

A Mobile-Based GPS Bus Tracker System for UTM Students

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Abstract

Global Positioning System (GPS) bus tracker system is an android smartphone application to help students of Universiti Teknologi Malaysia (UTM) to track the current bus location in real-time. Furthermore, it also able to estimate the time taken to travel from another location to another. The system also will always display the actual distance from the initial location to desired destination. The processes that involved in the GPS bus tracker system were search for the bus current location. The search process can only be done after successfully login into the system with the valid username and password. In addition, user can save the picture of the map with the bus location and share it with other friends by uploading it to internet using cloud computing. This project using agile approach to complete all the tasks as proceeds to each iterations. The system was developed in Ionic Framework environment and AngularJS programming language because its focus on the mobile android operating system (OS) by taking the advantages of GPS units that already implemented in the smartphone. Students able to know the movement of the bus as they started using this system and they can prevent from wasting their time waiting the bus without knowing whether really bus present in time.

Keywords: UTM Students, Application, Ionic Framework, AngularJS, Android

1.0 Introduction

The early history of bus transportation was introduced in Paris by Blaise Pascal in 1662 which is known as a *Carriage* at that time. The word bus was defined from Latin word *Omnibus* meaning *Carriage for all*. It serves as a transportation carrying passenger who travel from one location to another. This was applied by John Greenword with his first modern omnibus service in 1824 by using a horse and a cart as transportation from Manchester to Liverpool turnpike. Since the early omnibus, people was innovate to improve the bus service by invented new type of buses – Steam buses, Trolley buses, Motor buses. The Steam buses was introduced by Walter Hancock in England in the 1830s. After that the first mechanically propelled omnibus appeared in London on April 22, 1833 which was faster than horse-drawn carriages. Followed by the invention of the electric trolleybus in 1882. It was first proposed by Sir William in England about the trolleybus concept. From there, the Electromote was invented by Dr. Ernst Werner von Siemens in Halensee, Berlin, Germany. At 1898, Motor buses begin to mark as the great evolution of bus transportation. Daimler-Motoren-Gesellschaft (Daimler Motors Corporation)

was the earliest production for motor-bus. Founded by Gottlieb Daimler. Expanded the production until twentieth century.

Transportation in Malaysia began since during the British reign. It is then extend until today. *Perkhidmatan Bas Mini Kuala Lumpur* or *Bas mini* was the oldest public bus transportation in Malaysia which covered the route from Kuala Lumpur and Lembah Klang. The early history of public bus transportation began in 23 September 1975 under the Ministry of Transport. The main companies that handle bus transportation at that time were Syarikat Kerjasama Pengaman (M) Bhd, Bas Mini Wilayah and Konsortium Pengusaha Bas Mini Sdn Shd. One *Bas Mini* can carry 20 – 30 passengers from one location to another location. On July 1, 1998, the public bus transportation was stopped and replaced with Intrakota bus service and Bas RapidKL (Rangkaian Pengangkutan Integrasi Deras Sdn Bhd) in 2005.

In century of twenty first, Information Technology (IT) is growing rapidly in time which involve application and technology of computers as one of the important components. Information Technology refers to anything related computing technology, such as networking, hardware, software, store, retrieve, transmit and manipulate data, or people that work with these technologies. This can be seen everywhere now for example Vehicle tracking system. It is the use of combination of automatic vehicle location with software that collect data for the vehicle current locations. Using GPS in modern vehicle tracking systems also can help to locating the vehicle.

GPS originally designed for military and intelligence application that come from the idea of the Sputnik satellite that launched by Russian in 1957, surprising the world. Then the very first GPS system was developed in the 1960s to allow the ships in the US Navy to navigate the oceans more accurately. GPS is a network of orbiting satellites that send the details of their position in space back to earth (Fernhout et al, 1994). Then the GPS receiver know what is their exact location now. Besides that, it can be used to calculate speed and time at the vehicle location at real time (Alfredo et al, 1996). This is very useful when navigate the route of the vehicle especially for students. By using this technology, students can know which bus will pass through their dormitory route and help them know how long the time to arrive at their faculty.

GPS system can help driver to save their money when spending on fuel and that is the main reason why people want GPS system in the vehicle. With the accurate driving directions also help to save time when travels. It is also benefit for fisherman or sailor. GPS system work as a life saver when they getting lost in the middle of the sea.

Furthermore, GPS system can also have the ability to function as a hands – free device for smartphone and it can help to avoid traffic. The GPS will updates in real time when caught in traffic, and can automatically change to other directions with the same destination as quickly as possible. For company like trucking companies and other delivery services can view the locations of all the trucks in a time. It is use to track other employees vehicle go throughout the day, ensuring that employees focused on their work and do not take advantages of company asserts (Katina et al, 2006).

