

RideExpress: An Online Seat Reservation and Vehicle Location Tracker with Estimated Time of Arrival

Enrico P. Chavez¹, Alexander A. Hernandez², Jasmin D. Niguidula³, Jonathan M. Caballero⁴

Abstract— Traffic is one of the biggest problems that the Philippines is now experiencing even though the government takes a deeper action to resolve it. Due to heavy traffic, vehicles and passengers are stuck in traffic, and some passengers tend to wait for an available vehicle even there's no particular time of arrival. This paper aims to help commuters of Utility Vehicle (UV) Express to ride by finding the nearest terminal with the use of Global Positioning System (GPS) and reserving seats through mobile phones and finding the nearest UV Express driver on the road with estimated time of arrival. The mobile application was developed using Java as a programming language and runs on Android platform supplemented by reliable information issued by the government for the UV Express drivers' information. The results of the software evaluation show that functionality, reliability, usability, efficiency, maintainability and portability criterions were rated as "Highly Acceptable" of the respondents. Practical and research implications are discussed.

Keywords— utility vehicle express, traffic, online seat reservation, mobile application, global position system.

I. INTRODUCTION

TRAFFIC congestion is a major issue in transportation sector. In rich counties, the problem with transportation field is increasingly exploring new solutions to alleviate these with the use of modern technology [1]. Philippines is witnessing the emerging and worsening traffic situation in public transportation in any part of the country, especially in Metro Manila. Public transportation plays an important role in modern cities. Public transportation assumes a critical part in cutting edge urban areas. It brings a few effects financially, it could lessen the general transport expense of the city; socially, it guarantees all individuals from the city can travel and naturally, it spares more vitality than private transport [2]. In today's public transportation, a high number of passengers, lack of MRT (Metro Rail Transit) and LRT (Light Rail Transit) and high passenger limit in stations influence both the comfortability and passengers' safety. [3]. Moreover, in the Philippines, public transportation is one of the basic means of transportation to go in different places. There are many modes of transportation; private transportation and the most popular mode of public transportation are the jeepneys that became also an ambitious

symbol of the Philippines. Other modes of public transportation are the bus, LRT, MRT, tricycle and UV Express [4]. UV Express is a licensed utility vehicle to operate, particularly vans, as an alternative and faster way of the mode of public transportation in the Philippines. Metro Manila needs to have an innovation in terms of transportation network which suggest shortest path to specific location [5].

Public Utility Vehicle (PUV) in the Philippines such as UV Express is regulated by the Land Transportation Office (LTO) for the driver's license and by Land Transportation Franchising and Regulatory Board (LTFRB) to regulate their franchises. These two are in charge in releasing of the license of the drivers as well as the releasing of plate number for the new vehicles like UV Express. The Land and Transportation, Franchising and Regulatory Board (LTFRB) is the agency that is responsible for monitoring the vehicles, laws, rules and regulations for public land transportation services and vehicles on the road, and also releases franchising especially for UV Express. Also, since the creation of LTFRB, the franchises for land transport UV Express operators has more safer than before and result to higher percentage of safety travel on the road [6].

Although there are many franchises of UV Express, there is still a lack of vehicle especially when rush hour and vehicles are stuck on the road due to traffic. Some commuters are scattered everywhere trying to get a ride home while others stayed and waited at the terminal waiting for a ride into definite time. Thus, there's a need to create a solution that can ease the traffic in the Philippines thru innovating manual processes into an automated with the use of modern technology. At this point, this project aims to present a mobile application project that enables passengers to reserve a seat in UV Express stations and to monitor the real-time location of UV Express drivers and vice-versa.

II. RELATED WORKS

Metro Manila's population rate is now over 12% of the Philippines population or 12.2 million and over 15 million in daytime coming for their work and that's why Metro Manila called one of the world's densest and fastest-growing megacities today [7]. Because of huge population, there is a bigger need for public transportation. Public transportation plays most important role now in modern cities by using the shared services to the public [2]. Many vehicles on the road,

¹²³⁴Technological Institute of the Philippines, Philippines.

like franchising UV Express that is continuously increasing from time to time that why it becomes a bigger challenge to government agencies such as LTRFB and LTO to monitor and regulate their driver license and franchising lines.

