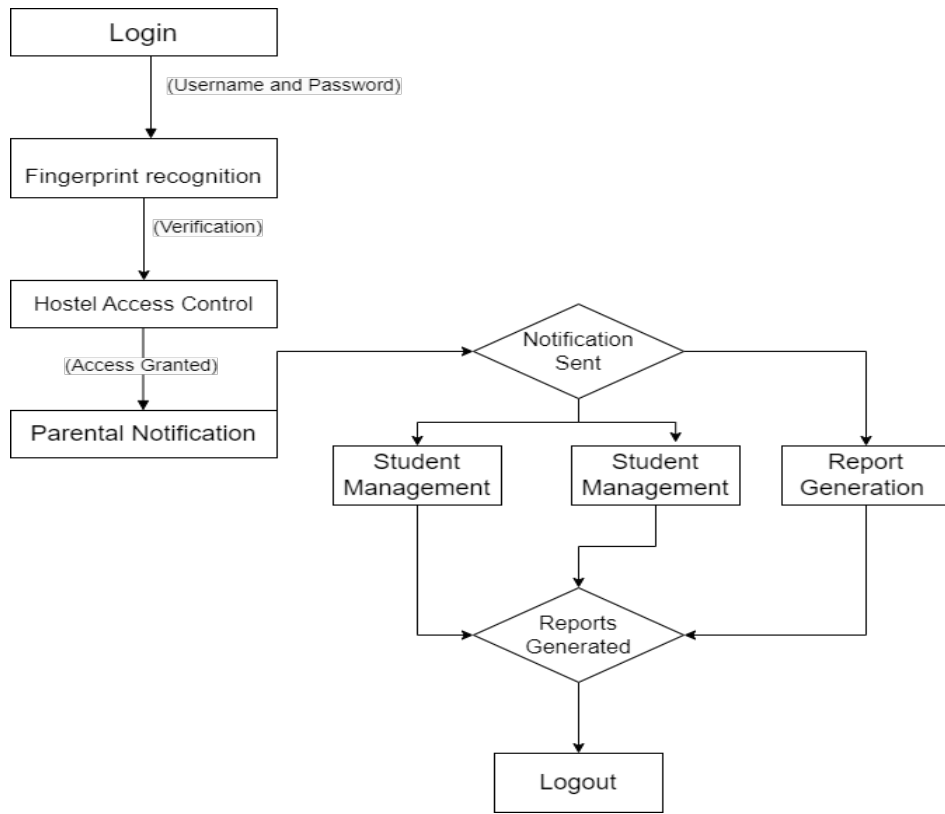


Figure 3 – Web app of the girl security system

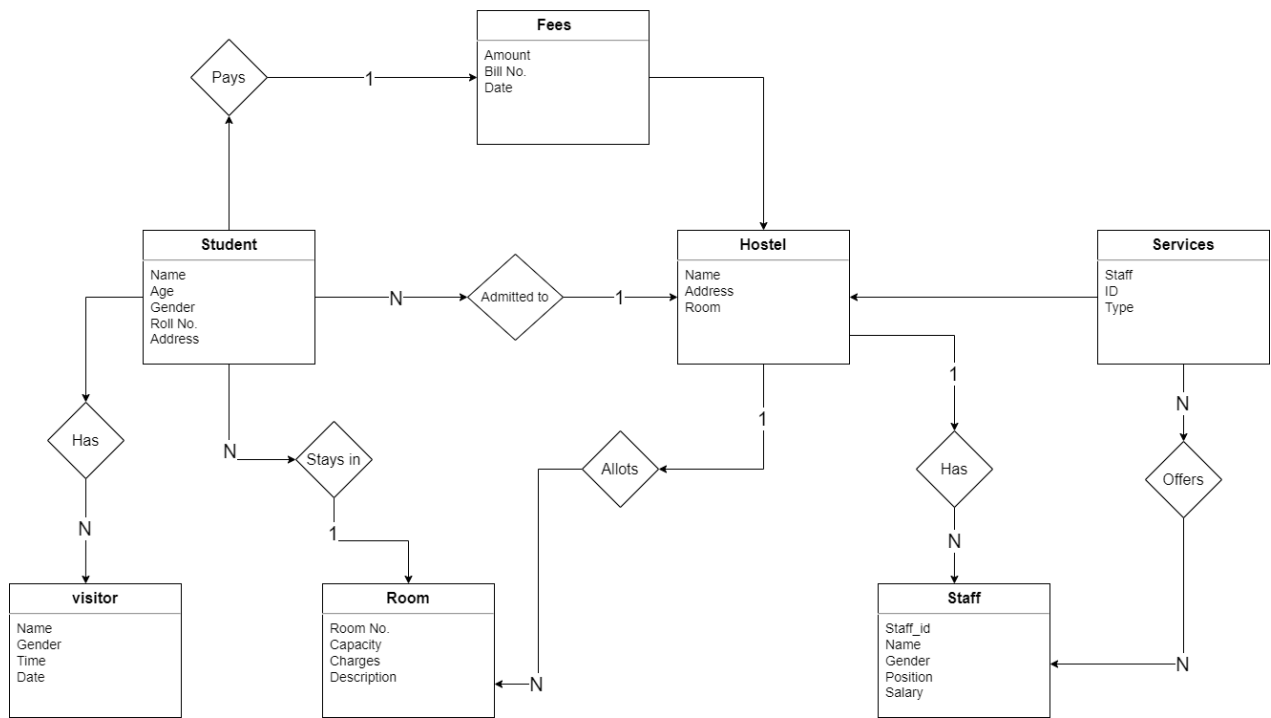


Figure 4 – UML-Diagram of Hostel Monitoring System

The Unified Modelling Language Diagram (UML-Diagram) in Figure 4 provides a graphical tool typically used in computing to structure data within databases or information systems. This specific ER-Diagram features six entities: STUDENT, HOSPITAL, SERVICES, ROOM, STAFF, and VISITOR, all interconnected to illustrate their relationships. For example, the STUDENT is “Admitted to” the HOSPITAL, which in turn “Offers” SERVICES. These SERVICES are associated with a “Type” of ROOM, which is linked to a “Staff Id” from STAFF. This diagram serves as a clear, structured overview of the system’s interactions, proving

invaluable for understanding and designing database systems.

As outlined in Figure 5, the Hostel Management System orchestrates the entire process, with Students applying for accommodation and the admin handling hostel setups.

3 System Architecture

Intelligence security systems are becoming a crucial component in ensuring the safety and privacy of residents in girls' hostels. The architecture of such a system is typically organized into four key layers as you can see in the figure 6.

