

Fusion of xFCD and local road weather data for a reliable determination of the road surface condition

SIRWEC Prague 2008

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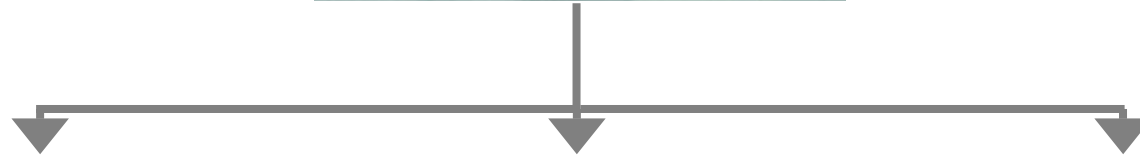
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(BAST)

Negative effects of critical road weather



Critical Road Weather / surface condition



Physics of traffic

- reduced traction between tyre and road surface
- extended stopping distance
- reduction of bearable radial forces
- water films cause spray that may limit driver's visibility

Traffic safety

2004 > 12 % of all fatal accidents in the EU can be traced back to critical road surface conditions.
SAFETY NET 2006

Traffic flow

- reduced speeds
 - reduced capacity
- MANGOLD 1996

How it's done today



Critical Road Weather /
surface condition



Detection by
stationary sensors

Control algorithms

Control algorithms



Section Control

Variable
Message Signs:
Warnings,
Speed limits

Protection from
snow, snow
removal, methods
against slickness in
winter



Winter Maintenance

Motivation

- Meteorological events are highly instationary and inhomogeneous
- So far: measurements are taken locally (~ 2-5 km)
 - The picture is not precise enough (spatially)
 - No information in case of break down of one station
- Exact information about actual road weather should be available
- Optimization of winter maintenance
- Acceptance of variable message signs depends on plausibility

► several research projects are in progress

Project “Reliable determination of the road surface condition”

Basic idea

Aggregate locally detected road weather data and extended Floating Car Data (xFCD) towards more reliable and more accurate information about road condition on the stretch

Funded by

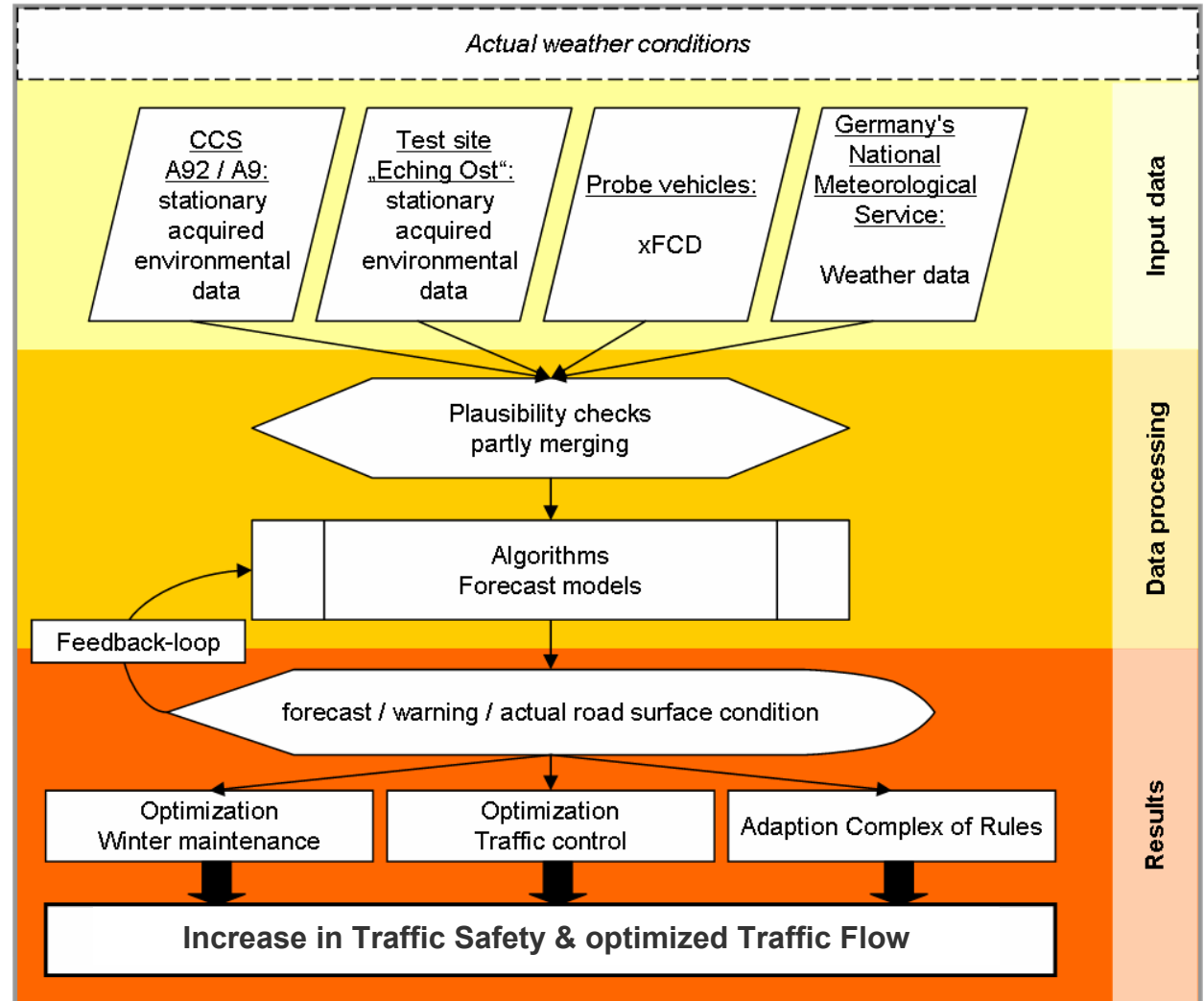
Federal Highway Research Institute
German Federal Ministry for Transport (BMVBS)

