

COMPARATIVE ANALYSIS OF STAGE AND PHASE SIGNAL CONTROL
OF A SIGNALISED INTERSECTION

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A project report submitted in partial fulfillment of the requirement for the award of the
degree of Master of Engineering (Civil –Transportation and Highway)

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JULY, 2011

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ACKNOWLEDGEMENT

I will like to give special thanks to ALMIGHTY GOD for giving me the strength to complete this study even in hard times, my special thanks also goes to my supervisor Assoc Prof Dr Johnnie Ben Edigbe for his fatherly role and academic guidance towards my study

I also say a big thank you to my friend Ikuesan Richard Adeyemi and those that have supported me morally and spiritually during my studies especially the members of Skudia Joy Gospel Chapel.

And finally, without the help of my beloved parents, my siblings this wouldn't be a reality. I therefore say a big thank you to them for their support which money can not buy.

ABSTRACT

Traffic signal control can either be based stage or phase based and as such phase is when a set of movements takes place simultaneously and stage is that of cycle in which a particular set of phases receives green. A four arm signalized intersections was studied to make comparison of this two types of signal control, the saturation flow rate, cycle time, turning movement, signal timing, delay and level of service for each approach and the intersections for peak periods for both morning and evening periods was determined. British design, Highway capacity Manual and Transyt 13 were used to analyze for both stage and phase control. At the end of the study it was observed that the cycle time for stage control was high delay was very high, and as such level of service for the intersection was F for both morning and evening data. When phase control was used the cycle time reduced, the delay reduced, the level of service improved from F to C for all the three methodology used.

ABSTRAK

Kawalan, trafik isyarat boleh sama ada peringkat berasaskan atau berdasarkan fasa dan se-
bagai fasa itu apabila satu
set pergerakan berlaku serentak dan peringkat adalah bahawa kitaran di mana satu
set tertentu fasa menerima hijau. A empat persimpangan signalized lengan telah
dikaji untuk membuat perbandingan ini dua
jenis kawalan isyarat, kadar aliran tepu, masa
kitaran, pergerakan membelok, pemasaan isyarat, kelewatan dan tahap
perkhidmatan bagi setiap pendekatan dan persimpangan bagi tempoh puncak pagi kedua-
dua dan tempoh petang telah ditentukan. Reka
bentuk British, Lebuhraya Manual kapasiti dan Transyt 13 telah digunakan
untuk menganalisis untuk mengawal kedua-
dua peringkat dan fasa. Pada akhir kajian diperhatikan bahawa masa kitaran untuk
mengawal peringkat tinggi kelewatan sangat tinggi, dan sebagai tahap perkhidmatan pers-
impangan F data bagi kedua-dua pagidan petang. Apabila kawalan fasa digunakan masa
kitar dikurangkan, kelewatan dikurangkan, tahap perkhidmatan yang lebih baik dari F
hingga C bagi semua kaedah tiga digunakan.

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CHAPTER 1

INTRODUCTION

1.1 Background

Highway transportation relevance to the development and industrialization of any society cannot be over emphasized hence a lot of research has been done in making improvement in highway transportation. Traffic engineers have developed from ages where traffic was controlled manually mainly by human to traffic signals today which has helped in controlling traffic flows ,having in mind that population are increasing, car owners are increasing, development is increasing every day. Analysis of signalized intersections with respect to the capacity and level of service and performance analysis has been conducted several times globally.

Automobiles have increased tremendously and continuously and this has contributed to changes in pattern and characteristic of traffic, however all the changes have contributed to the modification of geometric and traffic analysis of intersections.

The importance of signalized intersections where traffic flows from various directions converge cannot be over-emphasized. The capacity of intersections is reduced much more lower than their approach link due to the influence on each other, disturbances of pedestrians and bicycles to vehicles, lost of green time for the beginning and clearance lost time and many more.

In Malaysia there is tremendous increase in population, car ownership and traffic volume in links increases everyday which is causing traffic congestion of different degree in many cites like Johor Bahru and Kuala Lumpur. Traffic signal setting in use is fixed-time for peak and off peak period. Many studies have been conducted on signal timing and the relevance of delays and queues at intersections in Malaysia

At the TermanTaratai signalized intersections along E5 LebuhrayaSkudia-Pontai road, traffic signal operates under staging signal timing i.e 4 stages. Although when the traffic signal lights fail during peak period police officers control traffic movements temporarily till the issue is resolved. This is to be expected. Even when the traffic lights are working properly delays and queues at peak arms are quite high and unacceptable. The signalized intersection operates a four-arm staging sequence at the moment, it can be postulated that a three-phase movement might work better. That has to be tested against a four-arm staging movement for acceptability. After all, it can be argued that the choice of signal timing sequence is a function of traffic directional distribution as well as other competing demand and land use activities in the vicinity.

1.2 Problem Statement

Intersections are a major concern to traffic engineers as a result of conflicting traffic movement and also intersections are major source of vehicle collision and delay. Stage signal timing involves the allowing of all movement from one arm and every other arm remains red while phase signal timing involves the allowing of movement from two or more arm at the same time and others movement that would result to collision remain at a halt or are given red. In Malaysia it is strictly stage signal setting hence at the four arm signalized intersection in TermanTaratai along E5 Lebuhrayaskudia –pontia road.

