

Hostel Management System With AI Chatbot

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ABSTRACT

Managing hostel facilities in educational institutions requires efficient coordination of student accommodation, record management, complaint resolution, and communication between students and administrative staff. Traditional hostel management approaches often rely on paper-based processes or basic web portals, which frequently lead to operational delays, data inconsistencies, and limited transparency in administrative workflows.

To address these challenges, this paper proposes a web-based Hostel Management System integrated with an AI-powered chatbot. The proposed system is developed using Angular for the frontend interface, Node.js RESTful APIs for backend services, and MySQL for centralized database management. The platform enables students to register, check room availability, book hostel rooms, submit complaints, and track request status through a unified digital interface.

An AI-based chatbot module is incorporated into the system to provide real-time assistance for frequently asked queries such as hostel rules, mess schedules, room availability, and complaint status. The chatbot operates as an intelligent support mechanism that reduces dependency on administrative staff while ensuring continuous availability of information for students.

The proposed system improves operational efficiency by automating hostel-related processes, minimizing manual intervention, and enhancing transparency in hostel administration. Experimental evaluation and user feedback indicate that the system significantly reduces response time for student queries and improves overall user satisfaction. Additionally, system architecture diagrams and workflow models are presented to illustrate the interaction between student modules, administrative components, and the chatbot subsystem.

Keywords: Angular, Node.js, MySQL, REST API, AI Chatbot, Hostel Management System.

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1 Introduction

Effective hostel management plays a crucial role in ensuring the smooth functioning of academic institutions. Universities and colleges must manage various hostel-related operations, including student accommodation allocation, maintenance of student records, complaint handling, and continuous communication between students and administrative staff. Traditionally, these operations have been carried out using manual processes involving extensive paperwork and physical record keeping. However, such approaches often lead to inefficiencies, delays in service delivery, data inconsistencies, and limited transparency in administrative operations.

With the advancement of digital technologies, many

educational institutions have begun adopting web-based hostel management systems to improve administrative efficiency. These systems aim to automate routine tasks such as room allocation, complaint registration, and information dissemination. By digitizing these processes, institutions can reduce manual workload, improve data accuracy, and provide students with faster access to hostel-related services. Despite these improvements, many existing systems still rely heavily on administrative intervention and lack intelligent support mechanisms capable of providing real-time assistance to users.

Recent developments in **Artificial Intelligence (AI)**, particularly in the field of **conversational agents and chatbots**, have created new opportunities to enhance

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user interaction within digital management platforms. AI-powered chatbots are capable of processing user queries, delivering instant responses, and providing continuous support without requiring human supervision. Integrating such technologies into hostel management systems can significantly improve accessibility, reduce response time for common queries, and enhance the overall user experience.

In this study, we propose a **web-based Hostel Management System integrated with an AI-powered chatbot** to improve the efficiency and transparency of hostel administration. The system is designed using **Angular for the frontend interface, Node.js and Spring Boot for backend services, and MySQL for centralized data storage**. The platform enables students to perform key operations such as room booking, complaint registration, and information retrieval through a unified digital interface. The integrated chatbot provides real-time responses to frequently asked queries related to hostel facilities, room availability, complaint status, and institutional guidelines.

The proposed system aims to reduce administrative workload, improve service response time, and provide students with a more efficient and accessible platform for hostel-related services. Furthermore, the system architecture and workflow are presented to demonstrate how modern web technologies and AI-based conversational interfaces can be effectively integrated to enhance the functionality of hostel management platforms.

2 Literature Review

In recent years, a range of hostel and accommodation management systems have been developed using traditional web technologies such as PHP, ASP.NET, and various Java-based frameworks. These platforms have primarily aimed to streamline routine tasks like student registration, room assignments, and fee tracking. While they have successfully reduced manual effort, many still feature static user interfaces and lack intelligent tools to support users more effectively.

