CHAPTER 8

LIVE COURIER TRACKING AND DELIVERY SYSTEM

Nadzirah Abd Rahman, Nabilah Filzah Mohd Radzuan

ABSTRACT

Live tracking courier offers the ability of real-time tracking of vehicles to identify current locations of customers packages and parcels when postal courier is on delivery duty. Tracking and tracing technologies are widely used nowadays for some purposes. This study will focus on the live tracking and delivery system application for the purpose of efficiency issues in the delivery system. To enhance the customer satisfactions towards the delivery services, this system can be one of the solutions. The location in the system is real time and using tracker devices to detect the live locations. There are few related works that have been discussed, which are GPSWOX, DeTrack and Grap apps that come with similarity of function for this proposed project. Hence, this proposed study designs a mobile app to evaluate the live tracking system based on hardware and software specifications. The targeted audience just need an Android device that will be used for this proposed project development. The software specifications for this proposed project are related with mobile app development, in which Java platform and Android platform will be used for software implementation and testing. The expected outcome for this development is based on the interface that have been designed for early proposed design and fulfilled the expectation results of implementation.

Keywords Courier tracking, delivery system, android, UI design

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INTRODUCTION

The Tracking and tracing parcel are widely used by people in the world to know the status of the parcel, such as parcel shipment, parcel dispatch out, parcel arrival date and time, either in-delivery or in-progress. Every parcel that has been recorded in the courier service system to make a shipment to other people must have a unique number known as tracking number. People who will receive the parcel must give a tracking number to track and trace until the parcel reaches the right destination and right receiver. Besides that, the tracking number on every parcel every day is created with a different number and may contain few alphabets or 12 digits numbers that will prevent any overlapping number with other parcels and can cause some error to track and trace. This paper will focus on live tracking, where it is more simple for people to track and trace their parcel in actual time. In simple terms, “real-time tracking” is “live track and trace”. The meaning of “real time” as per dictionary is as follows; “the actual time during which something takes place”.

In this era of technology, real-time monitoring is commonly used by visibility technologies such as Barcode, RFID, GPS, GSM and BLE. These technologies and IoT solutions are being used in many organisations and fields to monitor vehicles, construction equipment, medical devices or other inventory. In recent years, current mobile phones contain GPS receivers that allow people to track other people's location such as WhatsApp live location. GPS-enabled mobile phones can be carried by the user whenever and wherever he or she travels, and provide the opportunity to record an individual’s transportation behaviours for any mode of transportation, including travel via public transit or non-motorised modes such as walking or biking.

Track and trace information on the courier service system is updated based on the current process of the parcel and user is able to know his or her parcel status. However, the user is not able to know the exact location when the courier company is proceeding with the delivery services. Some of the time, delivery men had to call the parcel receiver to let them know that their parcel is heading to the receiver's location, which takes time when making delivery services. Therefore, this project is focused on real-time courier tracking and delivery systems for users to be able to see their parcel in live location.

Background of the Problem

There is a famous courier service company, Pos Malaysia, that has insisted that its "track and trace" system on its website and mobile app is fully functional, amid customer complaints on social media about delivery delays, as well as problems locating packages. Besides that, global industries are facing problems both from tracking and tracing in their logistics networks that creates huge coordination problems in the overall product development sites. In order to achieve customer satisfaction, enhancing the tracking and tracing delivery system into real-time track and trace for users. Most of the courier service companies do not provide any live tracking in the system for users to trace their parcel location from source to destination. This project is about live courier tracking and delivery systems, which increase user satisfaction towards tracking and tracing in real time.

Objective and Scope

There are three objectives in this study, which are (i) to design parcel tracking for driver courier, (ii) to develop track and trace mobile apps between customer and courier driver using GPS, and (ii) to evaluate the live tracking system with mobile app development.

This study is only limited to nearby dispatch centres that are close to the district at customer address. The parcel information must be registered or arrived at the district dispatch centre for customers to be able to track and trace the driver courier that brings the parcel. If the parcel has not registered or arrived at the dispatch district centre, the customer is not able to track the parcel in the system. This system is tested in the near location area, which is Johor Bahru for both targeted user; courier driver and customer.

RELATED WORK

There are different methods for live tracking and tracing in many industries. Almost all the applications and systems were enabled with a live location that users can use to monitor and track someone in real time. This system involves the GPS tracker on current mobile phones that contain the new features that allow location to be tracked by another person.

GPS Tracking Software by GPSWOX is an effective vehicle tracking software that works with almost any GPS tracker. It is involved in applications for personal tracking, vehicle tracking and the management of a fleet via GPS. This tracking software is suitable for small business, medium business and enterprise that run dispatch services or for personal use that requires the user to register an account to track other objects or vehicles. It is compatible with any GPS trackers and able to monitor the tracking objects in real time by mobile app for Android, Ios and web based. With supported mobile apps, users are able to receive alert notifications and are able to trace the history of locations.