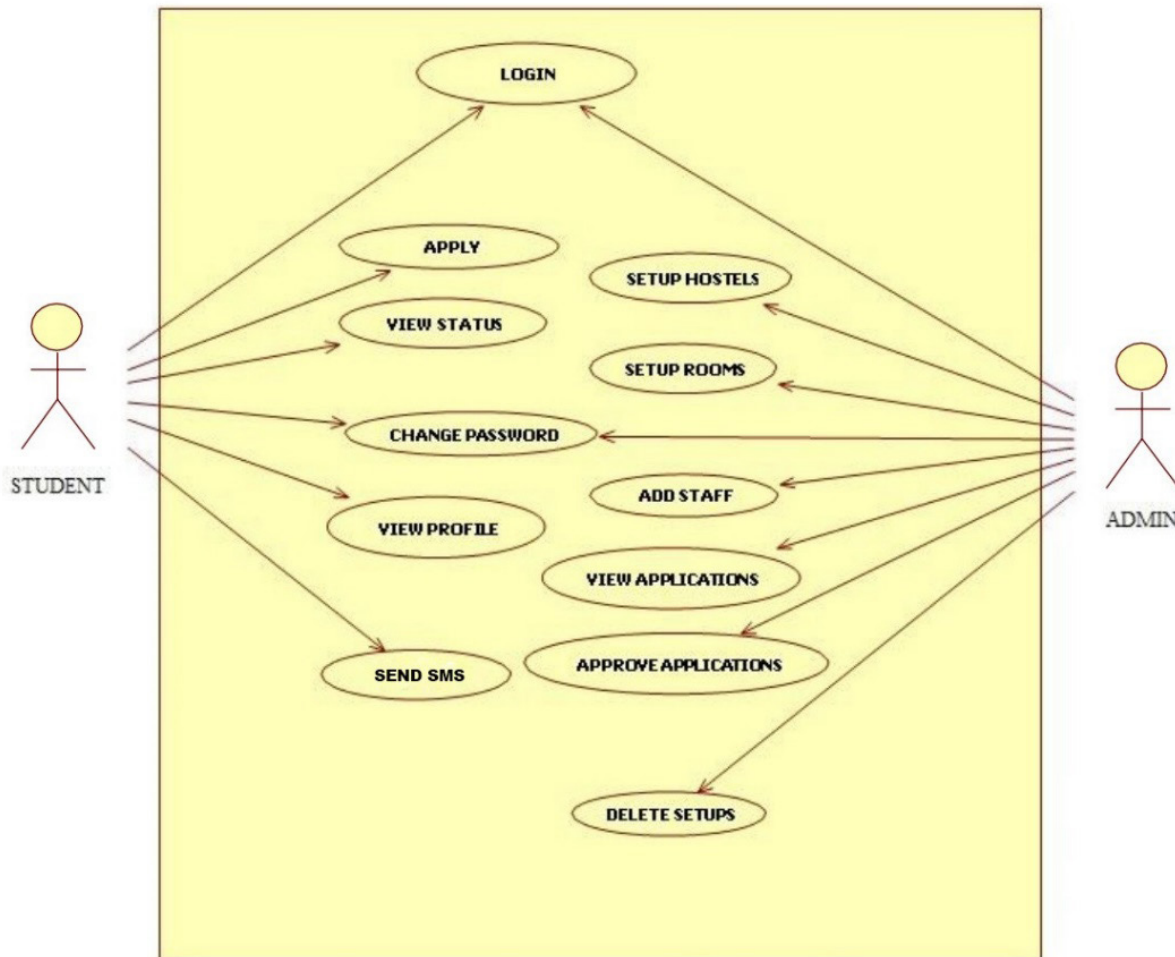


Figure 5 – Use Case Model of Hostel Management System

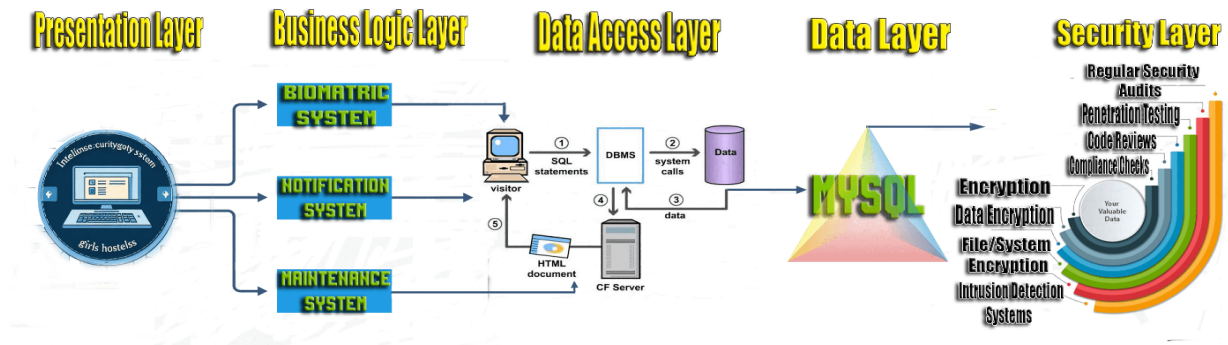


Figure 6 – System Architecture of Integrated Intelligence Security Solutions

Each layer has a specific role, and they work together to provide a secure and efficient biometric system. The architecture is designed in such a way that each layer can function independently, yet they are interconnected to ensure smooth operation of the system. This layered approach also makes the system more manageable and scalable. As depicted in Figure 6, the architecture of a biometric system is divided into four layers. Please refer to it for further details.

