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FOT-Net
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REPORT ON FOT-NET SEMINAR

FOT-Net extra seminar: FOT achievements and opportunities for the future

Monday 23 September 2013
Versailles, France

FOT-Net Seminar: FOT achievements and opportunities for the future

On 23 September 2013, the final planned seminar for FOT-Net 2 was held in Versailles, France, on **FOT achievements and opportunities for the future**. The subject for the seminar was drawn from feedback received throughout the programme of the areas that seminar participants had indicated might benefit most from further consideration. On this basis, it was decided that this, the final seminar of the programme, should focus on FOTS that have completed (or who are close to completion) reporting back their achievements at each of the three key stages of the FESTA process (Stage 1. 'Preparing', Stage 2. 'Using' and Stage 3. 'Analysing'). In so doing, the seminar picked up best practice in FOTS as well as further promotion of FESTA,

The agenda was as follows:

09.30 - 10.00	Registration	
10.00 - 10.15	Introduction and welcome	
10.15 - 12.45	**Session 1.** Project presentations on best practice in each of the three stages in the FESTA methodology	
10.15 – 11.00	FESTA Stage 1 'Preparing'	Presentation: DRIVE, Martin Baumann (DLR)
		Commentator: Oliver Carsten (University of Leeds)
11.00 - 11.15	Coffee break	
11.15 - 12.00	FESTA Stage 2 'Using'	Presentation: FOTsis, Jorge Alfonso (Universidad Politecnica de Madrid)
		Commentator: John-Fredrik Grönvall (Volvo Car Corporation)
12.00 - 12.45	FESTA Stage 3 'Analysing'	Drive C2X, Oliver Sawade
		Adrian Zlocki (IKA)
		Niels Agerholm (Aalborg University)
12.45 - 13.30	Lunch	
13.30 - 14.45	**Session 2.** In small groups: Make inventory of lessons learned and needs for practical guidelines (groups divided over 3 FESTA stages) Make inventory of lessons learned and needs for practical guidelines (groups divided over 3 FESTA stages)	Chaired by speakers and commentators
14.45 - 1530	**Session 3.** Outcomes and achievements from FOTS and deployment strategy	euroFOT: Mohamed Benmimoun (IKA) TeleFOT: Andrew Morris (Loughborough) Deployment strategy: Tom Alkim (RWS)

15.30 - 15.45	Coffee break	
15.45 - 16.30	**Session 4.** The future for FOTs and FESTA Panel discussion Questions: • What is the future for FOTs? • How should the FOT methodology be further developed? • What are the challenges for the future?	Moderated by: Andrew Morris (Loughborough) Expert panel: 1. Niels Agerholm 2. Gwenaelle Toulminet (ASFA) 3. Oliver Sawade 4. Oliver Carsten
16.30 - 1700	Summing-up	Yvonne Barnard (ERTICO) and Erik Thomasson (University of Leeds).

1. Introduction

Participants were welcomed by Haibo Chen (University of Leeds) who explained that as this was to be the last FOT-Net 2 seminar, it was an important opportunity to exchange knowledge and FOT-Net experiences (the aim of WP4) and feed into the revision of the FESTA methodology that will be taking place in November.

Haibo explained that the format of the seminar was devised to be both informative and challenging, since each presenter was paired with a peer 'commentator' who would comment on the speaker's presentation and lead further discussion - culminating in an expert-panel discussion in the afternoon. An important contribution to learning was hoped to be more 'dirty stories' where participants would be candid about things that had gone wrong or mistakes that had been made within projects in order to pass this learning on to others.

2. Session 1. Project presentations on best practice in each of the three stages in the FESTA methodology

1a FESTA Stage 1 'Preparing' (Presentation: DRIVE, Martin Baumann - DLR, Commentator: Oliver Carsten – University of Leeds)

Martin Baumann provided an overview of the UDRIVE project which seeks to understand relevant aspects of road safety and efficiency under naturalistic driving conditions and continuous data collection through unobtrusive recording of driver and vehicle parameters. By this process, the development of research questions is an iterative process.