DeTrack is a system to track the deliveries and reduce customer calls with automatic real-time notifications when their orders are delivered. This system replaces the communication platform with customers to reach the destination. This application is compatible for current mobile phones, which are Android or iOS, and needs an Internet connection while making delivery services. This system is like the other courier company website when making the deliveries, such that the user is required to submit the deliveries information before proceeding to make delivery services. All the listed deliveries will be sorted with the delivery location with the device's current location. This system provided capture proof of delivery that allowed the driver to access a camera to capture signature proof and parcel's location via the application.

Grab offers different ride-hailing transport services, food delivery services and payment solutions on mobile applications and websites. GrabFood and Grab Transport are some of the almost like the purposes of this project study, which it provides for Grab users to track the delivery riders or hailing drivers in real time. This system is compatible with any current mobile phones and operating system such as Android and iOS, and available on web based. This system will randomly select drivers or riders to perform delivery services and hailing services to any Grab users that need their services, including messaging and calling functions in the application.

Comparative Analysis

GPSWOX provided the features in the GPS Tracking Software, which is the system that provides an alert notification to the users. Alert notifications contain road accidents or over speeding driving, which encourages the drivers to be more careful while on the road, and the system provides alternative routes when something happens on the road. Next, this tracking software enhances fleet management such as dispatch management or employee management. This management will increase the work order efficiency by monitoring the system, especially for businesses or enterprises that are involved in delivering services, and reduce the paper to record any documentation. Apart from the advantages, the disadvantage of this system is that all tracking devices must register for an ID. This means that only registered tracking devices on vehicle or mobile phones can be tracked and monitored by the admin panel at which the devices must have the same system. Based on the customer reviews, this system provides inaccurate GPS positions. GPSWOX has delays on GPS positions most of the time and provides inaccurate times when the tracking devices are moving, which can lead to late delivering services.

Meanwhile, DeTrack is a system that is suitable for courier or delivery services to sort the deliveries' location. The advantage of this system is it is easy to plan the route and delivery, which will display all the delivery destinations to ease the delivery drivers planning the route to reach the destinations. Other than that, this system mostly replaces all the paper documentation into the application. All the deliveries information is filled in the application before delivery drivers and the information will route the delivery drivers to the destination. However, the disadvantage of this system is requiring an Internet connection for delivery drivers when routing to the destination. Next, bad interface design is one of the disadvantages of this system. Based on the user reviews, bad interface design is confusing the users to use either delivery drivers or customers that want to customize the user dashboard.

The advantage of GrabFood and Grab Transport system is providing time estimation with real-time delivery tracking. Grab users are able to receive the notifications from their riders and drivers through the applications, such as pick-up orders or a few minutes before reaching the destinations, and users are able to track the riders and drivers on the map. Furthermore, this system provides a payment solution as users use their services. This system is linked to the API as users easily make transactions to the Grab riders or drivers by using online banking or Visa card. Other than advantages, the disadvantage of this system is Grab users requiring an Internet connection to use Grab application. All transactions, delivery tracking or hailing services are available when connected to the Internet to get accurate positions of the drivers and riders. Next, only certain applications in the Grab are available on the web based, such as Grab Transport. This means that GrabFood development is only compatible on the mobile apps, in which users need to use smartphones to use GrabFood, because web based does not provide messaging and calling notifications. All these can be seen in table 1.

Table 1: Formatting

Apps	Advantages	Disadvantages
GPSWOX	• Provides an alert sounds and notifications about road reporting for safety purposes. • Employee management functioning to make	• The system only monitored the registered devices only, which the driver only uses the devices that valid. • High possibility of delay GPS position

Apps	Advantages	Disadvantages
	the dispatch management easier to record the employee information.	on the map while monitoring.
DeTrack	• Able to plan the destination with map routing to the destination. • Delivery record is paperless and made through app replacing the paper documentation.	• Live tracking requires strong internet connection to view on the map. • Unattractive interface design and usability that confuse the targeted user.
Grab	• Alert notifications from riders to customers to gives information about the delivery status, including messaging and calling. • Provides payment gateway for customer to prevent cash on hands, which make it easier for cashless people.	Riders and users need a strong and consistent internet connection while using the app. • GrabFood is only compatible for mobile platform only because including messaging and calling functions.

METHODOLOGY

This study is about Android app development that uses a lifecycle methodology that is called Android Activity Lifecycle. Android is an open-source operating system with Java programming interface for mobile devices. As this study is involving GPS location development, Android is the convenient choice, as it consists of multiple API that supports GPS location services. In lifecycle call-back methods, the behaviour of the activity can be declared when the user re-enters the activity. The transition of the activity occurs through different stages in the lifecycle when a user navigates through the application. The class in each activity provides several call-backs that permit the activity to know that a state has changed. In this Android life cycle, the stages in the system are creating, stopping, resuming or destroying the process in which the activity resides.

