

## Smart bus and it's services and facilities

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**Abstract**— Transportation system for any country is one of the key features in deciding the infrastructure of that country. For managing the movement of public from one location to another in country having large population is not an easy task. Transportation facility generally includes railways, waterways, roadways and airways. In this paper we will specifically focus on buses which is one of the primary means of transportation in roadways. This theoretical paper aims at providing the effective solution for the current underlying problems faced by the passengers who use public transport as the means of transportation such as defer in arrival time of bus, long waiting time, overloaded bus with passengers. To overcome these problems this paper suggests several methods which can result in improvement of passenger experience. In this paper the real time transportation information is used for knowing the current status of the bus. There is online mode of payment such as credit card, debit card, UPI based payment and also offline cash-based payments. A vacuum robot cleaner which helps in cleaning the bus is installed in the bus. This electronic bus contains the Display which is installed in front of the conductor seat and shows the map of the route followed by the bus, it is also used for other purpose. There is also audio message played in the bus through preinstalled speaker which announces the current stop of the bus and also the next stop in path to be followed. When the passenger arrives at destination they get notified through SMS.

**Keywords:** Electric bus, GPS, Smart bus, Robot Vacuum cleaner, e-ticket, Smartphones, Bluetooth.

### 1. INTRODUCTION

In a past decade or two the technology has transformed significantly. This drastic change in technology has opened the several new doors in the area of science and technology leading to creation of some amazing tech gadgets and software which earlier seemed impossible to humans. This advancement in technology has made human life easy and effortless. In this era of technology, where we talk about technology like AI, automation of various day to day activities but we still use traditional way of transportation. This paper talks about the technological changes to improve the traditional approach of transportation by bus with the new and more fast, timesaving and effortless approach using the various technological devices.

In country with huge population, managing the population is not an easy task. Transportation is one of the major factors of the infrastructure of any country and it is also required by the people who wants to go from one place to another. Roadways are one of the major ways of transportation. People often use buses as the mode of transportation. In this paper we will talk about modification of the existing bus system and replace it with new one. These buses contain the display device which is inbuilt with the GPS, Bluetooth. It also contains the preinstalled and preconfigured software. The data maintained by the device is synced continuously with the central server where the information is stored. This central server lets the passenger waiting in the next stops to know the status and other important details like number of vacant seats available in the bus, location of the bus etc.

### 2. LITERATURE REVIEW

Mr. Jayakumar. S (2018) [1] proposed the facility of scanning QR code avoiding the traditional system of using paper. Smartphone were used which contained the app which provided the passenger two options which were login and registration. The registered passengers could easily login to their account by providing loginId as well as password entered by them while registration. After logging into their account passenger has to enter their source and destination which provided them the information of the buses running on their route along with the amount which is to be paid for each passenger. The total amount will be deducted from the wallet of the app in which the money was transferred earlier and the passenger get ticket through SMS in their mobile phones. The IR sensor connected with Arduino was used in order to transmit the data to the database.

Mrs. D. Anuradha (2018) [2] In this paper user can register in android application and can add the bank details to their app account after which they can select the number of passengers and total amount will be calculated and use the QR code scanner. The options were provided to the passengers between the government and private buses and the amount was generated which was based on the choice made by the passenger. Web Services were used for connecting android application and servers which will run 24 hours and data obtained from the user will be transferred to the server. SOAP protocol was used to connect android app to server. Admin could see all the details of the user like the bus stop from where they started their journey, where they got out of the bus, amount, etc.

Mr. A J Kadam (2018) [3] This paper proposed a system for tracking city bus. This paper suggested use of four IR sensors which were used to maintain the record of people getting inside the bus and people leaving the bus. The IR sensors were connected to the Bluetooth and sending the information to Arduino UNO via Bluetooth. The information like number of passengers, location was collected by Arduino UNO through Bluetooth was updated and uploaded to the cloud server in real time. Android app provided for the public download can track the bus, number of passengers in it can also see the ETA (Estimated Time Arrival) as the changes made to the server would be replicated in android app.

Mrs. Swati Chandurkar (2013) [4] In this paper the focus was to obtain the passenger information in real time. It was suggested to install the GPS in the bus. This paper proposed system that enabled the passengers to obtain the data related to location of the bus which will be transferred to centralized server control unit. The primary objective of this paper was to monitor the buses in real time and providing information to the user about the bus schedule.

Gaikwad Parmeshwar (2017) [5] This paper suggested the combined use of GSM and GPS system to identify the bus location in order to properly manage the transport system. Arduino was used in designing of smart bus. IR sensors were used to maintain the count of person entering and leaving the bus.

Sudhir N. Divekar (2018) [6] This research proposed the installation of the two systems one at bus stand and other in the bus. A bus that was approaching to the nearest station was identified and details of that bus was shown on LCD (Liquid Crystal Display) installed at the bus stand for the passengers waiting on the bus stand. The bus details were announced using the previous recorded voice. The bus coming to the bus stand was identified with the help of Radio Frequency technology.

Gaurav Chheda (2012) [7] This system proposed the displaying of real - time location of the buses in Mumbai city. The tracking device was used in the system to know the real time location of the buses and also the data of bus locations was collected and then was transferred to the centralized control unit.

