Using Instrumented Probe Bicycles to Develop Bicycle Safety and Comfort Prediction Models

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ABSTRACT

A common deterrent to cycling are the real and perceived concerns on the safety, comfort, and practicality of choosing cycling over other modes of transportation. The challenge lies in effectively quantifying the desirability of cycling facilities to assess return on investment for bicycle infrastructure decisions. In this paper a Bicycle Comfort and Safety Prediction Model (BCSPM) is developed to quantitatively predict a cyclist's safety and comfort for a given cycling path. This was done by conducting experiments utilizing an Instrumented Probe Bicycle (IPB). The IPB used in this study was developed using research from around the world [1] [2]. Among the many sensors configured on the IPB is a state of the art 3DM-GX3 sensor to collect time-stamped, position, velocity, acceleration and the tilt/yaw/pitch angles. Additionally, a Microsoft Kinect sensor was utilized to record time-stamped eye/head positions, facial expressions, pulse, and ambient noise levels. The BCSPM was developed with a forward stepwise regression analysis [3] utilizing the data collected from the sensors and from surveys completed by IPB riders. This paper outlines the potential applications of the BCSPM, the early results of the study, the challenges faced, potential improvements that can be made to the IPB, and the next steps in the research.

Keywords: Bicycle Comfort and Safety Prediction Model (BCSPM), Stepwise Regression Analysis, Instrument Probe Bicycle (IPB).

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