

How do new e-vehicles compare to bicycles? New measurement challenges and opportunities for safety analyses

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Today, technology and digitalization promote unprecedented solutions for personal mobility. For instance, during 2019, e-scooters became suddenly ubiquitous in several cities around the globe, rising new concerns about urban safety. Monowheels, electric skateboards, hoverboards, and other electric personal mobility vehicles (e-PMVs) are also on the rise and are changing the traffic systems. To keep the traffic system safe, we need to understand how these new e-PMVs behave and interact with other road-users and the infrastructure.

In this project, we reviewed e-PMVs on the market and instrumented a few of them in order to measure how they may compare to traditional bicycles in terms of safety. We used inertial measurement units, steering angle sensors and a LIDAR to measure both bicycle and e-PMV dynamics with an existing protocol in field trials.

Our preliminary results show that, although some of the new e-PMVs may present an alternative to cycling, they may pose different safety challenges compared to bicycles. In this respect, the role of learning is central for a correct and safe use of e-PMVs.

Different types of e-PMVs also necessitate different instrumentation in order to capture the vehicle kinematics that may be crucial for the stability and maneuverability of each individual e-PMV. The definition of stability and maneuverability from traditional bicycle dynamics may need revision before its application to e-PMVs. Specifically, while e-scooters may still suffer from similar stability issues than bicycles, hoverboards are more concerned with longitudinal than with lateral stability. Maneuverability is important for obstacle avoidance; our preliminary results suggest that avoidance by steering and braking are vehicle-specific and will result in different types of e-PMVs being challenged in different ways by the infrastructure and the weather conditions.

A larger study is now planned to collect more data and provide statistically sound insights on the stability and maneuverability of new e-PMVs in comparison to bicycles. The main results from this larger study will be presented at the conference.