

DICOUNT- Distraction and Inattention COUNTERmeasures



Figure 1: Note that noise has been added to the driver image due to integrity reasons.

Project within "FFI - Fordons- och trafiksäkerhet"

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FFI in short

FFI is a partnership between the Swedish government and automotive industry for joint funding of research, innovation and development concentrating on Climate & Environment and Safety. FFI has R&D activities worth approx. €100 million per year, of which half is governmental funding. The background to the investment is that development within road transportation and Swedish automotive industry has big impact for growth. FFI will contribute to the following main goals: Reducing the environmental impact of transport, reducing the number killed and injured in traffic and Strengthening international competitiveness. Currently there are five collaboration programs: **Vehicle Development, Transport Efficiency, Vehicle and Traffic Safety, Energy & Environment and Sustainable Production Technology.**

For more information: www.vinnova.se/ffi

1. Executive summary

In the DICOOUNT, DIstraction and COUNTEr measures, project a prototype for safety driver coaching has been developed and to a limited extent also been evaluated. The focus of DICOOUNT has been distraction counter measures but the project has showed it is very feasible to have an integrated solution for safety coaching training as the new functionality has been integrated in an existing driver coaching program, DriveCam, from Lytx.

A key issue in the project has been the Swedish camera surveillance law. As it is important to understand the context in which a critical event occurs so a front looking camera has been part of the DICOOUNT systems. It was not foreseen within the project that the front looking camera would fall under the Swedish law regarding camera surveillance, 'Lagen om Allmän Kameraövervakning, LAK'. This has caused much delay in the project and limited the time to evaluate the system.

The results from DICOOUNT show that the system is efficient in capturing distraction events. The coaching strategy is necessary to evaluate the coaching strategy on a larger fleet and with more drivers. If the efficiency of the coaching follows the same rate as the normal DriveCam Program a reduction about 50% is feasible. Volvo and Lytx will launch a pilot in 2014 of a fleet of 10 vehicles with a 6 month of training period in order have confirmed values. Due to the legal situation in Sweden these test will be conducted in the Netherlands. In parallel Volvo together with other stakeholders will continue to have dialogue with the Swedish authorities on how such a system can be deployed in Sweden as it can reduce traffic accidents significant.

2. Background

Accident studies have identified inattention as the dominating cause of road crashes, indicating that countermeasures that target driver inattention have great potential. Distraction and inattention countermeasures are highly prioritized, for example by Volvo. "Inattention to forward roadway", including distraction and drowsiness, was identified as the primary contributing factor, contributing to 78% of all crashes and 93% of rear-end crashes in 100-car study (Dingus, et al., 2006). More recently in a commercial vehicle (heavy truck) study, distraction alone was shown to be the primary contributing factor in 71.4% of all crashes and 60% of all safety critical events (Olson, et al., 2009). Recent statistics from NHTSA (2010) show that distraction was involved in crashes causing 5,474 deaths and leading to 448,000 traffic injuries across the US in 2009.



Studies of crash databases such as NHTSA (2010) largely underestimate the problem because they rely on driver admitting to distraction and inattention in interviews after they have crashed. Interestingly, when the events leading up to crashes are recorded on video, as in the new Naturalistic Driving Study (NDS) research (Dingus, et al., 2006; Olson et al, 2009; Hickman et al, 2010b), it becomes apparent that inattention and distraction play a much larger role than previously thought. Recent NDS research has yielded some very important insights that are very useful when designing countermeasures.

3. Objective

Focus will be on adapting on-market aftermarket real-time inattention monitoring technologies and associated safety services.

- WP1 Understanding will determine warning algorithms, and study business models working with a customer.
- WP2 Develop Countermeasures will develop and prove the maturity and feasibility of a selected system(s), install and implement in-vehicle driver feedback, implement aggregated feedback, and integrate with driver training and safety management programs.
- WP3 Countermeasure Evaluation: will work with a customer to study product maturity and ROI.
- WP4 Deployment and Dissemination will analyse deployment feasibility, report and demonstration

4. Project realization

The following has been realized within the project

Volvo Driver Alert Support, DAS.

