

# Gate Pass Management and Monitoring System Powered by Raspberry Pi

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## Abstract

A significant amount of data is gathered on college premises including tracking faculty and student attendance, transportation information, and outside visitors. This data needs to be gathered and maintained. Traditional methods include having a designated authorized person manually record it. This can be a difficult task at times, and a lot of time is wasted. To solve this issue, we are developing an application that can store it effectively and assist us in retrieving the important data that is being generated and can be utilized for a variety of different purposes. The system created could use scanner machines to automatically fetch the data, which could then be fed into the system and the application created is user-friendly.

## Keywords

Server, Gate pass management, Raspberry Pi, Cloud, Nanotechnology

## Introduction

Nanotechnology-enhanced gate pass management and monitoring system seamlessly integrated with Raspberry Pi. In an era where precision and efficiency are paramount, our cutting-edge solution redefines the standards of gate pass management. By leveraging the power of nanotechnology, our system introduces a level of accuracy and sophistication that goes beyond conventional methods. The fusion of nanotechnology and Raspberry Pi technology creates a robust platform capable of delivering secure and seamless entry experiences.

The system is being built in such a way that it tries to avoid generating any errors. The system also provides error messages when invalid data is entered. The system created is error-free, secure, and reliable. Log files can be generated whenever any information is required for verifying the data. A gate pass management system is an important tool for ensuring the security and safety of any secured area. By allowing only authorized individuals to enter and exit the area, it helps to prevent unauthorized access.

One of the key features of a gate pass management system is to store data of people visiting the college. This system generally stores an individual's name, photo, and the reason for their visit, as well as the duration of their access. This information allows the gate pass management system to monitor and control access to the secured area, ensuring that only those with a valid gate pass are allowed entry. In addition to controlling access, a gate pass management system can also be used to generate reports and logs of all access activity. This provides a record of who has entered and exited the secured area, which can be helpful for security purposes and for tracking the movement of individuals within the area.

We have created a QR code scanner which is built using Raspberry Pi whenever a student enters a college his college ID is scanned and if it matches with the

records in the database the LED light blinks and the timings of the particular student is stored in cloud and if the ID doesn't match with the database the LED doesn't blink which means it is not present in the database.

Another benefit of a gate pass management system is that it can help to improve the overall efficiency and organization of the secured area. By streamlining the process of granting access to authorized individuals, the gate pass management system can help reduce congestion and improve traffic flow in and out of the area. This can help to improve the overall experience of those visiting the secured area. Overall, a gate pass management system is an essential tool for ensuring the security and safety of any secured area. By controlling access and providing a record of access activity, the gate pass management system can help to prevent unauthorized access and improve the overall efficiency and organization of the secured area.

Banait et al. proposed a system to track the data of the students, faculty and visitor's info using the RFID reader and card and here if any visitors come the faculty need to approve it and everything will be stored in the database [1]. Anwar et al. proposed the model UTAUT to determine the acceptance of visitor. The main aim of this project was knowing the visitors where they are [2]. Karimah et al. developed a VIMS Application and Design. This captures new visiting record and assignment of visitor pass. Visitor's information in a database server in a particular manner which helps to generate report and search a particular thing. E-VIMS able to record visitor information during visitor registration by using visitors Malaysia Government Multipurpose Card (MyKad) [3]. Rapahtiwari et al. paper aims for gate pass using Raspberry Pi. The motto of this paper was to save paper and use technology like sending email and SMS [4].

Sunico et al. proposed a system which was able to track the monitoring of students, visitors, and employees entering the college. The system's planning, design, creation, deployment, and testing all followed the Rapid Application Development model. Additionally, software like XAMPP, MySQL, and PHP (Hypertext preprocessor) were used to create and implement the system. The system developed had helped in monitoring who passed through the premises and thus for the administration, this approach assisted in generating feedback [5].

Gaur et al. proposed a system which made it possible to keep track of entry and exit actions inside the specified premises efficiently and precisely. Since pen and paper could be problematic for both visitors and the security staff, this approach has helped eliminate their use. Recording all the necessary data becomes simple if the administrator could learn how to manage the system. The primary goal was to make the administrator or appropriate authority's interface simple to use [6].