For unconventional uses, GPS system is use in the hospitality industry especially a luxury hotel in Singapore by installing vehicle tracking systems in their limousines to ensure

they can welcome their VIPs when they reach the hotel. While for food delivery van may alert the temperature of the refrigerated compartment moves outside of the range of safe food storage temperatures.

The main objective of the project is to design and develop a bus tracker mobile application which enable time estimation of the bus arrival at certain location within UTM's vicinity. The requirements of the proposed system are elicited by analyzing the problems faced by UTM students in transportation. Once the system has been developed, the system was validated and tested on the functionality of the developed system to meet the user requirement.

2.0 Comparison of Existing Software

Table 1 below show the comparison among the existing system that used GPS in transportation.

Table 1: Comparison software

APPLICATION	SPECIAL EATURES	PAID/FREE	TRACK FOR VEHICLE
EVO GPS Tracker (EVO GPS Tracker, 2016)	Sent SOS emergency alarm Vehicle security secure	Paid	Yes
Garmin nuvi (Garmin nuvi, 2016)	3D map Active Lance Guidance with Voice Prompts Voice-Activated	Paid	Yes
Run with My App (Run with Map My Run, 2016)	Voice feedback Record activities	Free	No

Overall, EVO GPS Tracker is the best result among the applications. It has powerful features when it comes to security, which is the user is fully in control with his or her vehicle. Not only serves as a vehicle tracker, but also serves as a monitor to the vehicle throughout the road.

3.0 Result

Use case diagram for GPS bus tracker system is shown in Figure 1 below. The students of UTM and driver bus will become the actor for the system. The common action of both role can do are login, signup, logout, view profile, and update profile. For specific role, student role can track current user location, select bus location, share to social media, view details of distance and time between user and bus location. While specific role for driver is upload their current location to the Backend server.

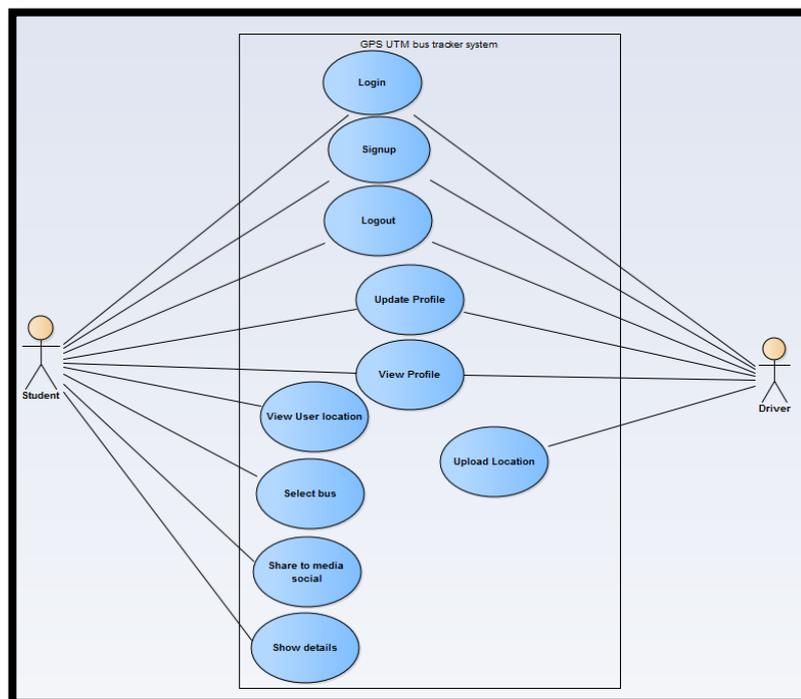


Figure 1 Use Case Diagram

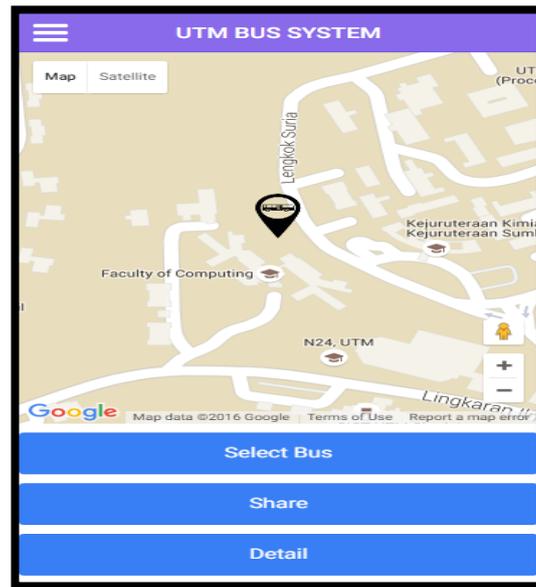


Figure 2 User Interface of Google Map

One of the main feature of GPS UTM bus tracker system is able to track the bus location using Google Map API as shown in Figure 2. There are many features that involved in this page such select bus, share to social media and display the details of the distance and time arrival estimation between user and bus location. The other interface design as shown in Figure 3.