The Volvo Driver Alert Support system uses camera sensor that tracks the position of the truck in its lane and also monitors steering wheel movements. If any symptoms of tiredness are detected, the system activates an audiovisual alert. The system has to level of warning depending on the severity of the distraction. Today there is no post-trip feedback from the system.



Figure 2: Driver Alert Support is an intelligent system that tracks your driving behaviour. If it differs from normal and indicates tiredness, you are alerted by a signal and a message in the display, advising you to take a break

Lytx, DriveCam Program

The DriveCam Program identifies why accidents happen using video event recorder to capture and correct risky driving habits, see image below. Two cameras are used, one looking forward on the road and a second one looking at the driver. The events are triggered by acceleration sensors in longitudinal and lateral directions. The current system does not use in-vehicle data and do not target specifically distraction.

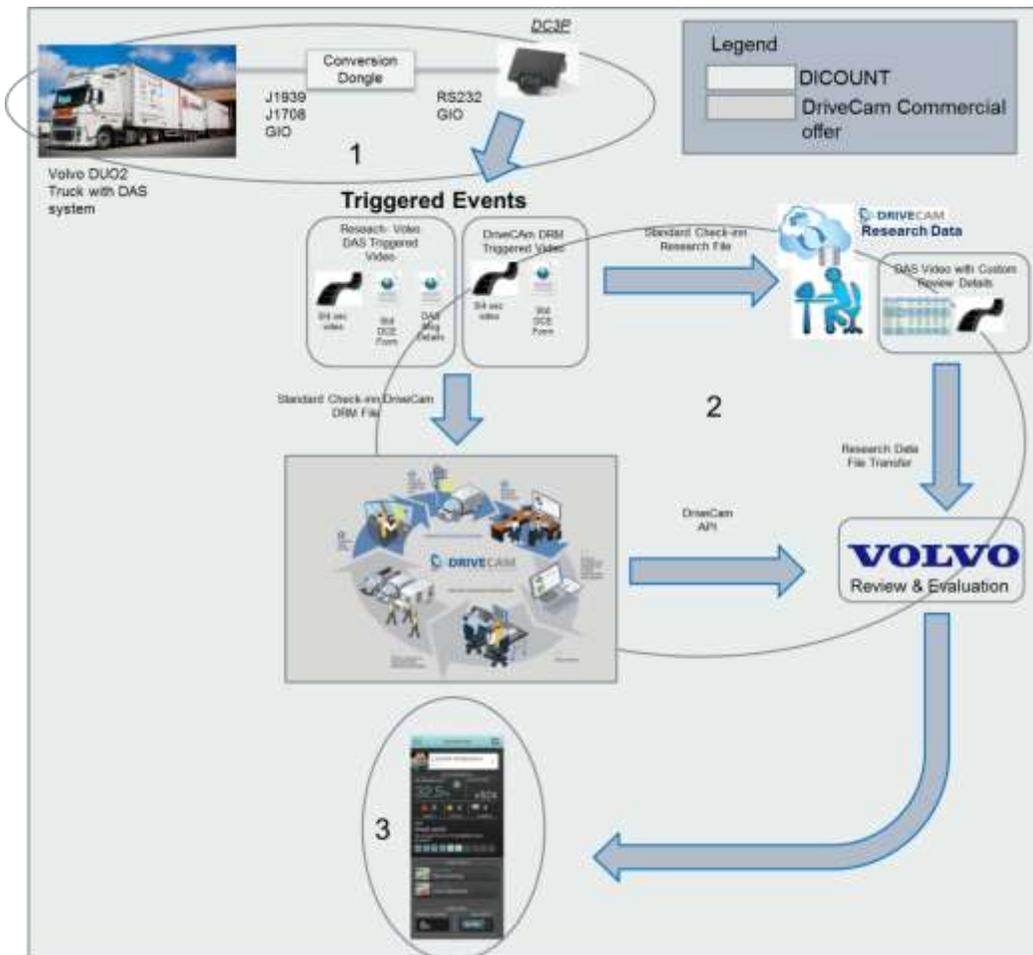


Figure 3: Overview of the drivacam program plus an Example of the video event recorder. Note that noise has been added to the driver image due to integrity reasons.

