

Application of Sidra 4.0 Software Traffic Flow in Intersection in Kuala Lumpur

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Abstract

Traffic signals are one of the most effective Traffic Flow and flexible active traffic control utilized extensively in a number of global cities. The traffic signal benefits include an organized traffic movement, an increased intersection capacity and needs only modest geometric design. Furthermore, there are numerous significant methods in improving network performance by directing the traffic lights' flow at the intersection. This study showed, together with the capability of improving the level of service (LOS), the intersection light signal volume, fuel consumption (FUC), average delay (AVD), operating costs (OPC), Carbon dioxide emissions (CO₂E) and travel speed (TS). The Jalan Kampung Pandan intersection light signal capacity is 1985.3, Jalan Imbi – Raja Chulan 1793.2 and Jalan Imbi 3238.1. The FUC present condition is approximately 58,881.3 lit/s from Jalan Raja Imbi- Chulan, in addition to 34,687.6 lit/s Jalan Kampung Pandan on the trip, along with 55,173.6 lit/s to Jalan Imbi railway journey. Additionally, the results displays that the quantity of OPC acquired was 1138847.2 RM/hr for Jalan Raja Imbi- Chulan, 659235.5 RM/hr for Jalan Kampung Pandan and 1054115.7 RM/hr for Jalan Imbi. The CO₂E results amount of CO₂E attained were 147203.3 to Jalan Raja Imbi- Chulan, in addition to 86719.1 Jalan Kampung Pandan and 137934. To Jalan Imbi. Peak Travel speed at TS intersection current status is approximately 0.5 km/h from Jalan Imbi- Raja Chulan, along with 0.8 km/h for Jalan Kampung Pandan in the trip, together with 1.2 km/h to Jalan Imbi on a trip.

Keywords: SIDRA Software; Travelling Speed; Level of Service; Fuel Consumption; CO₂ Emissions; Average Delays.

1. Introduction

The practical capacity of a signal-controlled intersection in intersection design is usually occupied 90 per cent of the eventual capacity. When a green aspect is specified to a traffic stream that waits in a lane of approach at a signalized intersection, the early vehicles queuing take time to increase their speed to the constant running speed at which most of the queue discharges into the intersection at a more or less constant rate. The suitable theory of a stable saturation flow rate over a saturated green time makes late group calculation capacity easy, which is equivalent to the saturation flow rate increased by the green to cycle time ratio 1. Delays signify one of the indirect costs concerning frustration, loss of time and drivers' discomfort. Alternatively, it characterizes a direct cost regarding road networks fuel consumption/wastage during idleness and inactivity. Signalized intersections extreme delay replicates the signal timing incompetence *i* as a consequence of successive signalized intersections on the specific site 2. One of the main challenges faced by developed countries worldwide is highway traffic congestion. Accordingly, Malaysia's intersections

traffic congestion's delays and long queues are repeatedly observed during peak hours as a result of road networks' poor strategies 3. Years has been dedicated to increase the field of traffic safety modelling effort. Transit operation, although being traffic flows' attached component, is often less explored compared to the general traffic. Apart from being diverse dimensionally from the general traffic, surface transit displays numerous different operational features, for example having transit stops, uncompromising use of lanes, and intermittently signal significance. Formerly, the transit operations design stage often accentuate the more quantitatively measurable metrics for example capacity, speed and reliability 4. Traffic Signal Countdown Timers (TSCTs) are clocks that numerically showing the remaining time for a specific signal indication, namely, red, yellow, or green. Drivers are provided with real-time information to hypothetically better driver decision making and vehicle control. For instance, a red signal countdown timer (RSCT) role is to alert the driver to an approaching green signal and to reduce the time lost because of driver reaction at the green signal's commencement. Related TSCT displays can be displayed too for a green or yellow signal 5. The observation that private car ownership and usage is not limited or controlled in Kuala Lumpur

as there are no development of cautious and cruel policies to lessen car ownership and usage 6.

The video systems' original capital cost is lessening, and then their increasing usage at road junctions. Parallel system used in extracting traffic movement speed and direction information, to generate movement descriptions with specified regions ('cells') on the road. This system did not produce vehicle size or shape information, or the number of vehicles 7. The methods described to process range imagery and perform vehicle detection and classification 8. The used image processing and analysis tools overview was presented for traffic applications to monitor traffic and guide automatic vehicle 9. The usage of SIDRA Intersection HCM version is based on model parameters calibration against the highway capacity manual (Manual 2000). The existing road infrastructure optimum use is traffic management's essential goal for both federal highways and the urban road network 10. The current study's purpose is to decide and assess the intersection's traffic jam volume and capacity of a traffic intake.

