

A decision support system for reducing CO₂ and black carbon Emissions by adaptive traffic management

Introduction

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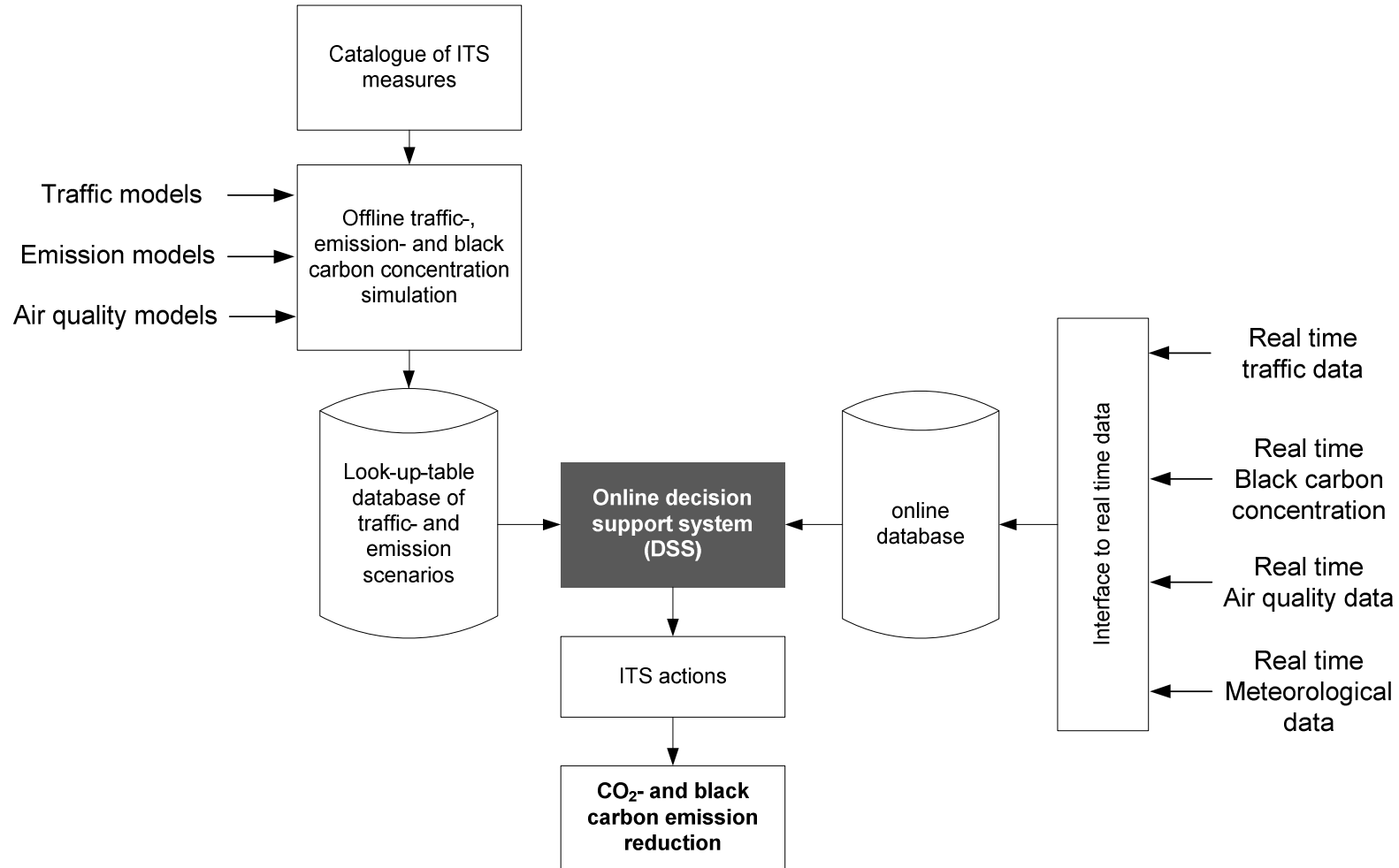


Overview

- Project CARBOTRAF idea and innovation
- Decision support system
- Smart eye TDS traffic data sensor
- Acceleration detection concept from vehicle trajectory analysis