DICOUNT Technical set-up

The aim of the technical set-up is to combine the Volvo DAS that captures distraction with the video event and feedback system in the DriveCam program. In order to have a flexible and more direct feedback to the drivers an iPhone app was developed to give the direct feedback to the driver. The figure below shows the set-up.

1. **Onboard System:** The triggered events, either from the DriveCam standard events or from the DAS system, are sent via a secure cellular connection to Lytx for evaluation.
2. **Analysis:** The standard events are reviewed to identify the causes of poor driving and prioritize actions needed to reduce fleet risk and operating costs. The new DAS triggered event is handled specially in order to build training strategy connected to the event and are then re-entered in the event data.
3. **Coaching system:** The analysis events are used to coach the driver. The coaching system is an app available for iPhone/iPad.



5. Results and deliverables

The results from DICOOUNT show that the system is efficient in capturing distraction events. The coaching strategy is necessary to evaluate the coaching strategy on a larger fleet and with more drivers. If the efficiency of the coaching follows the same rate as the normal DriveCam Program a reduction about 50% is feasible.

5.1 Delivery to FFI-goals

DICOOUNT connects to the following two areas of the program:

- *”A. Fordons- och trafiksäkerhetsanalys inklusive annan möjliggörande teknik och kunskap Analys av olycksorsaker och olyckor. Effektanalys och utvärderingar av fordonstrafiksäkerhet och användningen av säkerhetssystem i fordon.”*

The DICOOUNT system is in principle and real-time traffic analysis systems that evaluates the safety critical events and use them to train the driver to reduce the risk for actual accidents.

- *”D. Förarstöd och relaterade gränssnitt mellan förare och fordon Avancerade hjälpmedel för att stödja föraren i uppgiften att framföra fordonet på ett säkert sätt.”*

The DICOOUNT feedback system aims to improve the behaviour of the driver.

- *”E. Intelligenta krockundvikande system och fordon Det intelligenta fordonet som fattar beslut och som manövrerar för att undvika eller mildra effekten av en olycka. Samverkande och kommunicerande fordon, fordon som ”talar” med varandra och med infrastrukturen.”*

The events are transferred to back-office for analysis and evaluation and then the information is looped back to the driver through the app.

The DICOOUNT goal support directly the following program goals

- *“Teknik utvecklas med potential att svara för en tredjedel av den minskning av antalet trafikdödade som riksdagens etappmål för år 2020 innebär.”*

The technology has the potential to reduce a large amount of the percentage (90%) that are connected to the human factor.

- *”De svenska fordonsföretagen förblir världsledande när det gäller utvecklingen av säkra fordon och system för fordonssäkerhet”*



A feasible system that can be deployed has been developed fulfilling the goals on business models and as aftermarket solution. This will clearly give a competitive lead if implement in future products.

6. Dissemination and publications

6.1 Knowledge and results dissemination

DIOCUNT has showed the potential to reduce distraction traffic accidents. The system has been evaluated on a truck in operation and in dialogue with the fleet operator in order to have a system that can be commercially deployable.

As the legal issues with the camera surveillance has become clear during the project, has Volvo Cars, SAFER and Volvo Group started to discuss how to move forward together as we see a large potential to reduce traffic accidents with systems like the one developed within DICOOUNT

7. Conclusions and future research

The results from DICOOUNT show that the system is efficient in capturing distraction events. The coaching strategy is necessary to evaluate the coaching strategy on a larger fleet and with more drivers. If the efficiency of the coaching follows the same rate as the normal DriveCam Program a reduction about 50% is feasible. Volvo and Lytx will launch a pilot in 2014 of a fleet of 10 vehicles with a 6 month of training period in order have confirmed values. Due to the legal situation in Sweden these test will be conducted in the Netherlands.

8. Participating parties and contact person

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