MNNF Publisher
ISBN NO: 978-967-17324-9-6

Mobile Application for Carpooling System in UiTM Seremban Based on Customer Rating

Nurul Najihah bt Hisamuddin, NurFatin Nabilah bt Md Fauzi, Nur Farrah Ain bt Mohamad Johari & Rosmah Abdul Latif

Faculty Computer and Mathematical Sciences, UiTM Negeri Sembilan, Persiaran Seremban 3/1, Seremban 3, 70300, Seremban

rosmah283@uitm.edu.my

ABSTRACT

Students need a transport to go anywhere they want to go. In Malaysia, Grab and myCar are the most known e-hailing services. For UiTM Seremban students, its hard to get transportation like Grab because it is limited in UiTM Seremban area and because of that, the cost of using this services is a bit high. Most of the passengers want the driver who can provide them a comfortable service, make them feel safe and can minimize risk during their riding. In term of selecting driver, some students prefer to find the driver which suit with his/her need. The use of star rating in this application will help the passenger to rate the driver and based on the rating given it can help the other passenger to decide in choosing the driver according to the ranking. Currently, using grab and myCar, passenger cannot choose their own preferred driver. Therefore, by developing carpooling mobile application, it will give a chance and some advantages to the passenger for deciding by their own, according to their need to choose their own preferred driver. Moreover, it also helps the student to save their time of waiting the driver because the passenger can select nearby driver around them. This carpooling application uses Average Rating method before generates the lists of the driver. The higher rate driver is the top driver while the lowest total rate is placed at the bottom. At the end of the study, it shows the mobile application that lists the driver from the highest rating to the lowest rating based on their average to help the passenger to select their own driver when they want to carpool.

Key Words: e-hailing, carpooling, mobile application, Average Rating method.

1. INTRODUCTION

In this growing era, public transportation is an important basis in daily life which is to ease people to move from place to place. Carpooling or car-sharing is a scheme that requires more than one individual to travel in a vehicle and prevents drivers from driving alone. Furthermore, by using carpool system it certainly will save time and cost.

Generally, casual carpooling is the driver will decide to pick up passengers to enable the occupancy of vehicles in order to share the trip cost and on the spot forming the crews,

MNNF Publisher
ISBN NO: 978-967-17324-9-6

Burris and Winn (2006). The instances of organized and most efficient carpooling application are Droupr, lyft, Pool My Ride and many more. Most of these are operating in the overseas. By using carpooling application, it fortuitously will give the occupant a community based and safe travelling experience.

However, according to Correia and Viegas (2011) classical carpooling systems have low flexibility, likewise in the handling of variants of schedules and destinations for sooner or later people who are bugging other people. Therefore, this has resulted only small groups who make positive changes in commute-mode to carpooling to stay with this new mode until they are no more travelling to their workplace, Burris and Winn (2006) .

The issue that escalated concerning past research is whether there is any way to enhance flexibility by considering a distinct type of organizing and supporting this option transportation. Most studies that relates to this study was published a long time ago. Hence, there is a need for more exploration of the sources to improve carpooling usage.

In UiTM Seremban, there is a transportation service that operates around UiTM area. It eases the students who stayed far from home and do not have any transports to move to the destination they want to go to. But the service provided seems disorganized and not systematic. In particular, the transportation service did not have an efficient system. This is because sometimes their service is not available due to transport break down or other reasons. This boldly will provoke the other users who need to go to a destination in a rush due to the van tardiness.

As a result, to encounter this problem we come up with a mobile application related to the carpooling system among UiTM Seremban residents. The main purpose of this study is to sort the list of the driver based on customer rating. On top of that, this mobile application provides the list of the diver that can help the passenger choose the driver on their own.

2. LITERATURE REVIEW

Hesitant Fuzzy Linguistic Term Set

The purpose is to build the carpooling system that is safer and trusted (Montes, Sanchez, Villar, & Herrera, 2018). Their system gives the detail of information about the driver and passengers. The researches use hesitant fuzzy linguistic term set (HFLTS) as a model on their study. The idea of hesitant fuzzy set HFS was presented in quantitative setting. The function of HFLTS is to help people in making a decision.

