SAFER

VEHICLE AND TRAFFIC SAFETY CENTRE AT CHALMERS

Review of Naturalistic Data Collection and Analysis at SAFER

– Current Issues and Project Highlights

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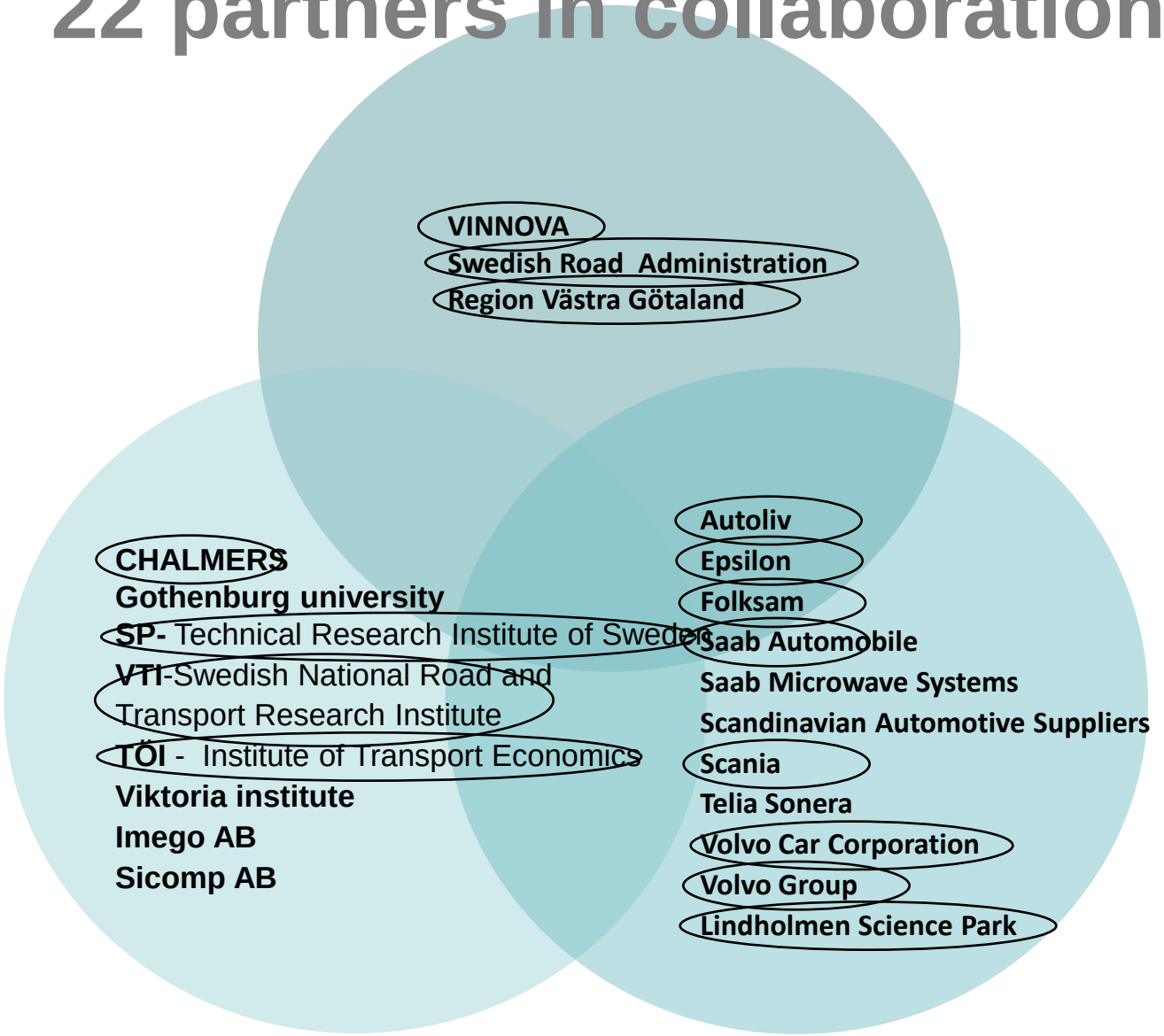
Blacksburg, 2010-08-31

