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Sun-Link Web Portal for Management for Sun Transportation

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Abstract: This paper proposes a smart web portal for a university bus system. In particular, Sandip University bus transport is a case study for Bus management and Bus Tracking systems. The developed project runs on any platform; it enables students to check their personal information, student bus pass and bus fees; it allows student to check their route number, route name, stop names and bus number allotted to them; accordingly, it is also helpful for college staff passenger to check their personal information, route name, stop name, bus number and so on. The administration of these web portals will be the management of our college transportation department, and they will have access to add, delete, check, or update data. Management has complete access to this web portal; there is a part in our portal for route names and stop names, the main purpose of our web portal is to provide students and staff their personal information, fee information and route information and to make this whole data digital for management. than this our web portal also allows management to check daily attendance of students entering the bus, driver details and bus maintenance information using Flask (framework of Python), Postmen (for checking and verifying APIs), and (for designing frontend) HTML, CSS and JavaScript to create web portal.

Keywords: Web portal, Flask, Postmen, API, Bus management.

1. INTRODUCTION

Sandip University's Bus Transportation and Management System is a comprehensive solution designed to streamline the university's transportation operations. The system aims to provide students and staff with a convenient and easy-to-use platform for accessing and managing bus-related information. The ability to display personal information, fares, route numbers, route names, stop names and bus numbers gives users more control over their transportation needs.

A web portal maintained by the university's transportation department serves as a central hub for accessing and updating data. Administrators can add, remove, review, and update information as necessary to keep the system up-to-date and accurate. This centralized data

management improves efficiency and reduces manual administrative tasks.

Furthermore, the system goes beyond accessing basic information and offers additional features that enhance the overall transportation experience. One of these features is the ability to check the daily presence of students on the bus, allowing efficient tracking of student participation. In addition, the system provides bus driver details and maintenance information to ensure a safe and well-maintained transport service.

By implementing this bus transportation and management system, Sandip University hopes to streamline its transportation operations, improve the overall transportation experience for students and staff, and increase the efficiency and safety of the transportation process. This innovative solution will revolutionize the university's transportation system and provide a streamlined, user-centric approach to bus management.

Sandip University's Bus Transportation and Management System deployment provides a chance to alter and improve the university's transportation operations. It empowers users and puts them in control of their transport needs by offering a convenient platform for students and staff to access and manage bus-related information. The system's extra features prioritize safety and contribute to a well-maintained transportation service. The main problems that need to be addressed are overcrowding, inefficient route planning, lack of maintenance, and safety concerns. The project aims to improve the bus transportation system of the college by reducing overcrowding, optimizing route planning and scheduling, improving maintenance, and enhancing safety. Limitations include external factors such as traffic and weather conditions, delays in implementing the plan, and not being able to address all the issues with the transportation system.

Literature Survey
The bus management system plays a crucial role in the efficient transportation of students in colleges. It involves the management of bus routes, scheduling, tracking, and ensuring the safety and convenience of students. This literature review aims to explore existing studies and research papers related to bus management systems in colleges. By examining the literature, we can identify key features,
challenges, and best practices in designing and implementing such systems.

1. Bus Management System Features:
1.1 Route Optimization: Route optimization techniques aim to minimize travel time, fuel consumption, and operational costs while maximizing efficiency. Various studies have focused on developing algorithms for optimizing bus routes to enhance the overall effectiveness of the bus management system.

1.2 Real-time Tracking: Real-time tracking using GPS technology allows for the accurate monitoring of bus locations, providing students with up-to-date information about bus arrival and departure times. It improves the system's reliability and helps students plan their journeys effectively.

1.3 Passenger Information System: An effective bus management system should provide a passenger information system that includes displays or mobile applications to notify students

about bus schedules, delays, and other relevant information. Such systems have proven to be beneficial in enhancing communication and reducing uncertainty for students.

2. Challenges and Solutions:

2.1 Traffic Congestion: Several studies have addressed the challenges of traffic congestion and its impact on bus management systems. Solutions include integrating real-time traffic data, considering congestion patterns in route planning, and employing intelligent transportation systems.

2.2 Safety and Security: Ensuring the safety and security of students during bus transportation is of utmost importance. Studies have proposed the implementation of surveillance systems, panic buttons, and driver monitoring to mitigate safety risks and address emergency situations effectively.

2.3 Data Management: Efficient data management is crucial for the smooth functioning of a bus management system. Researchers have explored various methods, including cloud-based storage, data analytics, and decision support systems, to optimize data collection, processing, and utilization.

