SAFER SUCCESS STORY: Quantitative Driver Behaviour Modelling for Active Safety Assessment (QUADRA)

"Knowledge and competences gained in QUADRA give us now an opportunity to quantify safety benefits of future safety systems in early development stages. Newly identified driver behaviours are now considered in the development of our future generations of vehicle stability control systems."

Stefan Edlund, Chief Engineer
Chassis Strategies & Vehicle Analysis
Volvo Global Trucks Technology

- Computer simulations allowing system evaluation at an unprecedented level of detail (e.g. effects for individual drivers, or on specific real-world crashes)
- Models and evaluation methodology are influencing product development processes and tool chains at both Volvo Cars and AB Volvo
- Several novel ideas and findings that connect driver modelling with state of the art neuroscience, potentially game changing for future driver modelling research

Virtual testing methods are increasingly important for automotive product development. The QUADRA project developed mathematical models of drivers' behaviour in critical traffic situations, to allow computer simulation of driver interaction with active safety systems in the final seconds leading up to a crash (or its avoidance). The challenge, at the time when the project was decided, was that driver behaviour modelling was a new and highly unproven topic. SAFER decided to push this emerging area by supporting an academic PhD student in collaboration with an industrial PhD student funded by FFI.

Benefit to the project partners and impact on society:

- Mathematical models of driver behaviour in selected crash scenarios – "virtual crash test dummies with a brain"
- Computer simulations allowing system evaluation at an unprecedented level of detail (e.g. effects for individual drivers, or for specific real-world crashes)
- Several concrete ideas for system improvements, including one patent application
- Models and evaluation methodology are influencing product development processes and tool chains at both Volvo Cars and AB Volvo
- Strengthened international collaboration through a Scientific Advisory Board with leading researchers from Europe and the US
- Several novel ideas and findings that connect driver modelling with state of the art neuroscience, potentially game changing for future driver modelling research
- Extensive media coverage for one of the findings (taken up by more than 100 news outlets worldwide)

Approach:

One key decision, agreed upon in a pre-study for the project, was to constrain the driver modelling very tightly to a few well-defined applied scenarios. In this way, it was possible to look very deeply into each separate scenario, and reach across the full cross-disciplinary chasm from vehicle dynamics and safety systems, via psychology all the way to neuroscience. Thus, the modelling could keep a high scientific level, while at the same time remaining in touch with the intended application. Furthermore, since driver modelling was a relatively new area for all of the project partners, interactions with leading international experts were established in the form of a Scientific Advisory Board.

Measurable results:

- Two PhDs graduated
- Numerous publications and presentations
- One patent application

SAFER
VEHICLE AND TRAFFIC SAFETY CENTRE AT CHALMERS

Funding: 2,3 MSEK SAFER internal (cash and inkind), more than 21 MSEK external

Partners: AB Volvo, Chalmers, Volvo Cars, VTI

Funding: FFI

Period: 2010-2014