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| Title of presentation Creating driver-vehicle collaboration in autonomous environments: Siemens Autonomous Tram | Institution Siemens Mobility Siemens AG |
| Please highlight workshop topic(s) your paper is relevant for <input type="checkbox"/> Ergonomics and Usability of advisory and assistance systems <input type="checkbox"/> Automation, Train control systems <input type="checkbox"/> Situation awareness | |
| Abstract <p>Autonomous driving has become one of the core topics for a wide range of vehicles, both for individual and public transportation. Siemens premiered the world's first autonomous tram in 2018, showcasing the competencies in the field of environment perception as well as our User Experience driven approach to creating a well-balanced interaction between the human and the autonomous system. We present the development of the driver HMI and environment perception technology of the autonomous tram behind it and also touch upon considerations for passengers using autonomous vehicles.</p> <p>Sensor fusion is a core technology of autonomous driving. The key challenge is to get a comprehensive understanding and interpretation of the environment. The combination of heterogeneous sensor data (like cameras, lida, radar) or data derived from disparate sources (e.g. maps) enhances the reliability and safety of the environment perception. The information within the resulting environment model (digital twin) is used to gain environment awareness and therefore self-awareness of the autonomous system. This awareness enables autonomous systems to perform actions that are situationally appropriate responses to environment changes.</p> <p>For an autonomous tram that recognizes tracks, signals, other trams, and obstacles such as vehicles or pedestrians, the key user experience design challenge is the collaboration between tram and the safety driver. The safety driver supervises the tram's operation and drives manually when needed. At any time, sufficient information needs to be provided, without overloading the drivers with too many details. Possible dangers must be clearly visualized, and the driver must be able to take over control at all times. On a broader scope, three research questions emerge: First, how to optimally distribute control tasks between system and driver to not only achieve the best driving result (regarding safety and passenger comfort) but also reduce stress and overload for the driver. Second, how to create trust in an autonomous system for both drivers and passengers. Third, how to apply these principles to the design of autonomous systems in general.</p> <p>The technology is illustrated using the Autonomous Siemens Tram which is developed in customer co-creation with the operator of "Verkehrsbetriebe Potsdam". The sensor fusion technology and the HMI is developed in cooperation with Corporate Technology and different departments within Siemens mobility.</p> | |