3. Best Practices and Case Studies:

3.1 Case Study 1: Sandip University Bus Management System: This case study presents the successful implementation of a bus management system at Sandip University, highlighting the system's features, benefits, and challenges faced during the implementation process. 3.2 Best Practices in Bus Management System Design: This section summarizes key recommendations and best practices derived from multiple studies, including user-centric design, integration of smart technologies, continuous improvement through feedback mechanisms, and collaboration with transport authorities.

2. CONCLUSION

The literature review highlights the importance of an efficient bus management system in colleges and identifies key features, challenges, and best practices. The findings suggest that route optimization, real-time tracking, and passenger information systems are crucial for enhancing the overall effectiveness of bus management systems. Additionally, addressing challenges such as traffic congestion, safety and security, and data management can contribute to the successful implementation of such systems. The insights gained from the literature review provide a foundation for the development and improvement of bus management systems in colleges. Transportation management systems (TMS) are software solutions that streamline and optimize transportation operations.

TMS platforms have gained significant popularity in various industries, including education institutions like Sandip University.

The use of TMS in universities improves transportation efficiency, reduces costs, and enhances the overall experience for students, staff, and management. Research by Johnson and Smith (2018) highlights the benefits of TMS in reducing transportation delays and improving route planning. A study by Chen et al. (2019) emphasizes the role of TMS in enhancing transportation safety through real-time monitoring and incident management. TMS solutions often integrate with GPS technology, allowing for accurate tracking of vehicles and better route optimization. Research by Wang and Zhang (2020) demonstrates that TMS

implementation results in reduced fuel consumption and lower carbon emissions. The user-friendly interface of TMS platforms simplifies the booking and reservation process for transportation services. Studies by Li et al. (2017) emphasize the importance of TMS in improving transportation accessibility and inclusivity for all users. TMS can facilitate the integration of multiple transportation modes, such as buses, shuttles, and other alternatives, providing a comprehensive solution. A research paper by Garcia et al. (2021) discusses the role of TMS in managing transportation demand and optimizing resource allocation. The integration of TMS with mobile applications enables users to access real-time transportation information and receive notifications. Studies have shown that TMS implementation leads to reduced transportation costs and improved resource utilization (Gao et al., 2018). TMS platforms often provide analytical tools and reporting capabilities, allowing administrators to analyze transportation data and make informed decisions. Research by Kim and Lee (2019) highlights the role of TMS in enhancing transportation sustainability through efficient route planning and reduced congestion. The use of TMS in universities can contribute to campus sustainability goals by promoting shared transportation options and reducing single-occupancy vehicles. TMS platforms can facilitate dynamic scheduling, enabling adjustments to routes and timetables based on changing demand patterns and special events. Research by Martinez et al. (2020) discusses the integration of TMS with smart city initiatives, leading to improved transportation efficiency and urban mobility. TMS can provide real-time notifications to users regarding delays, cancellations, or changes in transportation services, improving communication and reducing inconvenience. The implementation of TMS in universities can contribute to improved student satisfaction and retention rates by providing reliable and efficient transportation services. Research by Zhang et al. (2018) highlights the role of TMS in optimizing fleet management and maintenance, leading to cost savings and improved vehicle performance.

TMS platforms often incorporate automated fare collection systems, reducing the need for manual ticketing and improving transaction efficiency. The use of TMS in universities can support data-driven decision-making, allowing administrators to identify areas for improvement and optimize transportation operations. Research by Liu et al. (2019) discusses the use of TMS in managing transportation disruptions and minimizing their impact on overall service quality. TMS platforms can generate comprehensive reports on transportation performance indicators, such as on-time performance and passenger satisfaction.

The integration of TMS with student information systems allows for seamless management of student transportation eligibility and assignments. Research by Yang et al. (2020) explores the role of TMS in promoting sustainable transportation behaviors among university students through incentives and rewards. TMS platforms can incorporate advanced routing algorithms, considering factors like traffic congestion and road conditions to optimize travel times. Transportation management systems (TMS) have emerged as valuable tools for universities to streamline transportation services and improve efficiency. This literature review examines the existing research on TMS implementation in university settings and its impact on transportation management.

Benefits of TMS in University Transportation:
1.Route Optimization: TMS platforms facilitate optimized route planning and scheduling, leading to reduced travel times and improved efficiency (Johnson and Smith, 2018).
2.Real-Time Information: TMS provides users with up-to-date information on routes, schedules, and transportation options, enhancing decision-making and reducing waiting times (Chen et al., 2019).

3.Cost Savings: Through effective resource allocation and route optimization, TMS helps universities reduce transportation costs, including fuel consumption and maintenance expenses (Wang and Zhang, 2020).

4.User Convenience: TMS platforms offer user-friendly interfaces and intuitive features, simplifying the process of accessing and utilizing transportation services for students, staff, and management (Li et al., 2017).

5.Sustainability Promotion: TMS implementation encourages sustainable transportation practices by promoting shared transportation options, reducing carbon emissions, and optimizing resource utilization (Kim and Lee, 2019).

