

Digital Bus Pass and Payment System

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ABSTRACT

This work is concerned about having a digital approach towards issuing bus passes rather than a manual one. In this system, the main objective is to generate bus passes digitally and eliminate the need of manual paperwork. With this system, commuters will be able to get their passes made within a fraction of seconds without having to stand in queues waiting for their turns. Also, it will help people to make payment for their passes online. All the data will be then passed on to the cloud as the work gets bigger with time. Very soon, the hassle to keep change in pockets is going to get over as we move towards a smart bus pass generating mechanism. The online based bus pass generating and payment system will not only be a step towards paperless green city approach, but it would also be a huge sigh of relief for daily commuters, saving their time and also saving them from the daily hassle of standing in long tiresome queues waiting for their passes. Not to forget about our old age and female commuters as well.

Keywords—digital, Smart pass, android, Bus e-pass

1. INTRODUCTION

In the world of ever-growing population, the need for transportation is increasing day by day. Talking about India, the population distribution by wealth is such that 67 million of Indians falls under the category of lower class and more than 40 million falls under middle class category[1] Meanwhile, these groups of people prefer travelling by public transport rather than buying or using their own vehicle as a means of transportation. It is also recommended to do as it would help saving a good amount of fuel. If we look at this scenario in a fast-growing city – Bangalore, bus is one among the most preferred means of transportation having the ridership of 35.8 lakhs on a daily basis[2]. As the process of issuing bus pass is manual, it results in usage of paper on a huge basis each day. This work eliminates the use of paper thus helps in saving trees and fuel contributing to the green city approach.

Advanced technology has become the integral part of our life [3]. To satisfy the need of the society, almost in each work, we use the technology[4][5]. In current era computer science is major subject [6]. It has many real life applications such as cloud computing[7], artificial intelligence[8], remote monitoring[9], Wireless sensor network[10, 11, 12], internet of things[13, 14, 15], Neural network[16, 17], FSPP[18, 19, 20], NSPP [21, 22, 23, 24, 25], TP[26, 27, 28], internet Security[29], uncertainty [30, 31, 32, 33, 34] and so on. Technology is the mode by which user can store, fetch, communicate and utilize the information[35]. So, all the organizations, industries and also every individual are using computer systems to preserve and share the information. The internet security plays a major role in all computer related applications. The internet security appears in many real-life applications, e.g., home security, banking system, education sector, defense system, Railway, and so on. In this manuscript we discuss about the protection of authentication which is a part of internet security.

From the deep literature survey, we have understood that ticketing and issuing passes through digital or smart cards is not a new concept. Countries like Europe, Russia, Hong Kong, United States, Canada etc. have already implemented this model. Depending on the mode and vehicle of transportation, these cards are used by the commuters for daily ticketing, bus passes and discounts for different section of the population (students, women, senior citizens, specially-abled etc.). Commuters need to carry these cards with themselves for using it as a pass in order to avail a public transport service. Minor problem with this existing system occurs when commuters, at times, forget to carry their passes with them or gets it misplaced. This issue can be eliminated by digital passes. Fig 1.0 shows the bus revenue generation statistics[36].



Fig 1 Bus Revenue

1.1 Motivation

Awareness for green city has been a great motivating factor during this work[37]. The existing manual system uses bulks of paper in each year becoming one of the main reasons behind depletion of trees and forests. On implementing a digital pass system, we would be able to help the environment to some extent. This work also offers a contribution in digital India campaign. It helps reducing paper-work, manual-work, and saves time. In this work, digital bus passes are generated using android application which would help commuters on a daily basis to issue passes, renew it and pay for it in a much more efficient and easy way.

The organization of paper can be seen as: Section II, containing the Literature review, followed by Section III having proposed model, the architecture and features of digital bus pass application whereas section IV discusses about the future scope, and section V concludes the paper followed by references.

