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SMARTBUS

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Abstract— *Bus is perhaps the most economical way to travel in a city. However the travelers face a lot of problems in the process. Some of the problems faced by people who travel in bus is not knowing when the bus will arrive at a particular stop, not knowing when the bus will reach its destination because of a traffic jam or road repair, not getting a seat in the bus, not being able to pay with a card etc. According to a recent survey done by a group of students on the problems faced by bus travelers, 80% of the travelers had no idea which bus to take to reach their destination. But in the era of SmartPhones a solution can be found to several such problems. And this solution comes in the form of "SmartBus".*

Index Terms—*Near Field Communication, Wi-Fi, Global Positioning System, GPRS, SmartBus*

I. INTRODUCTION

When we look at the existing system in a, a passenger waits a bus stop for anywhere between 5-40 minutes to catch the required bus. Once he boards the bus, he buys a ticket to the destination. If he has run out of cash, he will have to get down, draw money and pay. Sometimes the conductor may not give back the exact change. Sometimes passengers are not given a ticket at all, thus cheating our government lacks of rupees each year. If the passenger is new to town then he will have no clue where to get down or which bus to catch in the first place. Sometimes passengers would pay for travelling a shorter distance but would not de-board at the right stop etc.

The idea is to eliminate cash transactions as much as possible. Elimination of cash will ensure that all passengers will take a ticket and get down at the designated stop. There will be no hassles of providing change or not giving the correct ticket.

Another feature to be added is to make sure that there is a seat provided for each passenger. Once the bus becomes full no more passengers will be taken in. Once a passenger de-boards the bus, another can be let in. Details about the total seats available, the number of passengers travelling, the number of seats, and how many passengers will get down at which stop etc. should be updated at every stop. This will give the details about the availability of seats in every stop.

The reason to implement such a system is to promote more number of people to use public transport.
The project idea SmartBus aims to remove all those problems by using technology that is already existing. The technologies simply need to be integrated into one unit and should be provided with a proper communication system.

II. ABOUT SMARTBUS

A. What SmartBus Employs

This project employs the existing technology to create a smart environment in a bus where it hopes to make bus travel for everyone easier by using Near Field Communication (NFC), Global Positioning System (GPS), General Packet Radio Service (GPRS) and Wireless Fidelity (Wi-Fi) modules.

The advantage of this idea is in its simplicity of working. The second advantage is that there is comparatively lesser dependence of one module over the other. In case of failure of any block, other blocks don't fail. Third advantage is that the passengers can choose to either use their smart phone to pay for tickets or pay using a prepaid card (can be called a bus card or smart card).

The following block diagram seen in fig 1 will show the possible structure of a bus module providing a lot of functionalities along with ease of use.
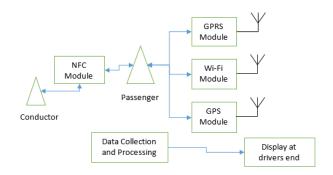
Fig 1: Block Diagram of Modules Used in SmartBus

Some of the functions that SmartBus module provides are:-

1. Tracking a bus en route to a particular bus stop.
2. Details of other buses travelling to the same destination.
3. Details of approximate travel time by considering traffic jams, road digging, path deviations etc.
4. Providing all details of approaching buses and their destination along with route.
5. Cashless payment of tickets either via smartphones or smart cards.
6. Alerts the passenger when destination has been reached.
7. Accessing the internet through Wi-Fi at a nominal cost.
8. Details about the availability of seats in every stop. Making sure each passenger gets a seat.
9. Providing a big board at all bus stops that automatically updates its information about busses en route.

III. NFC MODULE

Near Field Communication[1] is new advancement in the field of Wireless Communication where data is transferred from our mobile phones to another reader placed within a few centimeters of one another. The advantage of NFC is its simplicity of working and design. Since data is transferred from within a few centimeter, we can make cashless payments by using our mobile phones.