Project Idea and Innovation

- Idea
 - CO₂ and back carbon (BC) reduction by smart traffic management
 - Pilot operation in Graz and Glasgow
- Innovation
 - Linking of CO₂ - aspects and ITS measures (focus not on reduction of congestion but rather “CO₂-reduced“ traffic)
 - BC is the second most important greenhouse factor and is also dealt with in the project
 - ITS aspect: Not only traffic development prediction but also decision support for ITS counter measures
- Goals
 - Development of methods and tools to reduce emission of CO₂ und BC by e.g. re-routing traffic
 - **Traffic data sensor with acceleration detection capability**
 - Evaluation of the concept in two pilot installations/test operations



Decision Support System (DSS)

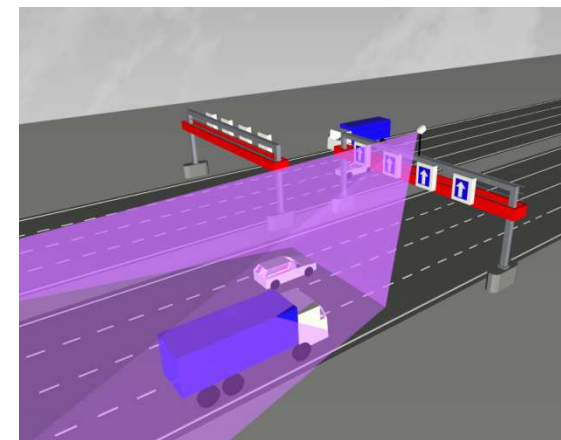
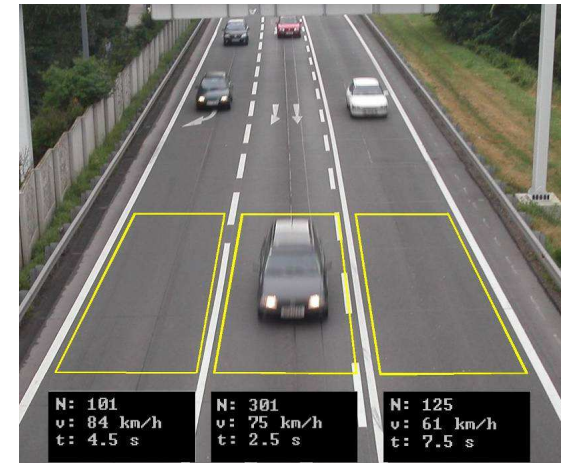
- step 1: real time monitoring of traffic situation
Traffic monitors (existing devices and additionally installed by the project) **measure speed, volume and composition of vehicles and detect emission relevant traffic states (e.g. stop/start situation). Air quality is also monitored.**
- step 2: prediction of traffic situation 30-60 mins. into the future
- step 3: computing **CO₂ & BC emissions (current and prediction) from real time traffic data enriched by acceleration information**
- step 4: an improved traffic scenario is selected that is able to satisfy the traffic demand at reduced total CO₂ & BC emissions (and improves further defined key performance indicators)
- step 5: ITS action options are displayed to the traffic centre operator who finally decides on their implementation („human in the loop“)