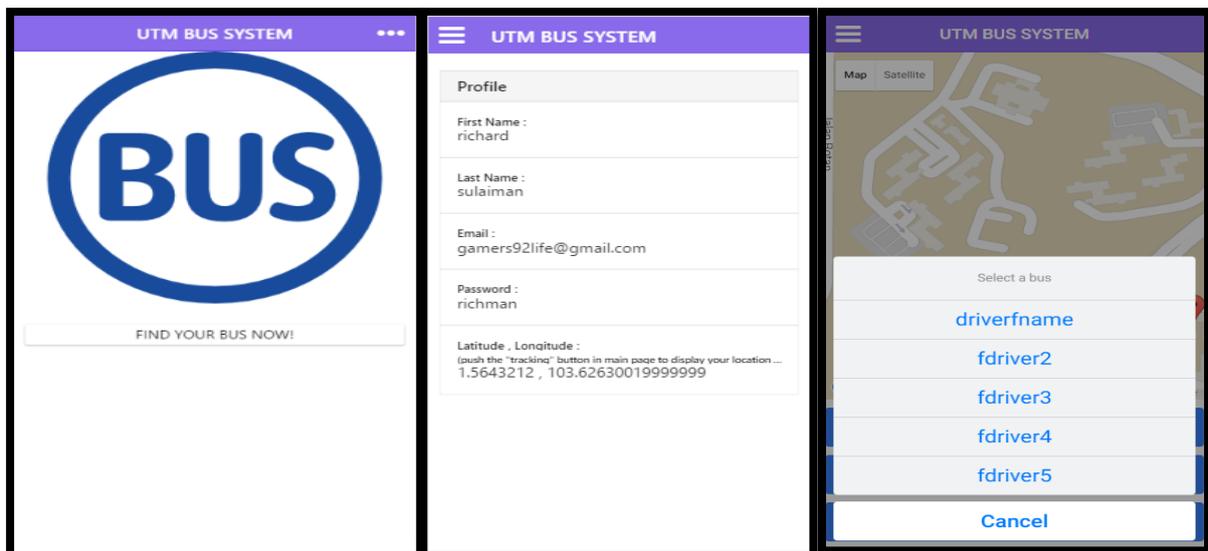


Figure 3 Some of Interfaces Design in the System

4.0 Summary of Black Box Testing

Table 1 below is summary of black box testing that has been conducted during testing phase.

Table 2: Black Box Testing

No	Testing	Expected Result	Actual Result
1	View Profile	Display user profile	success
2	Update Profile	Display updated user profile	success
3	Time and distance detail	Display time and distance between user and bus location	success
4	Add share caption	Display in social media with the caption entered	success

5.0 Discussion

GPS UTM bus tracker system has successfully fulfilled the objectives of this project as explained in chapter one. The first objective is to study the problems faced by UTM students regarding transportation. The study found that they always miss the bus especially for first year student. After using this application, students can solve the problem by able to track the bus location. The second objective is to design a system that can track bus location within UTM's vicinity. This application able to read all the bus location not only in UTM are but also outside UTM. For the third objective, to develop bus tracker mobile application which enable time estimation of the bus arrival at certain location. This application achieved the objective by implemented with Google Map API that can read the time and distance between two points in the map. It will display the time and distance when push the details button in the map page. Lastly, to test the functionality of GPS bus tracker system to ensure the system meet the user the user requirements. This objective achieved by produced a Software Testing Document (STD) which can separate into two parts. That include the user acceptance testing and black box testing.

6.0 Conclusion

As a conclusion, GPS UTM bus tracker system has delivered the objective of this project which are student can plan their time more effectively without having worry about missing the bus. They able to monitor the bus location and save their time for other preparations instead of wasting their time waiting bus.

References

- Alfredo J. Berard, James L. Mentzer, David C. Nixon (1996) *Cellular/GPS system for vehicle tracking*, US5515043 A, US
- Fernhout, H.C. (1994) *Device for determining the position of a vehicle*, US5334986 A, US
- Katina Micheal, Andrew McNamee & MG Micheal (2006) *The Emerging Ethics of Humancentric GPS Tracking and Monitoring*. School of Information Technology and Computer Science, University of Wollongong, Australia
- EVO GPS Tracker. <http://www.evogpstracker.com/product-overview> (accessed May 9, 2016)
- Garmin nuvi. <http://explore.garmin.com/en-US/nuvi/> (accessed April 10, 2016)
- Run with Map My Run. <http://www.mapmyfitness.com> (accessed January 23, 2016)