The main goals are:

a) to ensure that relevant data types and datasets are collected
b) to ensure data collection is compatible across study sites in different countries

Naturalistic Driving Studies minimise experimental design and control and instead, are observational studies as behaviour occurs.

Oliver Carsten commented that FOTS generally focus on the mechanism of how changes occur, whereas NDS's are both more open-ended (circular iterative processes) but focus by contrast, on what problems occur and why.

Problems encountered with UDRIVE were that many kinds of instrumental video and audio recording were wanted but this proved very difficult. Other practical problems had included deciding the angle needed for camera recordings and whether this must be different for rural versus urban driving.

Oliver concluded that the revision of the FESTA handbook would need to take into account revised definitions of research questions in order to make it better applicable to Naturalistic Driving Studies.

In the follow-on Q&A, the group was informed that 'Smart Analysis' (Marco Dozza) was a method that is being used to 'chunk' data into time and distance spans for different driving types that enables information to be extracted from the very large datasets collected through NDS (for example, UDRIVE will have collected more than 300 vehicle-years of data by the time of its completion).

In order to compare results between countries, it would be ideal to have the same equipment in all countries as well as the same group of drivers. This can however prove to be difficult because of the penetration of different makes of car in the vehicle fleet of different countries.

1b FESTA Stage 2 'Using' (Presentation: FOTsis, Jorge Alfonso - Universidad Politecnica de Madrid, Commentator: John-Fredrik Grönvall – Volvo Car Corporation)

FOTsis is a large-scale field testing of road infrastructure management systems to undertake a detailed assessment of their potential for wide-scale deployment. FOTsis follows the FESTA methodology throughout, but Jorge's presentation focused on the 'Using' stage of FESTA.

There are 7 FOTsis 'services' operating across 9 sites in Spain, Portugal, Germany and Greece. There is a complex environment with technical and organisational peculiarities that need to be taken into account when addressing any stage of the FESTA process. FOTsis established FOT Plans that translated the theoretical to practical actions. During preparation, issues included data sources, data repositories, main data flows, and data structures and most importantly, data management guidelines. Jorge described that there are a number of risks that may not have been foreseen until now but that risks can be mitigated during execution.

Services are the basis for the acquisition of the data. Data storage has not proved to be critical as the data is event-driven so generally, data is only stored when something happens so data volumes have been manageable. Impact analysis will probably be conducted as a combination of statistical analysis and focus-group studies so questionnaires are being carefully designed.

FOTsis services are infrastructure-side based, with data from road operators, traffic managers etc who have historical ways of storing data to meet their own requirements (which may not be the same as those of the FOT).

John-Fredrik clarified that FOTsis dealt with road infrastructure management systems and that the study mainly involved motorways and toll roads.

He enquired of Jorge, how easy it has been to use FESTA for the FOT Plan. In response, Jorge said that this had not been easy, also because they looked at several impact areas, not only at safety. On the matter of data sharing issues, Jorge confirmed that data is quality-assured for evaluation using a common evaluation database for all test sites.

1c FESTA Stage 3 'Analysing' (Presentation: Drive C2X, Oliver Sawade - Fraunhofer FOKUS, Commentator: Adrian Zlocki – IKA, additional presentation by Niels Agerholm – Aalborg University)

This joint presentation began by Adrian Zlocki providing an overview of the analysis process through from hypothesis definition through answers. Lessons learned show that many things can go wrong throughout this process.

