



GuestGuard: College Visitor Tracking Solution

¹Hemangshu Dey, ²Chiranjeev Sehgal, ³Neha Singhal

¹Student, ²Student, ³Assistant Professor

¹Department of Computer Science,

¹Christ (Deemed to be University), Bangalore, India

Abstract: GuestGuard is a College Visitor Gatepass Generator and Tracking web application designed to address the challenges posed by the absence of a centralized tracking system and an online portal for visitor gate pass at Christ University. The system aims to enhance security, efficiency, navigation and emergency preparedness by implementing an online portal, GPS tracking, and a college navigation system. There will also be a centralized database where the information of the visitors will be recorded where the admins can see all the details of the visitors.

IndexTerms - Gatepass, Navigation, Visitor, Emergency, GPS

I.INTRODUCTION

The web application seeks to increase performance and security by providing online access to visitors by generating gate pass [1] and centralized tracking system for visitors. The GPS [2] tracking functionality will provide live location of visitors which will increase the overall security of the system. By introducing an online access that also guarantees security, the web application will help overcome major weaknesses at Christ's University visitor management system safely implemented. A college transportation system will also be developed to improve visitor satisfaction and campus navigation. The overall objective of the proposed solution is to improve the Christ University visitor experience, speed up scheduling and increase safety.

A. Objectives

1.Establishing Centralized Visitor Tracking:

- Develop an online portal where visitor can register by giving some basic details about them like purpose of visit, email, duration of visit etc.
- Make a centralized database for the registered visitors to keep track of them within the campus.

2.Efficient Gate Pass Generation:

- Give the visitors the option to generate the gate pass after giving some basic details about them which will be reflected in the gate pass.
- Issue the gate pass to the visitors with essential information, serving as entry permits.

3.Enhancing Security with QR Code Verification:

- The generated gate pass will have a QR code so that the security guards can check the authenticity of the gate pass.

4.GPS Tracking for Enhanced Security:

- Add a GPS tracking feature in the web application so that the location of the visitors can be tracked at any time within the campus.
- The GPS tracking will be real time for added security.

5.Seamless College Navigation:

- Implementation of a navigation feature so that the visitors can be helped with navigation within the campus.
- Provide real-time directions to designated areas, offices, or facilities.

6.Streamlining Visitor Check-out Process:

- Enable visitors to log out through the portal upon completion of their visit.
- Update the centralized database to mark the end of the visitor's stay, ensuring accurate tracking.

7.Emergency Preparedness:

- Facilitate quick overview of visitor locations in case of emergencies, aiding in quick response and management.
- Enhance the university's emergency preparedness by taking help of the system's tracking capabilities.

B. Motivation

The project aims to transform the business model of other colleges and institutions such as Christ's University by addressing critical deficiencies in visitor management. By introducing a comprehensive online platform with features such as centralized tracking system, online gate pass application, real-time GPS tracking capability, and college transportation system, the project seeks to improve security, efficiency, compliance and safety. The acceleration depends on recognizing the current reliance on offline systems, which can reduce security and create security flaws. Utilizing the latest technology and prioritizing the safety, compliance

and comfort of every visitor, the project aims to provide a unique solution to create a conducive and safe environment for learning and collaboration at the institution in.

C. Contribution

The contribution of the proposed project varies. First of all, by utilizing centralized database and live GPS tracking capabilities, the application will significantly increase safety and security on college campuses by reducing the chances of unauthorized entry in the campus. Second, using a web-based interface for gate pass applications will streamline administration, and improve efficiency and compliance with visitor management guidelines. Third, engage college tourism program visitors through tours facilitating the campus and providing accessibility and ease of use will provide an overall better experience for. Ultimately, these improvements will create a safer, more efficient and welcoming environment at Christ University, and improve the experience for students and external visitors.

D. SDG Goals

SDG 3: Good Health and Well-being

The project improves the safety of students, employees, and visitors to the university by strengthening security measures and guaranteeing a methodical approach to visitor tracking.

