TRIMM is supported by funding from the 7th Framework Programme Call: SST.2011.5.2-2. Theme: Advanced and cost effective road infrastructure construction, management and maintenance

TRIMM

WP4 road monitoring:

- Monitoring road inventory and real time
- Monitoring of road functionality

TOMORROW'S ROAD INFRASTRUCTURE MONITORING & MANAGEMENT

Overview

- Background
  - General
  - TRIMM specific
- Results
- Conclusions

TRIMM overall approach

- Develop, test and validate selected advanced monitoring technologies (WP3 and 4)
- Show how the advanced monitoring methods can be implemented through indicators (WP2)
- Develop complimentary, accurate and relevant condition parameters and indicators to enable utilisation of advanced monitoring data
- Show how added value of monitoring can be assessed (WP2)

WP4 – Road monitoring

- **Monitoring road functionality in real time with data collected from vehicles.**
- **Monitoring of Road Inventory**
- Identification of Potential Water Ponding
- Monitoring of structural condition
  - TSD – Traffic Speed Deflectometer
  - GPR – Ground Penetrating Radar
- Monitoring of surface condition
  - Ravelling
  - Cracking

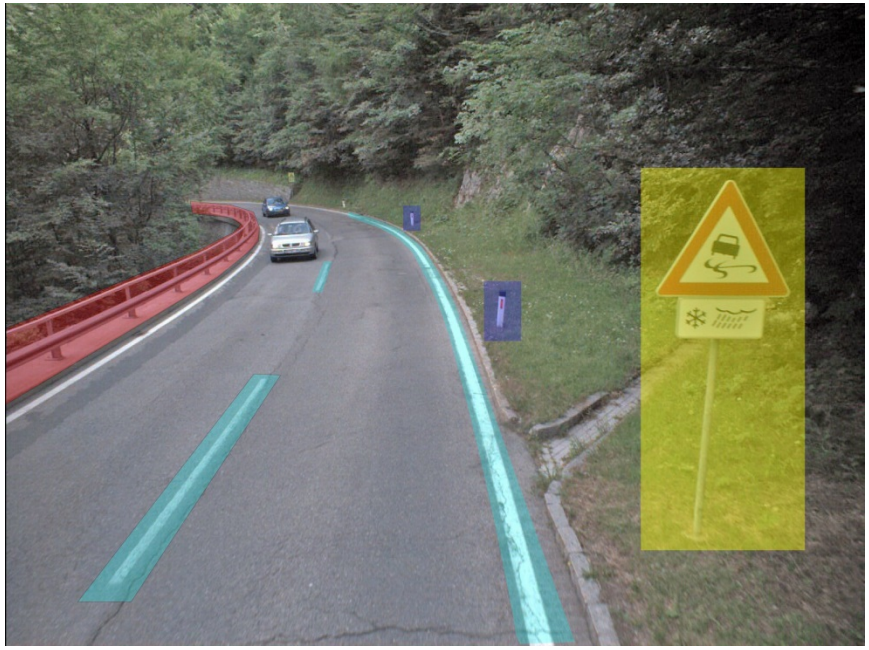
Monitoring road inventory

- Method

Conduct round robin test to identify suitabale methods for road inventory monitoring; develop guidelines for road operator on how to implement road inventory monitoring.

- Advantages

High speed/in traffic surveys lower risk during data collection and ensure a uniform level of quality/accuracy.



More information:
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Road inventories

- Road furniture or equipment (assets):

