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Smart Bus Ticket Vending Machine

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Abstract

It is indeed a fact that everyone does regularly travel in the city buses. But these days, the online cab booking has struck the government city buses profit very badly. People usually prefer cabs instead of city buses, as people feel more comfortable in cabs than buses. Changing the city bus system according to the following idea would bring a huge difference in number of passengers travelling in buses. The ticket machines which are now being used need to be upgraded, such that it will have GPS module and internet connectivity (for cloud connection).

Keywords: *Handheld printer, internet of things, local transportation*

INTRODUCTION

It is a fact that, almost each one of us, regularly travel in the city buses. But now days, the cab booking through apps such as ola & uber have struck the government city buses profit very badly. Since the people will get to travel more comfortably through cabs than that of the city buses, most of them have started preferring cabs. Upgrading the city bus system according to the following idea could increase the number of passengers travelling in buses at a large scale and bring much higher profit to the government transport organizations [1]. One simple thing that needs to be done is updating the ticket machines which are now being used, such that it will have GPS module and internet connectivity (for cloud connection).

Now, every time the bus conductor generates a ticket to the passenger that data is getting stored in the cloud. The same data should be processed and displayed on the APP. The following topics will be displayed on the APP:

- Bus number and bus route.
- Number of passengers within the bus.
- Number of passengers going to get down in the next stop.

Number of passengers will increase every time the bus conductor vends a ticket to the passenger and that number will simultaneously change (in real time) as the bus reaches consecutive bus stops. This data is updated in real time for each and every ticket machine, and the ticket machine for every bus should be specific else it should made such that at the beginning of the day (or 1st trip of the bus) the bus number and the route should be specified in the ticket machine and the same will be displayed to the app users (passengers).

Passengers, having bus pass will have to tap their pass on the ticket vending machine. The pass will have an RFID/NFC* tag which will have an ID number. This number has the passengers' travel details. When this pass is tapped over the machine, it registers the ID and uploads it to the database. In the cloud the respective ID is searched and identified, which will then be reflected in the APP, after incrementing the number of passengers or the user can display the QR-Code of their bus pass and that will be scanned and updated to the cloud.

EXISTING BMTC SERVICE

Bangalore Metropolitan Transport Corporation (BMTC), is a government agency which operates the public transportation service in Bangalore, Karnataka, India.

Figure 1: *BMTC (Bangalore Municipal Corporation) logo.*

The BMTC (logo of which is shown in Fig. 1) service recently has come up with an update of cashless transactions for overcoming the problems of money exchange between the conductor and the passengers. The new machines contain an RFID and online money transaction facilities. The RFID is used to take the count of passengers with daily/monthly/yearly passes.

BMTC has planned for replacement of about 11,000 old electronic ticketing machines (ETMs) with advanced Android-based ones. 1,000 have already been replaced. The BMTC has made a contract with INGENICO; it is a French-based company, whose business is to provide the technology involved in secure electronic transactions. Its traditional business is based on the manufacture of point of sale payment terminals, but it also includes complete payment software and related services, also software for merchants. They are providing solutions for electronic payment with business processes such as booking, ticketing and travelling programs. They will not allow any operators to accept non-cash payments from travel agencies, ticketing kiosks, the web or via mobile sales. INGENCIO offers alternatives to cash in public transportation and car parks through m-Payment.

IMPLEMENTATION

The system which we have developed is much simple, easy to carry and handle for the conductor(s) of the buses. All our system need is an android mobile phone and a handheld printer which can print the inputs given through our app.

Figure 2: *Image of ticket vending machine.*

The above Fig. 2 shows the handheld printer which can be used to print the tickets. This printer can be connected to the mobile through Bluetooth or Wi-Fi. Here, we have taken TP-B3AI Handheld Portable Bill Printer Thermal Ticket Printer 80MM as a prototype, since it is easy to handle and prints faster [2].

We have developed two apps, one for the passengers (Passenger App) and the other for the bus conductor i.e., Staff App. The below diagram represents the flow chart of our prototype (Fig. 3).

Figure 3: *Flow chart of our prototype.*

The staff app is connected to the printer through the app. Every time whenever the bus conductor lends a ticket to the passengers, the count will be sent to the cloud and then analyzed. Every time the data gets uploaded to the cloud, the same data is segregating the data based on the passengers starting point to the destination point. Then this segregated data is displayed on the passengers' app according to the bus number and its live location.

AMAZONE WEB SERVICES

Figure 4: *Amazon Web Services (AWS) is used as the cloud platform.*

Amazon Web Services, (AWS) (logo of it is shown in Fig. 4). is a very powerful platform for various applications like web site development, server development and maintenance, storage etc. Off lately, it is also being used for IoT applications as well. Our application aligns very close to the IoT application. When the ticket is generated from the Internet enabled ticket vending machine, the data of the ticket, i.e., source name, destination name and number of passengers will be sent to the cloud, for which AWS EC2 instance is employed. On the EC2 instance a Nginx server is run. In this server the data is getting stored. Data of all the tickets, in a given route, will be stored and that will be grouped by the bus number and its route number. Each bus number and route number will have its current travelling passengers' data in the server. The real time location of the bus is also fed to the cloud [3]. So that, as the bus arrives on a particular stop, the data of passengers who will get down in that stop will automatically get deleted. This real time data can be accessed by the APP.