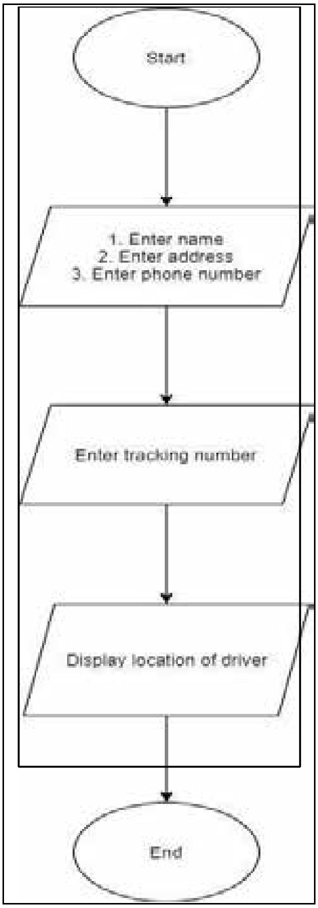


Figure 1: Flowchart for Customer activity

Flowchart

The user (customer) is required to register their name, address, and phone number for profile management in the apps. This application allows customer that they able to enter a tracking number only to track their parcel. The tracking number will be tracked if the district centre is already processing the parcel dispatched by an associated driver (employee), as shown in Figure 1. For the driver (employee) that is in-charge to deliver the parcel, every employee needs to register their email address, password, vehicle brand and vehicle plate number in the system, so that customers are able to know who is the driver. The registration details will be stored in the database (TrackTrace.db). The registered vehicle must be registered by each district centre to use as transportation for employees to send the parcel to the right destination. The driver is able to view and follow the route by using these apps that connect with Google Maps API for driver's guidance, until arrived at the destination stated on the parcel address as in Figure 2.

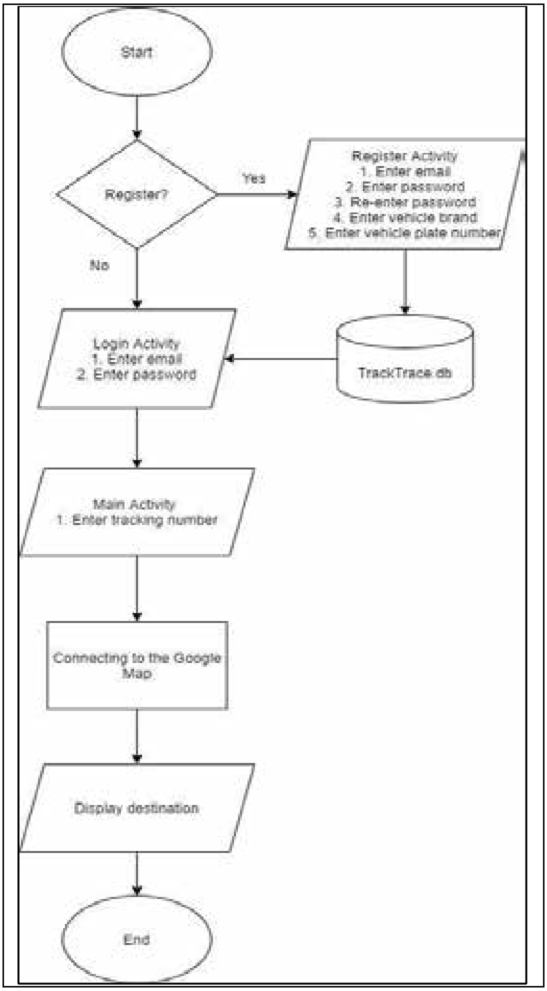


Figure 2: Flowchart for Driver activity

UI Design

Based on Figure 3, the main function in the customer module is tracking the parcel by entering the tracking ID. The maps that are provided in the app will display the live location of the courier driver that is in charge to deliver the parcel. Customers will be able to track and trace the courier in real time. To get the location of the courier driver, customer devices must be connected to the Internet to monitor the location.

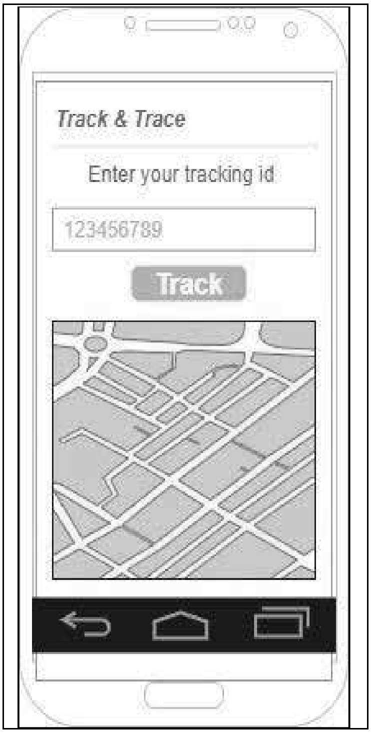
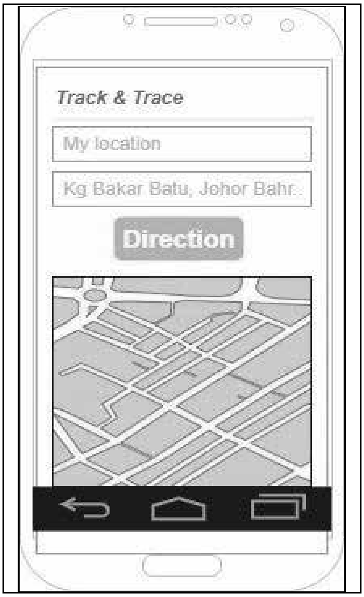


Figure 3: UI design for Customer tracking activity

Based on Figure 4, the expected outcome for the courier driver is quite similar with the customer. However, the map in the app for courier drivers is displaying the route to the destination address that has been submitted by the driver before beginning the delivery process and services. Apart from that, the location of the driver will be automatically detected by the device itself and it must be connected to the Internet.



