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博士の専攻分野の名称	博士（学術）
学位記号番号	博理工甲第 925 号
学位授与年月日	平成 25 年 9 月 20 日
学位授与の条件	学位規則第 4 条第 1 項該当
学位論文題目	SPEEDING MECHANISM FOR TRAFFIC SAFETY INTERVENTIONS ON RESIDENTIAL STREETS (住宅地道路の交通安全対策のための車両速度構造分析)
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論文の要約

Urban residential streets have the lowest ranking in terms of street function classification. In addition to having the primary function of providing access to adjacent buildings or land lots for all street users, residential streets are also usually used as spaces where local residents can congregate unlike other urban streets. In many cases, pedestrians/cyclists have to share the roadway with motorized vehicles on these roads, which puts them at high risks for accidents. As an attempt to create safer and more livable neighborhoods, a speed limit of 30 km/h has been widely introduced for the majority of urban streets in residential areas. However, despite efforts to slow down motorized traffic by setting the 30 km/h speed limit, excessive speeds on residential streets are very common causing traffic safety problems and threatening the livability of neighborhoods.

To date, abundant of studies have been conducted to explore the determinants of speeding behavior considering street features and human characteristics. However, there has been a very little effort dedicated for speeding on residential streets with a 30 km/h speed limit while it is conceivable that driving on these streets differs in some circumstances from driving on streets with higher speed limits. The present dissertation was designed to fill this gap by exploring speeding mechanism on residential streets with a 30 km/h speed limit for traffic safety interventions by taking into account street features as well as drivers' personalities and psychological factors. Specifically, this dissertation focuses on several aims of research namely (i) to examine residents' perceptions regarding traffic safety on neighborhoods considering traffic conditions and street characteristics; (ii) to develop operating speed models for streets with a 30 km/h speed limit to quantify the influences of street features on driving speeds; and (iii) to explore the impacts of human factors including demographic and psychological variables on speeding behavior on residential streets with a 30 km/h speed limit.

To clarify the rationale of the current research, this study dedicated a part to explore residents' perceptions regarding

the traffic safety of the residential streets (with a 30 km/h speed limit) on which they live by considering traffic conditions and street characteristics. The results show that on average people tend to have a negative perception about the traffic safety of their living street and they do not frequently use the street as an additional space for their daily-life activities. This fact suggests that more efforts should be paid on improving the amenity of neighborhood streets. In addition, traffic volume and vehicle speed were found as the key factors of perceived traffic safety. Although, compared to traffic volume, the role of vehicle speed on traffic safety perception is lower; this study has shown evidences that, reducing the excessive vehicle speeds can be a possible way to satisfy residential needs. Furthermore, various factors of perceived traffic safety and frequency of using residential streets for daily-life activities were discovered in this research that can be used for making these streets as a more enjoyable living environment.

The relationships between street features and driving speeds on residential streets with a 30 km/h speed limit are explored in this dissertation by developing operating speed models for these roads. Rather than using spot-speed data as it was often performed in previous studies, in this study drivers' profile-speeds were measured continuously under an elaborate field survey on 99 street sections with varying characteristics. Several speed models were developed by using advanced modelling techniques such as Simultaneous Equation Approach (SEA) and Neural Networks (NN) to ensure their predictive ability. The results show that various roadway and roadside characteristics associated with driving speeds are incorporated in the developed models. From the road design perspective, the results from these models suggest that attention should be paid to the selection of street section length, the allocation of cross-section elements, and the characteristics of intersections to obtain desired driving speeds on residential streets. While the data in this study indicate that speeding is a serious issue, this work provides a useful tool for coping with this problem. Following the performance based design approach, the relationships between traffic speeds and street environments developed in the current study can be used to assess the speeding issue in existing streets, to re-design streets to make them calmer, and to plan and design new urban streets to meet the intended traffic goals.

This study also explores human factors with respect to speeding and driving on urban residential streets with a 30 km/h speed limit. A survey methodology was developed to individually match attitudinal data (conducted by a questionnaire survey) and drivers' speeding behavior (measured by vehicle speeds observed on the field). The results reveal that almost all drivers often exceed the speed limit and that they still intend to do so in the future if nothing is changed. However, positively the application of a 30 km/h speed limit is supported by a number of drivers and people likely favour protecting the rights of vulnerable street users (i.e., pedestrians/cyclists). In addition, variety aspects of speeding and driving on residential streets with a 30 km/h speed limit were examined including: drivers' knowledge, opinions and attitudes towards speeding on 30 km/h residential streets and the current 30 km/h speed limit; and factors that influence drivers' speed choices while driving on these roads. Furthermore, the determinants of speeding behavior were deeply explored by using the Theory of Planned Behavior (TPB), a well-known theory in psychology, as a frame of reference. Under the framework of the TPB, various factors have been found to be connected with speeding intention and speeding behavior. Importantly, this study demonstrates that, a part from variables that have been found in literature, three new context-based variables namely perceived appropriateness of the 30 km/h speed limit, perceived residential street function, and perceived right of vulnerable street users were found as significant variables of speeding intention/behavior. These variables, therefore, should be taken into account to formulate appropriate policies for tackling speeding issues in residential areas.

On the basis of the abovementioned findings, a comprehensive approach should be used to address the speeding problems on residential areas. First, street environment should be redesigned considering the speed-influencing factors to make it inherently calmer. Secondly, educational measures and/or social campaign programs aiming to altering drivers' speeding behavior should be developed in the light of the speeding mechanism as explored in this study.