Duration

October 2007 - June 2009

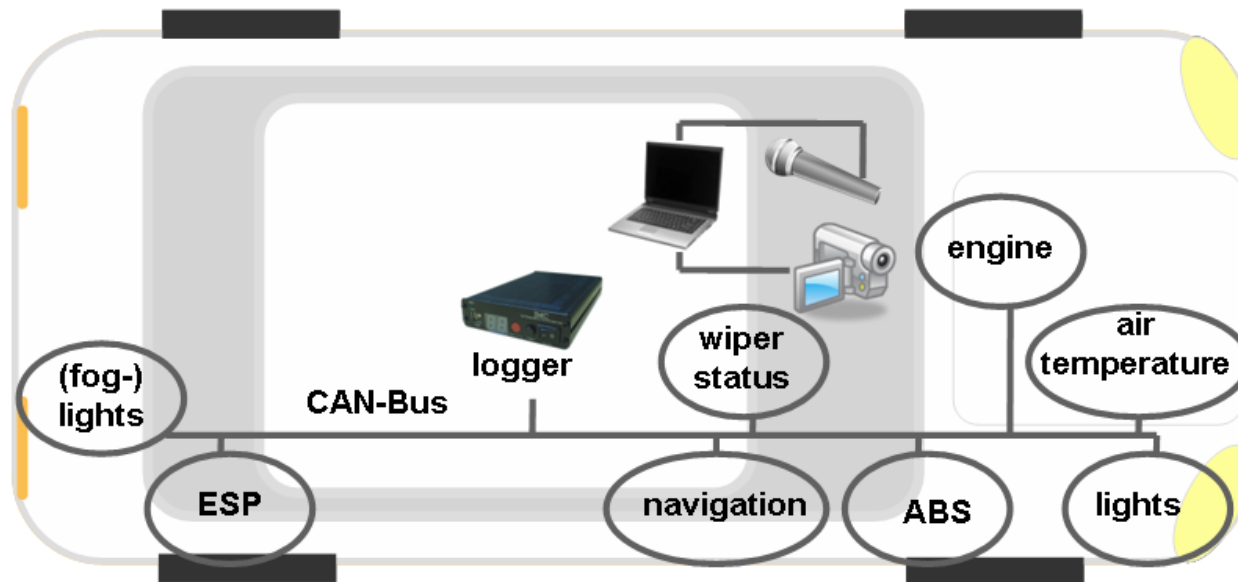
► no results available yet!