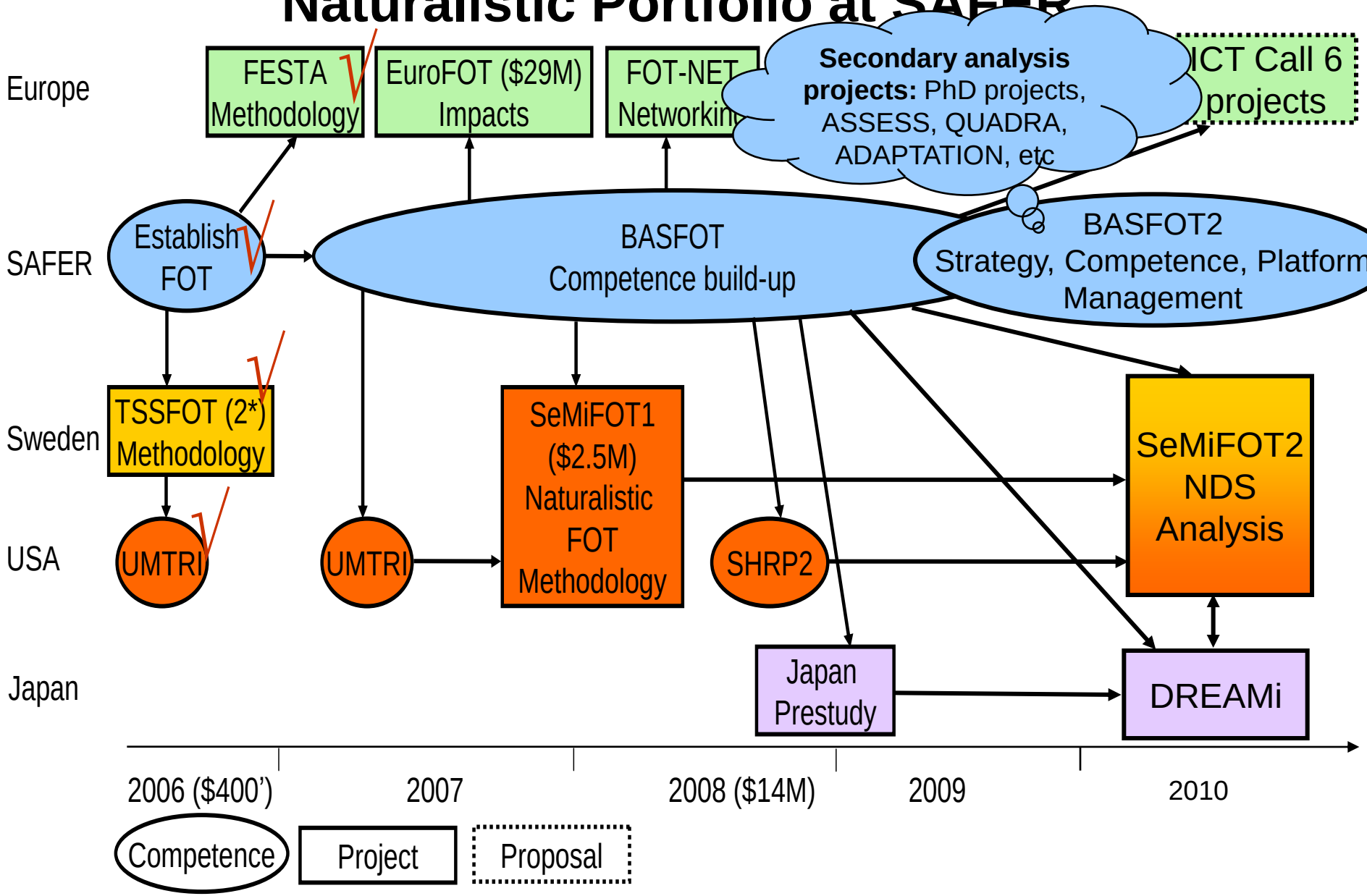
22 partners in collaboration



Current *Data* at SAFER

Project	Description	Collection Duration	Drivers	Data	Sites	Vehicles (DAS)
EuroFOT	Naturalistic Approach to Safety Impact	12m	250	On-Road collection now	3	130
SeMiFOT2	Analysis Development	6m	20	On-Road collection now	2	9
SeMiFOT1	Methods Development of the Naturalistic FOT	6m	39	106528 Mi, 2944 hrs	4	14
TSSFOT	Tools Development	6m	100	200 hrs	1	2
Total		**30m**	**>409**	**>2964 hrs**		**155**