Research suggests that the absence of real-time assistance and intuitive design often limits the overall effectiveness of these systems. Students, for example, frequently encounter challenges when trying to check room availability, make payments, or follow up on complaints, as these platforms typically require direct involvement from administrators. This dependency can lead to delays and negatively affect user

satisfaction.

Advances in Artificial Intelligence (AI), especially in chatbot technologies, have shown strong potential in enhancing service delivery in both educational and administrative contexts. Chatbots are capable of providing immediate responses, operating 24/7, and managing common queries with high efficiency. Studies have also demonstrated that incorporating conversational AI into management systems can improve student engagement, system accessibility, and operational efficiency.

In addition, the development of modern web frameworks like Angular, React, and Node.js has enabled the creation of dynamic, scalable, and modular applications. Paired with robust databases such as MySQL, these technologies offer a solid foundation for building systems that can manage large datasets and ensure consistent performance.

Despite these technological advancements, few hostel management systems have adopted AI-based features. This presents an opportunity to innovate by combining conventional management functions with AI-driven capabilities. The proposed system addresses this gap by integrating a chatbot, creating a platform that is not only functional but also interactive, intelligent, and focused on enhancing the user experience.

Table 2.1: Comparison between Traditional and Proposed Hostel Management Systems

Feature / Criteria	Traditional Hostel Management Website	Proposed System (Angular + MySQL + AI Chatbot)
Technology Stack	PHP/ASP.NET / Java frameworks (mostly static)	Angular frontend, Node.js REST API backend, MySQL database
User Interface (UI/UX)	Basic, static	Modern, responsive,
Real-time Assistance	No real-time support; depends on admin	Integrated AI Chatbot for 24/7 instant query resolution
Room Booking	Manual or semi-automated	Fully automated with real-time availability updates

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Complaint Management	Paper-based or slow manual tracking	Online complaint
Transparency	Limited, prone to delays	High transparency with automated updates & logs
Payment System	Mostly offline/cash payments	Online payments (UPI, PayPal, Razorpay) with e-receipts
Data Handling	Decentralized, error-prone	Centralized,
Scalability	Limited to small institutions	Scalable with cloud support & REST API
Analytics & Reports	Minimal/manual report generation	AI-powered (occupancy,
User Satisfaction	Low due to delays & inefficiency	High due to real-time support & automation

3 Proposed System

The proposed system is a web-based Hostel Management System integrated with an AI-powered chatbot designed to automate hostel operations and improve communication between students and hostel administrators. The primary objective of the system is to replace traditional manual processes with a centralized digital platform that enhances efficiency, transparency, and accessibility.

The system enables students to perform essential hostel-related activities through an online interface, including room booking, complaint registration, information retrieval, and status tracking. At the same time, administrators are provided with tools to efficiently manage hostel resources, monitor student requests, and generate operational reports.

Unlike traditional hostel management systems that rely heavily on manual intervention, the proposed platform introduces automation and intelligent assistance through the integration of modern web technologies and conversational AI. This integration allows the system to provide real-time support to students while reducing administrative workload.

The system is designed to provide a user-friendly interface and centralized data management, ensuring that hostel information is easily accessible and

securely stored.

3.1 System Overview

The proposed hostel management system consists of multiple interconnected components that collectively support hostel operations. The system is designed to serve two primary users: students and administrators. Students interact with the system through a web interface that enables them to register, log in, check room availability, book hostel rooms, raise complaints, and monitor the status of their requests. Administrators access a dedicated dashboard that allows them to manage student records, approve or reject booking requests, monitor complaints, and maintain hostel data.

The integration of an AI-based chatbot further enhances system functionality by enabling students to receive instant responses to frequently asked queries.

3.2 Key Features of the Proposed System

The proposed system introduces several features that improve hostel management efficiency:

Online Room Booking

Students can view available rooms and submit booking requests through the system. Administrators can approve or reject these requests based on availability, ensuring efficient room allocation.