2. LITERATURE REVIEW

With a digital approach, we can remove the drawbacks of a traditional system. The scope of having a digital pass is vast as it is going to eliminate the hassle of getting a physical pass on a daily basis, and also at the same time, it reduces manual intervention keeping the system very much safe and secure. The commuters will not have to worry about carrying such small denomination of money with themselves, rather they can easily pay through their cards or their UPIs. This digital system, though, is not only useful for the commuters, but it will also be a great help to the bus authority as they will no longer suffer from any losses caused due to misuse of passes and thereby increasing their revenue[36].The passengers can also benefit by the offers or discounts that the bus company may provide occasionally over the digital platform.

Digital pass system for buses either use a website or an application to provide services to commuters. For the development of this system, analysis of traditional system is needed. And to overcome its shortcomings, a digital bus pass application is proposed with various features such as pass renewal, pass generation, payment, category wise pass (student, women and elderly, specially-abled), editing of pass etc. Both, bus authorities as well as the passengers can enjoy benefits of this digital approach.

This new e-pass system is not only advanced but also effective and efficient. The objective of this approach is to automate the payment as well as pass issuing procedure with more safety and security than it was before. The passengers get the independence of using any fare paying model that is allowing full self-administration. The primary key success factor of the digital pass is the interoperability and simplicity of the system from the passenger's point-of-view[38]. The passengers can be sure that they will be guided safely to use this e-pass application and get the most of it.

This type of digital approach exists in one of the European country i.e. Germany and their success is very huge and motivating. Countries like Germany is using e-ticketing for public transportation by associating with their public transport companies such as Verband Deutscher Verkehrsunternehmen (VDV) who founded the VDV core application for bringing the e-ticketing approach in their country. With such a hit, other countries have started to evaluate the VDV core application. Australia has successfully developed a pilot model for the same as well[39]. As the time progresses, more countries will be coming forward and will become aware of the need of a digital approach in their transportation as well.

3. PROPOSED MODEL

The proposed model brings flexibility of issuing bus passes online and solves the problem of stolen and misplaced bus passes. Not only does it help in saving time for the office and college going commuters, but it also serves the passengers with an easy online system that issues hassle free bus passes with the method of online payment.

The modules included in this digital bus pass system are – pass generation, pass renewal, pass selection (daily pass, monthly pass, yearly pass, student pass, ordinary pass, gold pass, premium pass, dedicated pass), pass editing, pass cancelation and online payment module. Figure 2. shows architecture of various modules included in the proposed model

