Mario Boot
Transport Planning, Civil Engineering, University of Twente
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Intelligent transport systems (ITS) are more and more often integrated with bicycles, which forms Smart Connected Bicycles (SCBs). Such Bike-ITS contain interface and interaction designs, with the aim of supporting bicyclists in their bicycling experiences. Interfaces are the membranes in between the bicycle and the bicyclist, and interaction designs constitute design variables about e.g. communication channel, nature of messages transmitted, intended and perceived meaning, etc. Experiences are defined as the internal, subjective, and emotional response of bicyclists to the sensory stimulation that they receive from the Bike-ITS, the environment, the road conditions, etc. Experiences are of key value because customers are willing to pay for memorable experiences and because they interact with behavior, which make them attractive for industry and policy makers alike.

Despite the increasing popularity of Bike-ITS, little is known about the impact of SCBs on bicycling experiences. Also, little is known about how that impact can be measured, quantified, and evaluated. If for example a new intelligent speed adaptation is tested for speed pedelecs, how can we know whether bicyclists feel more safe due to lower speeds or feel more frustrated due to bad designs?

In this context, the aims for the current review and conceptualization are 1) to provide an critical analysis of state of the art methods for quantitative evaluation of cycling experience and 2) to propose a framework for causal analysis of effects that SCBs have on cycling experience. The evaluation framework that was derived from the literature is a common way of thinking and talking about how SCBs influence experiences. Also, it prescribes the variables that should be examined when evaluating impacts on experiences.

A systematic literature review led to the inclusion of papers that provide valuable insights in methods for determining causality in bicycling experiences. Selected papers comprise both peer-reviewed and grey literature. Reviewed literature shows that experiences are often not well conceptualized. The review also shows that there is significant interest in physiological and neurological variables, measured real-time via wearable on-body sensors, because these can capture elements of bicycling experience while reducing bias. Isolating the effects of SCBs from other effects such as road and weather conditions remains challenging and deserves more attention.

Future researchers and practitioners can use this framework for understanding how designs, applications, systems, etc. for SCBs influence what cyclists experience. Insight about this influence can optimize the fit between customer needs and solutions, and can lead to data-driven insights for design, roadmaps and policy about how smart connected bicycles can make cycling more safe, comfortable, and attractive.

During the Trail conference, I will present the most recent findings of this literature review.