Complaint Management System

Students can submit complaints related to hostel facilities such as maintenance issues, electricity problems, or water supply disruptions. The system allows administrators to track complaints and update their resolution status.

AI Chatbot Assistance

An AI-powered chatbot is integrated into the system to provide instant responses to common student queries, such as:

- a) Room availability
- b) Hostel rules and regulations
- c) Mess timings
- d) Complaint status
- e) Booking confirmations

The chatbot operates continuously and reduces the need for manual administrative assistance.

Centralized Data Management

All hostel-related information, including student records, room allocations, complaints, and payments, is stored in a centralized database. This ensures data

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consistency, improved security, and efficient information retrieval.

3.3 Objectives of the Proposed System

- The proposed system aims to achieve the following objectives:
- Automate hostel management processes such as room booking and complaint tracking.
- Reduce administrative workload through digital workflow automation.
- Provide real-time information access for students through a web-based interface.
- Improve communication between students and administrators.
- Integrate AI-based chatbot support to provide instant responses to student queries.

3.4 Advantages of the Proposed System

The implementation of the proposed system offers several advantages over traditional hostel management approaches:

- Reduction in manual administrative tasks
- Faster response time for student queries
- Improved transparency in hostel operations
- Real-time complaint tracking and monitoring
- Enhanced user experience through a responsive web interface
- Continuous student support through AI chatbot assistance

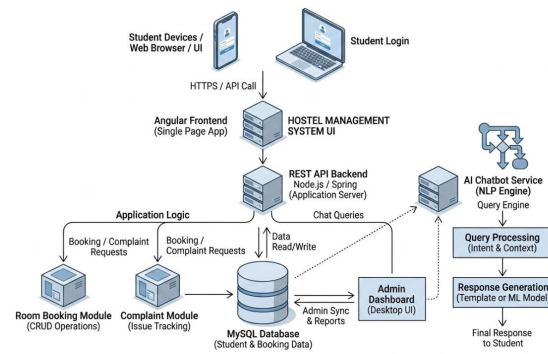
4 System Architecture

The proposed Hostel Management System follows a web-based client-server architecture designed to support efficient communication between users, administrators, and system services. The architecture integrates modern web technologies with an AI-based chatbot to provide automated hostel management and real-time user support.

The system architecture consists of four major components:

- User Interface Layer
- Application Layer
- Database Layer
- AI Chatbot Layer

These components interact with each other to ensure smooth data flow, secure data storage, and efficient service delivery.



4.1 User Interface Layer

The User Interface Layer provides the front-end interaction between users and the system. It is developed using Angular, which enables the creation of a responsive and user-friendly web interface.

Students and administrators access the system through this layer to perform various operations such as room booking, complaint submission, and information retrieval. The interface communicates with backend services through REST APIs to process user requests and display results.

4.2 Application Layer

The Application Layer handles the core system functionality and business logic. This layer is implemented using Node.js and Spring Boot, which process user requests, manage authentication, and coordinate interactions between the frontend and the database.

The backend services expose RESTful APIs that allow the frontend application to perform operations such as:

- user authentication
- room booking requests
- complaint management
- data retrieval and updates

This layer ensures that all system operations are processed securely and efficiently.

4.3 Database Layer

The Database Layer is responsible for storing and managing system data. A MySQL database is used to maintain information related to students, room allocations, complaints, payment records, and system logs.

The centralized database structure ensures:

- secure storage of hostel records
- data consistency and integrity
- efficient query processing
- scalability for handling large

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numbers of users

4.4 AI Chatbot Layer

The AI Chatbot Layer provides intelligent assistance to users by responding to frequently asked queries in real time. The chatbot acts as a virtual assistant that helps students obtain information without requiring direct administrator involvement.

The chatbot can provide responses related to:

- a) room availability
- b) hostel rules and policies
- c) mess schedules
- d) complaint tracking
- e) booking confirmation status

The chatbot interacts with the system database and predefined knowledge base to deliver accurate and timely responses. This significantly reduces response time and improves user experience.

