VTT Technical Research Centre of Finland

Impacts of conditional automation of passenger cars

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Abstract

This presentation makes an overview of interesting findings on the impacts of conditional automation of passenger cars, specifically on traffic safety, personal mobility, traffic efficiency and the environment. These results are an outcome of the European flagship project L3Pilot. An objective for the project was to test and study the viability of automated driving as a safe and efficient means of transportation. Impact assessment was based on simulation and large-scale automated driving pilots in the real world.

Mobility impact assessment focused on three main topics: the impact of automated driving functions (ADFs) on quality of travel, travel patterns, and amount of travel. Safety impact assessment concerned the estimation of ADFs' effects on the number of road accidents by severity. As for efficiency and environmental impact assessment, the objective was to assess the potential impacts in terms of changes in travel time, delay, average speed, energy demand, fuel consumption and CO_2 emissions. The results were systematically scaled up to EU27+3 (EU member states, the United Kingdom, Norway, and Switzerland) level. The scaled-up effects were considered at different penetration rates of ADFs in the car fleet.

Main findings related to mobility indicated that ADFs are likely to increase the quality of travel by enabling non-driving related activities and increasing travel comfort. Especially leisure activities and interacting with passengers were often mentioned as activities to perform during automated driving. Experience of travel quality depends on the individual traveller. On average, increased travel quality may decrease the perceived costs of travelling by car. Drivers may switch to routes where they can drive with automation. Nine out of ten participants would accept additional travel time on a route within ODD if they would not need to drive themselves.

The main results on safety impact concluded that overall, automated driving can reduce road injury accidents. On motorways and in urban environment, the reduction potential of road accidents in conditions fulfilling the requirements of ODD of automation is large. Overall, the number of fatal accidents on motorways was estimated to be reduced by 13.1% with 30% penetration rate. In relation to the target accidents taking place in conditions where automation can be used, this is equivalent to 25.1%. In the urban environment, the corresponding estimates were 12.2% and 25.9%.

The main findings of efficiency and environmental impact indicate that on motorways benefits are possible in situations with high traffic volumes, where ADFs have potential to improve efficiency and reduce emissions. Scaled up to EU27+3 level, the expected impacts are overall positive but small (less than 1% decrease of total CO_2 emissions and about 3% decrease of energy demand, for all penetration rates) due to most vehicle kilometres being travelled in low traffic volumes, where no large impacts were detected. The scaled-up impact on travel time and delay on European level is estimated to be small, with increases of less than 2%. On a local level, larger impacts may be observed, for example on regularly congested urban motorways.

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Dr Satu Innamaa works as Principal Scientist at VTT Technical Research Centre of Finland Ltd. She has over 20 years of experience in research on transport and mobility, connected and automated driving, impact and quality assessment, and user needs. Satu has wide experience in field operational tests and other evaluations. Currently, she is Methodology sub-project leader for on-going European flagship project Hi-Drive and the European co-leader of Trilateral (EU-US-Japan) Impact Assessment sub-group for Automation in Road Transportation.

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Publication

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Website: https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en

Earlier presentations and publications of the research

https://l3pilot.eu/downloads