Track & Trace

My location

Kg Bakar Batu, Johor Bahr.

Figure 4: UI design for Driver tracking activity

RESULT AND DISCUSSION

The results of the project have been developed based on the review of existing apps. The purpose of this chapter is to discuss how the apps have been developed and explain the outcome for this project. This project has gone through some testing to make sure all the functions in the activity are well-functioning, which have gone through try and error phase. The targeted users are driver courier/employee and customers.

Result

Based on Figure 5 below, there are two text input layouts for email and password that are required for the user to log in and move to the next activity. A user needs a registered email and valid password, which will be stored in the database. Apart from that, text input for password has password toggle that allows the user to re-check their password key. However, there are two buttons' layouts for login and register, in which login button is responding when a user enters a registered email and password, as stored in the database. For the register button, it is for users that do not have an account and it will automatically move to register activity.

Register activity shows eight text input layouts, including four auto complete texts for users to register an account. All text input layouts are required for targeted user display purposes. Every text input layout is set its own type such an email is in email address input type, password is in password input type including the password toggle for user to re-check their password key, phone number is in phone input type and plate number is in all caps input type. However, vehicle type, vehicle brand, vehicle model and manufacturer date are an exposed drop-down menu, where users have to select which vehicle that they want to register.

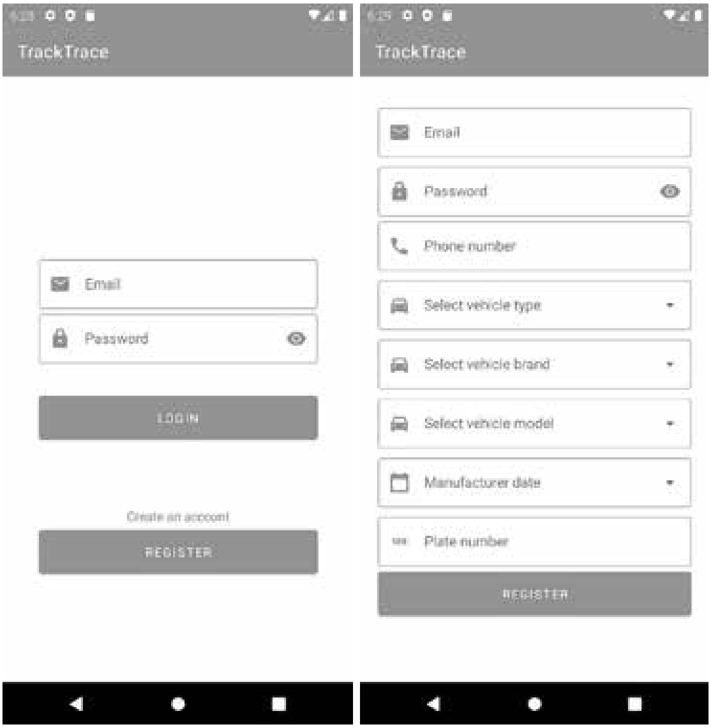


Figure 5: Driver login and register activity

Based on Figure 6, register activity has an item selected text input layout for vehicle type, containing three types of vehicle, which are car, motorcycle and van or lorry. These vehicle types are chosen based on common vehicles that people used to go anywhere. In the text input layout, it applied an auto complete text for users to be able to search or type instead of scrolling down to do the item selections.

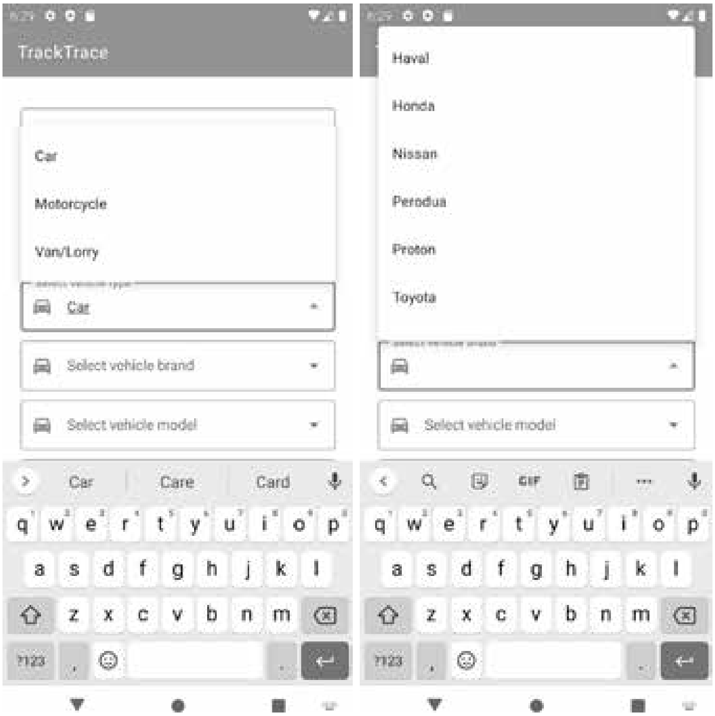


Figure 6: Selection list for vehicle type and brand

The vehicle brand text input layout is dependent on vehicle type text input layout. The dependent selection for vehicle brand will have different selections from selection from vehicle type. If the user selects a car as vehicle type, the selection for vehicle brand for it is the next step. In this text input layout, auto complete text makes it easier for users to search their vehicle brand instead of scrolling down to select the selection of vehicle brand.