Mrs. Shital Kolte (2018) [8] In this system three smartphones were needed. The user was provided with the facility of booking ticket online by using application which required the information like source and destination. After successful booking the QR code will be generated by the application which would contain the information related to the passenger's source and destination, route information etc. This generated QR code will be scanned by the application installed in the bus conductor's smartphone. Facility of loan was also provided in this proposed system.

### 3. PROPOSAL SYSTEM

This research paper proposes the use of an effective way of booking tickets for bus. This electric bus has number of devices inside it like tablet (17.3" display size) which has the features like Bluetooth, Wi-Fi, GPS and is placed in a fixed frame in front of bus conductor's seat. This tablet also contains the bus management application which is designed only for this tablet and is not available for public download. The application in tablet is installed by the transport authority before tablet is handed over to the bus conductor. Conductor can use his login credentials to access this tablet which will be issued to him each day in the morning by the local transport office. This application requires the internet connection which is achieved through Wi-Fi system installed in the bus, tablet is also connected to that Wi-Fi. The bus management application installed use the map API, displays route and current location of the bus on the tablet display and is configured in such a way that after reaching each bus - stop it uses the voice message to tell the name of the current location and also the name of the next bus stop for which the bus will leave from current bus - stop. This announcement is done via Bluetooth speaker which is paired to tablet. These announcements are done in order to let passenger know their current location and also the next bus - stop that will come in the path. This bus also contains the robot vacuum cleaner which moves on the bus floor and maintain it clean and dirt free. It is charged through the charging port installed in the bus near the seat of bus conductor when its charging gets over. It is fully automatic and can identify the trash spread on floor, rough surfaces using sensors and it also goes to its charging port when charging is about to over. Dirt and trash detected by it is taken inside with the help of the brushes in its base surface. This robot vacuum cleaner can also be managed by the bus conductor manually by the robot control application installed in the tablet. First screen to appear on the bus management application is the language which bus conductor has to choose. After choosing language he has to enter his login credentials provided by local transport office. After logging into his account, he will be provided with the following options:

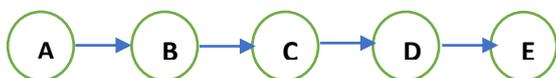
- **View Map** - which will display the map that will tell the current location of the bus and also the route to be followed.
- **List of current passengers** - This provides the list of passengers sitting in the bus currently. This list displays username, source, destination of the passengers.
- **List of booking** - This will provide the list of passengers who had booked their tickets online and will take the bus at next bus - stop. This list will also contain the name of the passengers, source and destination.
- **Offline Booking** - For offline booking, the bus - conductor will select this option, the current location of the bus will be chosen as source by

default and destination will be selected by the conductor as per passenger's requirement and amount will be generated according to the distance between source and destination which will be paid in cash.

This all data will be maintained in the central server as the data in the tablet will be continuously updated and synced with the central server which is the main component of this entire system to work efficiently. Central server is the backbone of entire system as it is in sync with the tablet in bus and also allows passenger to know current location of the bus and other related information like the seat availability etc. For the passengers to avail the bus services they have to download the application which is available for public to download. Passengers fill this registration form for bus services, they fill the form online and provide details like name, contact number, Email- id, password, gender, this information goes directly to the central server and get stored. Whenever, passenger wants to apply for the ticket, they have to login into their account using username and password provided at the time of registration. After logging into the account passenger has to fill details like number of passengers, source, destination, mobile number (if different than the one provided during registration). After submission, request is sent to the central server with these details and it checks whether vacant seats are available in the bus or not if seats are available than the new window will appear with the payment options like credit card/debit card/UPI etc. The passenger will choose the one payment option and if the payment is successful only than e-ticket is generated

As the central server is in continuous sync with the tablet in bus, the current location of the bus is known. The central server will send the message to the passenger whose destination is about to come by using the passengers mobile number stored in the database while ticket booking and live tracking. The message simply informs them, that they are about to reach their destination and asking them to be ready.

For better understanding consider the following scenarios-



In the above diagram A, B, C, D, E represents the bus – stops. When the bus is at stop A, the passengers who have booked the ticket online and have e-ticket can simply get into the bus by showing their ticket to bus conductor. Passengers who have not booked ticket can book in offline mode. At this point, all the passengers waiting at bus – stop B, C, D, and E can only look at the current status (current location, vacant seats available etc.) of the bus in the application installed in their smartphones. As soon as the bus will leave from bus – stop A, passengers at bus – stop B will be able to book the tickets online but not the passengers at Stop C, D and E. This approach is taken in order to minimize the passenger's waiting time and to let

them know about the seat availability in advance. Similar process will be followed for bus – stop C, D and E.

After the entire journey the passenger will be asked to submit the optional feedback form which will be sent to them in installed application.

#### 4. CONCLUSION

In this research paper, we have avoided the use of traditional paper-based system and provided the more efficient way of ticket booking system. The robot vacuum cleaner will help in maintaining the cleanliness in the bus. The audio messages played via Bluetooth speaker and message alert system will be helpful for the passengers who are not familiar with the route and don't know their destination. As the entire data generated during whole process will be stored in central server, it can be utilized by data analyst and others to make better business decisions. The data can provide insights on busy routes, busy hours of the day etc. Though this arrangement can be very effective but the entire process is based on internet and weak network connection can cause the problem.

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