Lessons learned:

- Take a layered approach
- Check that datasets are feasible for analysis
- Automate analysis if possible
- Analysis of video data is very time consuming
- Real time data synchronisation is essential

Research Needs:

- Need sophisticated models
- Need map-matching technology
- Relevant driver data
- Video analysis
- Common analysis tools
- Standardisation

Oliver Sawade had kindly agreed to stand-in to give the view from Drive C2X. Drive C2X is an umbrella FOT for national projects at 7 sites across Europe evaluating the impact of C2X in driving conditions. Though there are different methods, scale and purpose at individual sites, they are primarily safety focused and have a united technology, goal and standards. Oliver mentioned that TNO have produced a good automated tool for data quality and that the FOT simTD (Germany) have also produced useful factsheets that capture their learning.

Lessons learned:

- There is limited data and some events are just too rare to capture.
- Little things can cause big problems, e.g. different system times (lack of synchronisation) can lead to events being mixed up
- There are lots of errors in the data, quality checks are absolutely vital

Niels Agerholm then presented on the use of FOT data for the identification of hazardous road locations (i.e. where there have been more accidents than would have been expected). The study used 425 vehicles fitted with GPS, accelerator and gyroscopes in order to capture decelerations and 'jerks'. GIS was incorporated to map 'hot-spots' and thereby identify hazardous locations.

3. Session 2. Inventory of lessons learned (Chaired by commentators and speakers)

Participants worked in groups to list lessons learned and requirements for practical guidelines.

Group 1. Preparation stage:

- Does a FOT require a study of individual driver behaviour? FESTA assumes it does, FOTsis by contrast studies aggregate data?
- Can we plan experiments that deliver more conclusive results, for example aggregating across studies?
- Are we being over-optimistic about what we can detect with studies?
- Are NDS focusing on too many research questions? (e.g. could concentrate just on vulnerable road users)?
- If using video, continuous video is an absolute requirement. In fact, incident-triggered data recording of any kind is not trusted – especially as it gives no information on contributory factors in the period preceding the event
- Governance is very important

Group 2. Using Stage:

- Can we re-use data?
- FOTs need metadata and consistency of data methodologies
- Good metadata is essential – e.g. in some countries the economic crises affected travel data in some test sites – essential that this explanation is captured in the metadata
- EuroFOT and TeleFOT already combine data but it remains debatable whether the data can be compared
- Perhaps you cannot compare sites as local differences are just too great?
- Analysts should be involved from the outset to advise what is needed to enable them to get the results
- There are conflicts between the need for database communications versus privacy and confidentiality
- Need clear data requirements from the outset
- Financial constraints will limit larger FOTS

Group 3. Analysis Stage:

Adrian Zlocki informed the group that the FOT-Net Working Group on Data Analysis had produced an inventory which would be released shortly at the ITS World Congress in Tokyo. He was keen to gather additional ideas to add to this inventory however. Examples raised in this session included:

- Need to plan for analysis from the beginning – analysts need to be involved in the research questions (does the FESTA V methodology diagram reinforce the belief that analysis does not need to be thought of until later in the process?)
- Have open communications throughout the project to manage the expectations of funders – rather than leave the analysts to have to make up for what has gone wrong earlier in the project
- Less is more – focus on a deliverable project
- People can be too fixed on a particular technology
- If not all data are analysed a follow-up project is possible if you have all raw data and good documentation.

- Good practice for data analysis is included in the on-line toolkit
- Who owns the data can be important. A lesson should be to endeavour to ensure that data is publicly owned not by the OEMs.
- There is a trade-off between collecting wide generic data and specific narrow data – focus on few in-depth research questions rather than wide superficial and general
- There could be more collaboration between projects to gather data that would satisfy multiple specific interests
- Analysis is complicated by there being many variables at the time of an event (e.g. was the driver on the phone, if so was it a self-initiated call? Urban or rural area etc)
- Need to get a representative sample of the population however, the worst drivers will most likely not take part
- Could involve the driver better and improve qualitative data collection, e.g. a smart phone applications incorporating an incident button - ask driver after incident to explain incidents in real time.