Naturalistic Portfolio at SAFER



SeMiFOT1 Public Deliverables

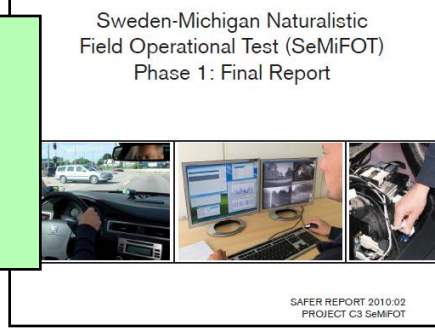
WP1 Management

WP2 Design

WP3 Data Management

WP5 Evaluation of Methodology

SeMiFOT Final Report



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Hypotheses

Questionnaires

Procedures

Task Reports:
Available on Request

CRE Analyses

CRE & Accident Stats

Visual Behavior NDS

Automatic Speed Cameras

Events-Prevented Analysis

CRESIA

Visual Behavior & ACC

Usage Analysis LDW

Subjective Data Analysis

FOT/NDS in Product and Infrastructure Development

Consumer Systems

OD data in VII

SeMiFOT2 Description

Issue: Define Naturalistic

The Naturalistic Driving Study (NDS)

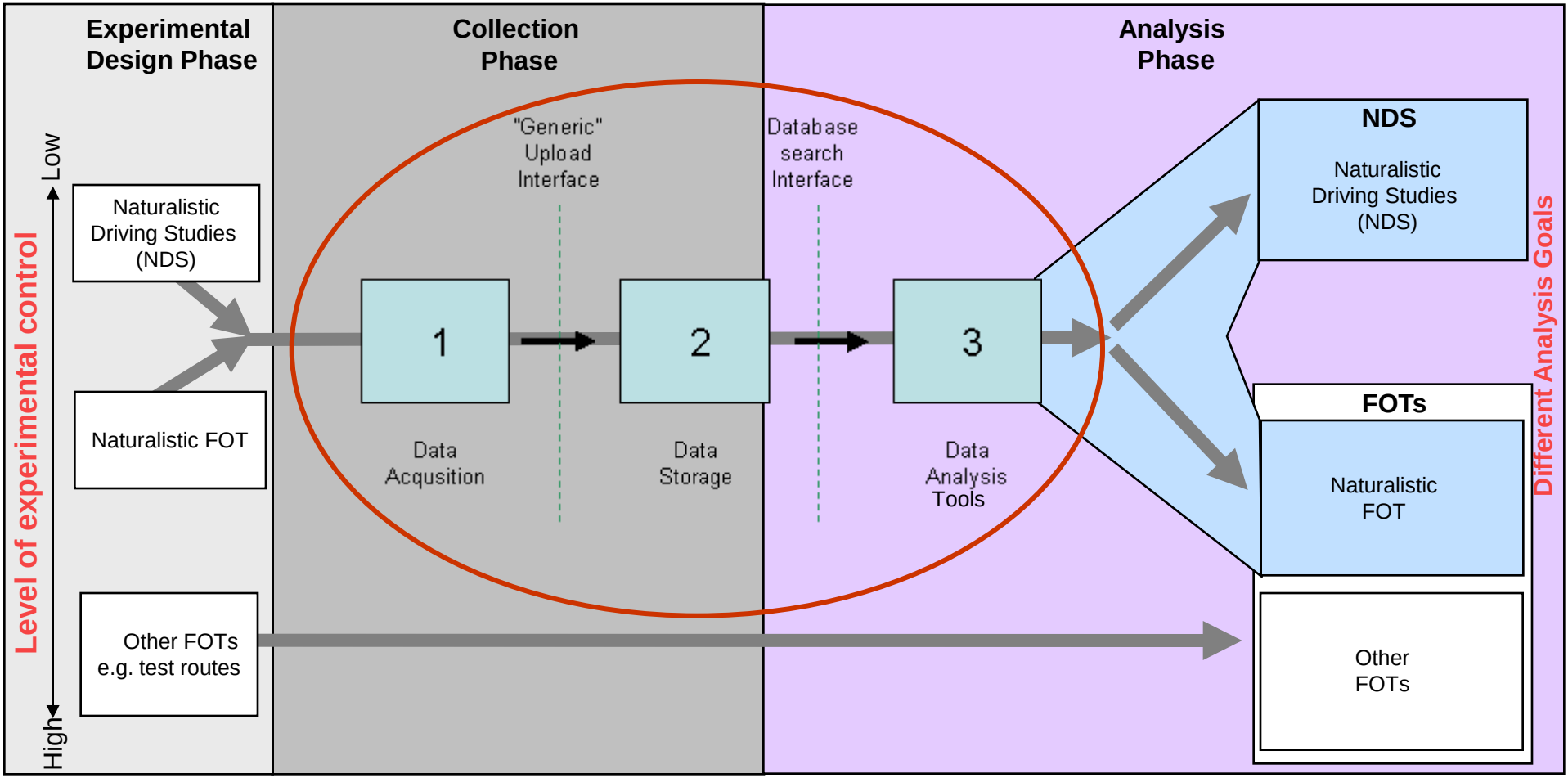
- A study “undertaken using unobtrusive observation or with observation taking place in a natural setting” (Dingus et al., 2006)
  - One experimental condition
  - Example research questions:
    - SHRP2-GRQ9b: What explanatory factors are associated with crashes or crash surrogates and what analytical models can be developed to predict crash or crash surrogates?
    - SHRP2-GRQ6: How do advanced driver support systems influence crash likelihood?
  - Studies relationship between driver-, vehicle-, and/or environment factors with crash risk
  - Needs enough km to get crashes/near-crashes