Previous studies stated that public transportation can bring ease and bigger problem to the country. Metro Manila, within four years from now, may become uninhabitable as said by the foreign chamber [8]. As the fast developing automotive industry of the country, the roads and other infrastructure in the Philippines needs to upgrade immediately unless the traffic in the metropolis would likely to worsen. Ease in public transportation that reduces the traffic congestion, too much oil consumption, water consumption, air pollution and even the fees to travel from one place to another is cheap [9]. Bigger problem such as congestion brings a lot of smoke that cause air pollution, construction and road under maintenance and it results commuters to be less productive to work because they are already tired when they arrived to work [10]. Due to this problem, the safety of the passengers of PUVs like UV Express is unsecured. Passengers are one of the people highly at risks to be unsafe because of commuting, always on the road travelling to work using the public transportation [11]. One solution is by the use of tracking and monitoring system. This system can provide security to passengers by track the passenger's location through GPS [12] and record ride of the passengers especially, in urban area. Drivers are responsible for complying with all rules and regulations associated with the private rental contract. One of the weaknesses of drivers is cause of lack of sleep or rest issue is a vital element in the expanding number of vehicle accidents on today's streets [13]. The degree of distraction on the road is on very high risk and the tendency is the driver's sudden speed up the engine, and the unpredictable steering behavior [14]. He must also know and monitor his passenger's safety along the road. Moreover, monitoring the number of seats available for his future passengers waiting for UV Express at the station is really important and must have a terminal code to easy monitoring the station, manual calculation and input [15]. Passengers have the rights to report crime related or undisciplined drivers to LTRFB [5].

There is also growing a number of related mobile applications for traffic monitoring and passenger reservations in Taxi while UV Express has none. GrabTaxi and Uber are some Taxi application and Rideshare Drivers applications that is widely used by many people in the Philippines that can provide an innovative and better way of commuting [16, 17, 18]. Singapore wants to manage quickly developing outsider taxi booking companies like Uber and GrabTaxi, topping expenses and obliging them to dispatch just authorized taxicabs and drivers [19]. These applications under the category of Transport Network Vehicle Service (TNVS) provides opportunities for a new mode of transportation that encourage drivers and operators to upgrade transportation service for commuters [20]. Also, these applications involve monitoring the current location of UV Express drivers and enabling the passengers to reserve a ride in specific time.

Also these applications involve driver's information for the safety of the passengers.

III. METHODOLOGY

This application used agile software development method to make all the necessary features accordingly based on the aspects of mobile application user requirements, developments, and outcomes. Also, this application uses Java as programming language running on Android Platform implementing Google Maps with the use of GPS to find locations and other relevant programming interfaces. This study also involves the different group of users like UV Express drivers, passengers, dispatchers and LTRFB as the receiver of passenger 'complain. This research used a system software evaluation following the ISO9126 criteria and given to the users during the testing phase of the application. The Likert's scale with the interpretation of Highly Acceptable, Acceptable, Moderately Acceptable, Slightly Acceptable and Not Acceptable was used to identify the users' level of satisfaction to the software evaluation items. The results of software evaluation are presented in the succeeding sections of this paper.

IV. RESULTS AND DISCUSSION

The succeeding parts of this section present the RideExpress application together with its features. Figure 1 presents the system architecture of the three applications which includes the passengers, drivers and dispatcher's app and the web modules which includes viewing all the users and generating PDF files.

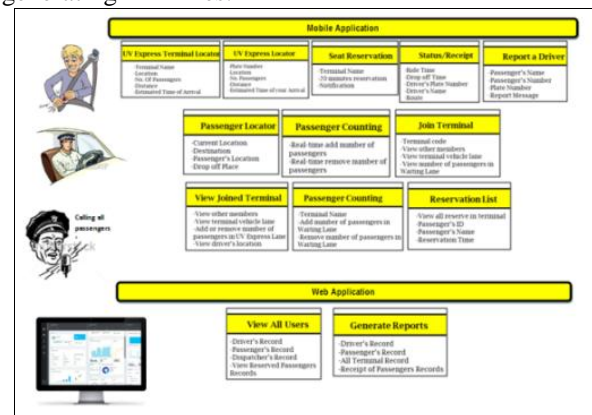


Fig. 1 RideExpress System Architecture

Figure 2 shows the terminal locator for the passengers' application wherein it uses Google Maps with the help of internet connection and global positioning system (GPS) to get the current location of the user and locate nearby UV Express Terminal. The application displays a "T" icon on the map telling that there is a UV Express terminal in that place. Users can click on the terminal they choose, and the application displays the terminal name, route available, number of passenger waiting in the lane. The application

displays the compute the distance and estimated time of your arrival in that terminal.