5 System Modules

The proposed Hostel Management System is divided into several functional modules to ensure efficient management of hostel operations. Each module is responsible for handling specific tasks within the system. The primary modules include the Student Module, Admin Module, and AI Chatbot Module.

5.1 Student Module

The Student Module provides students with a digital interface to access hostel-related services and information. This module allows students to perform various operations without requiring direct interaction with hostel administrators.

The key functionalities of the Student Module include:

1) Registration and Login

Students can create accounts and securely log into the system using authentication credentials. The system verifies user information through the database to ensure secure access.

2) Room Booking

Students can check the availability of hostel rooms and submit booking requests through the system. The booking status can also be tracked in real time.

3) Complaint Management

Students can raise complaints related to hostel facilities such as maintenance issues, electricity problems, or water supply interruptions. The system enables students to track the status of their complaints until resolution.

4) AI Chatbot Assistance

Students can interact with the AI chatbot to obtain instant responses to common queries such as:

- a) Room availability
- b) Mess timings
- c) Hostel rules and regulations
- d) Complaint status
- e) Booking confirmation
- f) Profile Management

Students can update their personal information, manage account details, and review booking or complaint history through their profile dashboard.

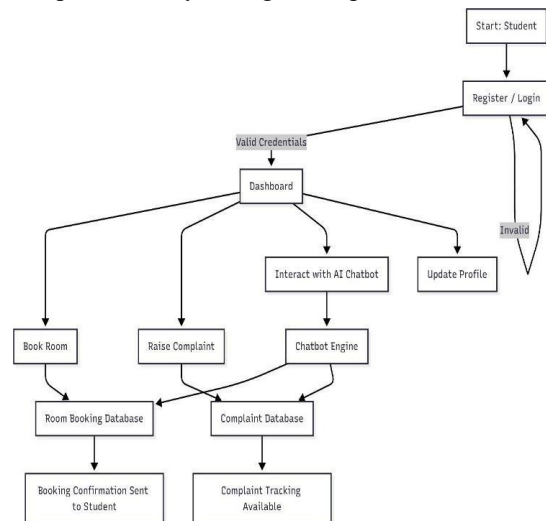


Figure 2: User Component

5.2 Admin Module

The Admin Module provides administrators with tools to manage hostel operations efficiently. Through this module, administrators can monitor student activities, manage hostel resources, and ensure smooth hostel management.

Key functionalities of the Admin Module include:

1. Student Data Management

Administrators can view, update, and manage student records stored in the database.

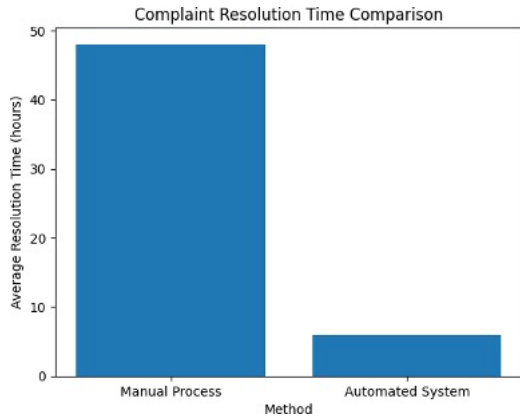
2. Room Allocation

Admins can approve or reject room booking requests submitted by students and manage hostel room availability.

3. Complaint Resolution

Administrators can monitor complaints submitted by students and update their resolution status once the issue is addressed.

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4. Chatbot Analytics

The system allows administrators to analyze chatbot interaction logs to identify frequently asked questions and improve chatbot responses.

5. System Monitoring

Administrators can monitor system activities, track hostel occupancy, and generate reports related to hostel operations.