Decision making is the process to select the best option that can give a benefit to the user. If the user cannot make a decision, it will give an advice to the user. The model is easy to use and very straight forward so it is very suitable to make a decision. They also said that the passenger user can rate and choose their driver for their safety. In the study, before the passenger want to find the driver, they can search location that they want to go, the detail of the transport and the detail of the driver. Even the driver also can check their passenger's detail in the application.

Based on the previous study by Deveci, Canıtez, and Gökaşar (2018), they said that fuzzy is use to evaluate some of the uncertainty problem in real life. The decision maker is one of the factors influencing the selection. Therefore, to make a decision, the values of the qualitative criteria that will be gained are not accurate. It is because from the individual evaluations, there are normally characterized as "very low", "low", "medium", "high", "very high". It is hard to precisely measure the rating of every option. There are the definitions of HFLTS. Hs is an order unlimited subset of consecutive linguistic terms.

Average Rating

Some of the website do some comparison about something and rank it based on the rating that have been given by the people. For example, to know the best movie among all the movie that have been released based on star rating, the best food in some area or the best

MNNF Publisher
ISBN NO: 978-967-17324-9-6

hotel to stayed. Mostly the rating is very important to other customers to make a decision. Ganu, Elhadad, and Marian (2009) utilize an average rating to locate the true quality dependent on the product review. They just focused on the rating and based on the rating review the average rating are used before it is ranked. The normal rating given by all audits, object with the most elevated normal rating will show up at the highest point of the rank rundown. The strategy is rank the item effectively as per the quality. The various sources have an alternate rating scale, for example, 1-5 star, 0-10 stars and so on.

3. METHODOLOGY

3.1. Research Goal

Average rating is the model we use as a benchmark measure. The estimated quality of an object is the average rating it has received from all the passenger feedback. This method is the one of the calculation methods with using the rating review value from the user that have been use by the other researcher before on their research. This is the straightforward technique that can help to find the average value. It also is an important calculation that are needed before the system make a rank list by sorting from the highest rating star to the lowest. The method is suitable with this research on this application when the customers want to make a decision on choosing the best driver based on their ranking. Because the best driver has the highest average.

3.2. Data Collection

The student and staff details such as IDs, name and phone number will be synchronized to the UiTM database. Moreover, for the address and distance in this study will be gathered by the drives and the passengers, when they start to search their location in the application. Their location will be stored in firebase.

3.3. Project Development

We already done with some test on the app to ensure the result that relate with the calculation are accurate. The ranking will be range based on the rating star that the passenger rate to the driver. Based on the steps to implement the Average Rating method, previous rating and the new rating are needed in the calculation. The value of rating is 0 until 5. Calculation process is done in the background of the app. The result shows the average value of each driver that meant the driver is automatically arranged based on the calculation value. Moreover, the app has the page that need the passenger to rate the driver based on their preference.

Equations

Below is the Average Rating method used to calculate the average value before sort it into rank. $\hat{q}_i$ as true quality, r_{i*} represents the rating that be given to the passenger and r_{ij} represents the rating that be given by the passenger. But r_{i*} this research it will be 2 because r_{ij} we assume as a submission of new rating and old rating.

$\hat{q}_i$ = current rate.
$\sum_{j \in r_{i*}} r_{ij}$ = newRating + oldRate.
$|r_{i*}|$ = 2.

$$\hat{q}_i = \frac{1}{|r_{i*}|} \sum_{j \in r_{i*}} r_{ij} \quad (1)$$

$oldRate = previousRate$, show that the previous rate is based on the rating that given by the current passenger.

MNNF Publisher
ISBN NO: 978-967-17324-9-6

$$current\ rate = \frac{(newRating + oldRate)}{2}$$

The formula was transformed to a simplest formula. It is because the formula can easily to use in the coding and can generate the result that we want to achieve in this research.

Calculation Process

Calculation process is based on the star rating that have been given by the past passenger. To make the calculation going very passenger must rate the driver.

oldRate = previousRate

$$current\ rate = \frac{(passanger\ 2 + new\ passanger)}{2}$$

Table 1. *The current rate for every driver based on old passenger and new passenger when starting using the application*

Driver	Passenger 1	Passenger 2	Current Rate
Driver 1	3	5	4
Driver 2	4	2	3
Driver 3	3	-	1.5
Driver 4	5	-	2.5
Driver 5	3	1	2

The value of passenger 1 is the value for new rating while passenger 2 is the old rating. In order to get current rate, the old rate must be added to the new rating and divided by 2.