„Emission Relevant“ traffic monitoring

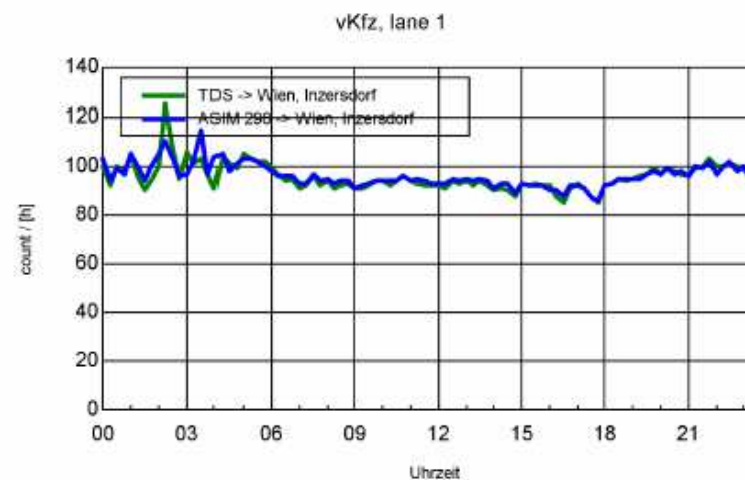
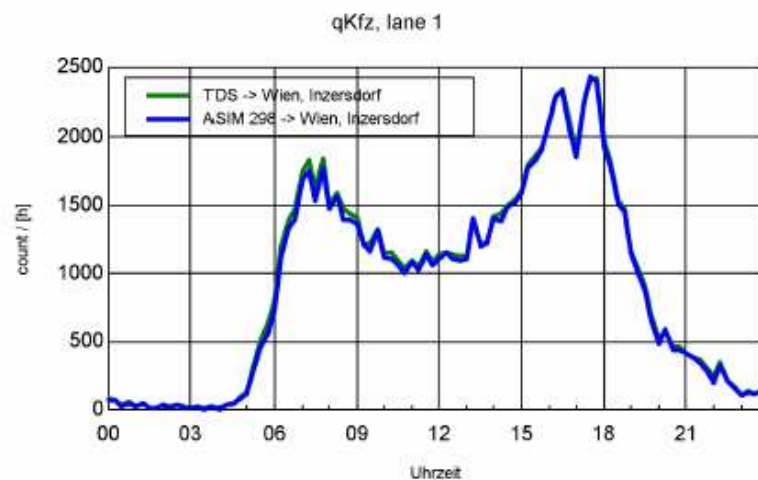
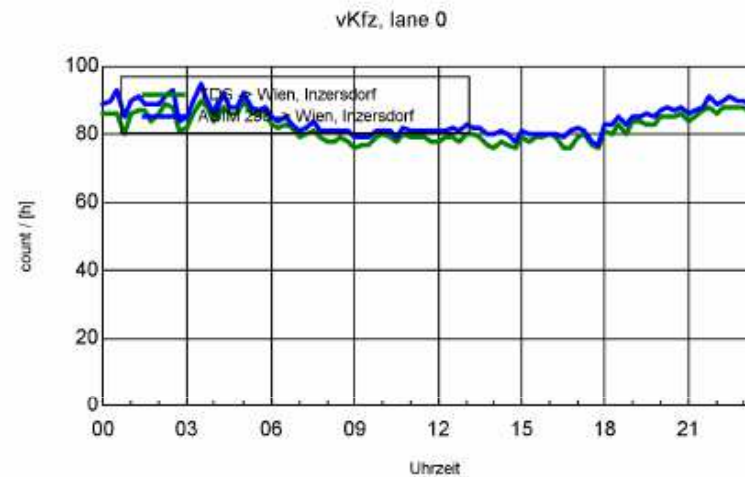
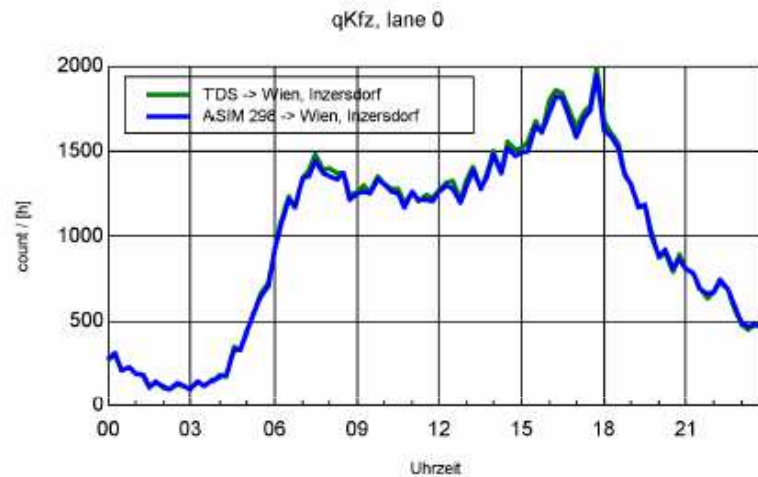
- Based on smart eye TDS technology
- „High speed“ optical sensor DVS – Dynamic Vision Sensor Technology
 - 128 x 128 Pixel
 - 1 Millisecond temporal resolution, asynchronous - no image frames
 - Precise tracking of vehicle trajectory on up to four lanes
- “Conventional” vehicle detection
 - Lane
 - Speed
 - Time Gap
 - Class
- CARBOTRAF extension for “emission relevant” monitoring
 - Analysis of trajectory detects acceleration/deceleration
 - optimally supports models and current estimate of emissions