Project overview



Probe vehicles

- A passenger car (Audi A4) and a van (VW Multivan) are used to collect data in the Greater Munich area
- No additional sensors (“series-production vehicles”)
- Methods can easily be exploited

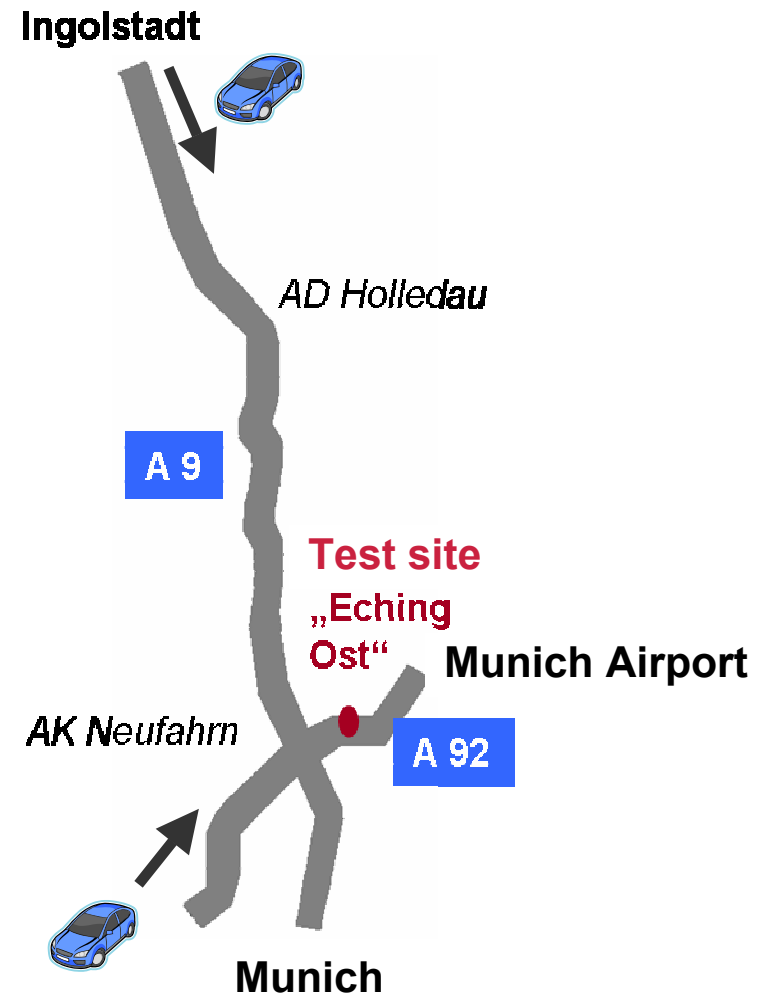
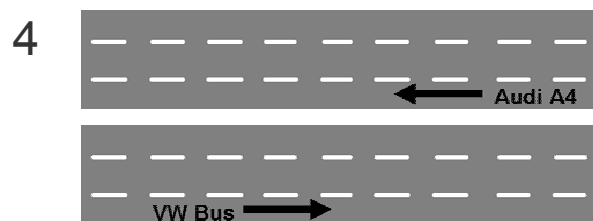
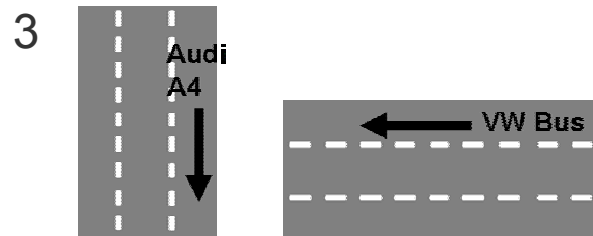


Documentation

- Every trip is recorded by video camera
- Driver's subjective impression of road surface is recorded by microphone



Driving scenarios



Test site “Eching Ost”



www.vt.bv.tum.de/umfelddaten

Test site “Eching Ost”