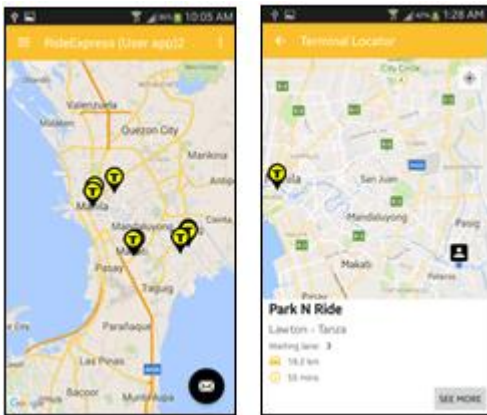


Fig. 2 UV Express Terminal Locator Module

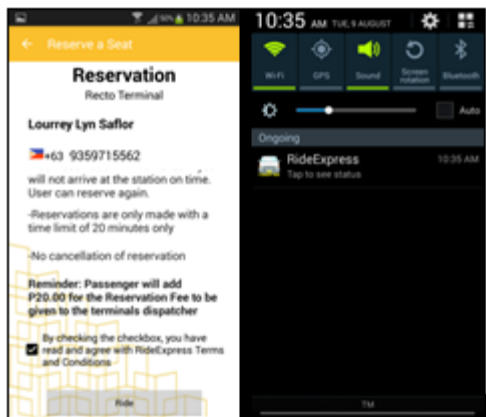


Fig. 3 Seat Reservation Module

Figure 3 shows the reservation page in the passenger’s application after locating terminal available. The reservation page displays the terminal name, phone number and the name of the user. Also, on the reservation page, the users can see and read the Terms and Conditions of RideExpress upon clicking the ride button to be reserved. If the ride button clicked, it would notify the passengers to click the notification upon arriving in the terminal. The reservations of passengers have allotted time of 20 minutes and if the passenger fails to arrive within the allotted time, the system automatically remove the passengers’ reservation.

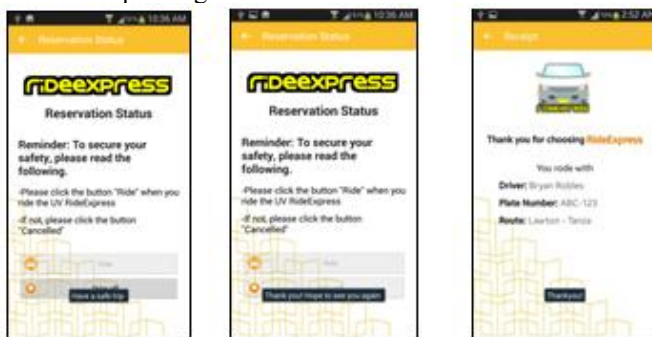


Fig. 4 Status/Receipt Module

Figure 4 shows the reservation status after clicking the notification displayed on the phone. The Ride button records the riding time of the passenger to the UV Express and the drop off button records the drop-off time of the passenger from the UV Express. Upon recording the drop-off time, the receipt display that contains the driver’s information including the plate number and the time record registered in the database. Recording the time of reservation, ride and drop-off are vital, especially when an accident happens to the passengers.

