BMTC e-pass Application

Guna Shekar B, Darshan C, Ganesh Horamata B V, Basavaraddi Mulimani, Sarvamangala D R

Abstract— Bengaluru Metropolitan Transport Corporation (BMTC) is a prominent public transport service provider in Bengaluru. It makes commuting favourable and cheap compared to other modes of transport within the city. The organization enhances its services by analyzing passenger demands and providing them the necessary services. BMTC working model is coagulating with information technology in terms of ITS (Intelligent Transport System- Global Positioning System [GPS] enabled buses, electronic ticketing machine [ETM]). In spite of these advancements, it charges its service fares through paper tickets and passes which need to be purchased by paying cash. In the Digital era, technological solutions pave the way for digitizing mechanisms for traditional methods or problems and synchronizing information in real-time. These paper pass which proves to be beneficiary for passengers are being misused by means of transferring, reusing the day pass when there is lack of inspection. We have designed a solution to overcome misuse and also to encourage digital transaction for a cashless economy. The solution is mobile application electronic pass (e-pass).

***Index Terms*: Android Mobile Application, BMTC, e-pass, QR code, digital payment.**

I. INTRODUCTION

Bengaluru is known as the **Silicon Valley of India**, which is one of fastest-growing Indian metropolis with an estimated population of 13.9 million, out of this 4.96 million people use the services of BMTC, generating revenue of 5.06 crores. The services are offered with the exchange of tickets, daily, monthly, student passes, which constitute 56%, 16%, 4% respectively. Total revenue generated by BMTC is illustrated in the Figure 1.

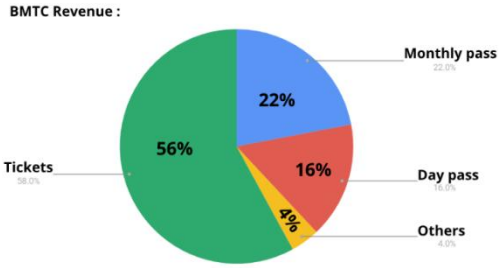

Fig.*1. BMTC Revenue*

With these fare systems, daily pass and monthly pass are more beneficial compared to tickets in passenger point of view in terms of money saved, distance commuted and frequency of money commute. The daily passes and monthly passes can be bought using BMTC ID which acts as proof of verification. Although it is not mandatory to buy BMTC ID for a daily pass, rather an alternative identity proof such as Aadhaar card, PAN, driving license, voters ID can also be used. Because of this passenger, who do not carry ID proof have to buy tickets with no other choice, thereby subsequently reducing usage of daily and monthly pass.

Daily passes were previously designed with a unique colour for weekdays, punched holes indicating the date, month, gender and was duly signed by the passenger to prevent misuse. The daily passes are currently being generated using ETM with passenger's ID proof number printed on the ticket. On the other hand, monthly pass needs only passenger information such as name, address, and BMTC ID. These passes lack verification at a glance and need thorough checking of ID proof with the pass. And since the process of checking all commuters is tedious task, and there is disadvantage in the present system and it is not able to attract passenger and is suffering losses because of the following reason.

1. *Rendering change problem*: Due to the circulation of high denomination currency at ATM's, passengers who carry this currency face difficulties when the conductor does not have the required change.

2. *Compulsory to carry BMTC ID/other ID proof*: To prevent buying tickets on every bus, passenger tends to buy daily pass/monthly pass. For this passes either BMTC ID/other ID proofs is required, when passenger forgets to carry these ID's, they end up in spending more for travel and for official BMTC ID and monthly pass, the passenger has to visit nearest bus depots which would be

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a tedious task of standing in long queues owning to the population of Bangalore

3. *Reuse and transfer of old pass*: Due to lack of verification for every single travel, passenger tends to reuse the old pass and transfer it to others. This action renders loss to the organization.

With the above-mentioned drawbacks, a passenger can easily forge daily pass and monthly pass.

To overcome all these drawbacks, we have designed a user friendly android mobile application. It solves all the drawbacks of daily and monthly pass by making automatic cancellation of daily/monthly pass at the end of the day/month, and easy verification using photographs, and an additional verification using QR code that indicates the number of times the conductor/ticket checker has verified passengers. Also, our application uses digital transaction methods such as e-wallets, UPI, Net banking which Encourages Digital India (An Initiative by Government of India) by going cashless and is eco-friendly reducing paper usage.

The organization of the paper is as follows. Section II discusses about the related work regarding the existing scenario of BMTC and problems faced. Section III gives the methodology used by e-pass application. Section IV discusses the experimental results of the e-pass application. Section V concludes the paper by giving suggestions for future work.