SDG 4: Quality Education

Through the implementation of an online portal and a college navigation system, the project seeks to enhance the quality of education by providing a more effective and secure learning environment.

SDG 9: Industry, Innovation, and Infrastructure

The project comprises creating and launching a cutting-edge web portal that uses GPS tracking technologies. This is in line with the objective of encouraging innovation and constructing robust infrastructure.

SDG 11: Sustainable Cities and Communities

The college navigation system encourages wise, sustainable urban development within the campus environment, making the university campus more accessible and sustainable. The initiative improves justice and security within the institution by putting in place a centralized tracking system, which addresses security concerns.

SDG 16: Peace, justice, and strong Institutions

The initiative improves justice and security within the institution by putting in place a centralized tracking system, which addresses security concerns.

II. LITERATURE REVIEW

I. Gowtham et al. describes a Visitor Gate Pass Management System (VGPMS) that uses biometrics and RFID to provide safe entry management in establishments. The system uses a web interface that allows staff members to upload visitor information and create gate passes. It was created using an iterative Software Development Life Cycle. Group leaders must first authorize online before security checks are performed. Database tables, Entity-Relationship Diagrams, and barcoded passes all help ensure consistent and effective information retrieval.

RFID, biometric authentication, CCTV, IP address tracking, email alerts, and comprehensive report generating are some of the key features of VGPMS. The relational database model with eight tables in the system prevents redundancy and guarantees data integrity.

Standout features include visitor details display, automatic email notifications, barcoded passes for simple recovery, and extensive reporting. Because of the system's independence, there are no dependencies on outside parties [3].

PM Kiritbhai et al. describes the design for an automated gate pass system that lets students move around campuses utilizing facial recognition technology. To process videos in real time, student images shot in different conditions are put into a database. The system uses a VGG16 deep learning model to identify students, provide gate passes, and update student data. The proposed architecture monitors student activities through an admin-controlled graphical user interface (GUI). Following evaluation, the system which sends student notifications via the Twilio SMS API—achieved an accuracy of 98.34. The document covers the system flow, dataset, and GUI operations and emphasizes planned upgrades including mask detection and parental notifications [4].

RJA Sunico et al. developed a project whose aim was to create and assess an automated gate pass system for the Del Carmen campus of Surigao State College of Technology. The system was created with the Rapid Application Development (RAD) Model in mind, utilizing technologies such as PHP, MySQL, and XAMPP. Its purpose was to facilitate and keep track of records of visitors, staff members, and students entering the campus gate. The research used an input-process-output (IPO) model and adhered to the System Development Life Cycle (SDLC). System analysis, design, development, deployment, and evaluation were all done in compliance to the ISO 9126 usability and functionality requirements.

Positive reviews on usability (4.13) and functionality (4.30) were found in the results. The technology proved effective in handling gate pass transactions, enhancing security, and giving the management quick feedback. The results indicate that respondents strongly agreed about the system's security features [5].

K Kaji et al. provides an article which offers a method for identifying gate passes in indoor settings using Wi-Fi signal strength and smartphone accelerometers. The method finds major changes in Wi-Fi environments, detects Wi-Fi significant places, and compares two types of traveling distances based on accelerometer data and Wi-Fi signal strength. If a abrupt turn is seen, it is

assumed that the user is passing through a gate. The authors offer a simple method for locating Wi-Fi hotspots using accelerometer-based step estimates and the Seidel model of signal propagation. Real-world scenarios are extended by accounting for numerous WiFi information sources and fluctuation in Received Signal Strength Indicator. An experimental evaluation in an interior environment with nine doors shows a recall of 76 and a precision of 59 for gate-passing detection [6].

Manvith et al. created an effective gate pass and exit management system required due to the rise in school and college enrollment. An automated solution was required since traditional manual techniques are prone to delays and mistakes. GATEZEE is a sophisticated gate pass management system that uses a paperless approach to expedite the procedure. Interactive dashboards, organized processes involving mentors, teachers, students, and security staff, as well as user-specific features are all included. Requests are sent to the Head of Department (HOD) and the relevant faculty member or mentor for prompt review and approval. To prioritize emergency instances, the system makes use of sentiment analysis and word processing. Furthermore, GATEZEE uses QR code authentication to make sure that only people with permission can enter, preventing unauthorized admission. The application has a phone and email notification system [7].

