
Città di Bolzano
Stadt Bozen
TiS
innovation park
AIT
AUSTRIAN INSTITUTE OF TECHNOLOGY
TOMORROW TODAY
Life
inTegreen
Jenesien
Integration of Traffic and Environmental data for improving green policies in the city of Bolzano
Bozen - Bolzano

Mobile Traffic and Air Pollution Monitoring

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and

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Mobile Traffic and Air Pollution Monitoring

bmvit

Austrian Industry

AIT Austrian Institute of Technology

Seibersdorf Labor GmbH

Nuclear Engineering Seibersdorf GmbH

- Energy
- Mobility
- Safety & Security
- Health & Environment
- Foresight & Policy Development

- BMVIT 50.46%
- Industry 49.54%

Mobile Traffic and Air Pollution Monitoring

The mobile sub-system of INTEGREEN

Mobile Traffic and Air Pollution Monitoring

Use case 1: Traffic state estimation in the city of Bolzano

- Traffic state / information
  - Static / dynamic / real-time
  - Decision support for the operator of the traffic management centre
  - Redistribution of traffic information to the drivers
- Reduction of infrastructure expenses
  - Enhancing traffic stationary sensors
  - Probes measure at the ‘major’ roads
- Several probe vehicles
  - INTEGREEN project probes, municipality of Bolzano, …
  - Existing fleets (taxi, busses, …)
  - Network coverage

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Use case 2: Air quality state estimation in the city of Bolzano

- Information support of the TMC
  - Provide combined traffic AND air quality information
  - Reduction of traffic based emissions
  - By means of traffic related actions
- Air quality measurement
  - Enhancing stationary sensors
  - Area-wide coverage beyond the fixed stations
- Mobile collection of pollution and meteorological data
  - Equip probe vehicles with dedicated sensors
  - Evaluation of existing sensors
  - Implementation of a sensing system

Mobile Traffic and Air Pollution Monitoring

Use Case 3: Estimation of emissions caused by motorized individual transport in the city of Bolzano

- Monitoring of traffic based emissions
  - Acquisition of the current state
  - Determination of trends
  - Spatial distribution
  - Evaluation of (traffic) measures
- Measurement of emissions of all vehicles is practically impossible

  <- equipped with a measurement unit
- Mobile collection of pollution and meteorological data
  - Equip probe vehicles with dedicated sensors
  - Evaluation of existing sensors
  - Implementation of a sensing system

Mobile Traffic and Air Pollution Monitoring

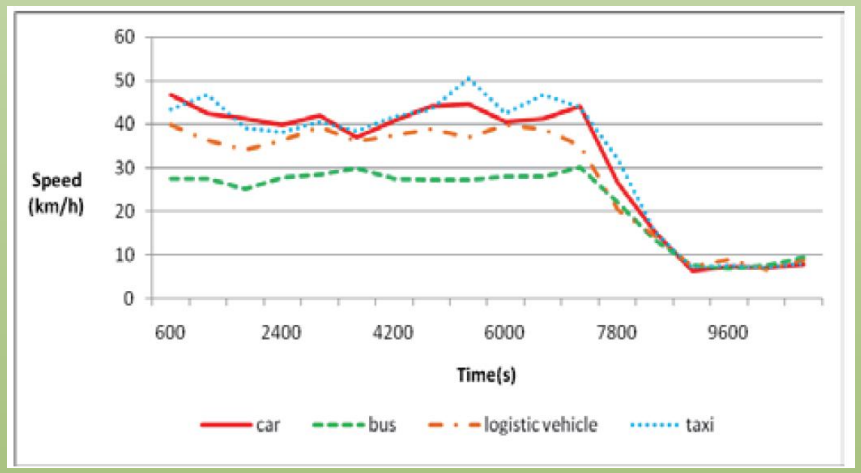
Interpretation of mobile sensing data:
Single mobile probe measurement → useful information

Traffic

- Traffic state
  e.g. free flow, slow-moving, stop & go, congested
- Traffic information
  e.g. travel time, routing, …
- Incident detection
  e.g. accident, congestion, event, construction site, …

