

Identifying and Testing SOTIF Triggering Condition for the Safety Verification and Validation of Automated Driving Systems

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Nowadays, automated driving systems are enhanced with multiple sensor modalities and diverse software algorithms to achieve higher automation levels. As for verification and validation of automated driving systems, the standard ISO 21448 brings up safety of the intended functionality (SOTIF) as a new focus. In this context, external triggers leading to unintended function outputs instead of direct malfunctioning and finally causing a hazardous vehicular behavior of the automated driving system, should be systematically investigated and tested. In the past, such triggers are mostly indirectly reflected in research works of critical scenarios or corner cases. Within the standard ISO 21448, they are formally defined as a stand-alone concept called triggering conditions and proposed as a testing objective. Still, the amount of corresponding studies for identifying, analyzing and testing of triggering conditions is very limited so far. In this contribution, we provide an overview of our ongoing research about SOTIF triggering conditions. The presentation unfolds into four aspects: firstly, we interpret triggering conditions in comparison with other relevant terms within the safety verification domain and provide a formalization of three main types of triggering conditions. Secondly, we introduce a knowledge-driven method for systematically identifying triggering conditions. Besides, we present a data-driven method for reconstructing triggering condition relevant scenarios from real automated test drives. Finally, we propose our strategy to incorporate triggering conditions into the testing process for automated driving systems and show how our overall approach to triggering conditions complies with the standard ISO 21448.