Watile et al. presented an article in order to validate and identify people. The article presents a security system built for industrial gates that uses facial recognition technology. Its main objective is to increase security by automatically creating gate passes for visiting people in government, military, and industrial campuses. OpenCV, Python, Raspbian OS, and the Raspberry Pi module are important components.

The technology uses a camera to take a person's digital picture when they enter. Facial features are identified and extracted using the Principal Component Analysis technique, and subsequently cross-referenced with a database that has been granted access. The gate opens and the entry is noted if the person is identified. The technology creates a gate pass and restricts admission to unauthorized persons.

The Raspberry Pi, IR sensor, Raspberry Pi camera, LM358 IC, and L293D motor are examples of hardware components. Software components comprise Raspbian OS, Embedded Linux, OpenCV, and Python [8].

Rodrigues et al. introduces an article for the Smart Gate Pass Security Management System, which utilizes random key generation to enhance corporate security. The authors created the system, which aims to replace traditional methods for visitor registration. The goals of the Gate Pass Management System (GPMS) are to improve management efficiency, reduce offline record-keeping issues, and strengthen security.

Important components of the system include web, Android, and hardware for gate access control. Users fill out the Android app with their details after registering on the website. An OTP (One-Time Password) is sent to the visitor's email, enabling them to access the gateway. To avoid numerous entrances or exits, the device locks the door automatically [9].

Gunawan et al. wrote an article about the use of Radio Frequency Identification (RFID) technology to construct a gate pass system at the Islamic University of Riau campus. The technology, which was created by Hendra Gunawan and Evizal Abdul Kadir, combines academic data about students with an RFID gate pass system to improve security and expedite access control.

Numerous uses of RFID technology are highlighted in the related works section, including asset tracking, toll collecting, vehicle license plate number tracking, and RFID authentication methods. The authors stress the increasing importance of RFID in tracking and identifying systems that operate automatically.

RFID readers, local databases, and microcontrollers are all used in the construction of the RFID gate pass system. Based on data collected from the RFID reader, the Arduino microcontroller regulates the barrier gate [10].

Kumar et al. introduces a facial recognition technology-based automated gate pass generation system for college hostels. The suggested solution seeks to solve the inefficiencies and error-proneness of traditional manual systems, as well as their lack of effective tracking tools. It takes digital pictures of the faces of the pupils, extracts their features accurately using an enhanced Canny edge detection technique, and authenticates the results by comparing them to a database. The process of implementation involves employing SQL Server, ASP.NET, and C.NET to create a student database. Real-time face matching, blocking illegal users, time-based pass generation, reporting during off-peak hours, and SMS alerts are some of the important features. All things considered, the system provides greater accuracy, efficiency, and security when it comes to controlling student movements on campus [11].

Raja et al. in order to streamline the entry/exit verification procedure, presented the report suggests integrating Aadhaar with the Identity Card Management System to operate an offline security gate. The visitor permit management portal's integration of Aadhaar ID enables appointment scheduling through registration from any location in India.

In order to function independently in both offline and online modes, an offline security gate operation is developed, which automatically updates data on people who are contacting the Unique Identity Authority of India server for the first time. Through Aadhaar scanning, the system uses a single global Aadhaar ID to save the data in the local database and provide offline access when connectivity is unavailable. This lowers expenses and labor force.

With the Aadhaar ID, the planned system allows for authentication, registration, validation, and appropriate identification in a secure manner for entry and exit [12].

Hamid et al. presented a paper which discussed the creation and deployment of the IAGS automated gate system, which uses QR codes and is intended for small businesses with medium-level safety concerns. The gate can be opened without setting off the alarm by using legitimate staff QR code pass cards. The system also has the ability to connect to the internet and send out email notifications in real time when any unlawful activity occurs.