Air quality

- Later on

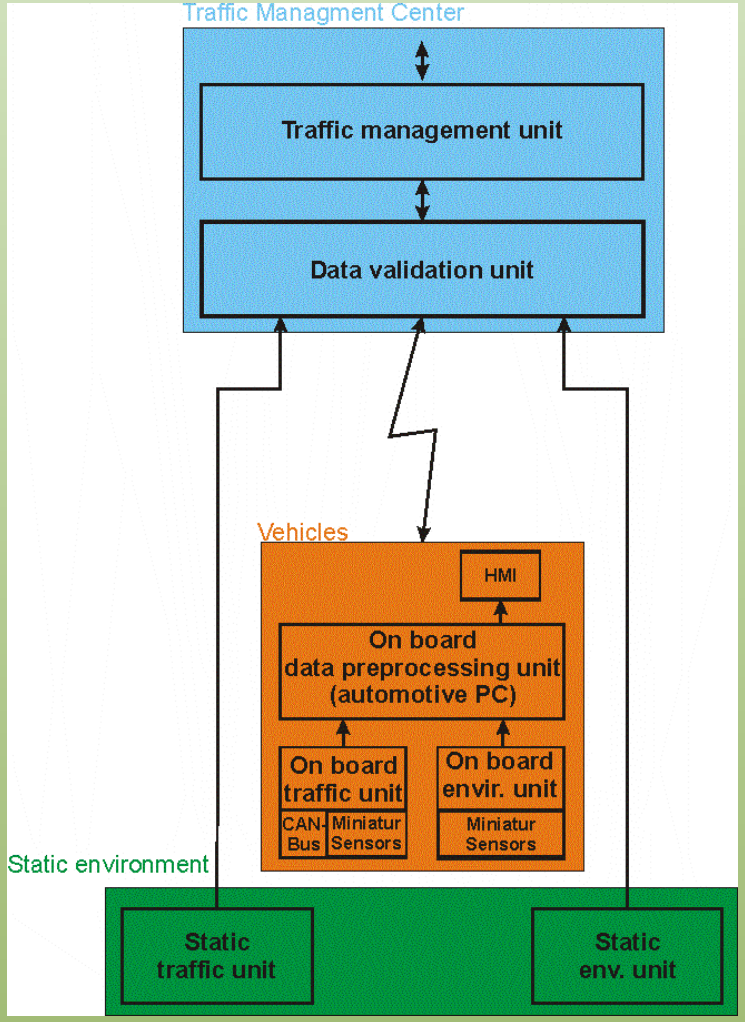


Pan, Shuliang; et. al. 2011

Mobile Traffic and Air Pollution Monitoring

Mobile System

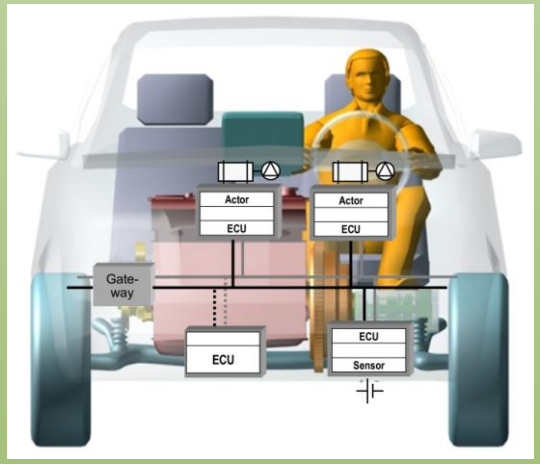
Architecture (1/2)



Mobile Traffic and Air Pollution Monitoring

Mobile System

Architecture (2/2)



- Main Characteristics:
  - On-Board Unit
    - On-Board Traffic Unit
    - On-Board Environment Unit
    - On-Board Data Processing Unit
    - On-Boad HMI
  - Plug&Play
  - Expandable & Flexible
  - Data Processing Unit with standard and future Wireless Communication System
  - Meets Automotive Requirements

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Traffic Unit:

- Planned functionalities:
  - CAN-Bus access (where possible)
  - GPS sensor
  - Position and heading sensor
  - USB-Connection
  - Generation of timestamps

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Environment Unit:

- Planned functionalities:
  - Pollution candidates:
    - NO_2
    - CO
    - PM10 (opt.)
  - Air inlet possibly distant from road surface
  - Air flow controll

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Communication Unit:

- Candidate Technologies:

- GSM/GPRS (2G)
  - Good and global infrastructure
  - Bidirectional communication
  - With GPRS 40kkbit/s upload rate

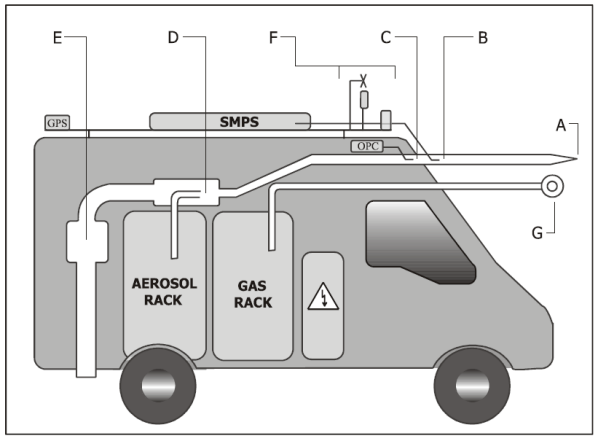
- UMTS (3G)
  - „Upgrade“ of GSM for higher data rates
  - Different air-interface
  - Good and global infrastruture
  - Data rates of up to 384kbit/s
  - Upgrade options with higher data rates possible