2. Scope of Study

The study's focus on traffic jam evaluation of one of Kuala Lumpur (KL)'s most crowded intersection. The valuation covered a variety of variables for example; carbon dioxide emissions (CO2), delay, fuel consumption, service level, travel speed and operating cost. It leads to evaluating capacity assessment of the existing intersection equated with the traffic's high volume per hour at the intersection during peak hours.

3. Methodology Data Collection

The study's method was dependent on the field observation, the data collection used a video camera from the site at peak hours for a period of 15 minutes, and then the data was calibrated and adjusted as vehicle, and analysed using Sidra software 4.0. The site (intersection)'s collected variables are for example; the traffic flow size, intersection cycle time, intersections stage and the traffic waiting length. This study's methodology is divided into four major steps; data collection, data analysis using software Sidra 4.0, enhanced outcome and findings and choosing the suitable intersections that normally experience congested traffic. The collected data from the Sultan Ismail junction with Imbi during the normal working days are illustrated in figure 1.



Figure 1 Study area Imbi in Kuala Lumpur.

Google Earth 2016

4. Results and Discussion

4.1 Capacity of a Signalized Intersection

The chief factors that affect the signalized intersections capacity are the intersection layout features, the traffic composition and intersections straight through and turning needs, and signal control setting. Fundamentally, all traffic signals that are not contained within in area-wide urban traffic control (UTC) systems are armed with vehicle detectors related to a switching device located in a control box at the side of the road. From Figure 2, the observation was that the number of vehicles passing through the intersection is high in volume. With the intersection's current capacity, it will not be able to absorb the traffic flow during peak hours and cause traffic jam. Furthermore, the cycle time also requires to re-coordinate in providing ample time for the lanes have more vehicle movement.

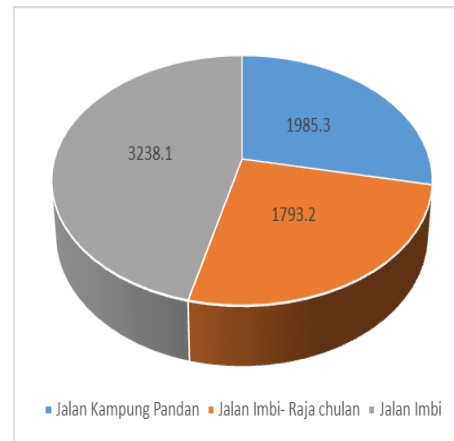


Figure 2 Capacity of intersection

4.2 level of Service of Study Area

Level of service is a qualitative measurement of the factors' effect, which comprise speed and travel time, traffic interruptions, maneuver freedom, safety, driving ease and convenience and operating costs. The concept of level of service is utilized in the intersections' capacity analysis. The obligatory levels of service to be utilized for intersections along the numerous roads categories shown in Table 1.

Table 1 Level of Service Referred to Delay

Level Of Service	Average Delay (s)	Conditions Of Traffic
A	<5	Low delay
B	5.1 - 15.0	Low delay
C	15.1 - 25.0	Average delay
D	25.1 - 40.0	High delay
E	40.1 - 60.0	Extremely high delay
F	> 60	Need to redesign

Figure 3 illustrates the level of service's study area present assessment, it was discovered that the intersection level of service was F which means the intersection require redesign according to Table 1.1. Consequently, the recommendation is increasing the intersection capacity or adding new lanes with cycle time adjustment.

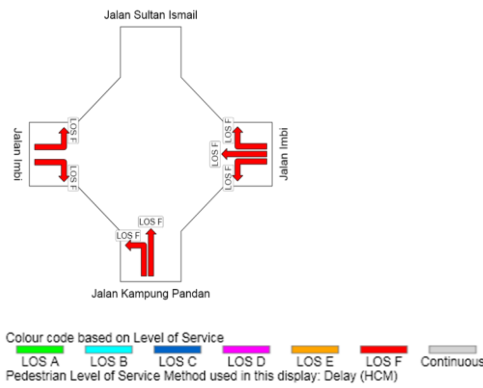


Figure 3 Existing site of the level of service (LOS) in the study area

4.3 Fuel Consumption (FUC) and Average Delay (AVD)

The exaggeration of travel trips (flight time) fuel consumption (FUC) owing to the large number of stops on the journey time’s intersection. It is seen in Figure 6 that fuel consumption is very high on the roads due to traffic jams occurring in the intersection. The present FUC situation is approximately 58,881.3 liters / second from Jalan Raja Imbi- Chulan, 34,687.6 liters / second Jalan Kampung Pandan in addition to 55,173.6 liters / second to Jalan Imbi.

