

Design and Development of Android Based Speed Limit Warning Application

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Abstract— Speeding remains a common practice on many roads, leading to a significant number of crashes. There are a number of traditional and well-proven measures to improve the speed limit compliance and reduce driving speeds, which consist of infrastructural measures and speed enforcement in particular. In this development, by using an android device, the application continuously provides a visual information about the speed limit in force. In the case of a driver exceeds the speed limit, the application warns the driver visually where the speed limit indicates on the screen of the smartphone and starts to flash. If the speed is not reduced, an alarm is triggered and a message will be sent to a registered contact.

Index Terms—Speed Limit; Android; GPS; Firebase.

I. INTRODUCTION

Speed is one of the most relevant factors that characterize road operations, directly and decisively influencing its evaluation by all its users, having two effects, which are negative and positive on looking at it. Usually, the most noticeable effect of the speed is its impact on road accidents, whether over occurrence risk or over seriousness, whose relationship has been demonstrated by several studies. Speed also affects the environmental conditions, such as emissions, fuel consumption, noise and quality of life for people living near a road [1].

The speed at which the vehicle moves determines the journey time from one destination to another. High-speed travel enables the efficient movement of vehicles on the road, but it also influences the risk of accidents and subsequent injuries.

Speeding, or commonly defined as exceeding the speed limit under prevailing conditions, is a primary crash causation factor worldwide. In many countries worldwide, it often contributes as many as one-third of the fatal car crashes. Based on traffic accident in this country, speeding is one of many of the main road safety problem on the road and contributes as an aggravating factor in most crasher, human behaviour still remains the most influential element in the selection of the preferred speed of travel overriding all other factors [2].

The main setting of speed limit is to ensure safety on the road they are driving on and make sure that does affect the outcome of the speed limit. When drivers consciously drive above the controlled speed limit, whether to show off, meet a deadline, or just for fun, they put their own lives and the lives of other drivers at risk. Moreover, the Speed Limit Warning is an application for anyone that is unable to perceive the speed at

which they are mostly driving in an area and the application will help them perceive the speed limit and alert them to the kind of speed that they are driving in a particular area by using a Global Position System that is readily available on the user's smartphones

II. LITERATURE REVIEW

A. Connected Car

We live in a place nowadays where we can connect to technology everywhere and anywhere. We need a current smartphone in the current time and we can literally do most of the things that the computer does. Nowadays, people also use smartphones to connect to cars, as simple as by wiring, for example, Universal Serial Bus (USB) cable connected to the car dashboard or even through the smartphone Bluetooth that can be implemented.

Using this connectivity, people can do as much, such as answering phone calls so that they won't get distracted when driving to even using smartphones to even warn them about the speed limit they are driving on when they are using their application their smartphone. This will, in turn, give them a lot of time to respond to the speed limit and reduce them without looking at their phones and instead of looking and focusing on the driver's road instead.

Most technological advance cars and even simple and cheap branded cars have Bluetooth enabled dashboards to do such activities above. By enabling this connectivity, we can lessen road crashes and the majority of the road problems caused by drivers taking their time to listen to answer calls using hand instead of using Bluetooth enable devices.

B. Speed

Therefore, speed is one of the many causes of accidents on the road and it is considered a significant factor in serious crashes. By Malaysia standard, the factor contributed to speed fatal crash are around 23% [3]. It is also being accepted that the reduction in travel speed would save lives and reduce crashes trauma that would produce significant and immediate road safety benefits. Even though there is conflict in speed between travel time needed and the shortest amount of time taken to arrive, speed needs to be adjusted to provide a balance between these two. But at the same time, the adjusted speed must be acceptable by a majority of the drivers to encourage compliance.

Excess Speed is defined as great speed limit implemented on the road to ensure safety while driving. Inappropriate speeding is defined as driving at the speed unsuitable for the road and traffic condition, Excess and inappropriate speeds are responsible for the high mortality and morbidity that result from road crashes. In many-high income country, accident contributes about 30% of the death on the road while middle to low-income countries are estimated to be about half of all the road crashes. By controlling speeding in vehicle, it can prevent crashes happening and lessen the crashes when they occur, lowering the severity of injuries by the victims caught in traffic accidents.

