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MODELLING STUDENT OF SRI ANGKASA RESIDENTIAL COLLEGE READINESS TO RIDE MOTORCYCLE USING LINEAR REGRESSION

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ABSTRACT

The primary objective of this study is to analyse the readiness of Sri Angkasa Residential College students to ride motorcycle in Universiti Malaysia Sabah using linear regression. To analyse this, the transportation model is developed. The location of study is located approximately 2.8 km from the main campus. A state preference survey was used to collect the data required for this study. The data acquired is aggregated accordingly. Three conditions was predetermined for the analysis and model development. From this study the transportation model was produced using linear regression in Microsoft Office Excel. It was also discovered that the implementation of motorcycle lanes within UMS is highly favorable.

Keywords: Motorcycle, Logistic Model, Linear Regression, Transportation, Motorcycle Lanes

1. Introduction

According to the Nielsen Global Survey of Automotive Demand in 2014, 93% of household in Malaysia has ownership of a car. Approximately 50% of the vehicles

registered annually in Malaysia are motorcycles. Usually smaller displacement motorcycles ranging between 70cc to 115cc are the preferred choice of purchase among Malaysian.

In a study conducted in 2015, the ownership of a car and motorcycle in Malaysia is deemed as a necessity instead of a social status (Abdelfatah et al, 2015). As cost of buying and maintaining a motorcycle is cheaper, many commuters prefer to use motorcycle as the main transport. Not only that, by riding a motorcycle, time is also saved especially during traffic congestion. The time saved is usually with the act of lane splitting or filtering through congested roads. Lane splitting is when the motorcycle overtakes slow or stationary vehicles by travelling in between lanes (Rice et al, 2015). This is a common practice in Malaysia, as even the police patrol riders are seen lane splitting.

According to an article by Malaysian Digest (2015), the main reason private vehicle is still preferred compared to public transport is due to the lack of efficiency. Especially in Kota Kinabalu, where the public transport system is far inferior when compared to Kuala Lumpur. Thus making it more desirable to use private vehicle instead. As most students are living of student loans, motorcycle is preferred as compared to cars, due to the fact that the cost of fuel and maintenance of a motorcycle is cheaper compared to a car (Grainger et al, 2015), even when it is known that chances of injuries are higher when riding a motorcycle (Lowman, 2017). The current condition of the main campus and residential college also lack safety features and creature comfort for motorcyclist. There are no motorcycle lanes within the campus, thus riders tend to ride in the emergency lanes. This is extremely dangerous as car drivers often forget to check blind spots before turning into or out from a junction. From a study conducted by Crundall et al. (2017), car drivers often fail to give way to motorcycle mainly due to failing to notice motorcycle even after looking at the direction the motorcycle is coming from.

The main objectives of this study are to study and analyse the readiness of students in Sri Angkasa Residential College to ride motorcycle in UMS and to develop the transportation model on the Sri Angkasa Residential College's students to ride motorcycle using linear regression. Regression analysis is a statistical technique used to investigate and model the relationship between variables. The application of regressions is vast and can occur in almost any field including engineering and economics (Montgomery et al, 2015).

2. Method

The study location is located approximately 2.8 km from the main campus. Due to this, walking to campus is impractical. The residential college is relatively new, and was opened in the effort to accommodate the increasing number of student intake with each passing years.

Figure 1. Location of Study Area (Red) and Main Campus (Yellow)

Busses are provided by the University however, due to the fact that this residential college is outside the campus, and several commercial areas nearby, students prefer their own mode private transportation. However, this in turn has led to parking spaces running low in all residential college causing students to park their vehicles in non-designated areas. This can be seen most notably during the night. Since Sri Angkasa Residential College is a relatively new residential college, only certain information is available for the purpose of this study. Thus, a stated preference survey is conducted to obtain the required data for the purpose of this study. Using the stated preference survey, the participants are given several hypothetical scenarios, and make a choice based of the information provided (Brazil et al, 2017). The respondent for this study was chosen at random, and based on the parameter of this study, only students of Sri Angkasa Residential College was chosen, while staffs and visitors are not involved for this research.

