Impacts of Driving Volatility on Road Safety and Emissions: The DICA-VE Project

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Abstract – The main objective of this communication is to present the project "DICA-VE: Driving Information in a Connected and Autonomous Vehicle Environment: Impacts on Safety and Emissions", which aims to develop an integrated methodology to assess driving behavior volatility and develop warnings to reduce road conflicts and pollutant emissions in a vehicle environment.

A particular attention is being given to the interaction of motor vehicles with vulnerable road users (pedestrians and cyclists) [1, 2]. The essence of assessing driving volatility aims the capture of the existence of accelerations and aggressive maneuvers [3]. Alerts and warnings can enable calmer driving, reduce volatility and potentially improve road safety, traffic flow performance, fuel consumption and emissions. A fundamental understanding of instantaneous driving decisions, distinguishing normal from anomalous ones, is needed to develop a framework for optimizing road transportation impacts.

Thus, the research questions are: 1) Which strategies are adopted by each driver when he/she performs short-term driving decisions and how can these intentions be mapped, in a certain road network?; 2) How is driver's volatility affected by the proximity of other road users, namely pedestrians or cyclists?; 3) How can driving volatility information be integrated into a platform to alert road users about potential dangers in the road infrastructure and prevent the occurrence of crash situations?; 4) How can anomalous driving variability be reduced in autonomous cars, in order to prevent road crashes and have a performance with a minimum degree of emissions?

The specific deliverables of this project will be: 1) a complete and micro characterization of individual driver decision mechanisms; 2) a prototype of a driver warning and control assist mechanisms to be applicable in connected or autonomous vehicles.

Keywords – Driving behavior; volatility; road safety; emissions.

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