Based on Figure 7 below, vehicle model text input layout is dependent on vehicle brand, where user will select what vehicle model based on vehicle brand that they select. The dependent selections from vehicle brands will result in different selections for vehicle models. From Figure 6, if the user selects Perodua as vehicle brand, vehicle model will provide selection for Perodua model only, as shown in Figure 6 above. The user is able to search their vehicle model in the text input layout to make the selection.

The manufacturer year text input layout is a selection for vehicle manufacturer year. In this selection, there is no dependent selection from vehicle type, brand, and model because every valid vehicle registration must have manufacturer year. The selections for manufacturer year are from 2009 until 2021. Like other text input layouts, users can search year in the auto complete text as it will result in the nearest year that user enter.

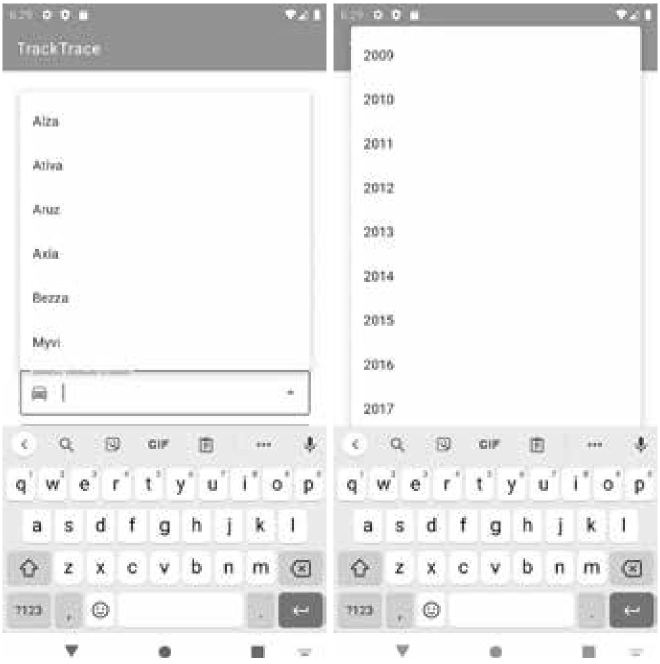
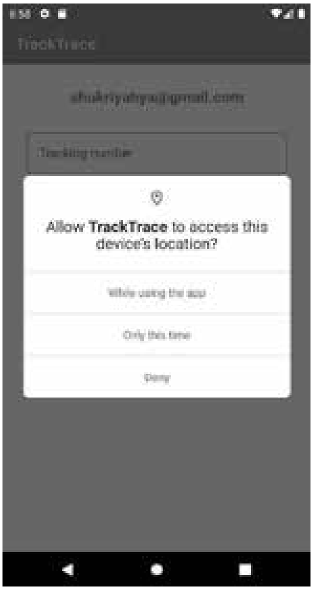


Figure 7: Selection list for vehicle model and year

Based on Figure 8, this app is requesting the access device's location, where this app will include the driver's current location. The purpose of this project is that the customer needs to know the current location of the driver while the driver delivers to the customer's location. If the driver denies this permission, the driver is unable to use this app to send their current location to the customer. This app requires a user's permission for ACCESS_FINE_LOCATION, and ACCESS_COARSE_LOCATION which result in the user needing to give permission to this app.



Allow **TrackTrace** to access this device's location?

Figure 8: Request location permission

Based on Figure 9, there is a text input layout for users to enter the tracking number of the parcel and a search button layout for users to search the entered tracking number in the text input layout. Below the search button, it will show the results of the tracking number, which are the tracking number, recipient name, recipient phone number and recipient address for the user to deliver the parcel.