4. Session 3. Outcomes and achievements from FOTS and deployment strategy

Mohamed Benmimoun (IKA) described the outcomes and achievements from euroFOT which completed last June. This FOT had benefitted from full access to vehicle data through the involvement of vehicle manufacturers in the project. The project, involving 28 partners had undertaken an assessment of ADAS in real traffic involving around 1,100 drivers of 1,000 vehicles collecting 35million km of data in five study areas (in Sweden, France, Italy and two in Germany). It was the first project to use FESTA (and in some cases to adapt it where guidance was not covered).

Findings showed 16% increase of headways for cars with ACC (Adaptive Cruise Control), a 2% increase in speed and up to 82% reduction in incidents. User-acceptance studies showed a positive acceptance for both ACC and FCW (Forward Collision Warning). For example, 94% of drivers felt that ACC increases safety and 77% felt that it increased comfort.

Andrew Morris (Loughborough University) summarised the findings from TeleFOT – a 54 –month project led by VTT across eight sites and involving 23 partners to assess the impact of aftermarket and nomadic devices. 2, 800 people were tested in large scale FOTS and 200 in Detailed FOTS plus 1,760 travel diaries and 6,400 questionnaires were compiled. The manual travel diaries provided valuable complementary data as they captured changes in personal circumstances. In-depth video was also used plus eye-tracking. The study began with 150 research questions that were iterated and conflated to 52 with the data centrally managed at a shared data centre at VTT, with detailed FOT data managed locally.

TeleFOT has chunked data into journey 'leg' types and led to the removal of the need to look at 1 Hz data points and also created structured theoretical modelling that helped to make the implications of the analysis easier to determine. Piloting worked well but might have been done sooner to test data flow.

Users were enthusiastic before the tests. This dropped off during the tests but increased again as they got used to using the device. The principal lesson learned was that one should never underestimate the time required for the data analysis.

Tom Alkim (RWS) completed this session by providing insight into Deployment Strategy, specifically through Cooperative Modelling in the Netherlands where several FOTS and initiatives have been undertaken since 2005.

This year, the Dutch Minister of Transport announced a transitional period over 10 years of public/private infrastructure-based projects as well as a roadmap for 'route projects' They will develop the cooperative ITS corridor with Germany and Austria (MoU signed 10/6/13), with one year preparation, one year testing and one year deployment.

Cooperative services initially involved roadworks warnings from roadside lorries, followed by probe data from vehicles back to the roadside. The future vision is:

- Reliable journey-times / forecasts
- Reduced congestion
- Fewer accidents
- Lower emissions
- Improved comfort

5. Session 4. The future for FOTS and FESTA (panel discussion)

The panel led an open discussion with the following core questions as prompts:

- What is the future for FOT? (e.g. type of FOT, use of technology)
- How should FOT technology be developed further? (taking advantage of the experiences of completed FOTS)
- How well does FESTA cope?
- Challenges for the Future (financial issues, autonomous vehicle/mixed vehicle fleets, demonstrating that FOTS offer useful results.

It was predicted that future technology will be smart phone based, and fixed in the car. For example, smart phone apps could have a remote connection into the CAN bus

There was a discussion about how Big Data is handled and also how this takes account of data for this being approved by voluntary participants.

Gwenaelle Toulminet (ASFA) described how the French are already proposing on-board SOS via mobile phone to replace existing fixed roadside orange boxes. This will e-call direct to the traffic control centre via SMS. Trials have indicated that this gains 4 minutes in detection/call out time as well as better positioning. In this case, a mobile phone app is better than an on-board app as it is safer for the driver of a broken-down car to exchange further information outside of the vehicle. Another app in deployment is an on-board VMS which will transfer event information into the traveller's phone based on location and direction of travel.

In terms of Autonomous Vehicles, it was suggested that OEMs are likely to be interested in working with FOTS as OEMs will soon start testing their own automated vehicles and will need to test these in the environment.

