

Analysis of BRT Priority Signal Control System Implementation in Major Intersections of Khon Kaen City

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1. Introduction

Generally exclusive guideway for BRT used to be set up on surface and has to cross many intersections so that priority signal control such as Public Transportation Priority System (PTPS) is required to promise effective operation. However, such signal control can't be applied directly to BRT in Asian cities because traffic signal control in those cities is quite different with that in developed country and there are many unique transportation modes such as para-transit.

In this study, impacts of introduction PTPS at two major intersections in Khon Kean city in where BRT is planned to introduce was estimated and its feasibility was examined using micro traffic simulation.

2. Study area and data collection

In Khon Kaen city which is the central city of northeastern of Thailand, five BRT lines are planned to open within 15 years from 2007 to 2022. Exclusive guideways for BRT will be basically set up on existing lanes of arterial roads. In this study, first BRT line which will be introduced on mainly national highway No.2 (Mittraphap road) and is expected to create significant impact and two intersections on this road were selected as the study area as shown in Figure 1.

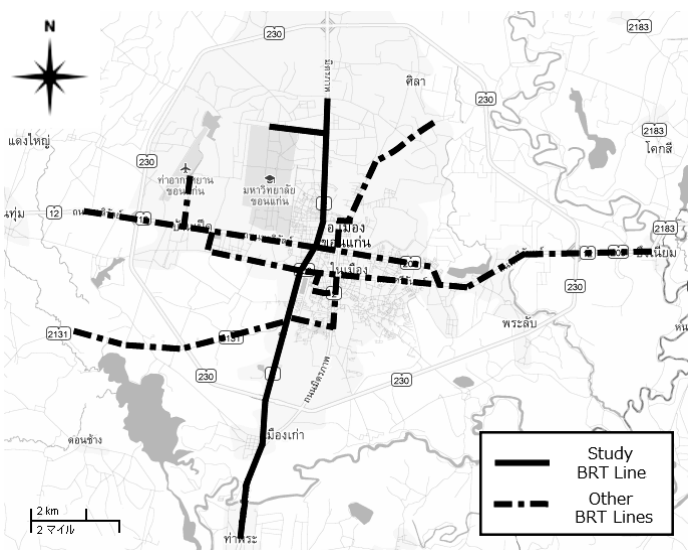


Figure.1 Survey point and BRT study line

The targeted study route is around 2 km road section from 500 m north of Samliam intersection to 500 m south from Central Plaza intersection.

Data was collected by following approaches;

- ① Signal phase : Use video camera
- ② Traffic volume : Use video camera
- ③ Geometric design : Use walking measure
- ④ Hearing : Hearing

3. Existing traffic signal control

According to observation at study route, traffic signals are controlled with a regular interval expect morning and evening peak periods. Signal phase used to be 3 and 4 as shown in table1 and table2,.

During morning and evening peak periods, traffic signals are controlled by local policemen manually so that the split and cycle time are not constant and fluctuated.

The reproduction, use the time zone that is operating Because the rush hour other than the constant periodic signal control and rush hour traffic volume.

Table.1 Signal phase at Samliam intersection

Phase	1Φ	2Φ	3Φ	Cycle Sec
Image				178sec
Green	51sec	35sec	40sec	
Yellow	3sec	—	3sec	
All Red	—	5sec	4sec	

Table.2 Signal Phase at Central Plaza intersection

Phase	1Φ	2Φ	3Φ	4Φ	Cycle Sec
Image					183sec
Green	30sec	30sec	55sec	40sec	
Yellow	3sec	3sec	3sec	3sec	
All Red	4sec	4sec	4sec	4sec	

4. Signal control

PTPS in on the simulation implementation went to signal control. Select signal control method for existing. Estimates made using the following 2 case.

*Keywords: BRT, PTPS, Khon Kaen, VISSIM, Micro Simulation, Thailand

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(1) Case 1: Traffic signal control system with point detection¹⁾

In this signal control system, approaching of BRT might be detected and priority might be given to BRT as follows;

a) If remaining time of green light for main direction when BRT will pass under the detector which was installed near an intersection will be in certain period of time, green time might be extended.

b) If signal will be red when BRT will pass under the detector, the green time on dependent direction might be shorten.

