Abstract

Hanoi, the capital of the Socialist Republic of Vietnam, has a population of 2.9 million people and is located in the centre of the Northern Delta. It has become Vietnam's most important economic and international transaction centre and is keeping a high speed economic growth.

Hanoi is a so-called "Motorcycle Dependent City" (MDC) where motorcycles are the most important means of transportation for traffic demand. MDC have to deal with a number of problems such as high accident rates, pollution and high traffic congestion, especially in morning and afternoon peak-hours. Congestions in the inner-city region of Hanoi and in particular at intersections are mainly responsible for the extremely high travel time and the low travel speed of Public Transport means. Consequences are the negative effects on the reliability and quality of Public Transport which contributes to the fact that Public Transportation is quite unattractive to potential customers.

One possibility to reduce these deficits is to implement a prioritisation system at traffic signals which on the one hand, could help to reduce delay and time-loss at intersections and on the other hand contribute to the increase of punctuality, reliability and overall quality. In the present Student Research Project the effects and feasibilities of Public Transport prioritisation for MDCs are analysed and a concept for prioritising Public Transport at traffic signals in Hanoi is developed.

First of all, the description of Public Transport prioritisation measures in other countries as well as the presentation and explanation of Public Transport priority systems in general serve as introduction. Thus, different measures of a former and a current developing city are described in order to get an overview of common strategies for Public Transport prioritisation. One can observe that an increasing population combined with economical growth leads to high traffic demand and consequently to an increasing amount of vehicles in developing cities. Since this growth cannot be served by Public Transport due to a lack of capacity more and more customers change to Motorised Individual Traffic (MIT) resulting in a shrinking Modal Split for Public Transport.

Different prioritisation systems and techniques are presented and methods like active, passive, absolute, conditional and special forms of prioritisation are explained. Furthermore, the technical elements and compositions of prioritisation systems are introduced, too.

The status quo of Hanoi's traffic and Public Transport situation has to be analysed before a prioritisation concept can be developed. This problem analysis considers general traffic issues as well as Public Transport related problems. Next to these findings, the general structure of the Public Transport system in Hanoi is analysed in terms of financial, organisational and technical aspects. To achieve a detailed impression, traffic observations, interviews with responsible persons dealing with Public Transport related issues (authorities, bus operators) and a survey among Public Transport customers were conducted. The findings of this analysis are organised in a problem tree consisting of problem causes (asking 'why' a prioritisation system has not been established so far) and problem effects (asking which problems could be solved by means of such a system). The effects of main problems are high time-loss at intersections resulting in a poor Public Transport quality, low economic benefit, high air and noise pollution as well as some side effects such as low traffic safety and congestion. Problem causes are mainly related to organisational, financial and technical deficits.

Based on these results some prioritisation concepts are developed in the following part. At first, an objective system is derived from the problem tree. Thereafter, different prioritisation measures are elaborated, taking into account the specific traffic situation and overall framework for Public Transport in Hanoi. Since not every objective has the same impact on effectiveness and applicability of Public Transport prioritisation, the objectives are weighted and assessed. One arrives at the conclusion that high variable prioritisation system in combination with an (partial) exclusive lane is the most effective measure especially for ring roads and arterials. If such a system is not reasonable the use of separate lanes for motorcycles and four-wheelers in combination with a moderate prioritisation method should be applied. In all other cases mixed traffic lanes are used where the prioritisation effect at traffic signals is comparable low. In all concepts a beacon/radio detection system should be applied for detecting buses and possessing priority.

Furthermore, an adequate prioritisation measure for a specific intersection in Hanoi is analysed and developed within the scope of this research. For this reason, a practical appraisal of the selected intersection is done. With the help of local observations, Public Transport related deficits such as time-loss at traffic signals for Public Transport are demonstrated. On this basis, an appropriate prioritisation measure is developed for the intersection with respect to the theoretical findings made before. Apart from an appropriate prioritisation measurement at traffic signals, rearrangements of the intersection layout are presented and discussed. A

combination of a roundabout with straight crossing exclusive bus lanes and exclusive traffic signal has been identified as the most appropriate alternative. This alternative has been analysed more closely and an adequate composition of the prioritisation elements and control logic has been developed.

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