Modeling the speed, acceleration and deceleration of bicyclists for microscopic simulation

In this paper models are developed, calibrated and evaluated to describe the acceleration and deceleration processes of bicyclists in three states; while accelerating from a stop, decelerating to a stop and while fluctuating around the desired traveling speed. Such models are necessary to reliably simulate the speed profiles of bicyclists in microscopic traffic simulations. To accomplish this aim, a sample of 1030 processed trajectories from bicyclists at four intersections in Munich, Germany is used to analyze the dynamic characteristics of bicyclists. The average crossing speed, the fluctuation in crossing speed as well as the minimum and the maximum speeds of uninfluenced bicyclists who cross at a green light are analyzed and correlations between these variables are investigated. The acceleration and deceleration profiles of bicyclists who stop at a red light, but are uninfluenced by other bicyclists, are used to evaluate four acceleration/deceleration models; the constant model, linear decreasing model, two term sinusoidal model and polynomial model. Two adaptions of the models are developed and evaluated, one to derive acceleration and deceleration as a function of speed rather than time.
and the other to account for the observed fluctuation in bicyclist traveling speed. The polynomial model is found to be the most flexible and produces the overall best estimates of the acceleration profiles. The constant model was found to best estimate deceleration as well as acceleration and deceleration while fluctuation around the desired speed.

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