(2) Case 2: Traffic signal control system with detection of embarking and disembarking²⁾

Since both intersections located near the bus stops, traffic signal control can be synchronized with embarking and disembarking of BRT riders as follows;.

a) If traffic lights on main direction will be green when BRT stop at the bus stop, the green time will be shorten and the green time might be increased at the next cycle time.

5. Analysis method

A reproduction the status of traffic using Micro traffic simulation VISSIM. Count the travel time using a measure point established in the case introduced the PTPS case introduction of BRT, and introduced the status of signal control simulation. Compare on the travel time it takes to pass through the intersection and the analysis the travel time saving.

6. Validation

Statics value $GEH^3)$ to evaluation The present situation reproduction confirmed that is reproduction, become all measure point where the calculation under 5.

$$GEH = \sqrt{\frac{2(M - C)^2}{M + C}} \quad (1)$$

M : Traffic volume In Simulation(Unit/hour)

C : Traffic volume In Survey (Unit/hour)

7. Simulation result

Version 3 simulations introduced the BRT to present and introducing a Bus priority point sensitivity control and introduced the Bus passengers sensing signal control.

Sought introduced during the present travel time travel time saving time as the travel time saving general vehicle by driving a sub street, general vehicle traveling on main street, the BRT. Furthermore, changing 6units/hour to 20units/hour BRT service units to 110% general vehicle traffic volume 90% is performed a Sensitivity analysis.

(1) BRT travel time effect of reduction

As sown Figure.2 and Figure.3, BRT travel time effect of reduction.

Case1 and case2 introduced the PTPS BRT found that travel time to reduction in all an observation point.

(2) General vehicle impact

Many traffic analysis this study area, results to increase the Travel time of the main street and sub street to be shown to Figure.4.

Especially sub street was the travel time to increase by the BRT operation frequency increase results.

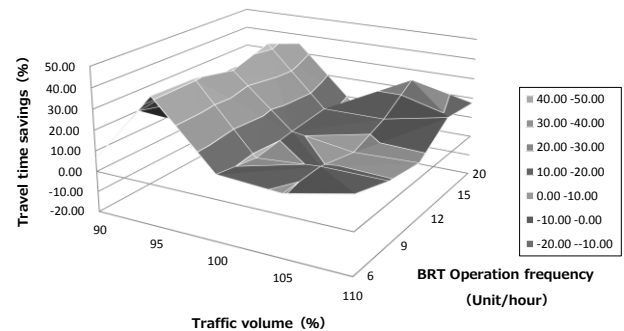


Figure.2 Travel Time Case1 (BRT, To North)

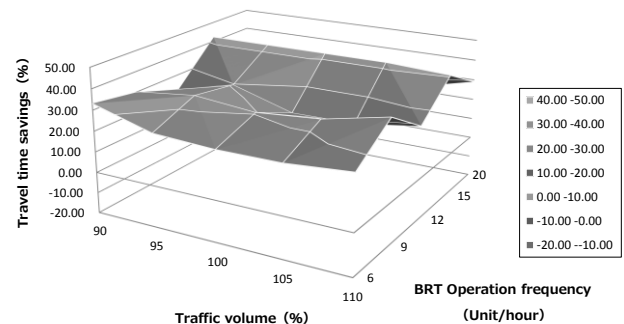


Figure.3 Travel Time Case2 (BRT, To South)

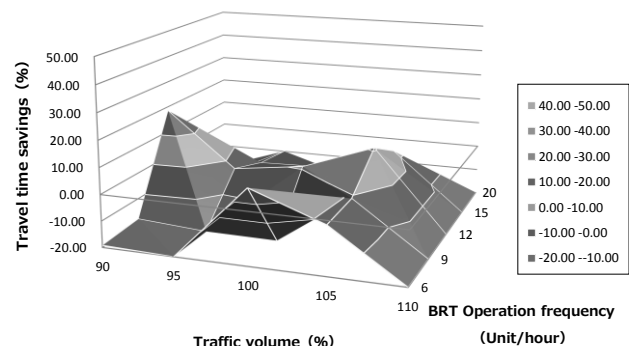


Figure.4 Travel Time Case2 (Samliam, General Vehicle, To East)

8. Conclusion

Assuming the signal control system to priority to south in this study, for as to North and to South big effect did not go out.

Also, need a dedicated system can affect follow roads if you increase the frequency of BRT operation like less.

References:

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