Speed limits are an important dimension of road safety management, but driving at speed in excess of the posted speed limit is common in Malaysia. Higher average (but not necessarily maximum) speeds mean shorter journey times, which in turn give economic and social benefits from lower costs and greater accessibility. However, excessive speeding can result in unwanted and costly environmental damage and increased deaths and injuries to motorists and other road users.

C. Speed Zones

Determine the appropriate speed limit, result of the assessment, recommendations are offered to improve safety and traffic operations on roads through the application of speed limits and other speed management techniques. Speed zoning is using a lot of time to influence vehicle behaviours, where its process is to establish speed limit for safety and reasonable speed on a particular road. Speed limit is primarily set for safety purposes, i.e., reaching a balance between time travel on a distance and minimizing crashing risk and enforcing an inappropriate speed action. Max speed limits are enhanced by putting an upper limit on the speed travel to and changes in vehicles speed by the driver using the road at similar times [4].

III. RELATED WORKS

There are few research and development carried out by authors. There are a few journals that mention somewhat projects related to our current project. One such is the Speed alert System with GPS enabled smartphones by Jameer G.Kotwal. His idea is similar to our Speed limit Warning project, where they warn the user in a specific location if their user is going over the speed limit. They warn that the user must enable GPS to alert the user if it is currently exceeding the predefined maximum speed limit [5]. Another project is called Detection of over Speeding Vehicles on Highways where these five engineers called Monika Jain, Praveen Kumar, Priya Singh, Chhavi Narayan Arora, Ankita Sharma created a device that can detect speed limit on highways. If the rash driver going over the speed limit, it will alert the traffic authorities if a violation of the law such as speeding occurs [6].

Automatic Speed Limit Violation Detection and Warning System Using GPS and GSM Modem by Prof. Paras Gosai is another type of warning by using GPS modules, GSM modem and Raspberry Pi to create feasibility of real-time speed limit violation detection and including vehicles tracking and its security. This is a module that is implemented in the vehicle and is created out of 3 hardware components that can detect the speed limit. In a circumstance, if the driver exceeds the speed

limit, it will produce a visible warning in the form of the message. Nevertheless, if the driver exceeds the speed limit multiple times, the tracked speeding data along with GPS locations will be used to produce a fine against the driver, which will be sent to the mobile phone [7].

Table 1
Existing Speed Research Works

Authors	Year	Title	Scope
Singh, D. N., & Ravi Teja C.	2013	Vehicle Speed Limit Alerting and Crash Detection System at Various Zones	Smart display is a device implemented on the car dashboard to detect over speeding at speed limit location and crash alerts, automatically sending help if crash is detected.
Kotwal, J. G., Kalokhe, N. S., Roundhal, A. V., Nakhate, P., & Kembhavi, R. D.	2015	Speed Alert System for GPS-Enable Smartphone's with Android Operating System	Using smartphones with GPS-enable to track speed limit and alerting the driver
Jain, M., Kumar, P., Singh, P., Arora, C. N., & Sharma, A.	2015	Detection of Over Speeding Vehicles on Highway Automatic Speed Limit Violation	Design a highway speed checker circuit to check for rash driver driving over the speed limit.
Gosai, P. P., & Joshi, J.	2016	Detection and Warning System using GPS and GSM modem	Device built in the car that can warn user upon over speeding beyond the speed limit.

IV. PROPOSED WORK

With the rising penetration of smartphones in the growing market, mobile multimedia data content is becoming the dominant form of information that people produce and consume on a daily basis. Speed Limit Warning Application or SWLA for short, which is an application that can inform user to slow down in a specific area that the user is supposed to slow down. This is created to avoid a few of the road problems such as road crashes and accidents among the drivers as well as the pedestrians. SLWA uses GPS that are mostly implemented in the current generation of smartphones to locate where the driver is and calculate the speeding. The GPS will then compare it to the set location in the database; if the driver is in the radius of speeding zones set in the database, it will inform the driver when the driver is speeding.

