Form 2

Dissertation Abstract

Report no.	(Course-based) No.1073	Name	NGUYEN DUC NGHIEM
Dissertation title	CYCLISTS' FACILITY CHOICE AND BICYCLE CONTROLLABILITY: THE NEW INSIGHTS INTO IMPROVING CYCLING COMFORT AND SAFETY (物的環境と自転車利用者特性が自転車の利用選好と操作性に及ぼす影響に関する研究)		

Abstract

Recently, cycling has been considered as one of the most potential sustainable transport modes for the future cities. Increasing bicycle ridership can help in improving public health, saving environment, and reducing the societal costs. However, there are several deterrents preventing citizens from cycling, particularly the low cycling comfort due to the lack of bicycle facilities and the high vulnerability of cyclists to road accidents. Therefore, improving cycling level of service and cyclists' safety have been become the central tasks for the city's governments to encourage their citizens to cycle more.

Regarding cycling comfort improvement, expanding bicycle facility system could be the most important and urgent act, because urban streets were often designed to serve for motor vehicle passengers on the carriageways and pedestrians on the sidewalks, leading to the lack of bicycle facilities in the cities. Realizing this, many cities have implemented a lot of bicycle facilities, recently. In which, bike lane (BL) is one of the most popular facilities ever built. However, in some circumstances, cyclists are diverted from using the new facilities. This is such a waste of resources.

So, facility choice (FC) of cyclists in daily cycling practice environments, between on-street facilities (curb, traffic lane, and BL) and off-street facilities (sidewalks), was investigated in this study. This aimed to find the ways to enhance the effectiveness as well as improve level of service of bicycle facilities.

Initially, the motives and deterrents for cyclists to use BLs were investigated. By indicating which factors can promote BL usages and which factors can prevent cyclists from using BLs, this investigation could be beneficial to planners, designers, etc. in controlling the impact factors to improve effectiveness of bicycle facilities.

Next, a model forecasting FC between the on- and off-street facilities was developed. An application of the model for predicting BL usage, if it is added in a certain street condition, was also developed. The application was validated in an independent street

segment which was surveyed both before and after implementing the BL. Through the comparison between the forecasted and the actual BL usages, the application showed very good performance. These investigations not only provide more insights in to FC behavior of cyclists, but also help in forecasting effectiveness level of bicycle facilities before implementing to avoid abandoned facilities in the future.

In terms of cyclists' safety, the review of the literature illustrated that cyclists are one of the most vulnerable road user groups. It also found that elderly cyclists often suffer much more severely from traffic accidents compared to their younger counterparts and loss of control accidents contribute an overwhelming part in cyclist's fatalities.

A meta-review covering well over one hundred former studies focusing on elderly group was carried out to seek for their accident's characteristics. It found that elderly road users in general and elderly cyclists in particular are frequently involved in accidents because of their failures in traveling practice, particularly in forms of inadequate steering control. Their failures were largely caused by their physical and neurological declines. The results suggested that countermeasures related to bicycle design, which can facilitate elderly cyclists in controlling their bicycle more properly, such as three-wheel bicycle, or bicycle equipped by auto-balanced system, etc. could help reducing elderly cyclist's fatalities.

Further effort was made to seek for mechanism and determinants of handlebar controllability (HC) which is often considered as the most important part of bicycle controllability (including HC, braking control, speed control, etc.). This is because improving HC has long been considered as one of the critical measures to against loss of control accidents. The new insights into HC achieved in this study are expected to serve as a base not only for proposing countermeasures to reduce one of the most popular types of bicycle accidents, loss of control accident, but also for the future studies in the new and potential field of HC.

To sum up, this study has contributed to the current knowledge some critical insights into cyclists' FC and BC, from which several measures to improving cycling comfort and safety of cyclists were recommended. We hope that our research will serve as a base for practical uses as well as researching in the future to make the one of the most sustainable transport modes, cycling, become a daily regularity of the future cities' citizens. This will not only benefit individuals but also the communities as a whole.