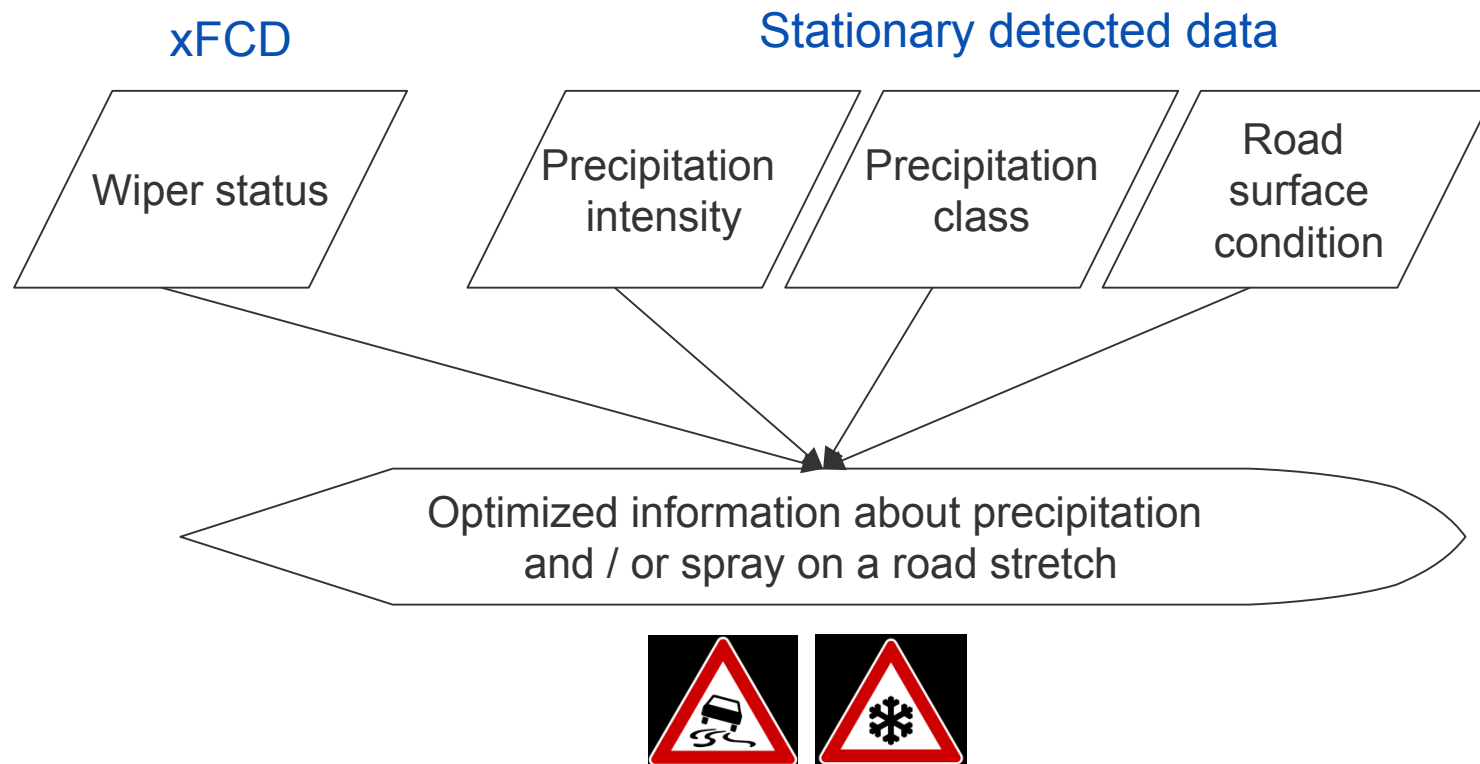
Good knowledge about “real” environmental conditions (“Reference”):