A total of 150 respondents involved in this survey. The data required for this study will be taken from the information gathered using the survey questionnaire. The questionnaire consists of five (5) simple questions. This is to avoid confusion to the respondent. By keeping the number of questions low, it will take less time for the respondent to answer. This in turn, minimizes the disturbance and also preserves the genuinity of the respondent towards the questions asked (Azavedo, 2015).

3. Results

Once the data collection was completed, the raw data was processed using Microsoft Office Excel 2013. The first process was to aggregate the data acquired. There are several data aggregation variables set, gender, distance of travel, distance of travel with shelter parking spaces provided, and distance travelled with priority lane provided.

TABLE 1. Percentage of Vehicle Ownership According to Gender

Gender	Vehicle Ownership (%)		Total (%)
	Yes	No	
Male	33	19	53
Female	26	21	47
Total (%)	59	41	100

The aggregation of data according to the gender and vehicle ownership shows that male students has a higher percentage of vehicle ownership compared to female students. This is shown in Table 1 below. The number of male students owning a vehicle is 33% while the number for female students is only 26%. By looking at the total number of respondent, reason for the difference in number is, it could be due to the number of male respondent. However, a more possible justification is that, since the percentage of vehicle ownership includes both cars and motorcycle, the number of male motorcycle rider is greater than female.

From the questionnaire the data for willingness of student to ride motorcycle was aggregated. Using the aggregated data, a bar chart is plotted for an easier comparison. As shown in Figure 4, the difference in percentage when motorcycle lanes are implemented is far more visible as compared to when sheltered parking space is provided. There is a jump from 20% to 48% for distance of maximum 30 km.

For the furthest distance of 45 km, it has a difference of 11% compared to riding under normal conditions. This shows that the condition during the ride and its environment is a far more concerning factor as compared to the condition of the destination.

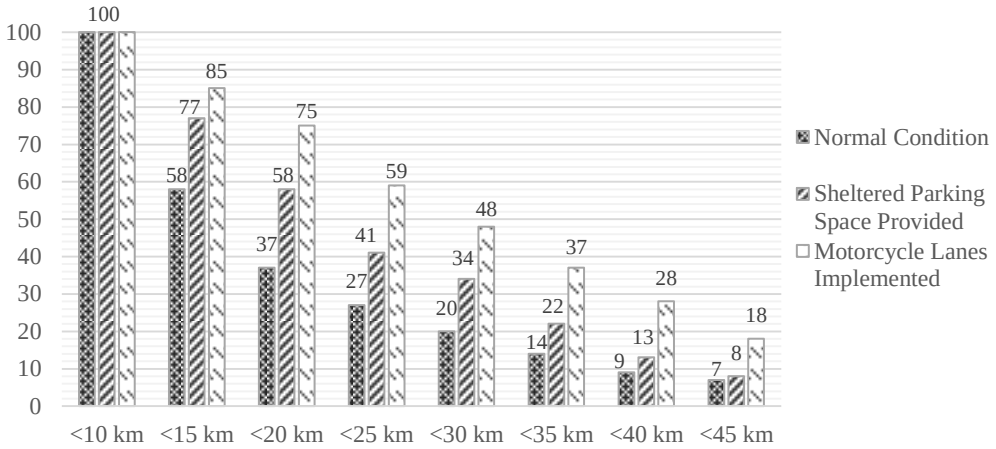

Figure 2. Percentage of Student Riding Motorcycle in Different Condition

In this study, three (3) main variables are identified for the analysis, which are the distance of travel, distance of travel if sheltered parking spaces is provided, and travel distance if motorcycle lanes are implemented. A total of three (3) models were produced using the variables mentioned. For all models, two (2) analysis was done, which are the Logistic Model analysis, and Linear Regression for Logistic Model Analysis. The general function used for this logistic model for the purpose of transportation is:

$$P = \frac{1}{1 + D_e{}^{(\alpha x + \beta y + \cdots)}}$$

Where;