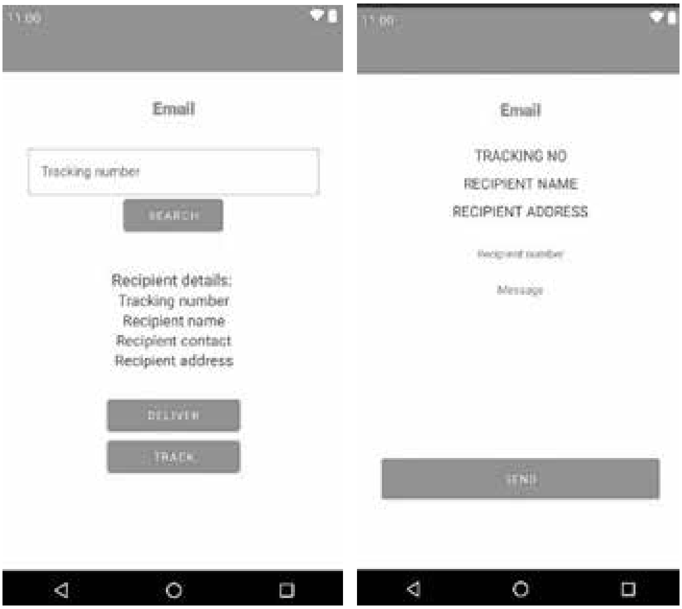


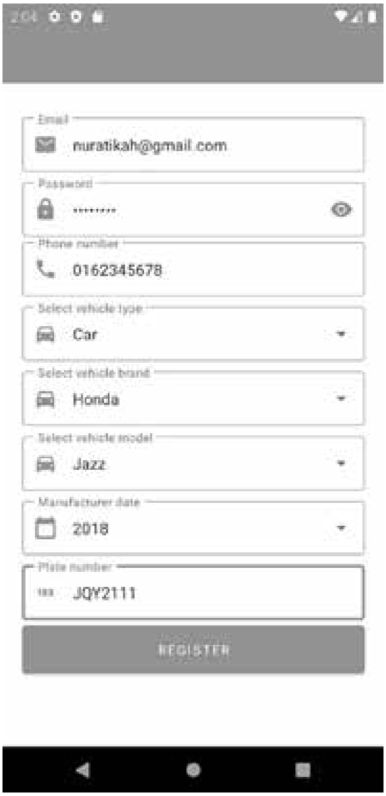
Figure 9: Driver home activity and message activity

There is a text input layout for users to enter the tracking number of the parcel and a search button layout for users to search the entered tracking number in the text input layout. Below the search button, it will show the results of the tracking number which is the tracking number, recipient name, recipient phone number and recipient address for the user to deliver the parcel.

There is a text view layout for tracking number, recipient name, recipient address, recipient phone number and message to the customer. The text view for tracking number is a tracking number from search text input while the recipient's name, address and phone number are the recipient details from Figure 9. The message is prepared automatically for the driver to send to the customer, to let the customer be aware of their parcel status.

Testing

Based on Figure 10, this is the example of the register activity for driver, where all the text inputs are required to be filled and will be sent to the database for record. Every text input and button layout has an ID in the XML file which user input will be sent to Java file in Register class only. In the XML file, email (ID: email), password (ID: password), phone (ID: phone), vehicle type (ID: vehicle_type), vehicle brand (ID: vehicle_brand), vehicle model (ID: vehicle_model), manufacturer year (ID: manufacturer_year) and plate number (ID: plate_no).



Email: nuratikah@gmail.com

Password: ••••••••

Phone number: 0162345678

Select vehicle type: Car

Select vehicle brand: Honda

Select vehicle model: Jazz

Manufacturer date: 2018

Plate number: JQY2111

Figure 10: Register activity testing

All these user inputs will be sent to Register class in .java file as String variables, which are String email, String password, String phone, String vehicletypeChoice, String vehiclebrandChoice, String vehiclemodelChoice, String manu_year and String plateno.

Toast “Registration successful” appears when the registration process is successful. It shows that the user’s email, password, phone number, vehicle type, vehicle brand, vehicle model, manufacturer year and plate number are registered successfully, and the user must use the email and password as their credentials to log in the app.

The table of registered users is represented in the database, where all the user’s credentials and user’s vehicle registrations are stored. In Figure 4.3.2, for the register button (ID: btn_register), the user input from Register class will be sent to server-side that uses PHP scripting language to store the register information in the TrackTrace database in XAMPP web server. In the PHP file, MySQL syntax for insert data is used to connect the user input data from .java and table of registered user in the database.

The login part must use a registered email and password that must be executed at Register activity first. When the user already registered their email and password, it will automatically move to Login activity to make a login authentication by entering the registered email and password. In the XML file for Login activity, email (ID: email) and password (ID: password) will be passed to the Login class in the .java file that has the same ID. Meanwhile, for the login button (ID: btn_login), the user input will be sent to server-side to search the same email and password in the database table that records the registered user.

Then, it shows “Login successful” as a login response if the user is able to log in using their credentials, which are registered email and password in Register activity in Figure 4.3.1. The login response will appear in the Home activity and it will be in the login session until the user logs out from the app. In the user login session, the user’s email will appear in every activity, identifying that the account belongs to which users.