Table 2. The current rate for every driver when keeps getting the passengers

Driver	New Passenger	Current Rate
Driver 1	3	4
Driver 2	3	2.5
Driver 3	3	3
Driver 4	5	5
Driver 5	2	1.5

Next, when there is a new passenger, the rating from the new passenger will hold the new rating value while passenger 2 from Table 1 will become previous rate. To get the current rating for every each of the driver, add up both value and then divide by 2. The process will calculate current rate repeatedly as there are new passenger.

MNNF Publisher
ISBN NO: 978-967-17324-9-6

Coding Process

```
if(dataSnapshot.exists()) {
    //////////calculate the average of driver rating/////////////
    String previousRate = (String) dataSnapshot.getValue().toString();
    oldRate = Float.parseFloat(previousRate);
    FloatcurrRate = (Float) (getrating + oldRate) / 2;
    upRating.setValue(currRate);
}
else{
    upRating.setValue(getrating);
}
```

Figure 1. The coding for calculate the average of driver rating

The figure above shows the code to get the value of rating and calculate the average of the rate. These values will be used to sort the rate of the driver on list of drivers.

```
Collections.sort(resultDriver, new
Comparator<DriverObject>() { @Override
    public int compare(DriverObject lhs, DriverObject rhs) {
        // -1 - less than, 1 - greater than, 0 - equal, all
inversed for descending
        return lhs.getRatingStar() > rhs.getRatingStar()
              ? -1 : (lhs.getRatingStar() <
              rhs.getRatingStar() ) ? 1 : 0;
    }
});
```

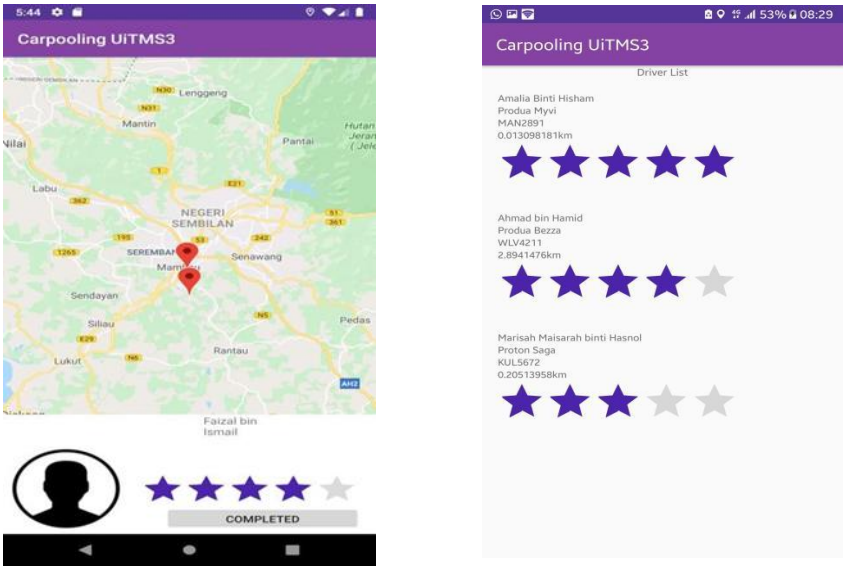
Figure 2. The coding of sorting the list of drivers based on rating

The Figure 2 shows the code for sorting the drivers list. In this application, the driver list will be sorted descending based on the rating star that rate by customers.

4. INTERFACE RESULT

Both of the interface appeared when the user is the passenger. Most of the application that have been developed have rating interface either rating star or other else. The star rating are the important component in this system to be calculate. In this mobile application the interface a) appear until the passenger already arrived at their destination. After the passengers arrived at their destination, the system will ask the passenger to give a rating to their driver based on their satisfaction. While interface b) shows the list of the driver who available to pick up the passenger around their current location which is within 5km. The driver detail was shown in this app to help the passenger to get the details of the driver, the value of scale that have been given by the past passenger also their current distance. The list of the driver who are available was ranked based on the rate given by all passengers.