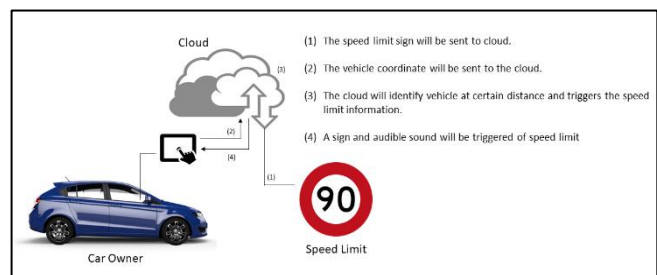


Figure 1: Working Principle

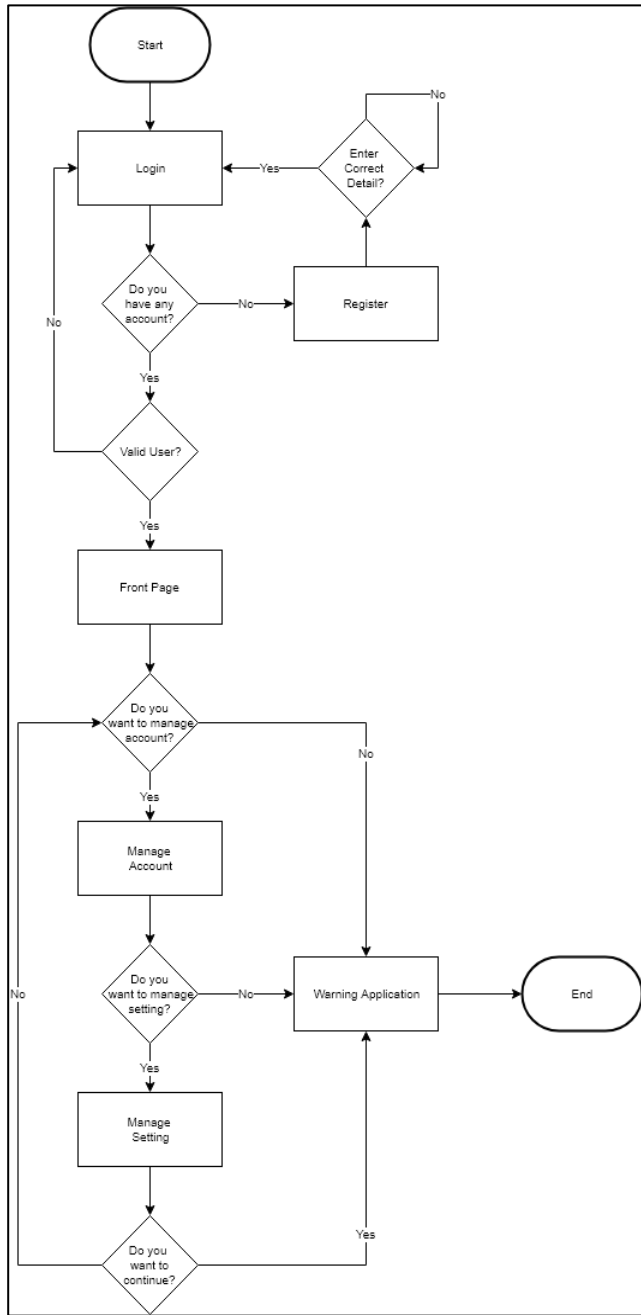
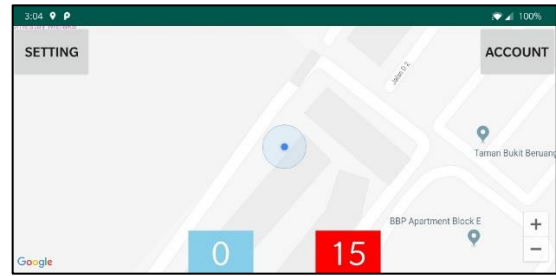


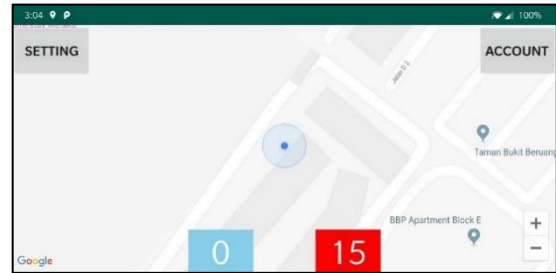
Figure 2: Flow Chart

V. TESTING AND RESULT

Testing is the backbone of a software application to ensure that when it is released in public for users, it does not have any complicated issues related to the project application, complaint with the user because it does not work. Testing should be done under duress to make sure that when released, it does not have any error when the user uses it. Since this project is speed limit warning application, testing is important to ensure that speed warning work in the specific area to make sure that it informs the user to lower the user speed limit to lessen road accident, if there is a problem in the application, some of the contribution that leads to road accident probably from our application that have not gone through enough testing.