II. RELATED WORK

Digitization of ticketing or passes is being carried out in other metropolitan cities, such as ridlr in Mumbai, for public transport such as buses and trains where the passenger can generate paper tickets online through a web browser or mobile application.

Smart e-Ticketing system [2] for public transport in which passengers can book tickets for the empty seats using ticketing machine at every bus stop.

For ticketing, BMTC has launched ETM which is a more secure, easy and reliable solution which cannot be forged either by conductor or passenger. BMTC has launched smart card which is similar to debit card partnered with Axis Bank, where the passenger can deposit cash into their card in bus depots and can be swiped in ETM to generate tickets and passes. This measure helped in mitigating change problem, but it is still not able to meet customer service at large scale and was successfully implemented only for student passes and it must again be cross verified by their college ID cards.

III. METHODOLOGY

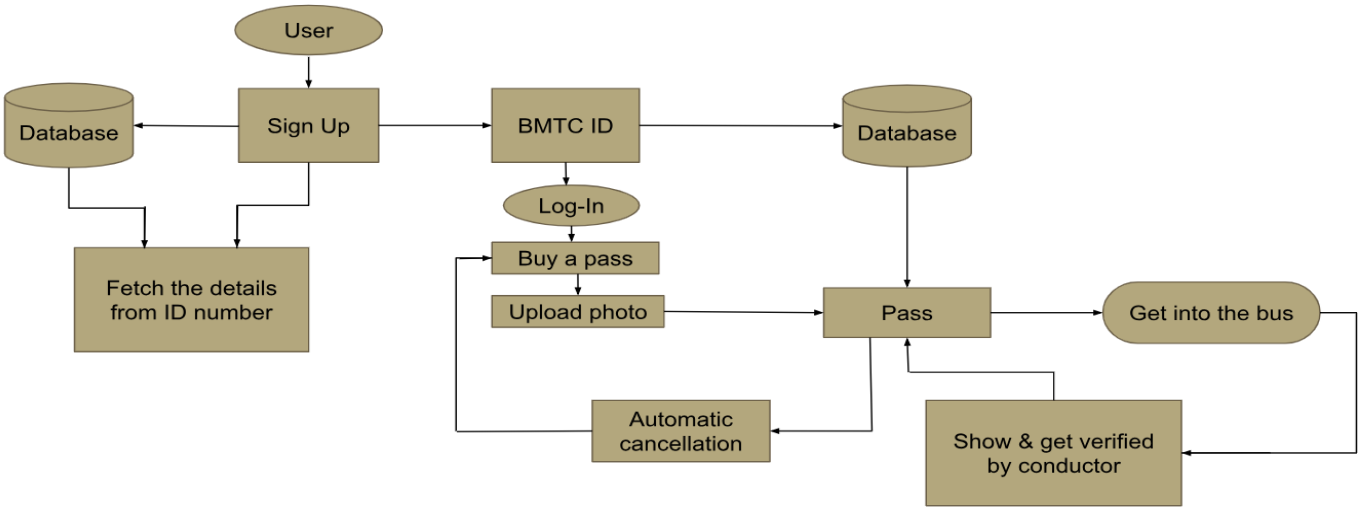
Android is an open source operating system for mobile devices. Android applications extends the functionality of devices and is written using android software development kit (SDK) and java programming language and developed using Android Studio integrated development environment(IDE)

Our Android Application uses features such as device camera to capture photograph, Google map application programming interface (API) to detect location, QR code scanner Database used for backend is parse server which stores data related to passenger information and the application is hosted on Google cloud platform.

Workflow of our application is as explained below,

User Registration:

In this phase, passenger information such as name, Date of Birth, Aadhaar number, Mobile number, Email ID and user-defined password is collected for creating an account in BMTC e-pass. After successful verification of passenger credentials, permanent BMTC e-pass account is created with email and password as login credentials.



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BMTC ID generation:

Along with user credentials, passenger permanent address /temporary address that is matched with Aadhaar card is read once and is not editable. The passenger recent photograph is captured using mobile and uploaded. With this credentials, the passenger has to pay the required amount for generating Permanent and unique BMTC ID of 8 characters. As a result, a virtual card is obtained for BMTC ID.

Day/Monthly pass generation:

After obtaining BMTC ID, the passenger can buy Daily/ monthly pass by uploading a recent photograph and completing digital transactions of required amount using any payment gateways. Unique BMTC daily /Monthly pass of 12 digits is displayed on the home screen of the application. This can be shown to the conductor/ticket checker and be verified at a glance with any one of the below mentioned steps.