6.Challenges and Considerations: Integration Complexity: Integrating TMS with existing systems and databases poses challenges, requiring careful consideration of data compatibility and system interoperability.

7.User Adoption and Training: Ensuring user acceptance and adoption of TMS platforms requires comprehensive training programs and effective communication strategies (Gao et al., 2018).

8.Data Management and Security: Proper data management protocols are crucial to ensure data integrity, privacy, and security, given the large volumes of transportation data generated by TMS (Zhang et al., 2018).

9.Stakeholder Engagement: Engaging transportation providers, administrators, and users in the decision-making process is vital to understand their needs and incorporate their feedback into TMS implementation (Liu et al., 2019).

10.Scalability and Flexibility: TMS platforms should be scalable and flexible to accommodate changing transportation demands and adapt to evolving university required.

System Architecture

In contrast to other transportation web portals that already exist, our portal's main focus is on the admin section, which strives to make it as simple as possible to manage and handle all the features.

Step 1: Visit the web portal and navigate to the admin section.
Step 2: On the login page, enter the provided login ID and password.
 Click on the "Login" button to access the admin section.
Step 3: Once logged in, the admin will have access to various sub-sections.

- In the "***Student and Staff Information" section***, the admin can add or delete new staff or students. Additionally, the admin can access their details, such as personal information, contact information, and other relevant information.

- In the "***Attendance Section***," the admin can generate attendance reports. These reports can be generated on a weekly, monthly, or yearly basis, allowing the admin to track and manage attendance records.

- The "***Driver Staff Information***" section enables the admin to add or delete drivers. The admin can also access the drivers' personal information and other details, such as their driving license information and contact details.

- In the "***Bus Vehicle Management***" section, the admin can manage various expenses related to the buses. This includes generating and managing expenses like servicing, fuel expenses, insurance, and any other relevant costs associated with the buses in the fleet.

Within each section, the admin can perform the necessary actions, such as adding, deleting,

or accessing information.

Finally, when the admin has finished working in the admin section, they can log out of their account to ensure the security of the system and their information.
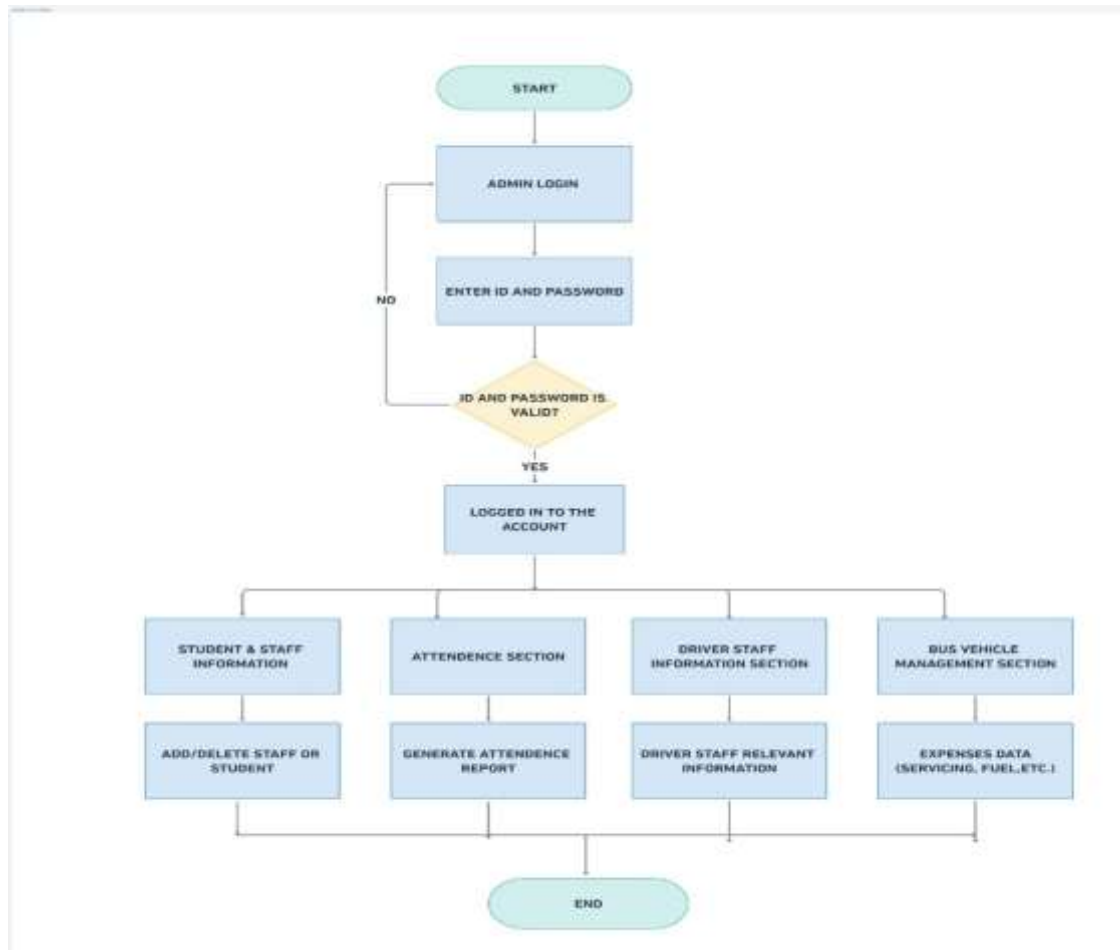