MNNF Publisher
ISBN NO: 978-967-17324-9-6



(a) (b)

Figure 3. (a) User Interface for rating and arriving destination; (b) User Interface to Lists Driver.

5. CONCLUSION

In this research, the Average Rating method is used to calculate and show the average value of each driver's rating. While to sorting the average value on the list need to use the If Else coding. The objectives of this mobile application is to ease passenger choosing the driver based on their preference and also to sort the list of driver based on passenger rating. The driver and passenger must be have the UiTM Id number that register under Seremban Campus. This application provided the list of the driver that have been sorted form the highest rating to the lowest rating. It also allows the driver to accept more than one passenger request before passenger's name listed in the driver's pickup list. This application will help the passenger to choose the suitable driver who provide a good service based on the past passenger rating feedback.

REFERENCES

Başaran, S., & Haruna, Y. (2017). Integrating FAHP and TOPSIS to evaluate mobile learning applications for mathematics. *Procedia Computer Science, 120*, 91-98. doi:https://doi.org/10.1016/j.procs.2017.11.214

Berrittella, M., Certa, A., Enea, M., & Zito, P. (2007). An analytic hierarchy process for the evaluation of transport policies to reduce climate change impacts.

Bruglieri, M., Ciccarelli, D., Colorni, A., & Luè, A. (2011). PoliUniPool: a carpooling system for universities.*Procedia - Social and Behavioral Sciences, 20*, 558-567. doi:https://doi.org/10.1016/j.sbspro.2011.08.062

Burris, M., & Winn, J. (2006). *Slugging in Houston — Casual Carpool Passenger Characteristics* (Vol. 9).

Chakraborty, T., Ghosh, T., & Dan, P. K. (2011). Application of analytic hierarchy process and heuristic algorithm in solving vendor selection problem. *Business Intelligence Journal, 4*(1), 167-177.

Deveci, M., Canıtez, F., & Gökaşar, I. (2018). WASPAS and TOPSIS based interval type-2 fuzzy

MNNF Publisher
ISBN NO: 978-967-17324-9-6

MCDM method for a selection of a car sharing station. *Sustainable Cities and Society, 41*, 777-791.doi:https://doi.org/10.1016/j.scs.2018.05.034

Ganu, G., Elhadad, N., & Marian, A. (2009). *Beyond the stars: improving rating predictions using review text content.* Paper presented at the WebDB.

Hussain, I., Knapen, L., Galland, S., Yasar, A.-U.-H., Bellemans, T., Janssens, D., & Wets, G. (2016). Organizational-based model and agent-based simulation for long-term carpooling. *Future Generation Computer Systems, 64*, 125-139. doi:https://doi.org/10.1016/j.future.2016.02.019

Ibrahim, Z. (2014). *A Comparative Study of the AHP and Topsis Methods for Implementing Load Shedding Scheme in a Pulp Mill System.* Universiti Tun Hussein Onn Malaysia.

Kosacka-Olejnik, M., Werner-Lewandowska, K., Geisler, A., & Marciniak, F. (2018). Which Option of Sustainable Mobility Should Be Chosen?–Ahp Method Application For Sustainable Decision Making In Transport. *Acta Technica Napocensis-Series: Applied Mathematics, Mechanics, and Engineering, 61*(3_Spe).

Montes, R., Sanchez, A. M., Villar, P., & Herrera, F. (2018). Teranga Go!: Carpooling Collaborative Consumption Community with multi-criteria hesitant fuzzy linguistic term set opinions to build confidence and trust. *Applied Soft Computing, 67*, 941-952. doi:https://doi.org/10.1016/j.asoc.2017.05.039

Ren, F., Kong, M., & Pei, Z. (2017). A new hesitant fuzzy linguistic TOPSIS method for group multi-criteria linguistic decision making. *Symmetry, 9*(12), 289.

Yadav, V., Karmakar, S., Kalbar, P. P., & Dikshit, A. K. (2019). PyTOPS: A Python based tool for TOPSIS. *SoftwareX, 9*, 217-222. doi:https://doi.org/10.1016/j.softx.2019.02.004