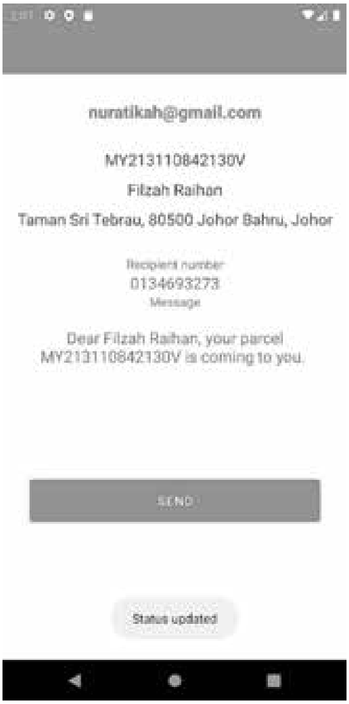
The user enters the tracking number that wants to be delivered to the customer. Assuming that the tracking number in the database is already in the system which the parcel in the process delivers until it is delivered to the customer. In the XML file, input data for tracking number is ID: trackingno and passed to the .java class as tracking_no. As for the search button (ID: btn_search), tracking number in the text input layout will be passed to the server-side when executing MySQL syntax for search in the parcel list table in the database.

The text input for tracking number in the XML file is tracking number, which is a unique value that can be digit numbers or alphanumeric, depending on the courier company. When the search button (ID: btn_track) is pressed, the input of tracking number will be sent to server-side that will perform a search task in the database table and the information about tracking number will appear in the recipient details, as shown in Figure 4.3.7 above. The information of recipient details is tracking number (ID: view_trackingno), recipient name (ID: view_recname), recipient contact (ID: view_reccontact) and recipient address (ID: view_recaddress).

As the details appeared, the delivery button (ID: btn_deliver) appeared to deliver a message to customer and update the parcel status in the database table while track button (ID: btn_locate) also appeared for drivers to connect to Google Maps for map routing.

Based on Figure 11, the text view in the layout represents the recipient details, which are tracking number, recipient name, recipient address, recipient phone number and message. The response message shown at the bottom of the layout represents the parcel status in the database.

The message (ID: textmessage) and the phone number (ID: phone) will be passed to built-in Android messages that use the intent object vns.android-dir/mms-sms. When the send button (ID: btn_send) is pressed, the message and recipient phone number will transit to the Android messaging app, in which the driver needs to notify the customer that their parcel is out for delivery.



nuratikah@gmail.com

MY213110842130V

Filzah Raihan

Taman Sri Tebrau, 80500 Johor Bahru, Johor

Recipient number

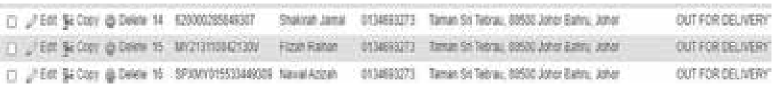
0134693273

Message

Dear Filzah Raihan, your parcel MY213110842130V is coming to you.

Figure 11: Sending message to customer

Based on Figure 11, the parcel status in the database will be updated after the delivery button where the button will be passed to the PHP file that executes the MySQL syntax to update the parcel status in the database. While the status of the parcel is updated in the database, the home activity will be transited to the message activity.

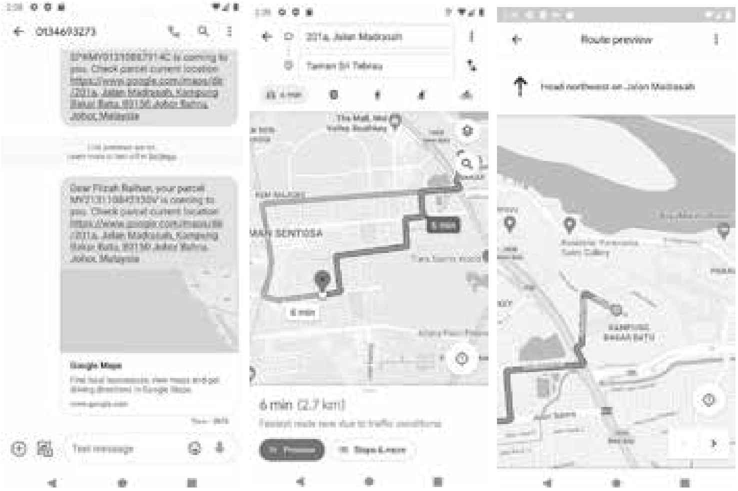


□	Edit	Copy	Delete	14	620000285848307	Shakirah Jamal	0134693273	Taman Sri Tebrau, 80500 Johor Bahru, Johor	OUT FOR DELIVERY
□	Edit	Copy	Delete	15	MY213110842130V	Filzah Raihan	0134693273	Taman Sri Tebrau, 80500 Johor Bahru, Johor	OUT FOR DELIVERY
□	Edit	Copy	Delete	16	SPXMY015533448009	Nawal Azzah	0134693273	Taman Sri Tebrau, 80500 Johor Bahru, Johor	OUT FOR DELIVERY

Figure 12: Parcel status in database table

Based on Figure 12, it represents the message from activity that the driver needs to send to the customer. The recipient's name and tracking number passed from the previous activity are mentioned in the message for the driver to deliver the message to let the customer be notified about their parcel status. The link in the message represents the driver's current location, in which this app location permission detects the device's location. The driver will notify the customer with their current location to let the customer be aware of the driver's current location.

It represents the preview map routing from the current location to the destination, which is the customer address in the home activity. The track button passes the intent object to the Google Map and automatically detects the driver's location and customer address on the map. The map routing will guide the driver to the destination, which is represented by the red mark on the map.