To guarantee data integrity, it encrypts the QR code pass cards and logs all personnel arrivals and departures. The system makes use of components including a camera, servo motor, Arduino microcontroller, Piezo buzzer, and PIR motion sensor.

The software is 99 percent accurate in identifying QR codes, and it is implemented in VB.NET [13].

III. METHODOLOGY

A. Designing

Visitor Registration:

Visitors access the online portal and register their visit. Provide necessary details, including purpose, date, and estimated duration of the visit.

Gate Pass Generation:

Upon successful registration, visitors receive a pass via the online portal. The pass includes essential information and serves as an entry permit.

Campus Entry:

Visitors present their generated gate pass at the entrance. Security personnel verify the QR code for quick verification.

GPS Tracking:

For enhanced security and monitoring, GPS tracking can be opted. The system tracks and records the locations visited by each visitor during their time on campus.

College Navigation Assistance:

Visitors can access the navigation feature on the portal. The system provides real-time directions to designated areas, office, or facilities within the campus.

Visitor Check-out:

Visitors log out through the portal upon completion of their visit. The system updates the centralized database and marks the end of the visitor's stay.

Emergency Preparedness:

In case of emergencies, the system provides a quick overview of visitor locations in case of unforeseen situations.

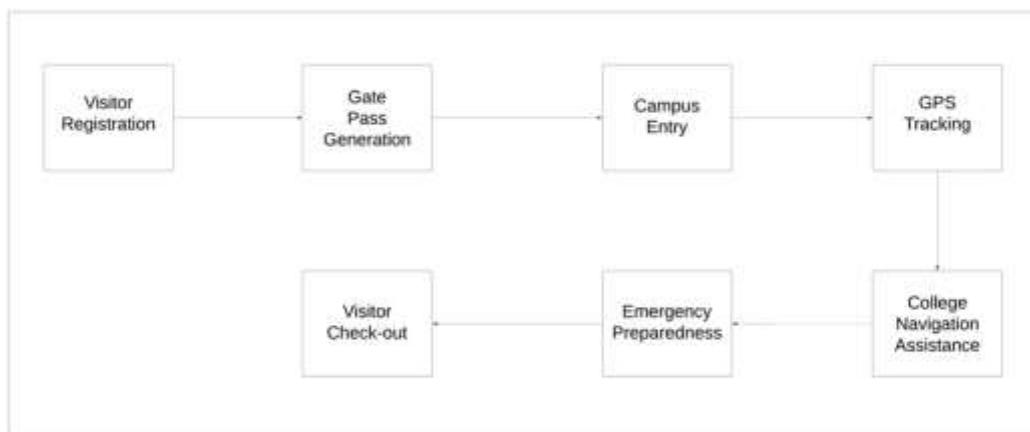


fig. 1. methodology

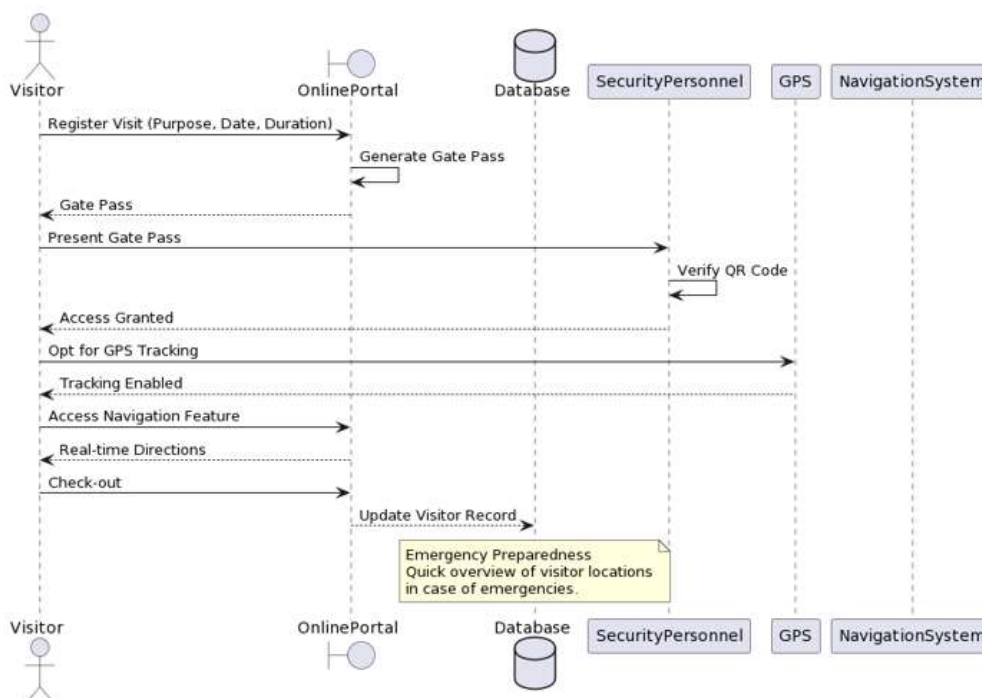


fig. 2. sequence diagram

B. Web Based Frontend (Client Side)

The technology used for creating the user interface of the website is React [14] and it will have a publicly hosted frontend where visitor of any institute or corporate office can register. Choosing React as our frontend technology enabled us the opportunity of building server-side rendering. It gave us the advantage of building both frontend and backend code. They will be able to add personal information including name, email, phone number, address, id number, purpose of visit for generating the gate pass. For signing in, the user needs to give their name, email ID and password after which they will be able to land in the gate pass generation page where they will be able to generate their gate pass. The details of the visitors will be stored in a central database for future references. The website will also have features like navigation and FAQ (Frequently asked questions) for better experience inside the campus.

The website will also have an admin page where the admin will be able to see the details of the visitors visiting the campus. From there the admin can send notifications to the registered visitors an emergency message in case of an emergency.