ANDROID STUDIO

Figure 5: *Android studio is used to develop and design the APP.*

Android Studio (logo of it is shown in Fig. 5) is the integrated development environment (IDE) for Google's Android operating systems. It is available for download on Windows, macOS and Linux based operating systems. Android studio is a replacement for the Eclipse Android Development Tools (ADT) as the primary IDE for native Android application development. On this platform, the application to access the real time data from the server is built. There are two types of APP that are built using it. One is for passengers and the other is for bus conductor, for whom the APP will be installed in the ticket vending machine. The APP with conductor will hold the route number and the bus number to which it is mapped in the server. The conductor needs to login to the APP with the bus number and route number to enable the function of APP. As, the tickets are generated, its data is sent to the cloud by the APP. Then, the passengers' APP will have a passenger login. After which the passenger can press the 'NEAR BY BUS STOP' button and the nearby bus stop locations will be displayed on the APP using the GPS service of the users' phone [4] as shown in Fig. 8 and Fig. 9. Then the passenger needs to enter the source and destination. After which the APP will fetch the data of total number of busses

travelling in that route, number of passengers travelling in it, from the cloud.

RESULTS

Figure 6: *Profile details of conductor.*

Staff APP has the profile details of conductor as shown in Fig. 6. The conductor needs to scan a QR code on the bus, after which the bus number and route number will be sent to cloud by APP.

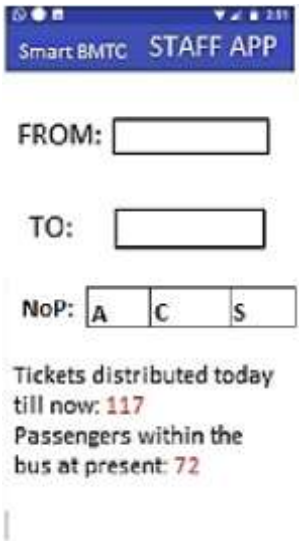

Figure 7: *Sub domain within Staff APP.*

Staff APP which displays the 'FROM', 'TO', 'NUMBER OF PASSENGERS', with three buttons 'A' – Adults, 'C' – Children, 'S' – Senior citizens and the data of number of passengers in the bus [5] as shown in Fig. 7.

Figure 8: *APP as seen by passenger, with 'NEAR BY BUS STOP' button.*

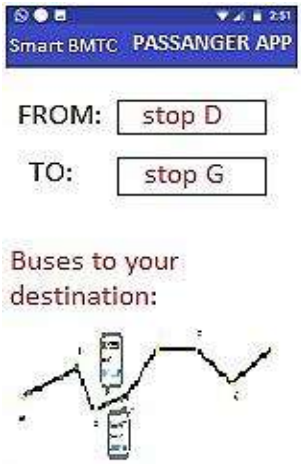

Figure 9: *APP with 'FROM' and 'TO' entered by passenger, displaying the number of busses on route.*

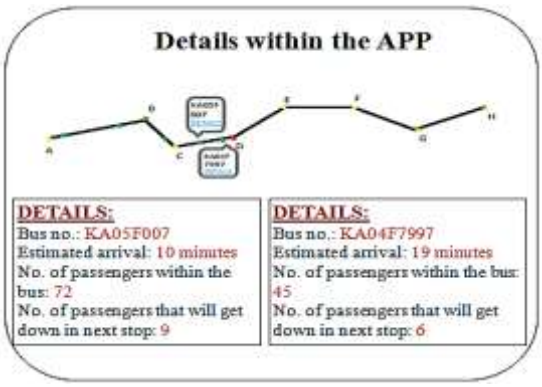

Figure 10: *Timing detail.*

APP with the arrival time of bus number of passengers in the bus at present and with the number of passengers who will get down the bus in next stop [6] as shown in Fig. 10.

CONCLUSION

Our prototype is a cost-efficient system; by using our prototype the government can save 60% of its money on each machine. At present, every ticket vending machine cost around Rs.12000 to Rs.13000 to the government bus services. But by using our prototype it would only cost Rs.4000 to Rs.5000 only. Since our system consists of a printer and the app service, there would not be need of any specific device for the particular application. Nowadays, everything is becoming smart and technology is growing fast. Everyone will have a smart phone, in our case since we are doing it for bus, i.e., smart ticket vending machine so, the bus conductor can utilize his/her mobile to print the ticket through our app. Hence, it is easy to carry as well.

From the passenger point of view, our app service plays a very important role. Here, every passenger can get to know about the number of people within the bus in advance, the number people who will get down in next stop, live location of the bus and the estimated arrival time of the bus. Depending on these factors, a person can easily decide whether to take the next bus or the up next bus.

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