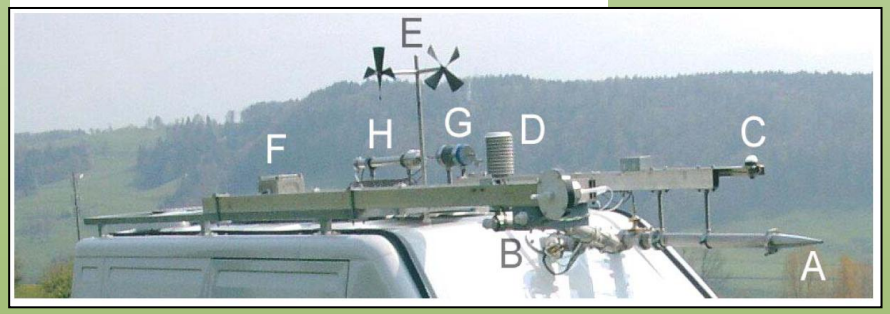
- CALM (Communications access for land mobiles)
  - Common architecture, network protocol and air interfaces
  - IR… infrared air interface
  - MM…milimeter wave air interface
  - 802.11p… dedicated C2C, C2I air interface
  - Infrastructure to be built in the future

Mobile Traffic and Air Pollution Monitoring

Challenges in Integreen:

- Large Mobile Solutions versus Plug&Play

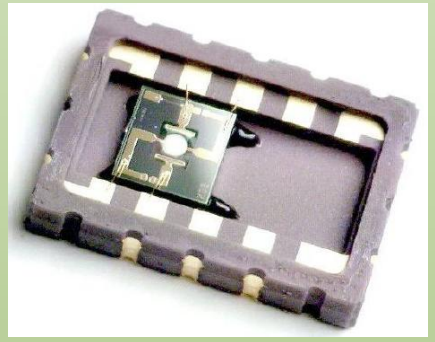


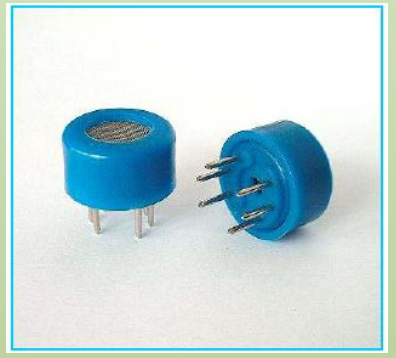


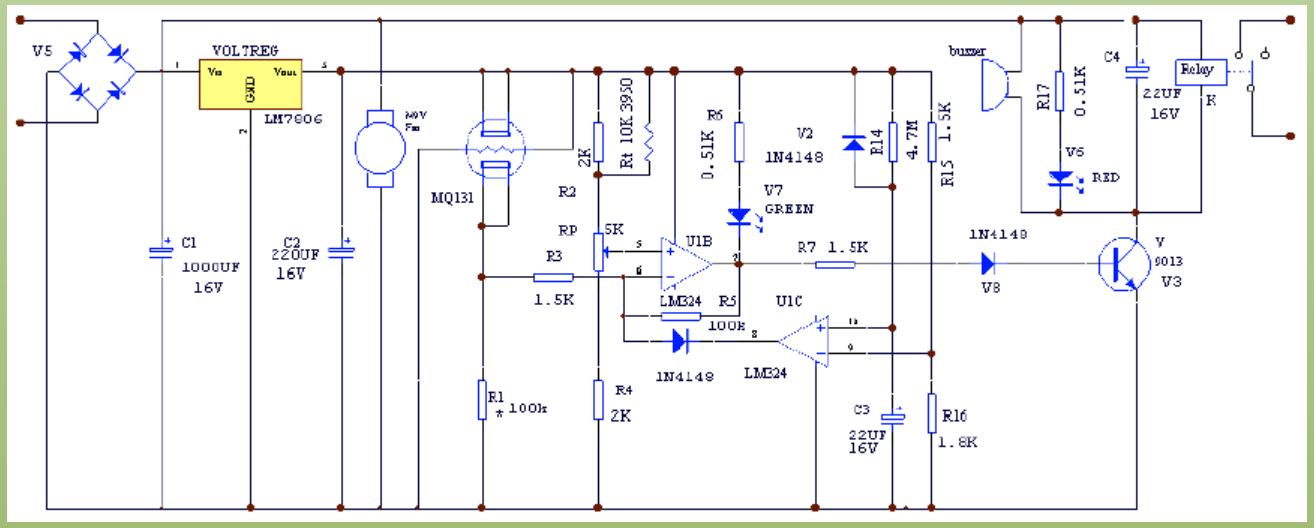
Mobile Traffic and Air Pollution Monitoring

Challenges in Integreen:

- Large Mobile Solutions versus Plug&Play
  - Solid State Sensors examples
  - Ad-hoc design required
  - Automotive environment use
  - Suitable for PT or fleet vehicles







Mobile Traffic and Air Pollution Monitoring

AIT Demo Vehicle for Integreen:

- Dedicated to project
- Customisable for INTEGREEN
- CAN-bus access
- Measurement campaign

Wireless Pedestrian Detection Test (AIT Vienna)

Side-Impact AIT stereo sensor (Fiat Torino)

Collision Avoidance Demo (Test Track Fiat Torino)