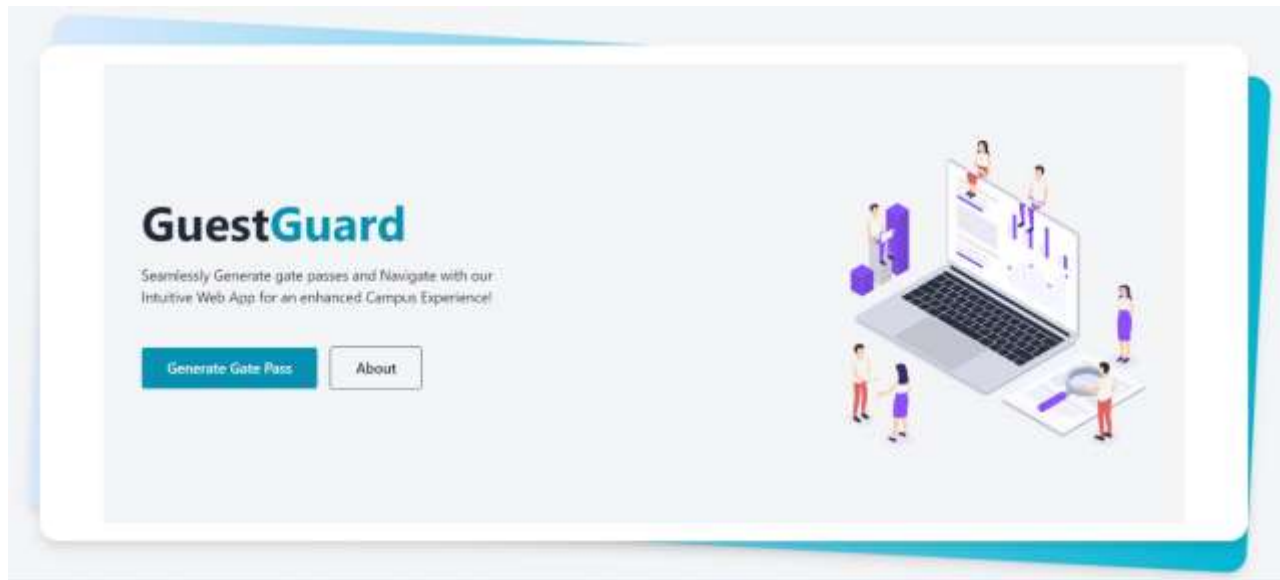


fig. 3. dashboard

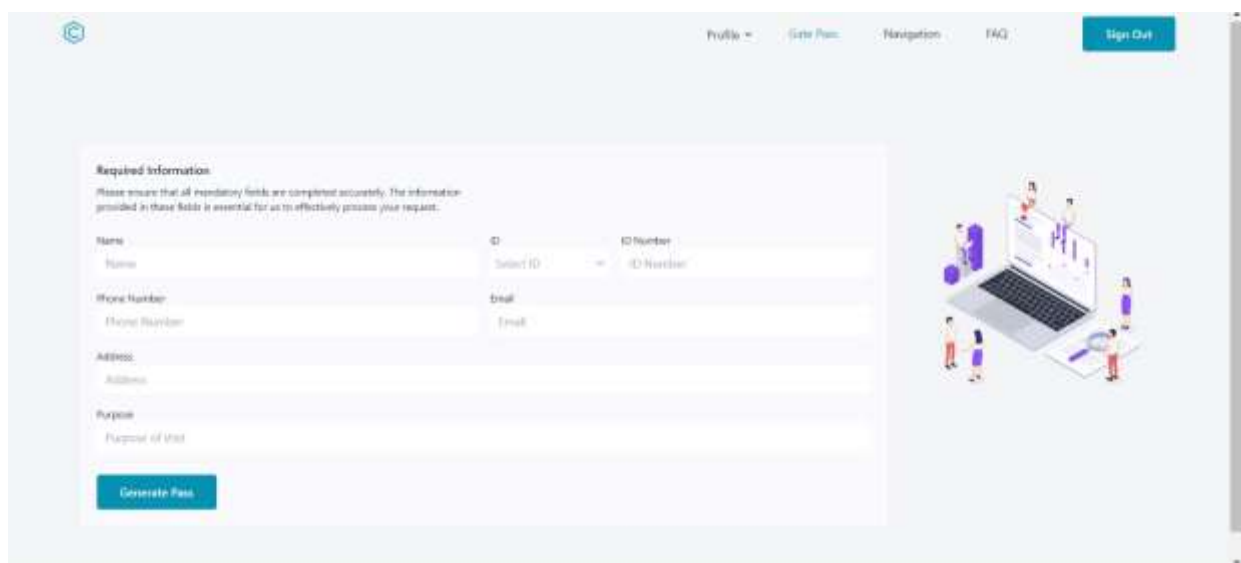


fig. 4. gate pass generation page

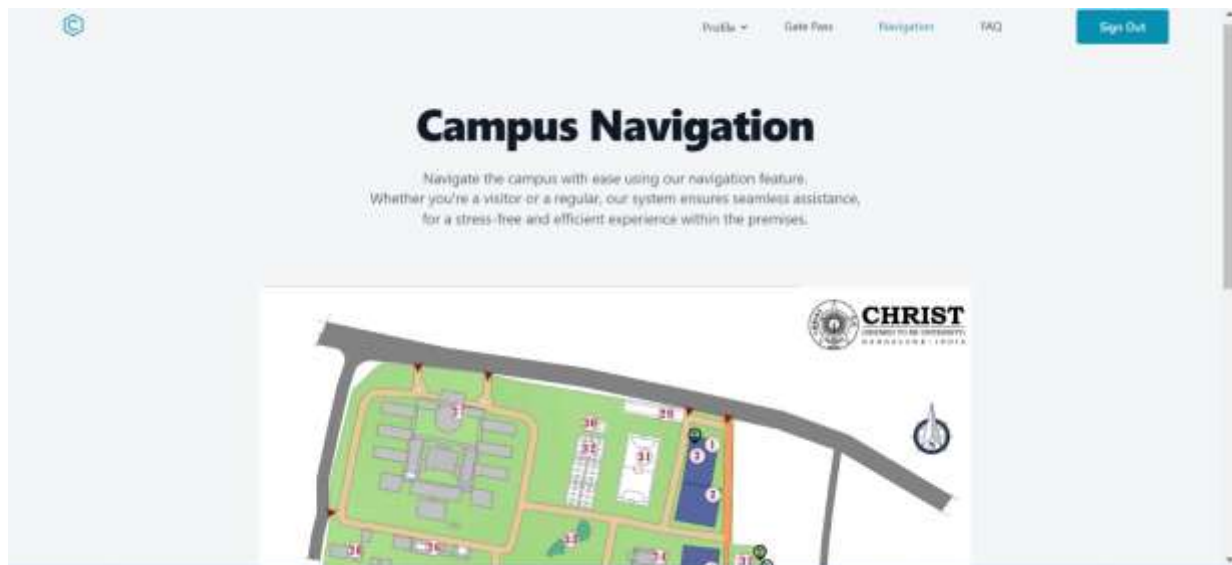


fig. 5. navigation page

Phone Number	Full Name	Email	Gate Pass ID	Purpose	Alert
6296207131	Hemangshu Dey	hemangshu7904@gmail.com	532423164221	Fast	<input type="button" value="SEND ALERT"/>
7765211629	Adesh K Dash	adesh@gmail.com	53242395252	Survey	<input type="button" value="SEND ALERT"/>
6763721132	Arshabh Gaurav	arshabh@gmail.com	53242342964	Admission	<input type="button" value="SEND ALERT"/>
9987612312	Akhshay Dutta	akhshay@gmail.com	532422594611	Entrance	<input type="button" value="SEND ALERT"/>

fig. 6. admin page

C. Database

The technology used in the web app is Firebase [15] by Google. Firebase is used because of additional features it provides like auth functions for checking email and password and fixing app crashes, tracking analytics, products experiment and creating marketing opportunities. Whenever a new user tries to register in the website, their email and password is collected. The user can add various personal details like id number, purpose etc. all of which get stored in firebase's firestore.

When registered users try to sign in, their email and password is verified against the details stored in the database. The admin can fetch the details of the visitors from the database who have generated a gate pass for future references. In the admin page there will also be a chatting function where the admins can communicate with each other.

