

Modeling Cyclist Behavior Using Naturalistic Data

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ABSTRACT

Over the past few years, many cities have witnessed the increasing popularity of cycling, especially among ordinary commuters. Accordingly, there has also been a fast growing demand for the knowledge of cycling performance as well as cyclist behavior, which can be valuable for both traffic planners and policy makers when it comes to the bicycle-related issues. The aim of this study, hence, is to investigate the cycling performance in detail and to further develop a proper model which can be implemented in the microscopic cycling traffic simulation. The study was initiated with data collection in the summer of 2013 in Stockholm. A number of commuter cyclists were recruited and then provided with GPS devices to record their ordinary cycling trips. The GPS devices were portable but qualified enough to measure cyclists' position, speed and altitude with a time interval of one second. Before the winter, around 100 cycling trips completed in the urban area of Stockholm were collected and a database was established to manage the raw data. Prior to the data analysis, measurement noise cancellation and profile smoothing were performed as well using the robust locally weight regression and the Kalman filtering. Further, the observed GPS data indicated that the cyclist could be reasonably assumed to behave in three different ways, including the acceleration, deceleration and cruising. Therefore, a cycling principle was suggested in the study that a cyclist is always endeavoring to achieve and maintain a desired speed which varies depending on multiple factors, such as the cyclist's own demographics and the road grade. If a cyclist's present speed was not corresponding to her present desired speed, she would accelerate or decelerate immediately. Based on this assumption, the GPS data were classified into three parts and acceleration profiles and deceleration profiles were selected, respectively. Statistical analysis was conducted for these profiles and a polynomial model suggested by [1] was eventually referred to model cyclists' acceleration and deceleration behavior.

Keywords: Naturalistic data, Cyclist behavior, Acceleration, Deceleration.

REFERENCES

- [1] Akçelik, Rahmi, and D. C. Biggs. "Acceleration profile models for vehicles in road traffic." *Transportation Science* 21.1 (1987): 36-54.