Four step Verification:

- First step verification:
  The conductor can match the appearance of the passenger with pass photograph and BMTC ID photograph

- Second step verification:
  Each pass has a unique id of 12 characters in which the third character represents the weekdays

For e.g.:- Pass id- 152169852456

↓

Signifies MONDAY

Digit	Weekdays
1	Sunday
2	Monday
3	Tuesday
4	Wednesday
5	Thursday
6	Friday
7	Saturday

Table 1. Identify Weekdays

- Third step verification:
  A dynamic run time timer will be displayed on the daily or monthly e-pass which specifies the time remaining for e-pass to expire.

- Fourth step verification:
  When the conductor /ticket checker is not satisfied with above-mentioned methods, the passenger can scan unique QR CODE. Fig [3] of conductor/ticket checker, which displays the result that is known only to conductor/ticket collector.

Fig.3. BMTC e-pass Validation

IV. RESULTS AND DISCUSSION

With these above-mentioned real-time verification methods, the passengers cannot forge BMTC, and user friendly.
e-pass application revolves around having secure, reliable and easy to use interface, and is more advantageous compared to normal paper pass.
Working model of our application is represented using screenshots mentioned below.

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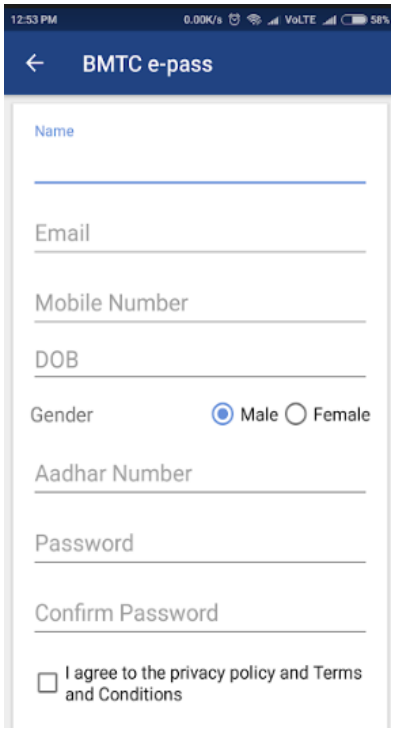