Watile et al. in their work suggested a "Security System for Industrial Gate and Generation of Gate Pass". From digital photos, the face recognition system automatically helps in the identification and authentication of people. The PCA technique was used to detect the face, extract its features, and compare it to the existing database. The gate will open if the

face matches the existing database, and a gate pass will be automatically generated if an unauthorized person is recognized [7].

Santhanaraj et al. in their work suggested a system "Digital Gate Pass System Using Hybrid Application". It comprises a web application that security personnel, students, and concerned head of the department (HOD) can use. The interface includes time intervals and the reasons for exit, which are both stored in the database. In this approach, students apply for exit with reasons, the HOD reviews it from a different application interface, and after approval, it is transferred to a personal security interface where the approval can be viewed. HTML (Hypertext markup language), CSS (Cascading style sheets), JS (Java script), and for server communication in this system, PHP are used. A Cordova plugin is used to package the entire system into an app. This system makes student exits more effective [8].

Raja and Divya proposed a system "Offline Security Gate Operation in Identity Card Management System Using Aadhaar ID". The proposed system enables authentication to be registered with the Aadhaar ID, validated and proper identification to be done in a secured way for entry/exit purposes. Aadhaar ID is integrated with visitor pass management for appointment, data is stored in local database and in offline security it helps us easy to verify. When a person comes with unique identification, offline access at the gate becomes easy as only identification is required which reduces manpower and high cost [9].

Princy and Nigel recommended a method in their paper titled "Implementation of Cloud Server for Real Time Data Storage Using Raspberry Pi." A Raspberry Pi can be configured to function as a private cloud server, which can be utilized as a storage device for applications using real-time signals. Using cloud platforms offered by particular cloud vendors, Raspberry Pi is a less expensive microprocessor in which cloud computing infrastructure can be achieved. The Raspberry Pi can be used as a cloud server that stores data for real-time applications [10].

## Methodology

### Hypertext markup language

HTML is markup language for displaying information sequentially in a browser. Technologies like JS and CSS can help with it. HTML provides a meaningful description of a web page's structure. Foundation of HTML pages are HTML components. Images and other objects, like interactive forms, can be embedded using HTML structures [1]. The HTML documents are rendered into multimedia web pages by web browsers once they are downloaded from a web server or local storage. Using HTML and various elements, including image, text, and submit, a dynamic website was developed such that security personnel could read the details.

### Cascading style sheets

CSS is a style sheet language which is used to present the information of a document created in a markup language, such as HTML, in more ways. CSS is a tool which is used

alongside HTML and JS. CSS was created to make it possible to separate content and presentation, including design, color, and font choices. This division can increase the web's ability to access content. CSS provides rules for different formatting.

### Java script

Along with HTML and CSS, JS is a computer language that is a fundamental component of the World Wide Web. JS, which makes use of third-party libraries, regulates the client-side behaviour of web pages [3]. JS is a high-level, typically just-in-time compiled language. It has first-class functions, prototype-based object orientation, and dynamic typing. It supports paradigms and is multi-paradigm.

### Hypertext preprocessor

It is a general-purpose scripting language. Proceeds on server by an interpreter implemented as module. PHP can be used for many programming tasks outside the web context, such as standalone graphical applications. PHP supports a wide range of protocols, including HTTP, POP3, SNMP, LDAP, IMAP, and many others [2]. The PHP programming language allows you to control which pages on your website visitors may access. PHP can manage forms, which includes gathering user input via forms, saving it to a database, and giving the user useful information.

### MySQL

Structured query language is a popular language for organizing and retrieving database information. MySQL is a relational database management system. MySQL is free and open-source software. The queries include those for inserting, updating, deleting, and selecting records as well as those for creating and dropping tables [11]. It enables us to rapidly discover essential data by arranging data into tables, rows, columns, and indexes. For carrying out database tasks including creating, maintaining, accessing, and finding the data it keeps, each database has a unique.

### XAMPP server

The abbreviation XAMPP is made up of the letters X for Cross-Platform, A for Apache, M for MySQL, and PP for PHP and Perl, respectively. It is an open-source collection of online solutions that also contains command-line executables for multiple servers including the Apache server, MariaDB, PHP, and Perl modules [4]. XAMPP unable to host the website in our local host before deploying in the main server to check if the application is working correctly or not. It is a platform that offers an appropriate setting for reviewing and confirming the functionality of projects created using Apache, Perl, MySQL, and PHP through the host's system. XAMPP serves as a representation of the classification of solutions for various technologies. It offers a framework for testing programs made using various technologies and a personal server.