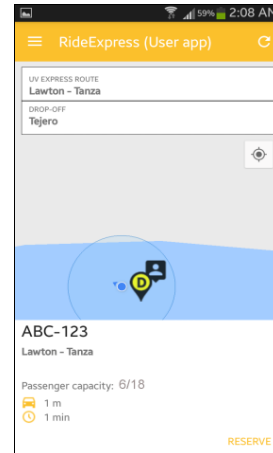


Fig. 5 UV Express Driver Locator Module

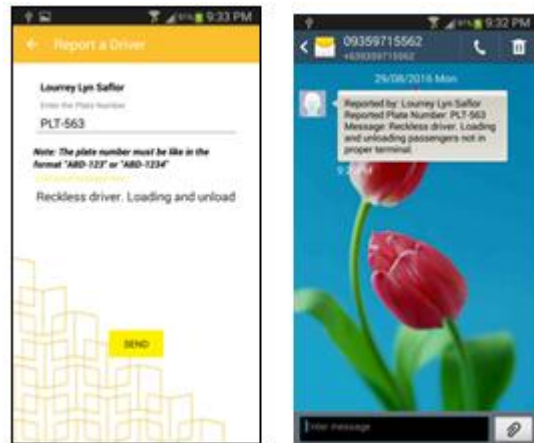


Fig. 6 Report a Driver Module

Figure 5 shows the driver locator in the passenger’s application. The passengers can locate nearby UV Express driver whose route is the same with the route entered, and it displays the UV Express location on the Google Maps. Passenger can see the information of the driver which includes the plate number, route of the UV Express, and even the real-time passenger count of the number of passengers riding in the UV Express. Moreover, the application can calculate the distance and estimated time of arrival of the UV Express in your location. Figure 6.0 shows that the passengers have authority to quickly report undisciplined drivers on the road with the use of Short Messaging Service (SMS) that directly sends to the LTRFB number. The message contains the name of the sender, plate number reported and the report message made by the passenger.

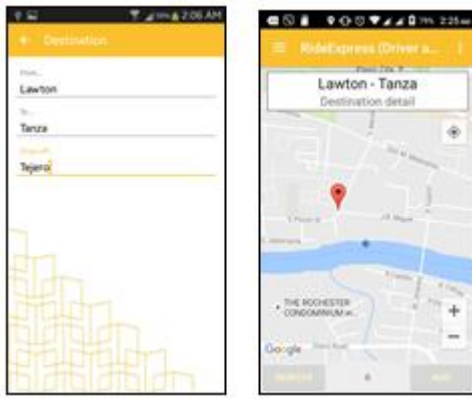


Fig. 7 Passenger Locator and Counting Module

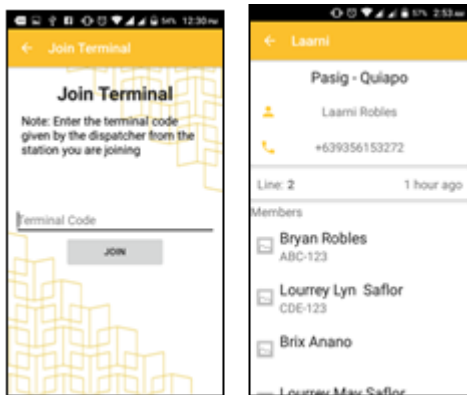


Fig. 8 Join a Terminal

Figure 7 shows passenger locator in the driver’s application. The drivers must choose destinations based on the vehicle’s route, and it automatically set upon clicking the back button, and it locates passengers having the same route. If passengers are available, the driver can click the icon, and it displays the drop off place of the passenger. Also, drivers can add or remove passenger count in the application, which automatically update in real time and can be seen by the passengers. Figure 8 shows join a terminal page in the driver’s application. The drivers enter the terminal code given by the dispatcher which is generated by the Terminal application. It consists of four letters and four numbers. After the successful joining, the driver can now view information of the terminal, members in the terminals and also the number of passenger lined up in the terminal.

TABLE I
SUMMARY OF SOFTWARE EVALUATION RESULTS

Criteria	Mean	Interpretation
Functionality	4.73	Highly Acceptable
Reliability	4.74	Highly Acceptable
Usability	4.77	Highly Acceptable
Efficiency	4.77	Highly Acceptable
Maintainability	4.77	Highly Acceptable
Portability	4.87	Highly Acceptable
Overall		
Weighted Mean	4.78	Highly Acceptable

In summary, the software evaluation indicates that the respondents of RideExpress mobile application are satisfied through the functionality (4.73), reliability (4.74), usability (4.77), efficiency (4.577), maintainability (4.77), and portability (4.87). Hence, the software evaluation receives an overall rating of 4.78 with an interpretation of Highly Acceptable. The results indicate that performance of RideExpress has certainly achieved the goal of the study for creating a mobile application to improve transportation for UV Express passengers by the use of mobile phones implementing the Google Maps to locate terminals and drivers, and reserve a seat in the terminal. Moreover, drivers and dispatchers also benefited from this study for making an automated system for locating commuters easily through the use of mobile phones with an internet connection.