The Field Operational Test (FOT)

- “A study undertaken to evaluate a function, or functions, under normal operating conditions in environments typically encountered by the host vehicle(s) using quasi-experimental methods” (FESTA, 2008)
  - Baseline-Treatment condition comparison
  - Daily routines, free driving
  - At least a number of weeks
  - Autonomous data logging
  - Not a Field Test

- Technology sets study restrictions
  - data logger and safety function maturity

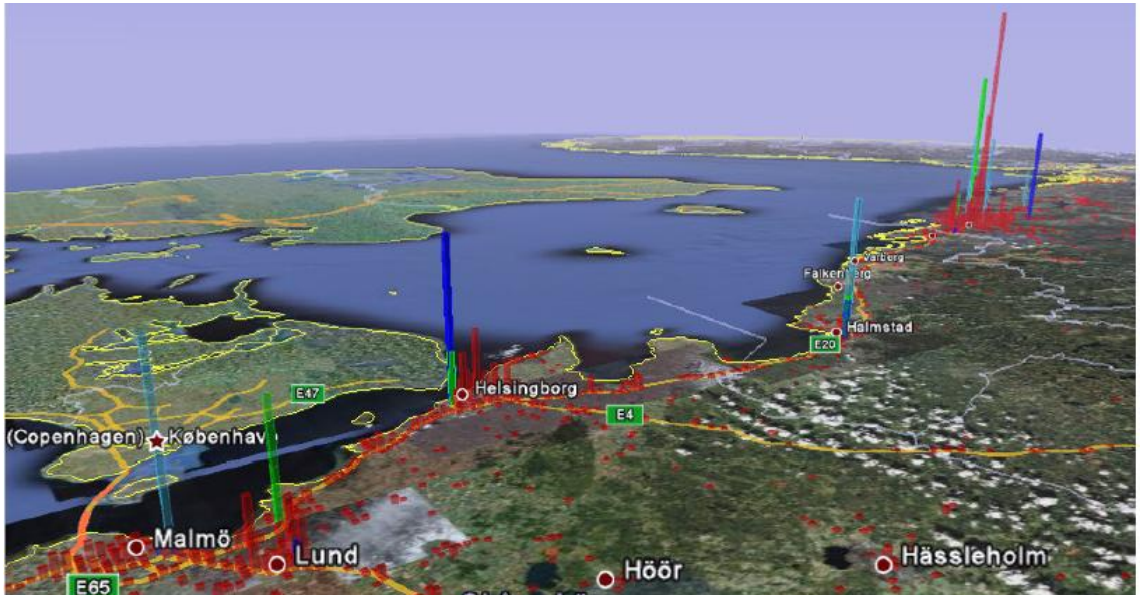
Method Chain in Relation to NDS & FOT



The *Naturalistic* FOT (N-FOT)

- “a study undertaken using unobtrusive observation in a natural setting, typically to evaluate the relationship between (permanent or temporary) driver-, vehicle-, or environment factors with crash risk, driving behavior, and countermeasure effectiveness.”