smart eye - TDS Traffic Data Sensor – Specifications

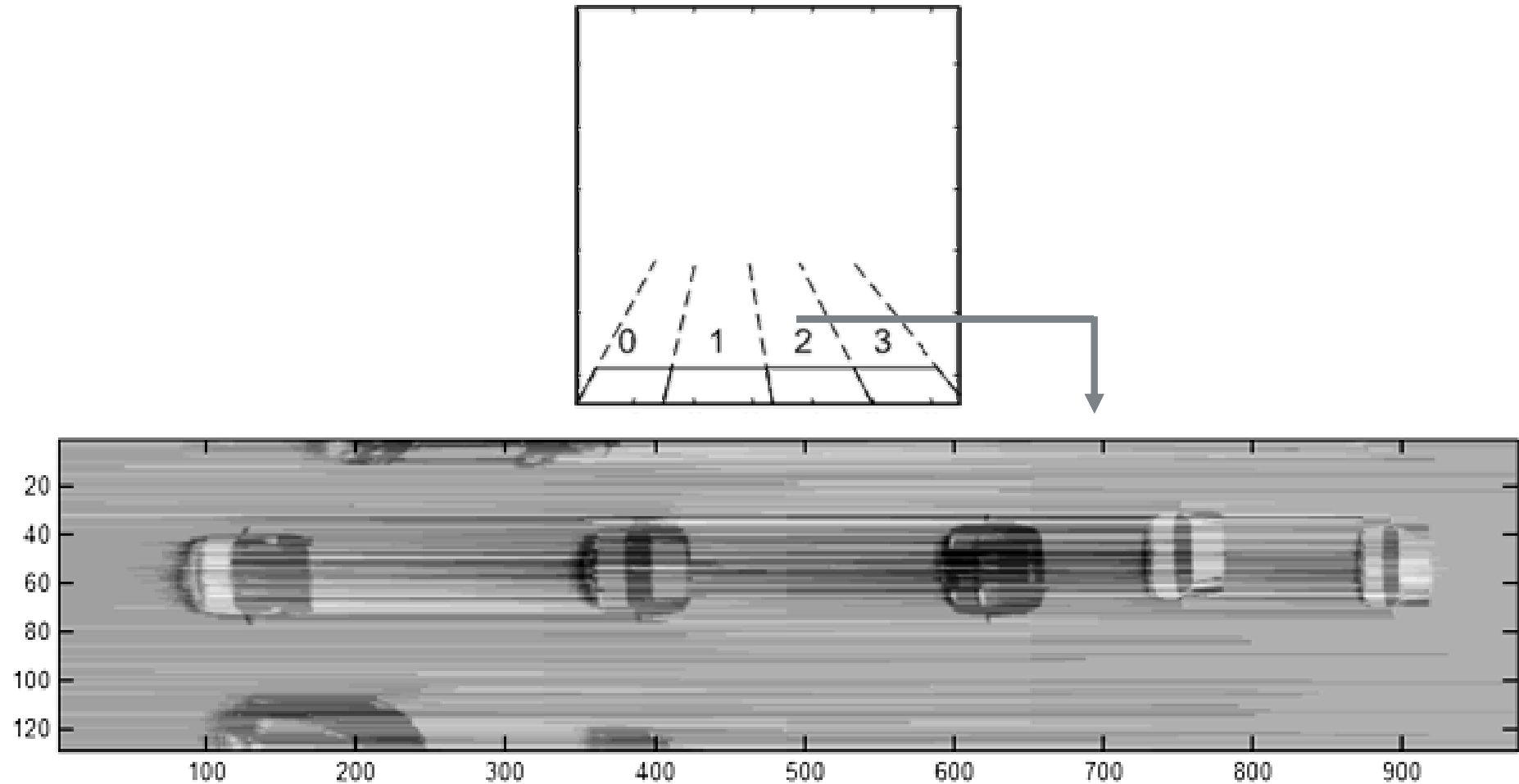
- ▶ monitors up to 4 lanes simultaneously
- ▶ individual vehicle detection
 - speed measurement (20-300 km/h)
 - time gap (milliseconds resolution)
 - 2 vehicle classes (cars, trucks)
- ▶ traffic statistics (each lane)
 - traffic volume per class
 - average speed per class
 - lane occupation
- ▶ mounting position overhead and at road-side
- ▶ mobile, temporary deployment possible



Dienstag, 15. September 2009: ASIM 298 -> Wien, Inzersdorf/TDS -> Wien, Inzersdorf