### Python

Python is a sophisticated language. Garbage collection and dynamic typing are features of Python. Programming language Python supports several paradigms. Functional programming and aspect-oriented programming are supported

by many of its features, while object-oriented programming and structured programming are also completely supported [12]. Python manages memory via dynamic typing, reference counting, and a cycle-detecting garbage collector.

### Raspberry Pi

Raspberry Pi is a small, low-cost computer that is widely used for various projects, including home automation and Internet of Things applications. It is a popular choice for building a barcode scanner because it is inexpensive, has a small form factor, and is easily programmable.

### Raspberry Pi implementation

The information of student in premises can be extracted using the barcode present in his ID card. To access the information. A barcode scanner is required. A barcode scanner is a device that is used to read and interpret barcodes.

Once the software is installed and configured, Raspberry Pi and barcode scanner are used to read and interpret barcodes. This can be done using a simple Python script that reads the data from the barcode scanner and displays it on the screen. All the data of students is stored in the database. Whenever student enters college, his college ID is being scanned using barcode scanner. Raspberry Pi checks with the database and if it matches with the database a LED blink happens which means it is successful and student can enter the college and if it doesn't match then the LED doesn't blink.

Another benefit of using cloud storage for barcode scanning is that it allows for easy sharing of data. With traditional storage methods, data might be stored in a central location and accessed by a limited number of people. With cloud storage, data can be shared with multiple users, making it easier for teams to collaborate and work together.

### Working of web application

A dynamic website is built for a designated person at the gate to monitor the inflow. This website is designed using HTML, CSS, Bootstrap, and JS [5]. This website has different components i.e., student data entry, faculty data entry, visitor's data entry, student's data report, faculty data report, visitor's data report, and college transportation raspberry data.

The website has two logins. The admin login and the security login, the security will be scanning the ID of the student who ever comes late. The scanning will be done by a Pi attached to it, and the data will be saved in the cloud and that is attached to the database. Then here the admin logins can view who has come late daily and they will be having logs day by day and department-wise also [8]. If the student comes more than one time late to college besides his roll number, there will be a frequency count so that the admins can easily see how many times the student came late. In this way, faculties are also done. If the visitor comes generally, we will be writing every data manually to reduce the paperwork we generated [6].

Here if any visitor comes to the college first, we will be taking the phone number and verify if he is a new user or an existing user, if he is a new user we will be taking all the details like to whom they are visiting, with how many people they

have come, what is the purpose of the visit and why are they visiting the college. If the phone number is already registered just, we will be taking to whom they are visiting [7]. Coming to transportation, generally, our security guards will note down the details of the bus at what time the bus is entering the college and at what time it is exiting the college and they will be making the note of the kilometer reading every day so that's the huge task so we have made it simple using this application just we need to select the bus number and click on submit the log data will be stored in the database. And finally, we can view the report of each and everything in detail [10]. So, this makes easy to everyone and if issue comes, we can easily fetch data and sort out the problem. Figure 1 represents the architecture diagram of the system.

### Results and Discussion

Gate pass management and monitoring system was constructed in order to help us identify people who were entering late to the college premises. Every faculty and student had a college ID, which included a distinctive QR code with information specific to each group [13].

A Raspberry Pi-connected QR code scanner was used to scan each person as they entered the campus. The generated data was uploaded to the cloud for storage. The generated data is saved in the database according to several parameters, which may comprise multiple departments [9].

The entry time of the student was also kept in this database, which is highly useful information that allows us to create log files that allow us to know the student's analysis

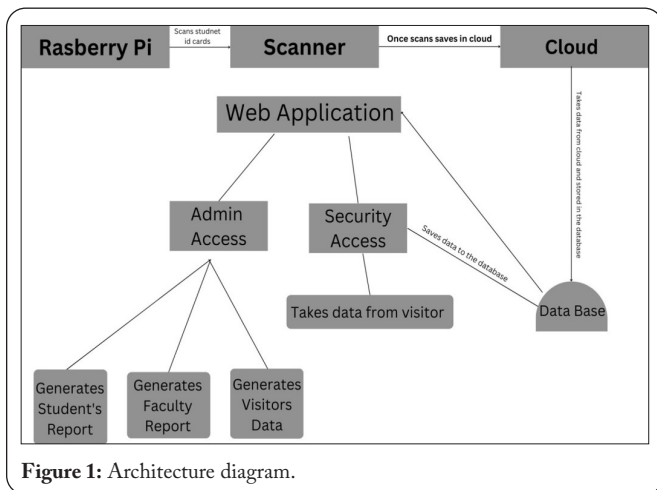


Figure 1: Architecture diagram.