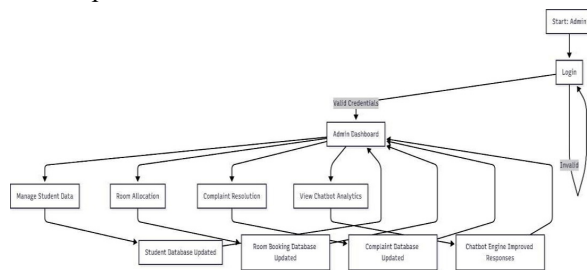


Figure 2: AdminComponent

5.3 AI Chatbot Module

The AI Chatbot Module functions as an intelligent virtual assistant integrated within the hostel management platform. It provides automated responses to frequently asked questions and assists students in navigating the system.

The chatbot offers the following functionalities:

- Real-time response to student queries
 - Information about hostel facilities and services
 - Assistance with complaint tracking and booking status
 - Continuous availability for 24/7 user support
- By automating routine queries, the chatbot reduces the workload on administrators and ensures that students receive timely information.

5.4 Additional Functionalities

The system also supports additional features that enhance the usability and efficiency of hostel management operations.

Online Payment Integration

Students can pay hostel fees or other charges through secure online payment systems, generating digital receipts for transparency.

Attendance Tracking

Students can record their attendance through digital mechanisms such as QR codes or biometric systems.

Mess Menu and Feedback System

Students can view weekly mess menus and submit feedback regarding meal quality.

Visitor Management

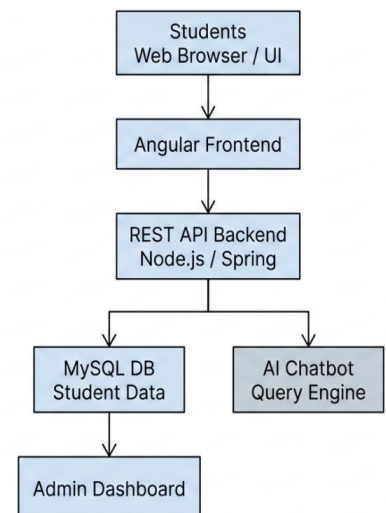
Students can request visitor passes, which can be approved or rejected by administrators and verified through QR codes.

Leave Application System

Students can submit leave requests through the system, which administrators can review and approve.

6 Implementation

The proposed Hostel Management System was implemented using modern web development technologies to ensure scalability, reliability, and efficient performance. The system follows a web-based client-server architecture where the frontend interface communicates with backend services through RESTful APIs. The implementation integrates multiple components including the user interface, backend services, database management system, and an AI chatbot module.



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6.1 Frontend Implementation

The frontend of the system was developed using Angular, which provides a dynamic and responsive user interface. Angular enables the creation of modular components that allow users to interact with the system efficiently.

The frontend interface includes several modules such as student registration, login authentication, room booking, complaint submission, and chatbot interaction. Angular services are used to communicate with backend APIs, ensuring seamless data exchange between the client and server.

The responsive design ensures that the system can be accessed through different devices, including desktops and mobile browsers.

6.2 Backend Implementation

The backend services were implemented using Node.js and Spring Boot, which handle application logic, authentication, and data processing. These backend frameworks expose RESTful APIs that allow the frontend application to perform operations such as user authentication, booking requests, complaint management, and data retrieval.

The backend also manages communication between the user interface and the database, ensuring secure data processing and efficient request handling.

Key backend responsibilities include:

- a) Processing user requests
- b) Managing authentication and authorization
- c) Handling room booking transactions
- d) Updating complaint status
- e) Providing APIs for chatbot data access

6.3 Database Implementation

A MySQL relational database was used to store and manage system data. The database maintains structured records related to students, room availability, bookings, complaints, payments, and chatbot interaction logs.

The database schema was designed to ensure data integrity, consistency, and efficient query execution. Relationships between entities such as students, rooms, bookings, and complaints enable the system to retrieve information quickly and accurately.

