Driver Readiness in Autonomous Vehicle Take-Overs

Authors : Abdurrahman Arslanyilmaz, Salman Al Matouq, Durmus V. Doner

Abstract : Level 3 autonomous vehicles are able to take full responsibility over the control of the vehicle unless a system boundary is reached or a system failure occurs, in which case, the driver is expected to take-over the control of the vehicle. While this happens, the driver is often not aware of the traffic situation or is engaged in a secondary task. Factors affecting the duration and quality of take-overs in these situations have included secondary task type and nature, traffic density, take-over request (TOR) time, and TOR warning type and modality. However, to the best of the authors' knowledge, no prior study examined time buffer for TORs when a system failure occurs immediately before intersections. The first objective of this study is to investigate the effect of time buffer (3 and 7 seconds) on the duration and quality of take-overs when a system failure occurs just prior to intersections. In addition, eye-tracking has become one of the most popular methods to report what individuals view, in what order, for how long, and how often, and it has been utilized in driving simulations with various objectives. However, to the extent of authors' knowledge, none has compared drivers' eye gaze behavior in the two different time buffers in order to examine drivers' attention and comprehension of salient information. The second objective is to understand the driver's attentional focus on comprehension of salient traffic-related information presented on different parts of the dashboard and on the roads.
Keywords : autonomous vehicles, driving simulation, eye gaze, attention, comprehension, take-over duration, take-over quality, time buffer