(a) Login



(b) Register

Identifier	Providers	Created	Signed In	User UID ↑
hazri93@gmail.com	📧	8 Feb 2019	9 Feb 2019	D11TeU6_HhoXsh7v6RtUQ7P0ZEc2
hazri@gmail.com	📧	10 Jan 2019	10 Jan 2019	d8wWhe4p7Ge_baCnWb700ZqN...
hazrimustakim@gmail.com	📧	16 Jan 2019	8 Feb 2019	fth4j8anIMF2K9Y20acBFPeYkL2
mastersumen@gmail.com	📧	8 Feb 2019	8 Feb 2019	x0NFa90cYRcVfouLW9aGcGRH...
hazri1@gmail.com	📧	5 Feb 2019	5 Feb 2019	z9ewUAMnSEcGwRPFmGDF41

(c) Firebase Authentication

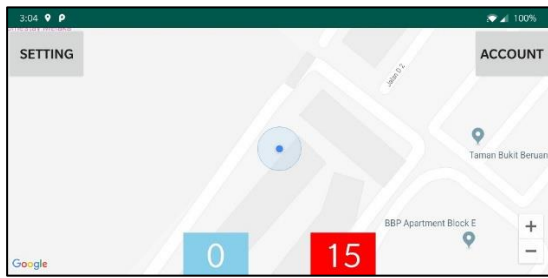
Figure 3: Login Screen and Information

Figure 4 (a), most of the time when the user is not speeding, shows that the user is not speeding in the area, and if the user moves outside the speeding zones, no prompt will appear. Figure 4 (b) shows that if the user is speeding, the prompt alarm will start showing and playing alarm sound to get the user's attention that the user is speeding the speed limit zones. Figure 4 (c) shows the data that is saved and retrieved from the firebase real-time database.

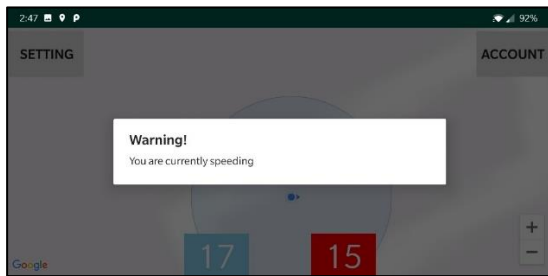
On the first testing, the developer only added the Account page on the android studio to ensure that the first testing works. By implementing login and registration, the user can create an account, and they will be able to open maps, but they will not receive any prompt saying that they are speeding in the given location. The user will be able to register to the application without any hiccups.

On the following testing, the developer created the setting page so that the user has an interchangeable alarm. If the user does not like the current alarm warning setting, the user can change the alarm warning manually. The user can still register and enter the application, but the map is still not set up for uses.

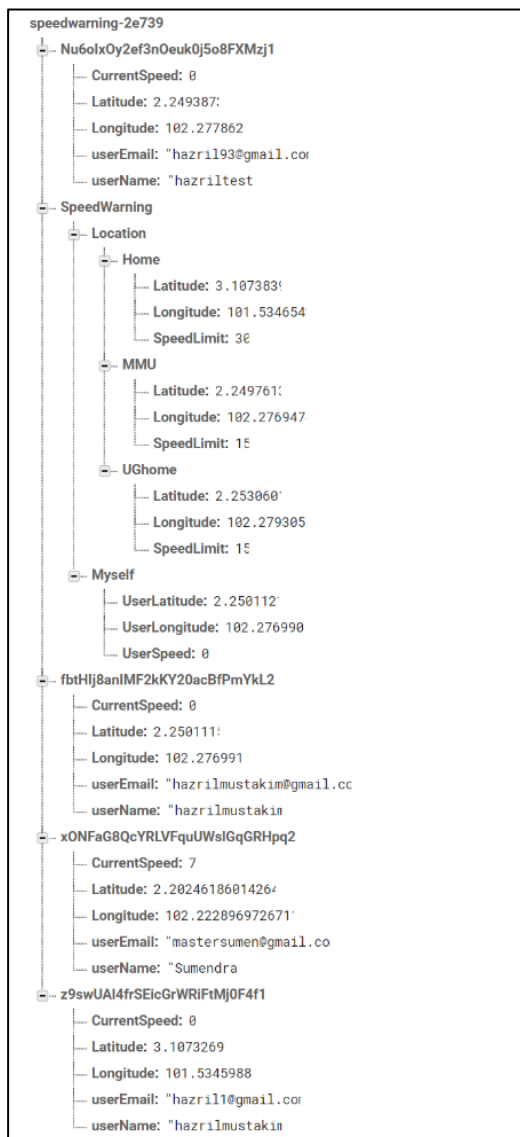
Upon the end of the testing, the user can register for the application. After the user registers in the application, the user must log in to the application to use the speed limit warning.



