

## Driver response process when overtaking cyclists on European roads

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One of the most complex traffic situations for a driver is overtaking a cyclist while facing oncoming traffic. In Europe, 30% of the bicyclist fatalities occur because of overtaking maneuvers. Typically on rural roads the infrastructure of separate cycle paths is often missing, the road is narrow, and the vehicle velocity is higher compared to urban areas.

The purpose of this study was to improve the understanding of how drivers behave, in terms of vehicle control, signaling and visual exploration, while overtaking a cyclist. This study aims to help the development of new advanced driver assistance systems (ADAS) so that they can address a larger number of crash scenarios in the future, particularly by preventing drivers hitting the cyclist or colliding with oncoming vehicles.

The UDRIVE naturalistic driving database was used to find segments of data where a car driver overtook a cyclist. Data segments were extracted from rural roads with cyclists travelling in the same direction of the vehicle overtaking. Driver glance behaviour and response process were manually coded in each segment. In total 88 cases were analysed from Germany, France, Netherlands, Poland and UK. Among the drivers, 53 overtaking maneuvers were performed by male drivers and 35 by female drivers; their age span was 20 to 70 years old.

The main finding from this study was that not all drivers exhibit the same behaviour when overtaking a cyclist. The most common driver response during overtaking is the release of the gas pedal in combination with visual exploration (i.e. looking in the mirrors and on the center stack, to check for the presence of other road-users and speed, respectively). In particular, drivers do not look straight at the road in average 7,6% of the time. Drivers' responses varied depending on whether a driver performed a flying or an accelerative overtaking. The responses were also significantly influenced by the presence of oncoming traffic.

The results from this study show that ADAS can gather cumulative evidence that a driver is engaged in the overtaking task and act accordingly to support the driving task. Lack of such evidence could signal an inattentive driver, and be used to trigger ADAS warnings and interventions.