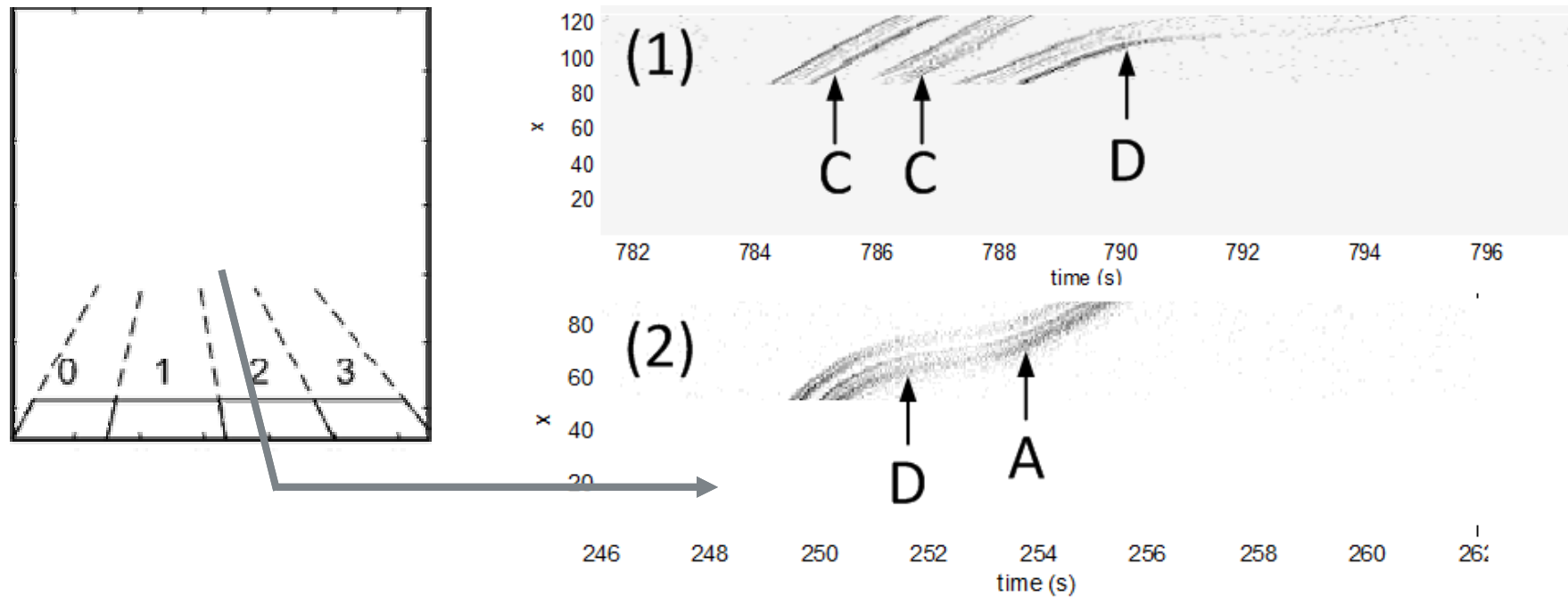


Smart eye TDS raw sensor data, image reconstruction



- Time axis with 1 ms resolution

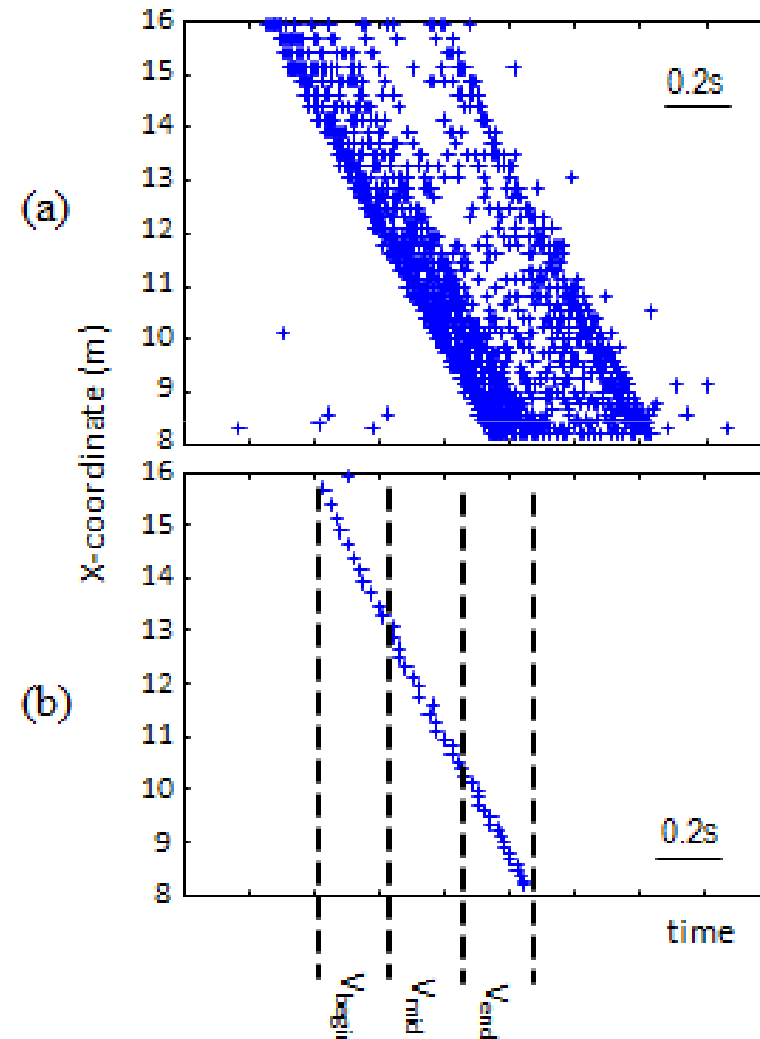
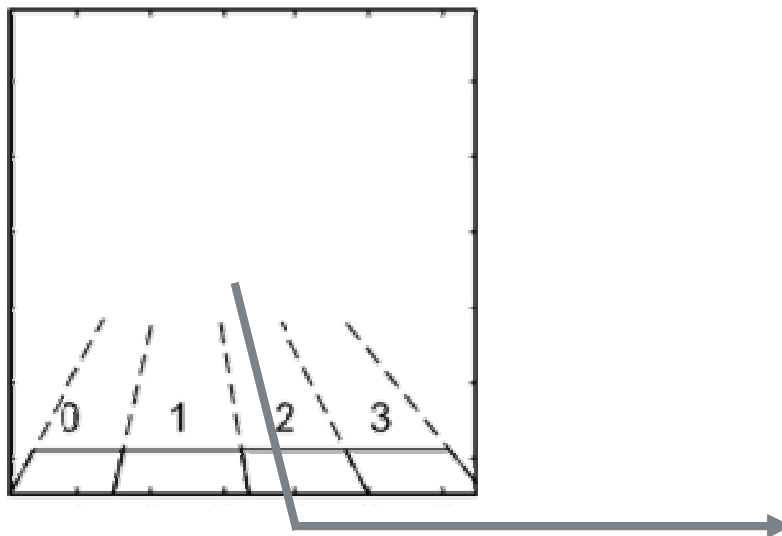
Smart eye TDS raw sensor data, vehicle trajectories



- Time axis with 1 ms resolution

Acceleration Detection from vehicle trajectory $x(t)$

- Time axis with 1 ms resolution



Project Facts

- EC collaborative research project in the 7th framework program:
 - submitted January 2011
 - project started Sept. 1st 2011
 - planned project end Aug. 31st 2014
- Project Coordination: AIT Austrian Institute of Technology GmbH
- Project Partners: 8 organizations from 4 different countries (Austria, Belgium, UK, Ireland)
- Budget: € 4,4 Mio. (€ 3,0 Mill. EC funding)
- Pilot cities: Graz & Glasgow

www.carbotraf.eu

Project partners and their roles in the project

- **AIT Austrian Institute of Technology GmbH**
coordination, air quality monitoring Graz, traffic monitoring technology provider
- **Österr. Forschungs- und Prüfzentrum Arsenal GmbH, Austria**
requirements analysis, traffic simulation and ITS actions selection
- **IBM Österreichische Büromaschinengesellschaft mbH with IBM Research Irland (as "third party")**
Decision Support System (situation prediction and ITS actions proposal)
- **EBE Solutions GmbH, Austria**
User Interface for traffic centres, installation of equipment in Graz, hosting of DSS
- **Imperial College London, UK**
traffic simulation, emission models
- **VITO, Belgium**
Emission models, planning of pilot installations, evaluation of results
- **Air Monitors Ltd., UK**
installation of equipment in Glasgow, air quality monitoring Glasgow
- **European Tech. Serv., Belgium**
Dissemination and exploitation of project results





CARBOTRAF

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