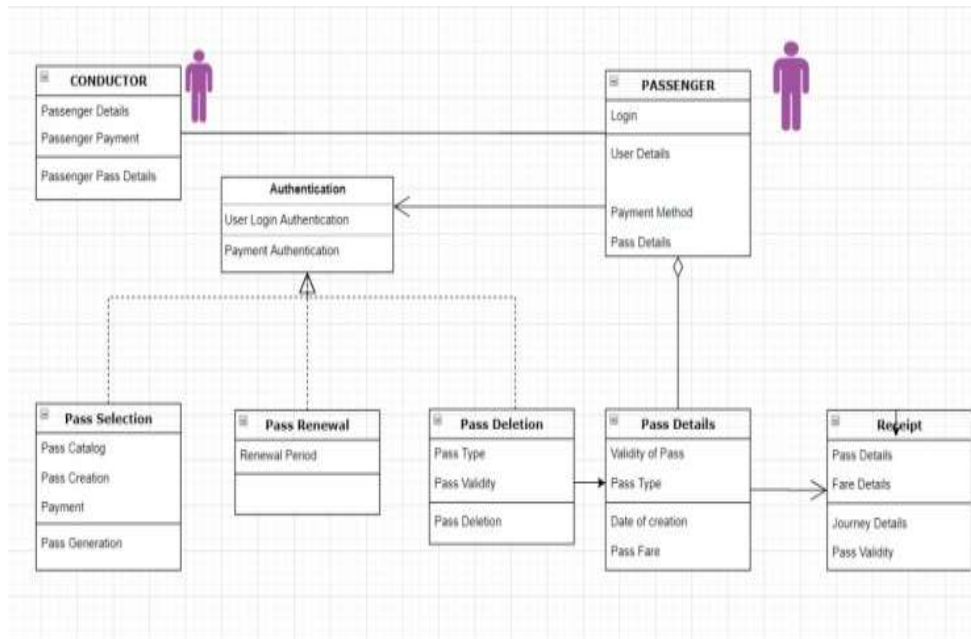


Fig 2 Architecture of modules in Digital Bus Pass System

3.1 Modules

3.1.1 Passenger Interface

Login module: In this module, the passengers will login into the digital bus pass application using their mobile phone and get themselves registered on the application[38]. For registering they need to provide the following details:

- Name
- Contact Number
- Password
- Payment method
- Address
- Email id
- OPT generated

After filling in the above information, they need to login using their credentials. This login data will move to the next module for authentication and if the authentication is successful then the user will be taken to the initial page of the application from where they can proceed further.

Authentication module: This module is responsible for authenticating a passenger based on their credentials information to check if the passenger is a registered user or not. This module is also checks if the payment method entered by the user is correct or invalid. In case if any of the checking parameters are not met, then the passenger will be prompted regarding the incorrect entered data and will be asked to re-enter them.

Pass selection module: In this module, the passenger has to select from the types of passes available in the pass catalogue section of the module such as:

- Daily pass
- Yearly pass
- Student pass
- Premium pass
- Monthly pass
- Ordinary pass
- Gold pass
- Dedicated pass

The passengers will select the type of pass according to their requirement and then proceed for pass creation section. In the pass creation section, the passenger needs to fill in details such as destination, pass number and pass validity needed. Once the details are filled, the passenger needs to pay for the pass in the payment section of the module. At last the passenger has to go to the pass generation module for getting the pass generated.

Pass renewal module: Most of the time the passenger forgets the validity of their passes and gets into difficulty[38]. This module deals with renewing the pass if the passengers wishes to get the validity of their passes extended. If the passenger’s pass has expired and no longer active, then they can get their passes renewed again by visiting this module.

Pass deletion module: If the passenger wants to get their pass deleted. This module comes into play when the passenger no longer requires the pass they had issued and wanted to get it deleted. The passenger needs to fill in the details like pass type and pass validity. If the pass is still unused, then the passenger gets the refund.

Pass details module: This module will have all the information related to the pass that the passenger has issued. It will contain the following details:

- Type of pass
- Date of pass creation
- Validity of pass
- Fare details

Receipt module: The receipt module contains the final receipt of the pass generated along with the details such as:

- Pass details
- Fare details
- Pass validity
- Journey details

3.1.2 Conductor Interface

In the conductor interface, the conductor receives all the details about the passenger who have registered, got their passes generated and played for the passes. The conductor is the one who manage the interface containing the following section:

- Passenger details
- Passenger Pass details
- Passenger payment details

4. CONCLUSION AND FUTURE SCOPE

This paper proposes a smart digital bus pass and payment system by using android as a platform for development. The digital bus pass system contains features that would help the daily commuters in their day to day bus journey not only with ease of use, but also is proved to be a cost efficient approach in comparison to the traditional system. This work not only contributes to the society but also to the green India campaign eliminating the use of paper. The paper demonstrates the use of android application that eases the hassle of passengers travelling across the city. It also offers a safe way of travelling.

This model can be further modified and changed depending on the future needs. Many additional modules and features can be enhanced in the proposed model such as pass category, additional feature of the application, user interface, payment category etc. In this fast-paced growing world, the needs of the people are as ever growing and it is necessary to keep the technology updated that would match the current requirements. That is why the version of this proposed model has a wide scope of modification and upgradation in the future.

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