Figure 2: Snapshot - 1.

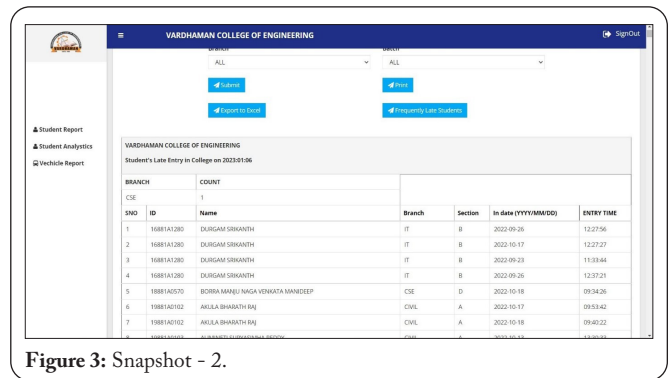


Figure 3: Snapshot - 2.

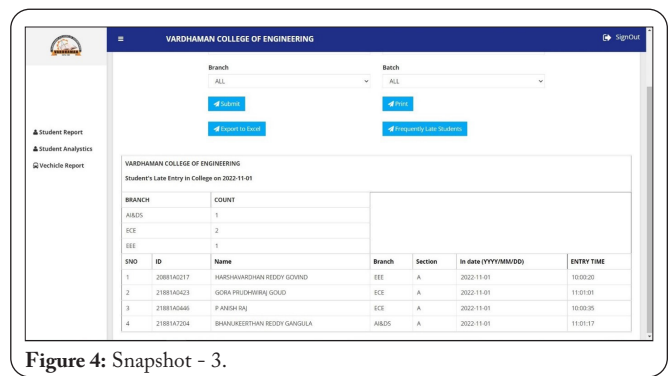


Figure 4: Snapshot - 3.

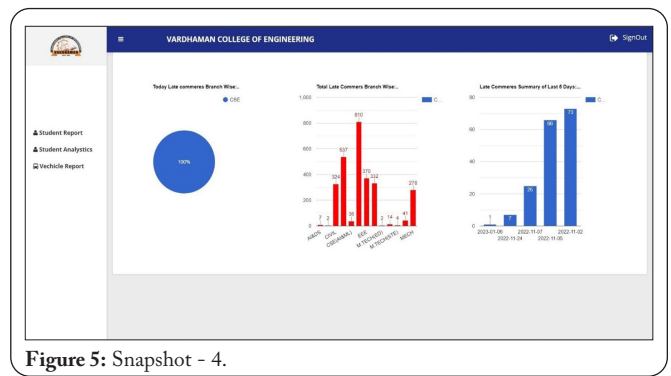


Figure 5: Snapshot - 4.

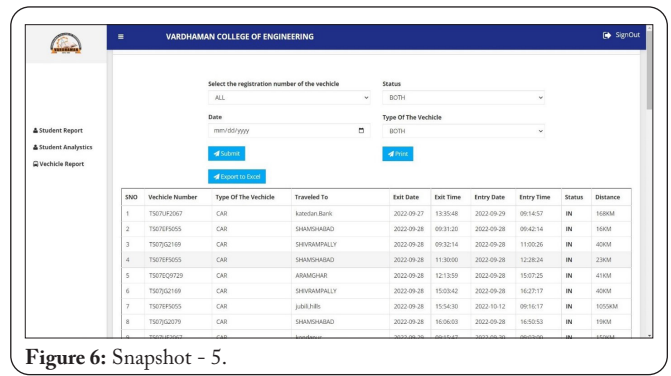


Figure 6: Snapshot - 5.

in depth, HOD and admins can view this information [14]. Figure 2 to figure 10 are some snapshots of the application.