V. CONCLUSION

This paper aims to provide a mobile application that enables passengers to locate nearby UV Express drivers and terminals, and reserve a seat in UV Express terminal that record time of ride and drop-off. Moreover, passengers can quickly send SMS and report undisciplined drivers directly to LTFRB number to regulate and improve the safety of the passengers. The software evaluation specifies that the importance of the features of the applications with the widely used of GPS is efficient. Therefore, the features of the application are helpful for the UV Express passengers, drivers and terminals by providing information and security for the users. However, this research also has some recommendations to enhance the capabilities and functionalities to perform really well which includes: (a) upon reservation of the passengers, they might quickly see the UV Express and driver information they might ride; (b) developing and improved RideExpress application that can be used in iOS platform or other platform; (c) developed RideExpress application running in different Android platform; (d) adding more driver utilities on monitoring traffic and passengers on the road; (e) adding capability for the passengers application to send a receipt through SMS and to hire a UV Express drivers in a contractual way.

ACKNOWLEDGMENT

We would like to thank Technological Institute of the Philippines for providing financial support in this research project.

REFERENCES

- [1] Henclewood, D (2016). Real-time data-driven traffic simulation for performance measure estimation.
- [2] Zeng, W., Fu, C., Arisona, S., Erath, E., Qu, H. (2014). Visualizing Mobility of Public Transportation System.
- [3] Yuen, K., Lee, M., Lo, M., Yuen, K. (2013). An Intelligence-Based Optimization Model of Passenger Flow in a Transportation Station.
- [4] Balinski, R.. Modes of transportation in the Philippines Retrieved February 19, 2015 from <http://preparetoserve.com/blog/modes-of-transportation-in-the-philippines/>.

- [5] Narboneta, C. (2015). A Study of Metro Manila's Public Transportation Sector By Implementing A Multimodal Public Transportation Route Planner.
- [6] Land Transportation Franchising & Regulatory (LTFRB). Retrieved September 15, 2016 from <http://www.ltfrb.gov.ph/>
- [7] Punongbayan, J., Mandrilla, K., Why are there so many cars in Metro Manila? Retrieved August 15, 2015 from <http://www.rappler.com/views/imho/102701-carmageddon-metro-manila>
- [8] Mercurio, R. (2016). Traffic can make Metro Manila uninhabitable in 4 years Retrieved January 4, 2016 from <http://www.philstar.com/headlines/2016/01/04/1539050/traffic-can-make-metro-manila-uninhabitable-4-years>
- [9] Vishwanath, A. (2015). Personalized Public Transportation: A Mobility Model and Its Application to Melbourne.
- [10] Traffic Problems in the Philippines and Proposed Solutions. Retrieved September 02, 2014 from <http://www.flatplanet.com.au/hard-heads-the-bpo-business-case/229-traffic-problems-in-the-philippines-and-proposed-solutions>
- [11] Hamilton, M., Salim, F., Cheng, E., Choy, S. (2012). Transafe: A Crowdsourced Mobile Platform for Crime and Safety Perception Management.
- [12] Chandra, A., Jain, S., Qadeer, M. (2011). GPS Locator: An Application for Location Tracking and Sharing using GPS for JAVA Enabled Handhelds.
- [13] Bhumkar, S., Deotare, V., Babar, R. (2012). Intelligent Car System for Accident Prevention Using ARM-7.
- [14] Feldges, J. (2012). Panel discussion on introduction of intelligent vehicles into society: technical, mental and legal aspects. Future driver assistance systems-product liability and driver's responsibility.
- [15] Stankov, E., Jovanov, M., Andonov, Jovan. (2016). Improving the accuracy of the code complexity calculation for automatically generated tasks with programming codes.
- [16] Ackaradejruangsri, P. (2015). Insights on GrabTaxi: An Alternative Ride Service in Thailand.
- [17] eCompareMo. Uber Vs GrabCar: The Benefits Of Ride-Sharing Services In The Metro Retrieved from <https://www.ecomparemo.com/info/uber-vs-grabcar-the-benefits-of-ride-sharing-services-in-the-metro/>.
- [18] The RideShareGuy. 12 Must Have Apps for RideShare Drivers retrieved from <http://therideshareguy.com/12-must-have-apps-for-rideshare-drivers/>
- [19] Rochan, M. Singapore Moves to Regulate Uber and GrabTaxi from November 21, 2014 from <http://www.ibtimes.co.uk/singapore-moves-regulate-uber-grabtaxi-1475866>
- [20] Wicaksono, A., Lim, I., Muromachi, Y., Vergel, K. N., Choocharukul, K., Tan, V. H., ... & Yai, T. (2015). Road-based Urban Public Transport and Paratransit in Six Asian Countries: Legal Conditions and Intermodal Issues. *Journal of the Eastern Asia Society for Transportation Studies*, 11(0), 227-242.