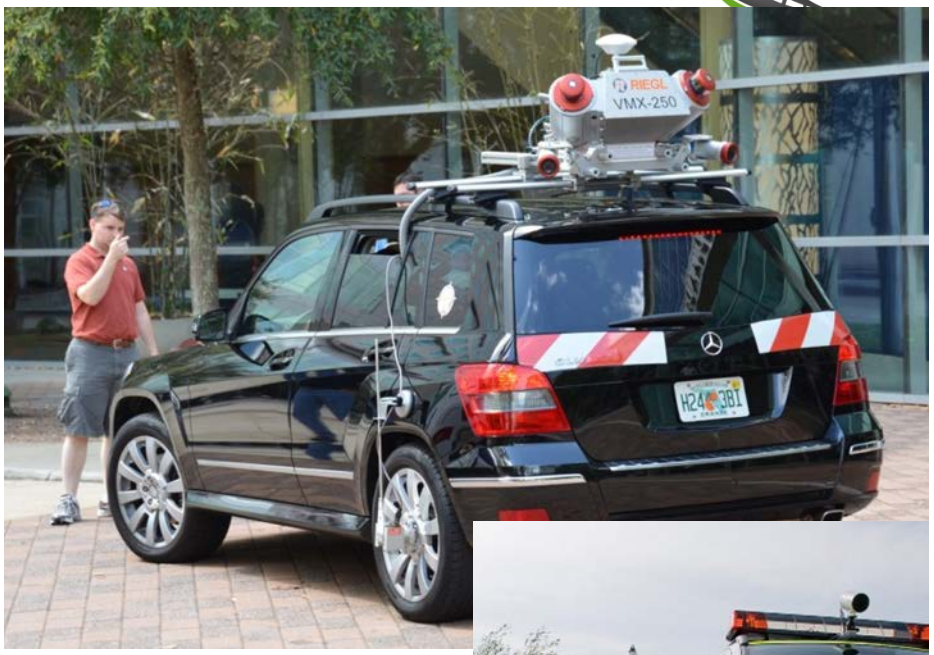
  Additional facilities of streets and roads, which do not belong to the layered structure of the roadway

Monitoring road inventories

- Requirements:
  - Location
  - Condition
  - Completeness
  - Up to date

Measuring equipment

TRIMM



Inventories, examples

- Road markings
- Traffic signs
- Street lightning
- Drainage systems
- other

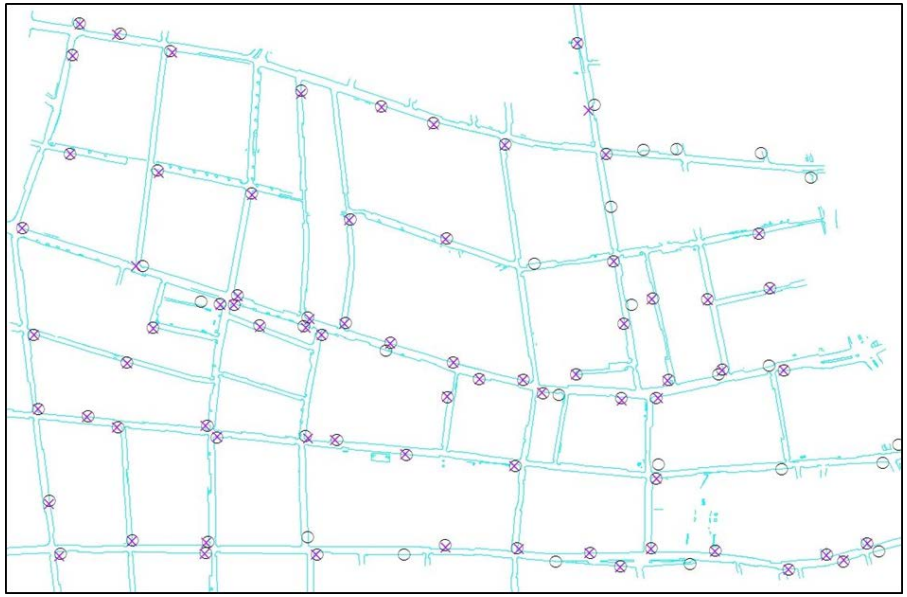
Situation in Sweden

type of road equipment	positioning	visual inspection	simple measurement	hand-held light measurement	mobile light measurement
Road signs	no[2]	yes	no	yes	no[4]
Road markings	no	yes	no	yes	yes
Road studs	no	yes	no	no	no
LED emitters	no	yes	no	no	no
Delineator posts	no	yes	yes	yes	no
Road lighting	yes[1]	yes	no	no	no[4]
Traffic lights	yes[1]	no[3]	no	no	no
Guard rails	yes[2]	yes	yes	no	no
Barriers	yes[2]	yes	yes	no	no
Deer fences	no	yes	no	no	no
Noise protectors	No	yes	no	no	no
Glare protectors	No	yes	no	no	no