- Presentation Layer: This layer consists of the biometric system, notification system, and monitoring system. These components interact with the user and present the information in a user-friendly manner.

- Business Logic Layer: This layer contains an SQL database and a visitor system. It handles the processing of data and implements the core functionality of the system.

- Data Access Layer: This layer is responsible for system calls and data management. It provides an interface for the business logic layer to access and manipulate data.

- Security Layer: This layer includes a MySQL database, a compliance check, and a security check. It ensures the security and integrity of the system by implementing various security measures and compliance checks.

The methodology of developing an intelligent security system for a girls' hostel involves several steps. First, requirements are gathered through interviews, surveys, and focus groups to identify the specific needs and security concerns of the hostel. This is followed by a detailed system analysis to evaluate the current security system and identify areas for improvement. Based on the gathered requirements and system analysis, a comprehensive solution design is created to address the security needs of the hostel. A prototype of the

proposed system is then developed and tested for functionality and performance. Once the prototype is refined based on feedback, the final version of the security system is implemented in the hostel, which includes the installation of hardware and software, user training, and system testing. Regular maintenance and support are provided to ensure the system's effectiveness, and continuous evaluation is conducted to make necessary improvements to meet the evolving security needs of the hostel.

4 Result of the implementation

This study underscores the collective responsibility in safeguarding girls in hostels. The "Intelligence Security System for Girls Hostel" plays a pivotal role in this context, offering heightened security through cutting-edge technology and an intuitive interface. The system leverages fingerprint authentication, offering a secure and user-friendly way for residents to access the hostel. It also keeps parents informed about their child's movements by sending notifications each time their child enters or exits the hostel. In addition, the system incorporates a comprehensive database for effective hostel management. It maintains records of students, their enrollment, and payments, thereby optimizing operations and enhancing efficiency. The system's design addresses the shortcomings of traditional security systems by integrating user-friendly and GUI-oriented features. The digitization of the hostel's transactions and data storage not only boosts efficiency but also yields valuable insights and reports that can assist in decision-making. In summary, the results indicate that the Intelligence Security System for Girls Hostels successfully fosters a safe and secure environment for residents while also simplifying hostel management tasks. However, it's crucial to remember that this system is

part of a broader security framework, and additional measures should be implemented to ensure the overall safety and well-being of the residents.

Testing is indeed a crucial part of the development process for any system. It involves a series of steps designed to identify errors, verify objectives, and ensure user requirements are met. In our case, the testing of the “Intelligence Security System for Girls Hostels” involved several stages to ensure its effectiveness and reliability. Let’s delve into each of these testing methods:

As shown in Figure 7, we conducted four levels of testing in the development process. Unit Testing tested individual modules independently, such as the fingerprint authentication module and

the notification system. Following this, Integration Testing then checked the interaction between these modules. Next, System Testing simulated operations like user login and fingerprint verification on the integrated system. Finally, User Acceptance Testing involved real-world testing by the intended audience, collecting feedback, and making necessary adjustments for deployment. This process ensured the system’s usability, performance, and reliability.

In each of these stages, we were actively involved in designing the tests, executing them, and analyzing the results. This rigorous testing process helped us ensure that the “Intelligence Security System for Girls Hostels” is reliable, secure, and user-friendly.