0134693273

[illegible] is coming to you. Check parcel current location https://www.google.com/maps/dir/201a, Jalan Madrasah, Kampung Bakar Batu, 80150 Johor Bahru, Johor, Malaysia

Dear Fitzah Raihan, your parcel [illegible] is coming to you. Check parcel current location https://www.google.com/maps/dir/201a, Jalan Madrasah, Kampung Bakar Batu, 80150 Johor Bahru, Johor, Malaysia

Google Maps

[illegible]

www.google.com

Text message

201a, Jalan Madrasah

Taman Sri Tebrau

6 min (2.7 km)

Fastest route now due to traffic conditions

Route preview

Head northwest on Jalan Madrasah

Figure 13: Sending customer, the current location

The grey mark on the map represents the driver's current location. This map represents the starter location when the driver starts moving and the Google Map guides the driver's movement by giving the direction as the above "Head northwest on Jalan Madrasah".

CONCLUSION

The result part is presenting the result of UI design and implementation of each activity. Each activity contains several layouts and drawable icons to make the Android app interactive and attractive for users to interact with the app. The concept of each text input layout for every input field makes the user understand the function of each activity, such as Login, Register and Home for search and view the tracking number details. In the testing part, the app was tested in every activity, where this app is connected with a web server, which is XAMPP in the server-side. Every user's input was executed in PHP scripting language, where the results and testing of this are successfully connected with the database server.

REFERENCES

C. Dickey, "Demystifying 'Track & Trace' vs 'Real-Time Tracking' vs 'Monitoring,'" 2017.

S. Barbeau et al., "Dynamic management of real-time location data on GPS-enabled mobile phones," Proc. - 2nd Int. Conf. Mob. Ubiquitous Comput. Syst. Serv. Technol. UBICOMM 2008, no. June 2014, pp. 343–348, 2008, doi: 10.1109/UBICOMM.2008.83.

S. M. Kamal, "Amid complaints, Pos Malaysia says some issues with 'intermittent system accessibility' but tracking service fine: Malay Mail," Malaysia | Malay Mail, 07-Nov-2019. [Online]. Available: https://www.malaymail.com/news/malaysia/2019/11/07/amid-complaints-pos-malaysia-says- some-issues-with-intermittent-system-acce/1807778. [Accessed: 10-Apr-2021].

A. Shamsuzzoha and P. Helo, "Real-time tracking and tracing system: Potentials for the logistics network," … 2011 Int. Conf. …, pp. 242–250, 2011.

Ali, E. (2020). Global Positioning System (GPS): Definition, Principles, Errors, Applications & DGPS. April.

Fonseca, D. (2019). About the Tutorial Copyright & Disclaimer. Tutorials Point (I) Pvt. Ltd., 1–13.

Haq, I., Rahman, Z. U., Ali, S., & Faisal, E. M. (2017). GSM Technology: Architecture, Security, and Future Challenges. International Journal of Science Engineering and Advance Technology, 5(1), 70–74.

Huang, Y., He, Q., Wang, Y., Xie, Z., & Wang, T. (2014). Research on Global Positioning System in Mobile Communication Equipment Based on Android Platform. Proceedings of the 2014 International Conference on E-Education, e-Business and Information Management, 91(888). https://doi.org/10.2991/iceeim-14.2014.64

Jafaar, A. N., & Nema, B. M. (2019). Geolocation android mobile phones using GSM/UMTS. Baghdad Science Journal, 16(1), 254–262. https://doi.org/10.21123/bsj.2019.16.1(Suppl.).0254

Keerthika, C., Singh, M., & Tamizharasi, T. (2017). Tracking system for vehicles using GPS, GSM and GPRS. Research Journal of Engineering and Technology, 8(4), 453. https://doi.org/10.5958/2321-581x.2017.00078.2

Kushal Gogri. (2020). Real Time Bus Tracking System. International Journal of Engineering Research And, V9(06), 829–831. https://doi.org/10.17577/ijertv9is060545

Maurya, K., Singh, M., & Jain, N. (2012). Real Time Vehicle Tracking System using GSM and GPS Technology-An Anti-theft Tracking System. International Journal of Electronics and Computer Science Engineering, 2(3), 1103–1107. http://www.estdl.org/wp-content/uploads/2012/08/Volume-1Number-3PP-1103-1107.pdf

Middleton, E. L. (2019). No 主観的健康感を中心とした在宅高齢者における健康関連指標に関する共分散構造分析Title. May. Of, E. (n.d.). Ujjain Engineering College, Ujjain (M.P.).

Ohiero, P. O., Ukang, J. U., & Ota, O. (2008). Vehicle Tracking System Using Gps-Gsm Technology. International Research Journal of Engineering and Technology, July, 1638. www.irjet.net

Wiehe, S. E., Carroll, A. E., Liu, G. C., Haberkorn, K. L., Hoch, S. C., Wilson, J. S., & Dennis, J. D. (2008). Using GPS-enabled cell phones to track the travel patterns of adolescents. International Journal of Health Geographics, 7(February). https://doi.org/10.1186/1476-072X-7-22