FOTs on road pricing are likely (especially as the end of the financial crisis will lead to more cars on the road) and road pricing solutions will need extensive testing.

Commuters currently mistrust the technology for automated vehicles and have the expectation that they would have to be 100% safe (as it their expectation of railways). A FOT may be useful to convince the public but also Governments and OEMs.

Challenges for the future?

- To increase environment/congestion consciousness (autonomic vehicles would increase the usable capacity on the roads)
- How to maintain cooperation between researchers and industry / OEMs once the initial C2X projects are completed
- How to move toward gathering details of all events rather than having to sample through a future 'grid' of instrumented vehicles and environmental sensors
- How to extract more out of existing data and Big Data?
- We are missing out on data already – e.g. Smart Cities data is not being fully exploited
- Clear requirements and measurement
- It is becoming increasingly difficult to keep up with the speed of technology development and FOTS are being overtaken
- It's a challenge to have all of the data when doing the analysis
- There is a danger that if funding agencies lose interest, OEMs will only fund positive results and objectivity may be undermined).

6. Conclusion and Summing up (Yvonne Barnard, ERTICO, Erik Thomasson (University of Leeds)

This final session summarised the conclusions from the day.

- Definition and selection of research questions. Stakeholder's needs should drive the process. Research should be iterative (but where to stop?). There are issues balancing between theoretical and practical issues and prioritising between them.
- Understanding the mechanisms (hypotheses) in FOTs versus understanding causation (why did this happen) in NDS.
- The focus in FESTA still is very much on Safety, but the problem is that accidents/events do not happen often enough to allow robust statistical analysis and interpretation, FOTs and NDS, however, also target other impact areas. There needs to be an editorial in the FESTA guidelines that makes the leap between the original safety focus and general good practice for other impact areas.
- Different approaches can be used in a mix of methods (eg semi-controlled, simulator..) but this would require a review of the definition of a FOT. Baselines can be taken from the data but also from other projects.
- A FOT-plan is recommended as it combines the theoretical approach with practical implementation, considering where to start and incorporating feedback loops and re-assessment of activities. In order to mitigate risks it is essential to identify them early on.

- Consideration of FOT data analysis, strongly suggested taking a 'Layered approach' and automating analysis wherever possible due to the volume of data to be analysed (and also to ensure standardisation of results). Standardisation more generally was an issue for data quality (e.g. of accident data, interoperability of services, ...). . In the meantime, documentation, standardisation and automation of routines is recommended in order to ensure that the skills and learning from FOTs are 'hard-wired' and are not lost as individuals move on.

- The increasing use of probe data in studies may provide new directions and opportunities.

- FOTs should not be overoptimistic in producing statistically conclusive results. Because FOTs are expensive and it is sometimes challenging to produce statistically significant and meaningful results, management of expectations amongst all project partners is therefore important. Aggregation across projects can increase the volume of data but there are barriers to doing this through different project-specific data issues and incompatibility. The group agreed that often 'Less is more' is a useful adage – i.e. FOTs should concentrate on achievable outcomes and studies that can be expanded pragmatically.

Yvonne concluded the event by introducing the forthcoming Support Action on FOTS – **"FOT-Net data"** which will commence in January 2014. FOT-Net Data targets efficient sharing and re-use of global data sets in up-coming analysis projects. It continues European and international networking activities in the FOT domain and aims to maintain and increase the momentum achieved in FOT-Net. FOT-Net Data explicitly addresses the need to exploit the collected data by:

- Developing the strategy for sharing and exploiting collected FOT data in national, European and international FOTs

- Addressing the actual data sharing and the procedures, templates and services needed for successful research on data gathered in earlier projects.

- Building a detailed catalogue of available data, enabling organizations to easily assess the value of different data sets for their research purposes.

Finally, the website (http://fot-net.eu) and Wiki (http://wiki.fot-net.eu) for the current FOT-Net project were recommended to seminar participants and to anyone else interested in FOTS.

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