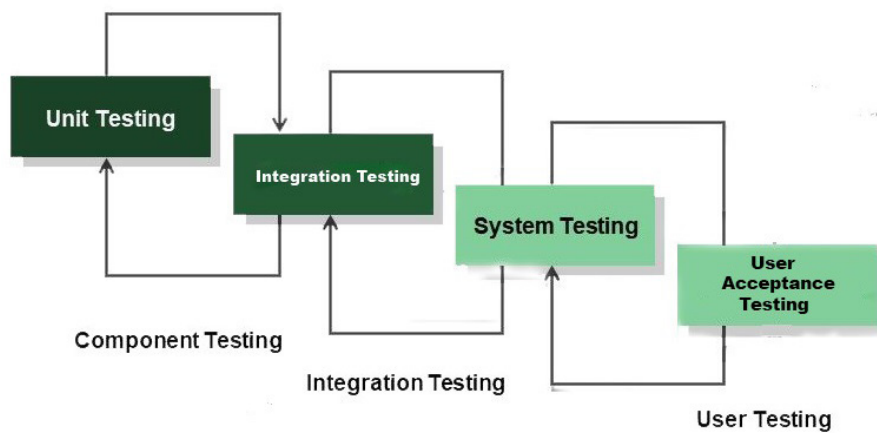


Figure 7 – Testing in the development process

Table 3 – Component of the system

Components	Features	Responsibilities
Web Application	Login, Fingerprint Recognition, Hostel Access Control, Parental Notification, Student Management, Payment Management, Reports Generation, and Logout.	Provide access to the hostel based on fingerprint verification, store and manage student information, handle payment transaction, send notification to parents, generate reports, and ensure information security
Fingerprint System	Fingerprint Verification at Entry and Exit, and Parental Notification	Verify student identity and notify parents of student’s entry and exit
Admin	Setup and Configuration, Enrolling Students, Adding Parent’s Information, Setting up Fingerprint Recognition, and Maintenance	Setup and manage the security system, enroll students, update student and parent information, and maintain the system and ensure its proper functioning

As you can see in Table 3, a hostel security system is composed of three main components. The first is the Web Application, which handles various functions such as login, fingerprint recognition, and report generation. The second is

the Fingerprint System, responsible for verifying student identities and notifying parents about their movements. Lastly, the Admin oversees system setup, student enrollment, and system maintenance.

Table 4 – Features and the benefit for user

Feature	Benefit
Login	Provides secure access to the system by requiring a username and password.
Fingerprint Recognition	Enhance security by verifying the identity of the user based on their unique biometric information.
Hostel Access Control	Limits access to the hostel to only authorized users, and logs entry and exit times for tracking purposes.
Parental Notification	Keeps parents informed for their daughter's entry and exit from the hostel, providing added peace of mind.
Student Management	Enables the hostel to store, update, and retrieve information about students residing in the hostel.
Payment Management	Handles payment of the hostel fees and other dues by students, providing a secure and efficient way to manage financial transactions.
Reports Generation	Generates reports based on various criteria such as hostel fees, payment status, etc., allowing for easier analysis of data.
Logout	Secures information stored in the system from unauthorized access by requiring users to log out.

The system, as detailed in Table 4, offers several beneficial features. It provides secure access through a login feature and enhances security with fingerprint recognition. It also restricts hostel access to authorized users, keeps parents informed about their child's activities, manages student information and financial transactions efficiently, and includes a report generation feature for easy data analysis. Additionally, it has a logout feature to prevent unauthorized access.

By implementing these features, this paper provides a comprehensive and secure solution for managing the security of girls in the hostel. However, it is important to remember that security is a complex and ongoing process that requires the cooperation and engagement of all stakeholders. The use of technology is just one part of a larger effort to ensure the safety and well-being of girls in hostels.

5 Conclusion

In conclusion, the development of the security system has been a valuable learning experience, providing insight into security, PHP, SMS notifications, file transfer protocol, and team

collaboration. The hostel management and security software were designed to meet the requirements of the user and improve upon the existing system. The increasing number of educational institutes and hostels requires efficient management, which this software addresses through its user-friendly interface and compatibility with the existing system. The research has provided good experience in working with security systems and the team is eager to apply their knowledge in future security-based applications.

The current research has developed a security system for a girls' hostel that sends SMS notifications to guardians. However, there are potential enhancements that could further improve the system's functionality and efficiency. One such improvement could be the addition of a multiple notification system, which would extend the reach of alerts to other guardians and the hostel provost. Another potential enhancement is the implementation of a recognition system. This system would verify whether the guardian has communicated with their child after receiving the SMS. While these enhancements would require additional development, they could significantly improve the robustness of the security solution for girls' hostels.

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