IV. CONCLUSION AND FUTURE SCOPE

In conclusion, Christ University's complicated problems of visitor tracking and gate pass application are fully solved by the GuestGuard web application system. By integrating online tracking, GPS tracking, and college navigation systems, the project aims to improve security measures, improve efficiency, and encourage emergency preparedness on campus intensity. The project documentation goes into great detail about the main objectives of the program including creating, facilitating gatepass generation, adding QR code verification for additional security, and adding GPS tracking to manage visitors travel in real time.

Combined with these incredible capabilities, GuestGuard not only closes current gaps in user experience, operational efficiency and security design, but also drives visitor management systems in educational institutes at the top. A new and innovative solution together with the working group led by Chiranjeev Sehgal and Hemangshu Dey was developed that will hopefully transform the visitor management system of Christ University. Dr. Neha Singhal provided expert support to the team. The development of the GuestGuard site security protocol is a testament to the transformative power of technology in flexible business processes. Once completed, the project has a lasting impact on the nature of visitor management programs and demonstrates the value of teamwork and creativity in improving the campus experience for students in academic institutions.

With the GuestGuard system, Christ University's visitor management could potentially grow even more in the future. Improving the GPS location tracking function to offer more thorough insights into visitors' travels throughout the campus is one area for growth. With the use of this technology, the system is able to provide real-time visitor tracking, facilitating effective monitoring and guaranteeing improved security protocols.

Additionally, investigating the incorporation of biometric authentication techniques can fortify security measures and expedite guests' check-in and check-out procedures. Advanced analytics and machine learning algorithms could also be implemented to improve operating procedures, forecast visitor behavior, and analyze visitor data patterns.

Future growth and innovation in visitor tracking solutions at educational institutions like Christ University appear to be headed in promising directions. These include embracing emerging technologies like Internet of Things (IoT) for smart campus integration and utilizing data analytics for continuous system enhancement.

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