  - Inspired by Distraction in Commercial Vehicle Operations study (Olson et al, 2009) & SHRP2.
  - accomodates for both *accident research-oriented* and *evaluation and development-oriented* research on new technology.

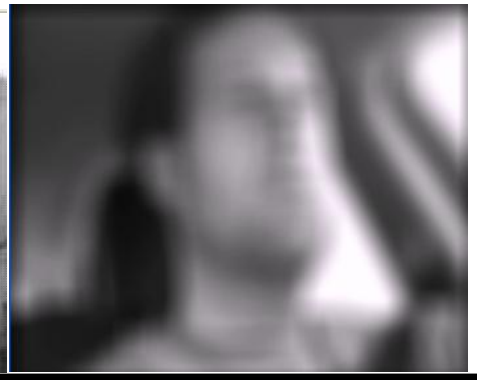
Some Project Highlights



Tech Achievements

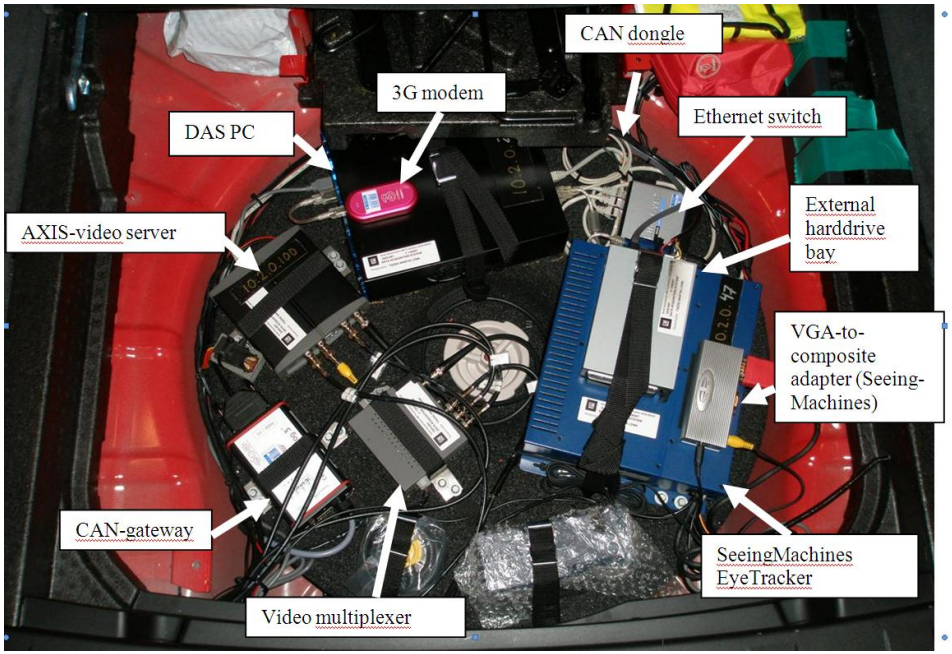
- ~3000h collected from 14(+2) vehicles
- 4 OEMs + 1 supplier vehicles instrumented
- Data uploaded in same database with access restrictions
- DAS with: 6 video, CAN, eye tracking, GPS, accelerometer, lane tracking, status upload/check etc
- Analysis tool with annotation and video/data sync
- A lot of experience and lessons learned!