Tests by TRIMM project

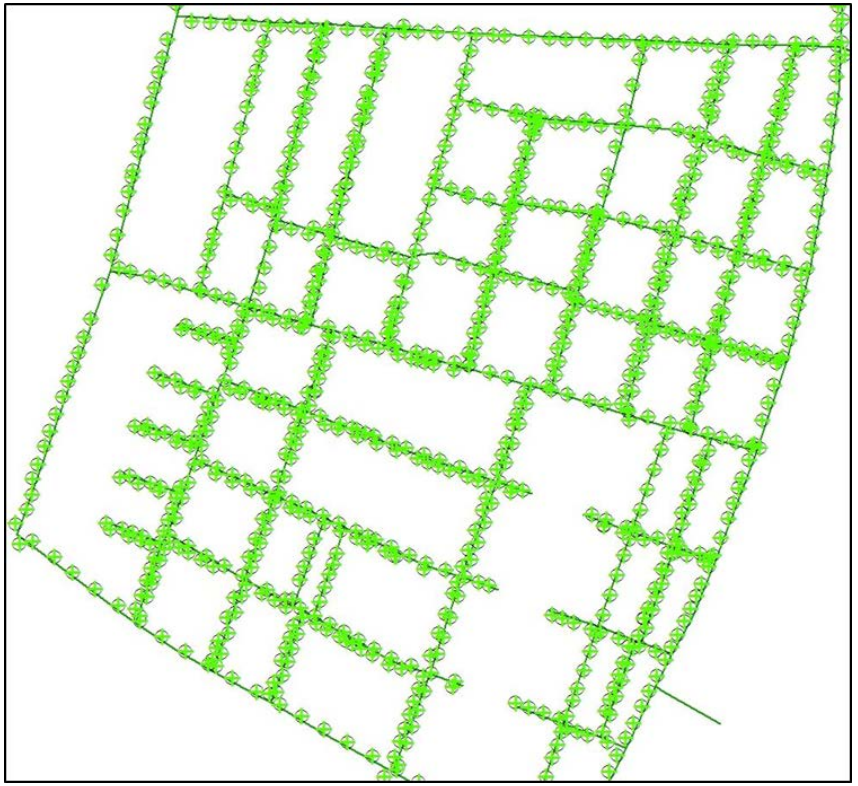
The company Yottas survey vehicle used in the TRIMM tests

Position of masts and poles, and hydrants



Hydrants, black circles reference and purple cross supplier

Mast and poles, black circles
reference and green crosses supplier



TRIMM reporting

More can be found in deliverable D4.2

Monitoring of Road Inventory

Monitoring Structural Condition

- Method
  - TSD surveys both with and without its 10t ballast.
  - Integration with coreless GPR and downward facing cameras.
- Advantages

Routine surveys and better prediction models to greater empower pavement managament authorities.

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Monitoring functionality; provide a good service to the road users

- Road administrators rely on data collected, typically annually, by dedicated “high-tech” measurement devices
- The TRIMM idea is to investigate new measurement techniques that have the potential to provide this data more frequently and with a reasonable cost.