(a) Main Page (Not Speeding)



(b) Main Page (Speeding)



(c) Firebase Real-Time Database

Figure 4: Main Application and Information

Table 2
Testing Outcome of the Speed Limit Application

No	Function Testing	Expected Result	Test Result
1	Registration and Login	User able to register and login. Information is stored in Firebase.	✓
2	Main Page (Not Speeding)	User able to receive not speeding prompt alert on "Screen"	✓
3	Main Page (Speeding)	User able to receive not speeding prompt alert on "Screen" and triggered "Alarm"	✓
4	Account Page	User able to change information	✓
5	Settings Page	User able to change preferred settings	✓

After logging in, the user can navigate the menus to change their account from a password or email and usernames. If the user did not make any changes, the user could just select on the map menu to identify the vehicle's current map location and its speed limit. In this case, if the user exceeds the permitted speed, a prompt message and audible sound will be played. Nonetheless, if the user prefers to change the preferred sound, they can use the settings option.

VI. CONCLUSION AND FUTURE WORKS

SLWA is an application that alerts and notifies the driver of speeding at a specific location. The first objective is to draw the user's attention by ensuring the person who drives, depending on the speed limit in a given area. The application provides a warning and notifies the driver of the speeding. The second objective is how the user can navigate the application easily. The user can start the application and log in, then navigate through the menus to edit their information or use the application immediately. The user does not have to activate the speed mechanism to make sure it meets the speed limit. The user needs to log in and sign up for the application, then navigate through the menus, and everything will be set accordingly. If the user has already logged in to the application, it will remain active to receive the alert of exceeding speed limits.

Several enhancements can be made in the future, such as adding more databases or splitting the databases to ensure one of the databases is for location and another for the account. On another aspect, improving location with the help of a GPS or a speed sensor could contribute to the specificity and calculation of the speed when the user drives in a specific area. Furthermore, adding speed behavior analysis could monitor driver behaviour attempts within the particular area most of the time.

REFERENCES

[1] Gregório, N., Silva, A. B., & Seco, A. (2016). NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>). Peer-review under responsibility of Association for European Transport ScienceDirect Speed management in rural two-way roads: speed limit definition through expert-based system. Transportation Research Procedia, 13, 166–175. <https://doi.org/10.1016/j.trpro.2016.05.017>

- [2] Sturza, M. A., & Hills, W. (1993). DIQ. *Transportation Research Procedia*, 13(19), 166–175. <https://doi.org/10.1016/j.trpro.2016.05.017>
- [3] Polis, S. P. (2014). Suruhanjaya Pasukan Polis. Retrieved from [http://www.parlimen.gov.my/ipms/risalat/2015/Laporan Suruhanjaya Pasukan Polis Bagi Tahun 2013.pdf](http://www.parlimen.gov.my/ipms/risalat/2015/Laporan%20Tahunan%20Suruhanjaya%20Pasukan%20Polis%20Bagi%20Tahun%202013.pdf)
- [4] Singh, D. N., & Ravi Teja C. (2013). Vehicle Speed Limit Alerting and Crash Detection System at Various Zones. *International Journal of Latest Trends in Engineering and Technology (IJLTET)*, 2(1), 108–113. <https://doi.org/10.15662/IJAREEIE.2016.0503086>
- [5] Kotwal, J. G. (2015). Speed Alert System for GPS-enabled Smartphone's with Android operating system, 6(1), 745–748.
- [6] Jain, M., Kumar, P., Singh, P., Arora, C. N., & Sharma, A. (2015). Detection of Over Speeding Vehicles on Highways, 4(4), 613–619.
- [7] Gosai, P. P., & Joshi, J. (2016). Automatic Speed Limit Violation Detection and Warning System Using GPS and GSM, 1585–1589. <https://doi.org/10.15662/IJAREEIE.2016.0503086>