Furthermore, AVD estimations specify individual corridor group identified to be analyzed. Consequently, the necessary measures were collected to reduce the lines and the whole intersection to decide service levels. Additionally, the attained AVD results were 16951.8 seconds to Jalan Raja Imbi- Chulan, 11803.7 second Jalan Kampung Pandan and 18185.5 seconds. ToJalan Imbi. In the following, Figure 4 note the Fuel consumption (FUC) and Delay Average (ADV).

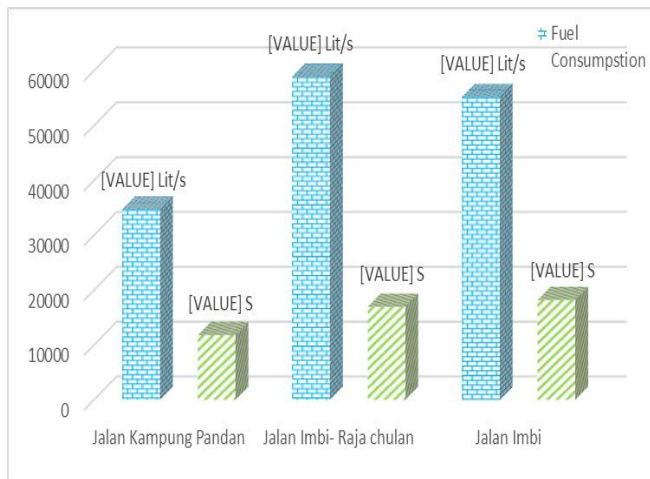


Figure 4 Fuel consumption and Delay Average

4.4 Operating Cost (OPC) and CO2 Emissions (CO2E)

The vehicles Operating Cost (OPC) in Figure 5 refers to differing costs with the use of vehicles, comprising fuel, tires and maintenance. The factors influencing vehicles OPC are; travel time, traffic speed and intersection delay. Additionally, the outcomes displays that the OPC amount attained were 1138847.2 RM/hr for Jalan Raja Imbi- Chulan, 659235.5 RM/hr for Jalan Kampung Pandan and 1054115.7 RM/hr for Jalan Imbi. Besides, Carbon dioxide Emissions (CO2E) estimations for each established lane group for the analysis are shown in Figure 5. Therefore, delay measures are gathered for lines and for the whole intersection and determine the amount of CO2E, the results obtained were

147203.3 gm for Jalan Raja Imbi- Chulan, while it was 86719.1 gm for Jalan Kampung Pandan and 137934 gm for Jalan Imbi.

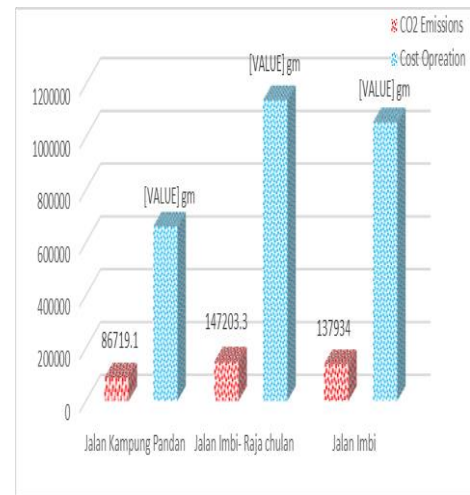


Figure 5 Operating Cost (OPC) and CO2 Emissions (Co2E)

4.5 Travel speed for a peak at the intersection

Traffic speed (TS) and non-stop frequent trips offer drivers a more comfortable trip, which was positively replicated on their behaviour on the roads. Figure 6 showed that the vehicles’ speed are slow causing traffic jams in the intersection’s flow of traffic. The TS current status is approximately 0.5 km/h from Jalan Imbi- Raja Chulan, and 0.8 km/hr for Jalan Kampung Pandan in addition to 1.2 km/hr to Jalan Imbi on a trip.



Figure 6 Travel speed (TS) for a peak at the intersection

5. Conclusion

It was discovered that each class of compounds on a Traffic Flow is important in the study of mixed traffic flow, particularly in studies connected to trafficking parameter. Flow ability is one of the most significant approaches to increase travel speed and reduce delays and fuel consumption, CO2 emissions and process cost and urban areas’ capacity. The use of Sidra 4 Package latest version showed that the averages of delay sum and Fuel Consumption fell, the Increase of speed travel system. Consequently, it has been observed that a large group of limit Outcomes from the flow of traffic in the Intersection. During this study, the recorded remarks in fields of study are as follows:

Urban roads mid blocks.

Controlled intersections.

Free flow stretch.

The methodology adopted in this study to determine Traffic Flow may be lengthened to any other type of vehicles and also under different traffic and roadway situations.

Acknowledgements:

The author would like to thank the Sustainable Urban Transport Research Center (SUTRA), UKM and Higher Institute of Science and Technology / Zahra, Tripoli, Libya who provided all the facilities for this research.

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