During peak period or hour at the site been consider, traffic congestion, queue especially from 7am till 9am and 5pm till 7pm are been experienced by motorist, it got to a point that a police officer is stationed there to control the traffic and while he does that most times he operates in phase signal timing by allowing all opposing through vehicles at the same time and giving right turning separate right of way. Hence we need to see and investigate if the delay under this type of condition phasing under the same site condition would have a better level of service.

1.3 Objectives

The aim of this study is to compare queues and delays, hence level of service under phase and stage signal control system at TermanTarartaifour arm signalized along E5 LebuhrayaSkudia –Pontain road.

The study objectives are to determine and compare outcomes of the followings:

- Cycle time for both phase and stage movements
- Delays and queues for both phase and stage movements
- Level of service for both phase and stage movements

1.4 Study Area

Skudai town is located in the state of Johor in Malaysia and it is the home of the first university of technology in Malaysia. It has recently been given a research status and this has attracted a lot of scholars, students across the globe to study here, coupled to the fact that Singapore is over-saturated and most people working in Singapore would prefer to reside in Skudai due to proximity and its relatively low cost of living compared to Singapore. Population is increasing every day due to so many factors. This has made the number of car ownership around this axis very high. Terman Taratai four-arm signalized intersection connects two residential districts to the main road.



Figure

1.0: on site picture taken on the 9th of May 2011

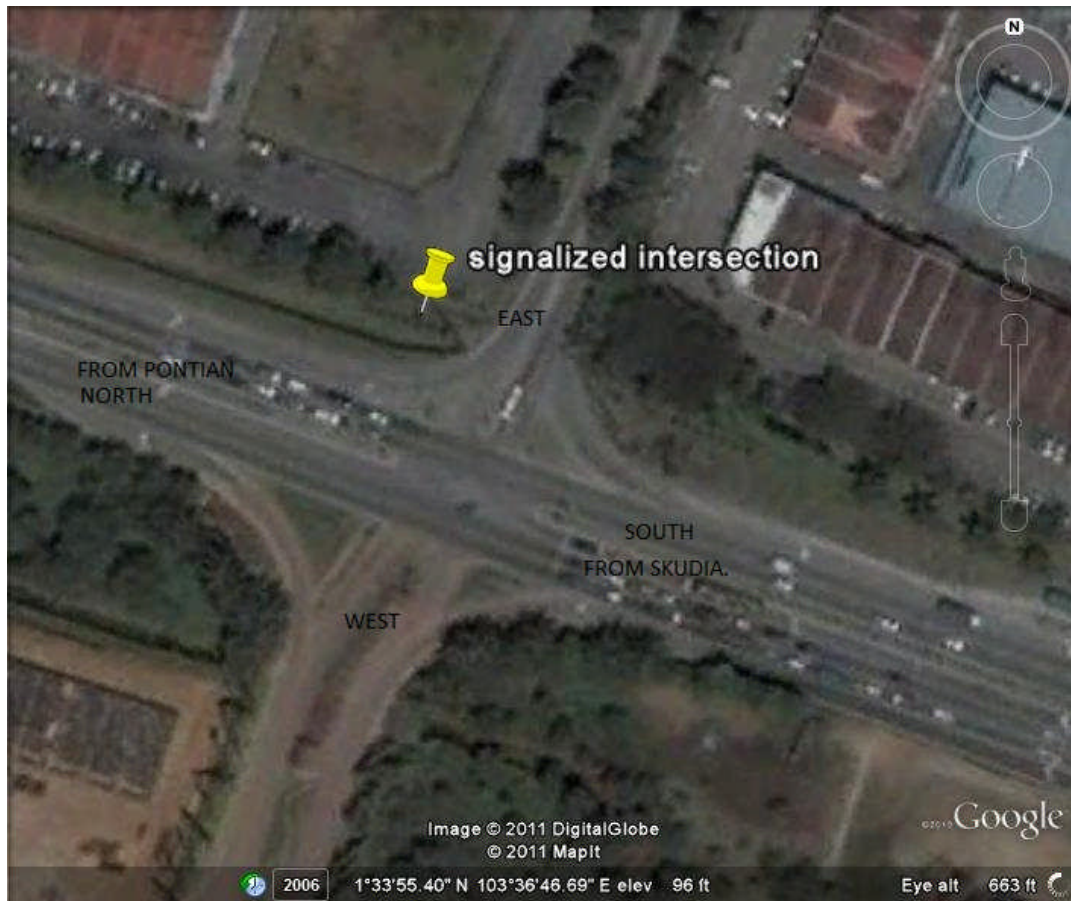


Figure 1.1 Source:Google earth

1.5 Scope Of Study

This scope of study shall involve the studying of four arm signalized intersections at TermanTaratai along E5 LebuhrayaSkudai –Pontian road.

Collection of field data was done for one day and analysis was based on the level of service achievable under phase and stage assignment of traffic signal setting at the study location.

1.6 Significance Of This Study.

This project will help in elucidating the achievable level of service in stage signal timing and three phase signal timing.

1.7 Organization Of The Thesis.

The first chapter of the thesis consists of an introduction, objectives, background of the study. The second chapter consists of the literature to the study .Chapter three of the study is on methodology used and it includes the type of data used, equipment and techniques used in the collection of the data.

Chapter 4 focuses on analysis carried out for the study, in Chapter 5 findings were discussed and finally in chapter six conclusions were made and recommendation given.

CHAPTER 2

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