### Conclusion and Future Scope

One potential area for future development in the field of gate pass management systems is the integration of advanced technology such as biometric authentication and facial recognition. This could allow for more secure and reliable methods



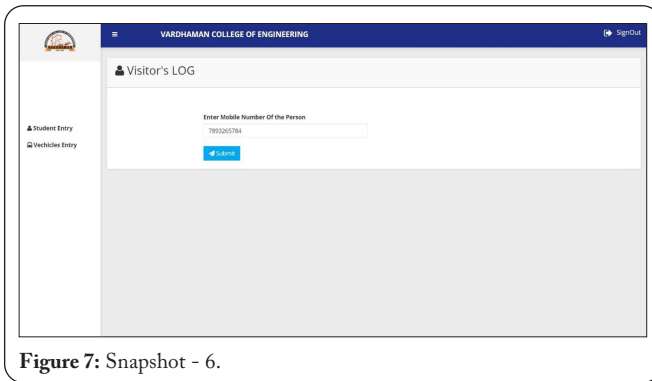


Figure 7: Snapshot - 6.

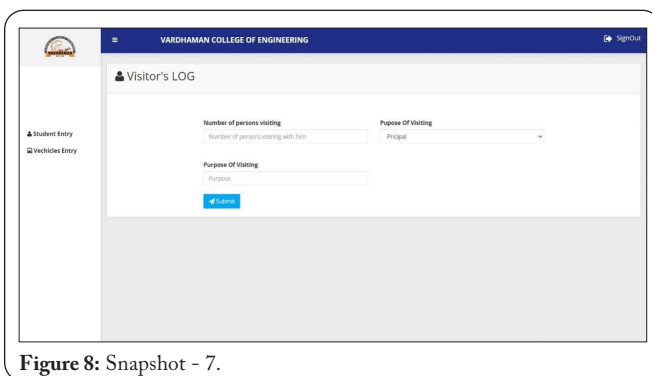


Figure 8: Snapshot - 7.

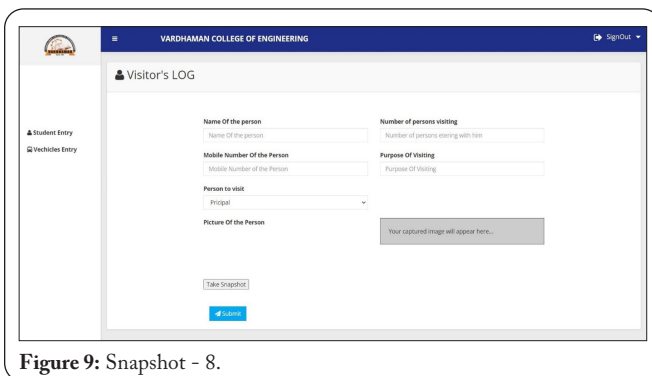


Figure 9: Snapshot - 8.

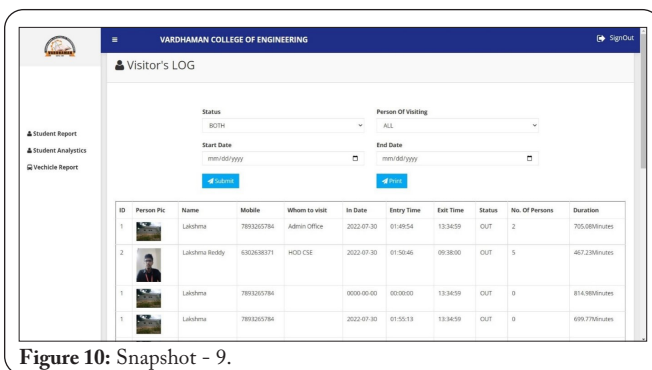


Figure 10: Snapshot - 9.

of identifying and verifying the identity of individuals seeking access to the secured area. Another potential area of future development is the integration of gate pass management systems with other security systems, such as CCTV cameras and alarm systems. This could allow for a more comprehensive and coordinated approach to security, providing real-time monitoring and response to potential security threats.

Additionally, the use of artificial intelligence and machine learning algorithms could be explored to improve the efficiency and accuracy of gate pass management systems. For example, these technologies could analyze access logs and identify patterns and trends that could indicate potential security risks. Overall, there is great potential for future development and innovation in the field of gate pass management systems. By leveraging advanced technology and integrating with other security systems, gate pass management systems could become even more effective in ensuring the security and safety of secured areas.

## Acknowledgements

None.

## Conflict of Interest

None.

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