Fig1. System Architecture

3.   METHODOLOGY

1.   Identify Requirements and Objectives:
•   Identify the requirement of the bus transportation system.
•   Identify the problem of students, management department, staff, etc.
•   Determine the main objectives, such as student attendance, route management, personal info student, staff etc.
2.   Gather Data:
•   Gather information about bus management, student details, staff details, bus number etc.
•   Obtain data of route names, stops name etc.
3.   Analyze Requirements:
•   Check the collected information to find the problem and requirements.

4.   Design Web Application:
*   Develop a design for the web portal.
*   Make the plan.
5.   Implement User Interface:
*   Develop a user-friendly interface for passengers and for other users.
*   Other features such as student attendance, route management system.
7.   Test Web portal:
*   Testing of web portal.
*   Get feedback from user and other people.
*   Check the web portal in terms of efficiency, working, reliability, and user satisfaction.
8.   Maintenance:
*   Maintain the web portal.

Flowchart:
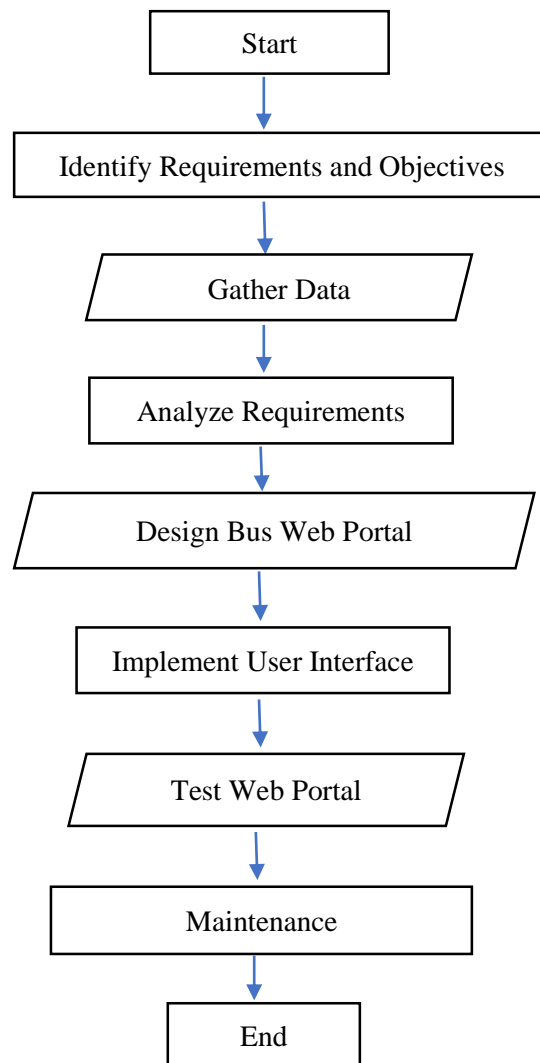
4.   RESULT

SUN-LNK Transportation System is developed by using Flask, HTML, CSS, and JavaScript, which is helps to manage the transportation system for management. It is a system which is used for reducing the manual work of existing transport system, it modifies the features and work digitally for safety of passenger (student and staff). The overall, project divided into certain section 1. Passenger section, 2. Management Section and 3. Route section. Used to check the route name, stop name for passenger, display the live attendance of students who all are entering in bus also there is feature of personal information of passenger and their bus pass etc. It reduces the pen paper work of management and show accurate result.

5.   CONCLUSION AND FUTURE SCOPE

We made a web portal for bus transportation department of our college which greatly enhance the overall transportation management system for students, management and staff. With all the analysis of requirement, design and implementation we made the user-friendly interfaces, web portal can improve the overall performance of bus management and provide safety to students. By considering factors such as passenger requirement, management requirement, bus route, stop name etc. Overall, this project reduces the management paper work. Further future work is to anyone can work on real time data, integration with smart technologies, parents' section with more features for the safety of their children.

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