P = Probability
x = Independent Variable
y = Independent Variable
α = Variable
ß = Variable
D = Constant

For the purpose of this study, only one independent variable is used, thus the equation can be rewritten as:

$$\ln\left[\frac{1-P}{P}\right] = \alpha x + \ln D$$

Using this newly derived equation, the process of regression can be done. The output of the regression will show the values of error, residual values, alpha value, and intersect point. For the result of the regression analysis, if the value of R Square is nearer to one (1), then there is a close relationship between X and Y. From

the regression of all three (3) model, a chart comparing the value(s) of the actual P and Model P is plotted as shown below.

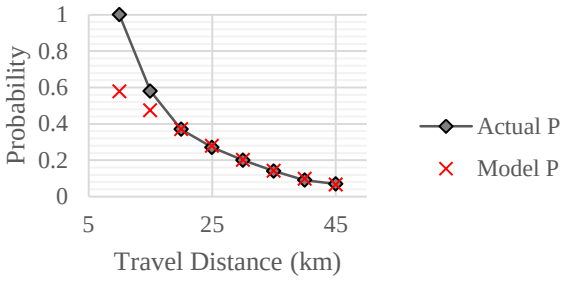

Figure 3. Willingness of Student to Ride Motorcycle in UMS

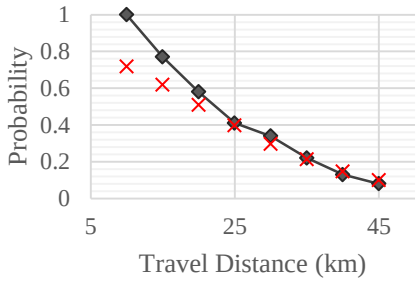

Figure 4. Willingness of Student to Ride Motorcycle if Sheltered Parking Space is Provided

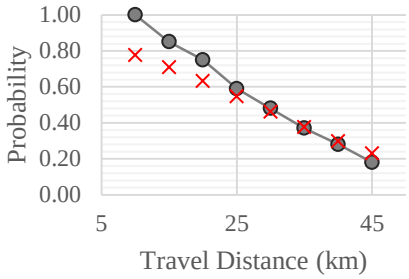

Figure 5. Willingness of student to ride motorcycle if motorcycle lanes are implemented

The model produced in this study can be used to plan facilities in campus, and infrastructure planning. For example, the first model can be used to plan the distance between parking spaces for motorcycle to the destination. For the second and third model, the validity of an infrastructure can be determined. The models can provide information whether if sheltered parking space for motorcycle is built or motorcycle lanes are implemented. Findings from this research is most beneficial for the respondents, in this case, the students themselves. It can be used to provide a more effective and efficient facilities for motorcycle users.

4. Conclusion

The study and analysis for the readiness of students in Sri Angkasa Residential College has been conducted. From that, the transportation models has also been produced. Thus, the objectives of this study has been achieved.

The transportation models produced is in the form of logistic models. The model produced for normal riding condition is:

$$P = \frac{1}{1 + 0.312514^{(0.084595x)}}$$

The model for readiness of student to ride motorcycle if sheltered parking spaces is provided is:

$$P = \frac{1}{1 + 0.160286^{(0.089780x)}}$$

While the model for readiness of students to ride motorcycle if motorcycle lanes are implemented is:

$$P = \frac{1}{1 + 0.144137^{(0.069872x)}}$$

It was discovered that for sheltered parking spaces, the most significant increase in students is up to 25 km. Thus, within this range the sheltered parking spaces would be beneficial if built. It was also discovered that if motorcycle lanes are implemented, there is a significant increase in students willing to ride further. This shows that the implementation of priority lanes for motorcycle is highly practical and beneficial.

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