6.4 AI Chatbot Integration

The AI chatbot was integrated into the system to provide automated assistance for common user queries. The chatbot processes user messages and provides responses based on predefined knowledge

bases and query matching mechanisms.

The chatbot interacts with the system database to retrieve information such as room availability, complaint status, and hostel rules. This integration enables the chatbot to deliver real-time responses and assist students without requiring manual intervention from administrators.

6.5 System Deployment

The system can be deployed on a web server environment where the frontend application, backend services, and database operate together. The modular architecture allows the system to scale for larger institutions by increasing server capacity or integrating cloud infrastructure.

7 Results and Discussion

The proposed Hostel Management System was evaluated based on system efficiency, response time, user interaction, and administrative workload reduction. The evaluation was conducted by testing different system functionalities such as room booking, complaint management, and chatbot query handling. The results demonstrate that the proposed system improves hostel administration processes compared to traditional manual systems.

7.1 System Efficiency

The automated hostel management platform significantly reduces the time required for administrative tasks. In traditional systems, hostel room allocation and complaint registration often involve manual record keeping and communication through physical forms or emails.

With the implementation of the proposed system, these tasks are performed digitally through an integrated web platform. Students can submit booking requests and complaints online, while administrators can review and update request status through a centralized dashboard.

Experimental observations show that room allocation and complaint registration processes are completed within minutes instead of hours, thereby improving operational efficiency.

7.2 Chatbot Performance

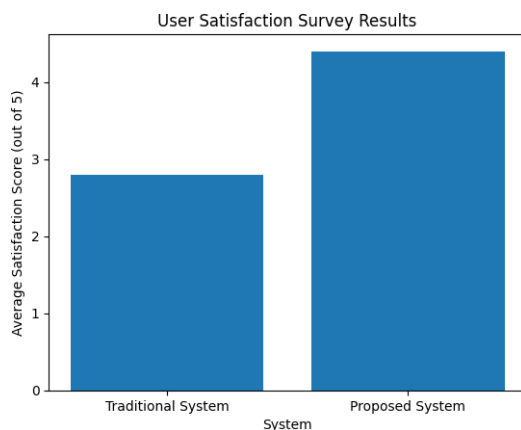
The integrated AI chatbot was tested to evaluate its ability to handle frequently asked student queries. The chatbot successfully responded to common questions related to hostel facilities, mess timings, room availability, and complaint tracking.

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The average response time for chatbot queries was observed to be less than 5 seconds, which is significantly faster than traditional email or administrative responses. Furthermore, the chatbot was able to resolve a large percentage of routine queries without requiring administrator intervention. This demonstrates that the chatbot can effectively reduce the workload of hostel staff while improving accessibility for students.

7.3 User Satisfaction Analysis

A usability evaluation was conducted by collecting feedback from students who interacted with the system. The majority of users reported that the platform was easy to use and improved access to hostel services. Students particularly appreciated the ability to check room availability, submit complaints online, and receive immediate responses from the chatbot. The feedback indicates that the system enhances transparency and communication between students and administrators.



7.4 Performance Comparison with Traditional System

The proposed system was compared with traditional hostel management approaches based on several operational parameters. The comparison shows that the proposed system significantly improves efficiency, transparency, and response time.

Parameter	Traditional System	Proposed System
Room Allocation Time	Several hours	Few minutes
Complaint Registration	Manual	Online
Query Response Time	1–2 hours	< 5 seconds
Data	Paper-based	Centralized Database

Management

Administrative Workload	High	Reduced
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7.5 System Scalability and Reliability

The system architecture supports scalability and reliable performance through its modular design. The use of REST APIs allows smooth communication between system components, while the MySQL database ensures secure and consistent data storage.

Additionally, the integration of AI-based chatbot assistance enables continuous user support without requiring additional administrative resources. This makes the system suitable for deployment in large educational institutions with a high number of hostel residents.