Fig.4. Registration form for BMTC e-pass

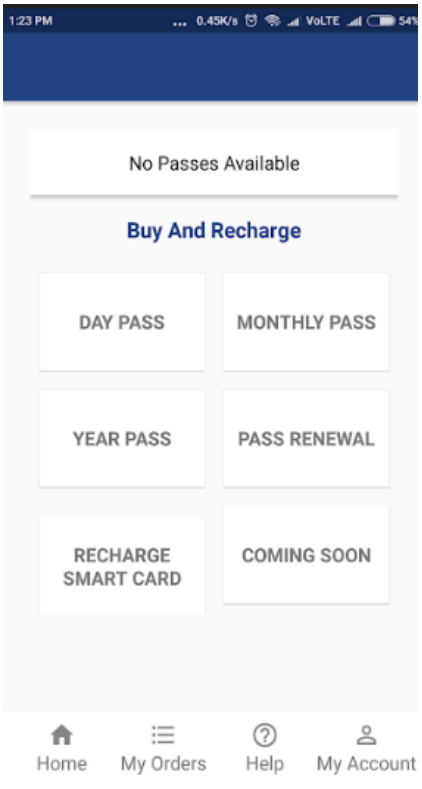

Fig.5.Home page of BMTC e-pass Application

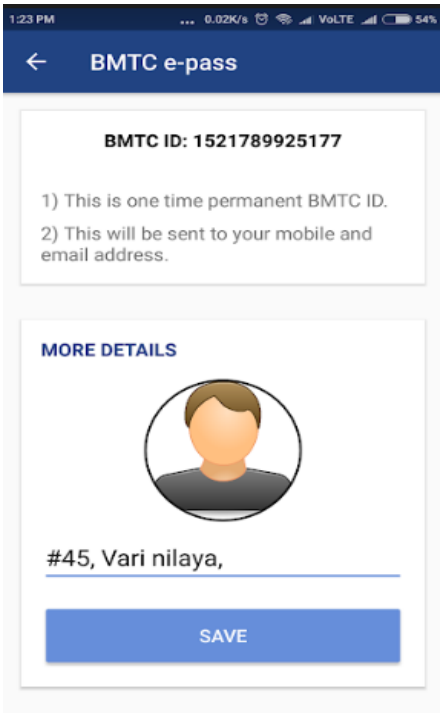

Fig.6.BMTC e-pass ID generation

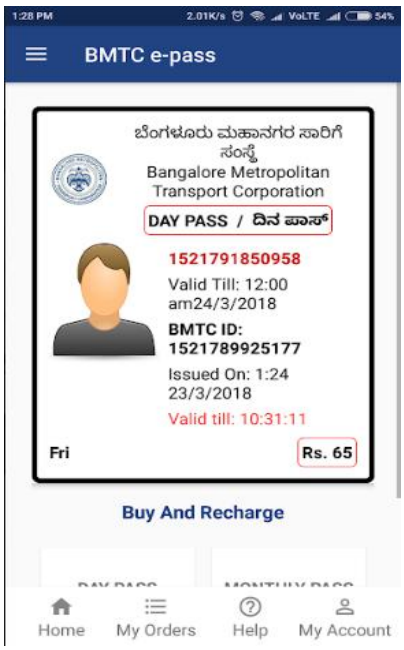

Fig.7. BMTC e-pass generation

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V. CONCLUSION & FUTURE WORK

e-pass mobile application is developed to provide solutions for loopholes found in traditional paper passes generated using ETM Machine. With the use of this app, the passenger can experience a hassle free transaction of not having to carry small denominations of money, carrying ID cards, or losing/tear/wear of passes and also BMTC does not suffer any losses due to misuse of passes anymore and also contribute to saving paper and in turn saving trees. These e-passes, can attract passengers thus increasing eco-friendly service along with increase of revenue of BMTC.

As further enhancements, this application can also be used for providing ticketing solution, when BMTC completely implements intelligent transport system where each bus can be tracked real-time using GPS (Global Positioning System) to book tickets beforehand, based on knowing the estimated time of arrival(ETA) and number of vacant seats or increase/decrease the frequency of the buses based on the demand and thus becoming more passenger friendly and encouraging everyone to utilize the transportation services.

With the use of mobile application, BMTC can track real-time user data and help in analysing passenger demands and deliver satisfactory service.

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REFERENCES

[1] Mrs. D.Anuradha, M.V. Durga Devi, K. Keerthana, K.Dhanasree "SMART BUS TICKET SYSTEM USING QR CODE IN ANDROID APP" vol. 06, no. 03, pp 2395-0072, Mar 2018

[2] Sanam Kazi, Murtuza Bagasrawala, Farheen Shaikh, Anamta Sayyed "Smart E-Ticketing System for Public Transport Bus"

[3] "Vehicle Tracking and Locking System Based on GSM and GPS", R. Ramani, S. Valarmathy, Dr. N. SuthanthiraVanitha, S. Selvaraju, M. Thiruppathi, R. Thangam, MECS I.J. Intelligent Systems and Applications, 2013, 09.

[4] "Taking an Electronic Ticketing System to the Cloud: Design and Discussion". Filipe Araujo, Marilia Curado, Pedro Furtado, Raul Barbosa CISUC, Dept. of Informatics Engineering, University of Coimbra, Portugal filipius@uc.pt, Marilia, pdf, rbarbosa@dei.uc.pt 2013.

[5] "Public Transport System Ticketing system using RFID and ARM processor Perspective Mumbai bus facility B.E.S.T", Saurabh Chatterjee, Prof. BalramTimande, International Journal of Electronics and Computer Science Engineering., 2012.

[6] "Bus Tracking & Ticketing using USSD Real-time application of USSD Protocol in Traffic Monitoring", Siddhartha Sarma, Journal of Emerging Technologies and Innovative Research (JETER) www.jetir.org, Dec 2014 (Volume 1 Issue 7).

[7] Thimmaraja Yadava. G, Prem Narayankar, Beeresh H.V, "An Approach for RFID ticketing used for personal navigator for a public transport systems", International Journal of Technical Research and Applications, issue 3, vol.2, 2014, pp.109-112.

[8] Macia Mut, M. magda, Payeras-C (2007)-" A survey of electronic ticketing applied to transport"-https://crisesdeim.urv.cat/web/docs/publications /journals/721.pdf

[9] Wang, J L and Loui, M C (2009). "Privacy and ethical issues in location based tracking systemrey.

[10] Thimmaraja Yadava. G, Prem Narayankar, Beeresh H.V, "An Approach for RFID ticketing used for personal navigator for a public transport systems", International Journal of Technical Research and Applications, issue 3, vol.2, 2014, pp.109-112.

[11] Z. Wei, Y. Song, H. Liu, Y. Sheng, X. Wang, "The research and implementation of GPS intelligent transmission strategy based on on-board Android smartphones", Computer Science and Network Technology (ICCSNT) 2013 3rd International Conference on, pp. 1230-1233, 2013.

[12] M. Yu, D. Zhang, Y. Cheng, and M. Wang, "An RFID electronic tag based automatic vehicle identification system for traffic iot applications" in Proc. Chin. Control Decision Conf. (CCDC), May 2011,pp. 4192–4197.

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