

How automated vehicles should operate to avoid fatal crashes with cyclists?

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The study assesses what kind of features would allow highly automated vehicles' (HAVs) safe operation in encounters with cyclists and allow avoiding fatal crashes between cyclists and passenger cars. Five features of HAVs' capabilities are formed based on previous studies and evaluated qualitatively using data from fatal crashes between driver-managed passenger cars and cyclist in Finland. By analysing these crashes, it is assessed which features HAVs should have in order to avoid each crash in a hypothetical setting, in which driver-managed cars would be replaced by HAVs. The necessary features of HAVs for crash avoidance are analysed crash-by-crash by considering the obligation to yield, visual obstacles at the crash scene and driver's behaviour prior to the crash. In order to avoid different types of fatal crashes with cyclists, the HAVs should be able to recognize nearby cyclists (feature 1), be aware of the priority rules in various intersections and traffic situations (2), indicate its intentions to cyclists (3), maintain safe driving patterns and anticipate future situations (4), and assess cyclists' intentions (5). Albeit the number of different features to allow crash avoidance is only five, implementing these features is a considerable challenge for HAVs' programming and design, as these should function in various and complex traffic situations. The study discloses the complexity in the encounters between HAVs and cyclists, which are to be considered in further studies and real-world implementations.