8 Future Work

Although the proposed Hostel Management System provides an efficient platform for managing hostel operations, several enhancements can be implemented in the future to further improve system functionality and user experience.

One potential improvement is the development of a mobile application that would allow students and administrators to access hostel services directly from smartphones. A dedicated mobile application would improve accessibility and provide faster interaction with system features such as room booking, complaint tracking, and chatbot support.

Another enhancement involves cloud deployment of the system infrastructure. Deploying the platform on cloud environments such as AWS, Microsoft Azure, or Google Cloud would improve system scalability, reliability, and availability. This would allow the system to support multiple hostels or campuses within large educational institutions.

Future versions of the system could also incorporate advanced Natural Language Processing (NLP) techniques to enhance the capabilities of the AI chatbot. With improved NLP models, the chatbot would be able to understand complex queries, perform sentiment analysis, and provide more context-aware responses to student inquiries.

Additionally, the system could be extended to include advanced analytics and decision-support tools. These features could provide administrators with insights into hostel occupancy trends, complaint frequency patterns, and resource utilization, enabling data-driven decision-making.

Finally, integration with smart technologies such as

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biometric authentication, RFID-based attendance tracking, and IoT-enabled hostel monitoring systems could further enhance security and automation within hostel facilities.

By incorporating these improvements, the proposed system can evolve into a more intelligent, scalable, and comprehensive platform for hostel management in modern educational institutions.

9 Conclusion

The management of hostel facilities in educational institutions often involves complex administrative tasks such as room allocation, complaint handling, and maintaining communication between students and administrators. Traditional approaches based on manual records or limited digital tools frequently lead to delays, inefficiencies, and lack of transparency.

This paper presented a web-based Hostel Management System integrated with an AI-powered chatbot designed to automate hostel operations and improve service delivery. The proposed system utilizes Angular for the frontend interface, Node.js and Spring Boot for backend services, and MySQL for centralized data storage. The integration of an AI chatbot enables students to obtain real-time assistance for common queries, reducing the dependency on administrative staff.

The implementation of the system demonstrates that automating hostel management processes can significantly improve operational efficiency, reduce manual workload, and enhance accessibility to hostel services. Features such as online room booking, complaint tracking, and chatbot-based assistance contribute to faster response times and improved user experience.

Overall, the proposed platform provides a scalable and efficient solution for modern hostel management and highlights the potential of integrating conversational AI with web-based administrative systems in educational institutions.

References

1. Martin Fowler – Patterns of Enterprise Application Architecture – Addison-Wesley, 2002 – Accessed on 06 Sept 2025.
2. Angular Team (Google) – Angular Official Documentation – <https://angular.io> – Created: 2016 – Accessed on 06 Sept 2025.
3. OpenJS Foundation – Node.js Official

Documentation – <https://nodejs.org> – Created: 2009 – Accessed on 06 Sept 2025.

4. Oracle Corporation – MySQL Documentation – <https://dev.mysql.com> – Created: 1995 – Accessed on 06 Sept 2025.
5. IEEE Xplore Digital Library – Chatbot Technology in Education – IEEE, 2020 – Accessed on 06 Sept 2025.
6. Deshpande, M. et al. – An AI Integrated Online Hotel Management System – STM Journals, 2022 – Accessed on 06 Sept 2025.
7. Swaminathan, J. N. et al. – AI-Powered Assistant for College Management and Decision Making – IJRASET, 2025 – Accessed on 06 Sept 2025.
8. Debnath, B.; Agarwal, A. – A Framework to Implement AI-Integrated Chatbot in Educational Institutes – Journal of Student Research, 2020 – Accessed on 06 Sept 2025.
9. Gawade, H. et al. – College Enquiry Chat-Bot System – IJERT, 2020 – Accessed on 06 Sept 2025.
10. Janthakal, S. et al. – AI-Based Chatbot for College Management System – IJRASET, 2023 – Accessed on 06 Sept 2025.