- a lot of sensor systems
- test site is regularly attended
- 4 webcams

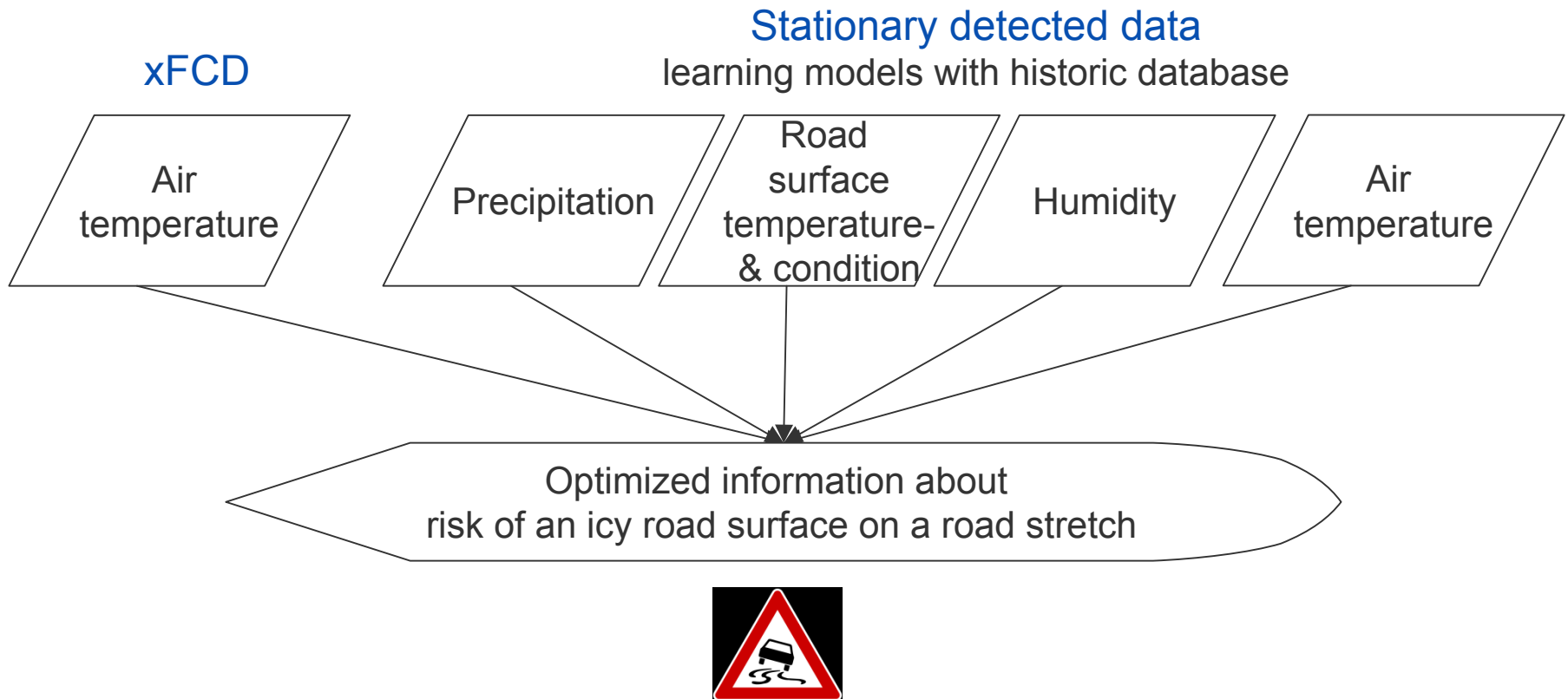


www.vt.bv.tum.de/umfelddaten

xFCD vehicle data: Wiper status



xFCD vehicle data: Air temperature



xFCD vehicle data

Safety Systems

Information about e.g. **Antilock Breaking System (ABS)** and **Electronic Stabilization Program (ESP)** is used as input for information about road surface condition on the road stretch.

These systems operate just in case of emergency, so an improved result will be derived by considering the wheel rotation.



Prominent features

- consolidation of traffic control and winter maintenance
- feedback-loop for optimization of algorithms
- application of experiences in other xFCD-projects
- great historical data base of environmental data
- for validation: well equipped test site for road weather data
- no additional (vehicle-)sensors in use
- focus on quality / plausibility checks

Expected benefits ...

- better knowledge about stretchwise road surface condition useable for **traffic control**
 - faster and more reliable warning of drivers
 - and **winter maintenance**
 - more efficient and timely disposition of winter maintenance service vehicles
 - additional possible applications:
 - information services
 - positioning of new sensors
 - ...
- ▶ increase in traffic safety and optimized traffic flow
- ▶ results will get published

Questions, comments ...?



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