A. Why we need this module?

Eliminating payments through cash is an important factor to take our world to the next level. For passengers who don't own a smartphone, a SmartCard can be issued which can behave as a prepaid card.

B. How will it work?

To pay for a ticket, the passenger has to tap his phone to a NFC reader carried by the conductor. An application can be developed where in money is deducted from an account when the passenger pays for a ticket.

Once the passenger pays for a ticket, details about total number of passengers is updated.

IV. WI-FI MODULE

Wi-Fi[2] network makes use of radio waves to transmit information signals across a network. It consists of a router which is connected to a modem. The modem in turn is connected to the GPRS Provider Network. It is used to provide internet connectivity wirelessly.

A. Why we need this module?

The Wi-Fi module connects to the phone of a passenger once he boards the bus. In this project, it is used to send alerts to the passenger about the destination and possible delays due to traffic. This module will be useful to those passengers who do not know where to get down.
This module is included for convenience than necessity. This service can be charged depending on the usage of the passenger.

B. How will it work?

It can be used to provide internet connectivity by using GPRS module. It makes use of radio waves to transmit and receive signals to phones, laptops and other devices. The same signal will be transmitted, via an antenna, to a decoder known as the router. Once decoded, the data will be sent to the Internet through a GPRS connection. As the wireless network will work as

a two-way traffic, the data received from the Internet will also pass through the router to be coded into a radio signal that will be receipted by the smartphone's wireless adapter.

V. GPRS MODULE

GPRS[3] is a wireless internet service provided by companies at a particular tariff. The module in the bus connects to the GPRS service provider. This facility is made use by a Wi-Fi router to provide wireless internet to the passengers.

A. Why we need this module?

To provide wireless internet facility to the passengers on board a bus. This module is included for convenience than necessity. This service can be charged depending on the usage of the passenger.

VI. GPS MODULE

GPS[4] is a global positioning system used to track the movement of any object in real time. GPS is the positioning system developed by USA. There are several other positioning systems developed by other countries. One such example is GLONASS by European countries.

A. Why we need this module?

As discussed earlier, one of the stressing problems faced by passengers is the lack of information about the time of arrival at each stop and the frequency of each bus. To eliminate such a problem, we make use of GPS. This will track busses and their approximate time of arrival at a particular stop.

This information can be accessed via an app from a smart phone and passengers can plan their activities accordingly. Today, in Bangalore, Volvo busses come with pre-installed positioning system. This system is used to track the bus and display the name of the next stop in a LED screen within the bus.
But what if a passenger does not own a smartphone? Then the details available on the app will be available at all the bus stops on a big screen. This SmartScreen will provide all the necessary details about all busses plying through that route, its route, how many seats are available, estimated time of arrival at that stop and lastly estimated time of arrival at the last stop.

A. How will it work?

GPS uses satellites to triangulate the position of each object. This information is later relayed to a central system which will update the app's details and details on the SmartScreen. This positioning system is used to find the approximate location of busses.

VII. DATA COLLECTION AND PROCESSING

Data collection in this project refers to the feature which make sure that there is a seat provided for each passenger. Details about the total seats available, the number of passengers travelling, the number of seats, and how many passengers will get down at which stop etc. should be updated at every stop. This will give the details about the availability of seats in every stop.

The above details should be updated with the driver as well. If the bus is full, the driver can avoid stopping at a bus stop where no one is getting out of the bus. This will save a lot of time and fuel

The details of the payment made by each passenger should be recorded/extracted and stored in a main database.

VIII. DISPLAY (SMARTSCREEN)

The display corresponds to the SmartScreen available at all the stops. This screen provides details such as busses plying through a route, its route, how many seats are available, estimated time of arrival at that stop and lastly estimated time of arrival at the last stop.

IX. CONCLUSION

This project is a small attempt to provide better facilities to people who travel in busses every day. Hopefully a larger crowd finds this useful and takes to public transport.

X. REFERENCES

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