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Results and lessons learned of a subjective field operational test on the Lane Departure Warning function

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The euroFOT project

- Field Operational Test.
- Perform multiple coordinated tests of Intelligent Vehicle Systems with ordinary drivers in real traffic.
- Investigate performance, driver behaviour and user acceptance.
- Assess the impacts on safety, efficiency and the environment, based on road data.

Italian test is focused on Lane Departure Warning, with a large subjective experimental test.
The Lane Departure Warning function

- The Lane Departure Warning (LDW) in the Italian test site is available as optional on the Lancia Delta.

- LDW provides the feedback to the driver through a torque applied on the steering wheel as soon as the driver is going close or overcome a lane border unintentionally.

- The device also warns the driver, acoustically, when it detects that he/she has not the hands on the steering wheel.
Italian test in euroFOT

- Assessment of the impact of LDW function.
- Subjective large scale test through questionnaires.
- CRF and Politecnico di Torino involved.
- FOT execution: February 2010 - September 2011.
- Passenger cars - 570 drivers recruited (1761 contacted).
- LDW group (i.e. 280 drivers with the LDW installed) and Control group (i.e. 290 without LDW).
- 9 month test per each drivers.
- No objective data acquisition system in-vehicles.
- Data collected through different questionnaires.
- Online and paper-based versions available.
- Assessment of the users’ acceptance and perceived safety.
Design of Experiment and questionnaire types

- Five periodical questionnaires planned to test the users’ perception about the system.
- Users could also report specific events when the device has been useful (or not) to avoid dangerous situations.
Filled-in questionnaires as example

Event register
Response rates

**LDW group**
Response rate ≈ 57%

119 LDW users filled-in all periodical questionnaires

**Control group - CG**
Response rate ≈ 86%

226 CG users filled-in all periodical questionnaires
More than 90% of the sample found the LDW system effective in increasing the driving safety. This perception is stable along time.
As regard the perception of road safety, most of the drivers (more than 80% at Time 4) found the LDW system able to improve it significantly. This perception is stable along time.
First results - Perceived safety 3/4

With respect to the ability to avoid dangerous situations, subjects perceived a moderate positive impact.

The reported influence did not change significantly over time.
First results - Perceived safety 4/4

Subjects recognized a positive impact of the LDW function on the correct use of turn indicators

\[ M = 1.26, \ SD = .87 \] at Time 4.

This influence increased over time

\[ F (2, 230) = 5.24, \ p = .006. \]
LDW is well accepted by users. Drivers found the system very useful and satisfying, with a prevalence of the former. This perceptions do not significantly vary over time.
First results - Trust in the system

The three considered features (i.e. Raises confidence, Trustworthy, Reliable) of the LDW system are high and stable at all the time points. Reliability and trustworthiness have higher levels.
Lessons learned collected about:

- Questionnaire design and planning for a large-scale test.
- Driver recruitment and pre-screening.
- Driver liaison centre.
- Day-by-day activity for a large-scale test.
- Data management tools.
- Piloting test phases.
- Hypotheses specifications and tuning of them during the FOT.
Thank you for your attention!

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