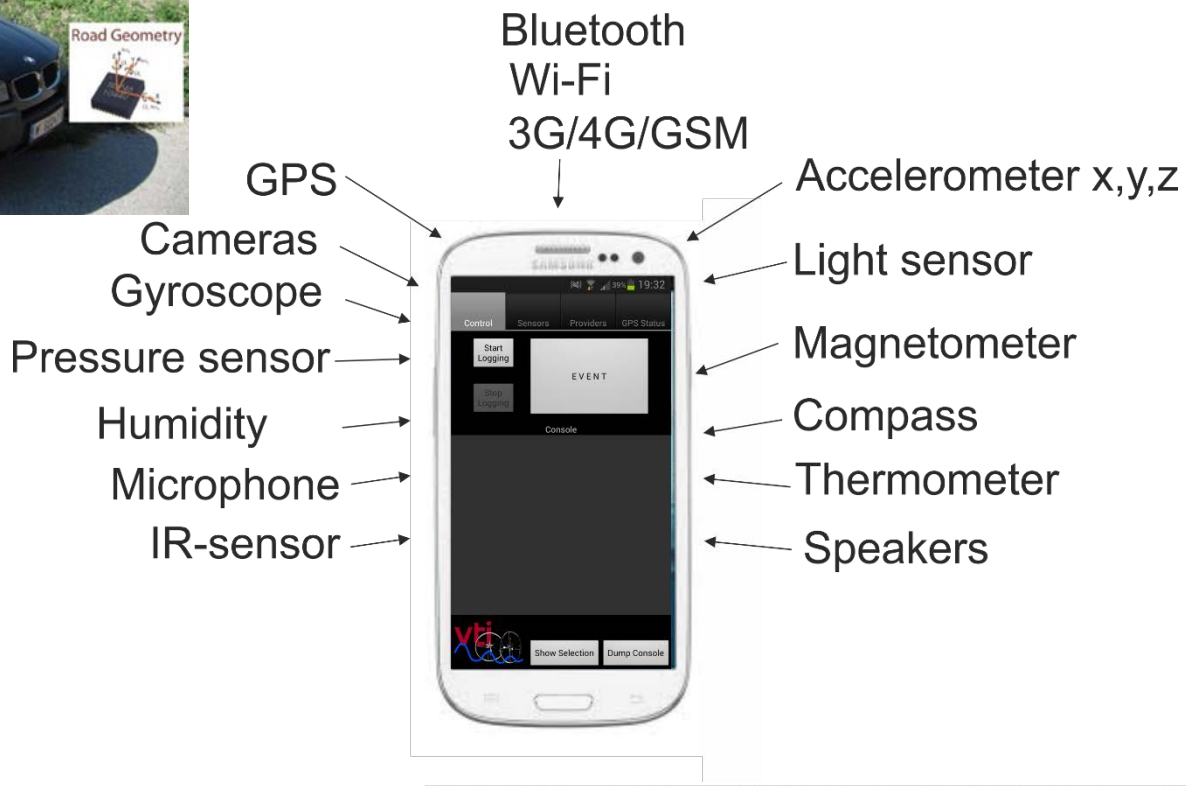
Ride quality (RQ)

- Ride quality is generally defined by the perception of a road user's driving experience, which is influenced by numerous factors such as pavement unevenness (e.g. vibration, shock), road alignment, and noise in the car, lack of friction and light conditions.

State of the art

- The technical development leading to making
- Sensor in personal cars, smartphones
- INTRO (smart cars)
- Mobi-Roma (smart cars)
- BiFi (smart truck)
- SENSOVO (smart cars and smartphones)
- Road Roid (smartphone)
- Numerous smartphone applications

Smart cars and phones



Tests in TRIMM

- Tests has been done in Belgium, Sweden and Austria
  - In Austria a smart car has been tested
  - In Belgium a smartphone application has been tested
- A questionnaire and test panel has been used
- The sections has been referenced measured

Tests in TRIMM

- The main focus has been on investigation of ride quality (RQ) measurements.
- The new equipment has been compared with traditional evenness measuring equipment and with road users opinions (questionnaire).
- Indicators:

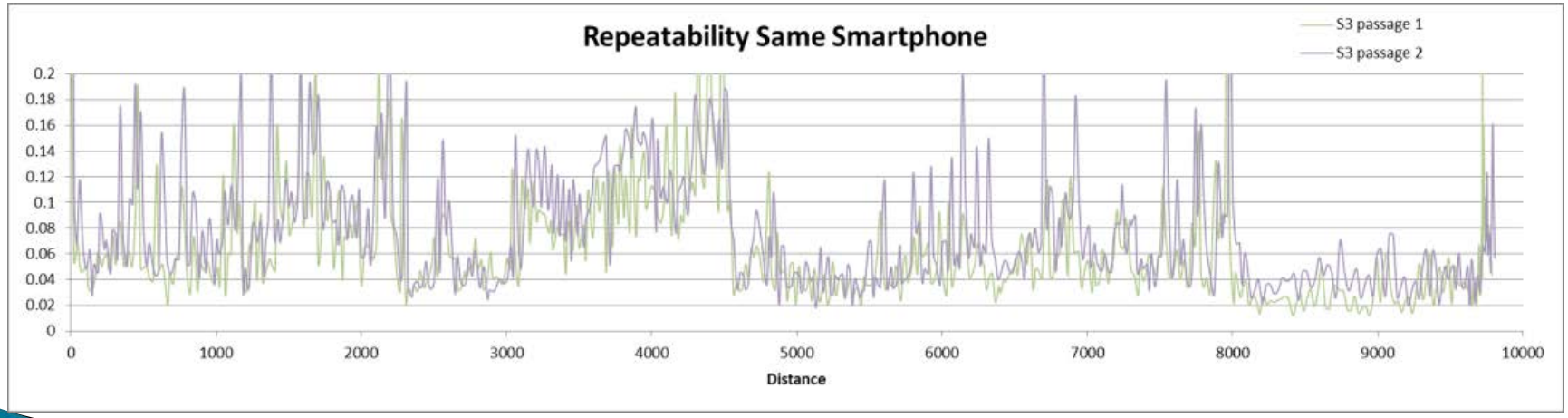
  IRI, International Roughness Index

  Wave band indicators (as in France and UK)

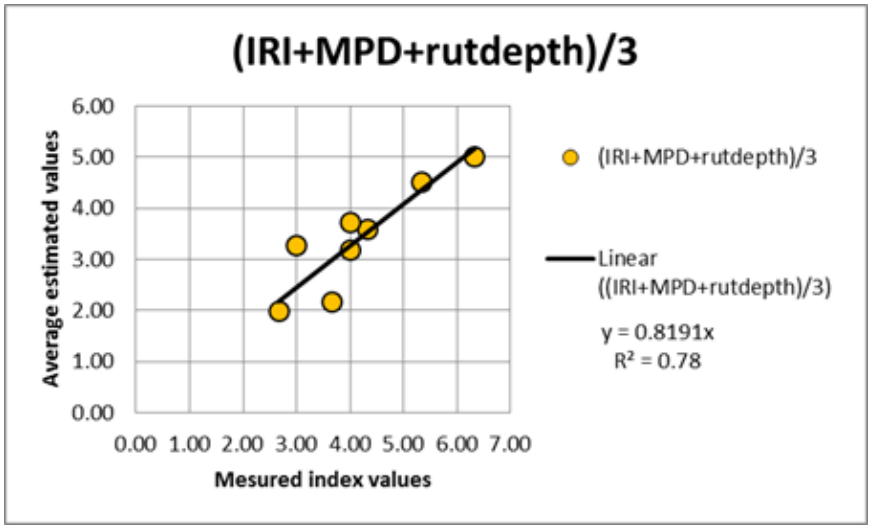
  WLP, Weighted Longitudinal Profile (as in Austria and Germany)

Some results

The app used is developed by VTI.
It collects data from all sensors and take pictures, all connected to a position by the GPS information.
After the measurements a rms is calculated



Estimated RQ compared to measured



When comparing the answers to the questionnaires to the scores obtained by the “VTI app” we tend to observe some relationship between them. The insight gained from the additional Swedish questions leads us to believe that the smartphone app is prone to capture an evaluation of “road comfort” as experienced by road users (passengers) but including the macro-texture of the road surface.

Monitoring functionality

TRIMM

- Method

Using already existing sensors in private cars, smartphones and other probes to collect data on functionality.

- Advantages

Large scale data collection (crowd sourcing) on a daily basis over the whole road network enriches the view of the road manager with information about the practical functionality of the roads.

- Challenges

The transformation of such raw data into an indicator with a real significance on road functionality for the road manager is not trivial.

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Thank you
For your attention