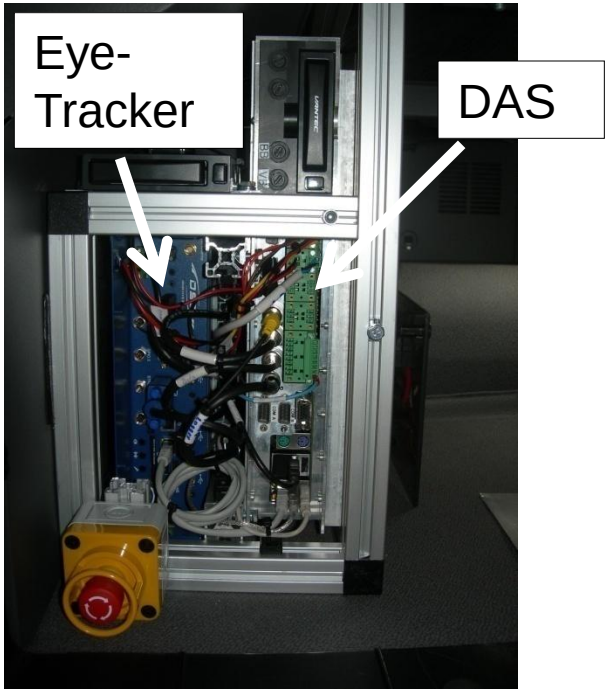


Hardware (SeMiFOT)

12(+2) with TSS-DAS (upgraded)



2 with new (SeMiFOT-DAS)



Bringing intelligent vehicles to the road

Swedish DAS in EuroFOT

- PC (Intel Atom CPU, 1.6 GHz)
- Video grabber card (MPEG4 hardware compression, PCI, internal to the PC)
- CAN-interfaces (USB, external to the PC)
- Eye tracker (Ethernet and CAN)
- BLIS interface (digital input to PC). Cars only.
- Accelerometer (CAN).
- GPRS/3G modem (PCI, internal to the PC).
- GPS receiver (internal to the PC).
- Combined GPRS/3G and GPS antenna.
- 16 GB Compact Flash memory for primary data storage.
- 500 GB HDD for secondary data storage.
- Extra relay to minimize power consumption in off mode. Cars only.
- Four cameras.
- Two IR illuminators (feet + driver).
- Cable harnesses.
- Mounting brackets.

Eye-trackers…

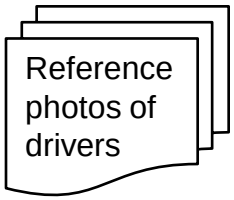
- SmartEye - 2xPro + 3xAntiSleep

- SeeingMachines - 8xDSSR

- SmartEye Embedded

Issues: EMC, video out, installation, power handling, data quality
Data: Now have >2000h of naturalistic Eye Tracker data

Data enrichment



Driver identification

Map data

DB

Questionnaires

External web
Questionnaire
handler

Remainder

Events

SeMiFOT1 Conclusions

- Joint database – open and proprietary signals
- Technology experience – Development of DAS, Databases, tools, etc
- Implementation experiences –
  - Data collection in real-world vehicles driven for work purposes,
  - Included many safety systems,
- Analysis methods
  - Crash-Relevant Events analysis method for accident causation research.
  - Events-Prevented simulation method
  - Visual behavior analysis method using eyetracker data
  - Automatic Speed Camera analysis by using map data attributes
  - Challenges to in the data reduction and measure calculation process,
  - Events-prevented development
- Integration in company product development processes.

SeMiFOT2 Analysis Development

1. Development of quantative definitions of crash-relevant-event severity
2. Exploration of new statistical and analytical approaches for the analysis of Crash-Relevant Events
3. Extraction of Crash-Relevant Events
4. Analysis of the impact of visual behavior
5. Events-prevented simulation techniques

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