

Traffic Data Detection during World SOCCER Championship – Analysis and Simulation of Traffic Situation report

**Prof. Reinhart Kühne
DLR – Transportation Studies**



Deutsches Zentrum
für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft

Outline

- The Approach of Air Borne Traffic Data Collection
- The Project Soccer
- System Description
- Results of the FIFA Worldcup 2006





Soccer

Theme: Air Borne Traffic Flow Measurement

- The Project is funded by the Federal Ministry of Business and Technology.
 - File Number is 19 B 5020.
 - There are Cooperation with the Ministry of Internal Affairs of Baden-Württemberg and the Police Department of Cologne.
- Soccer: Systematische Analyse und Prognose des durch die Fußballweltmeisterschaft induzierten Individualverkehrs unter Berücksichtigung der besonderen Gegebenheiten verschiedener Austragungsorte.



Content

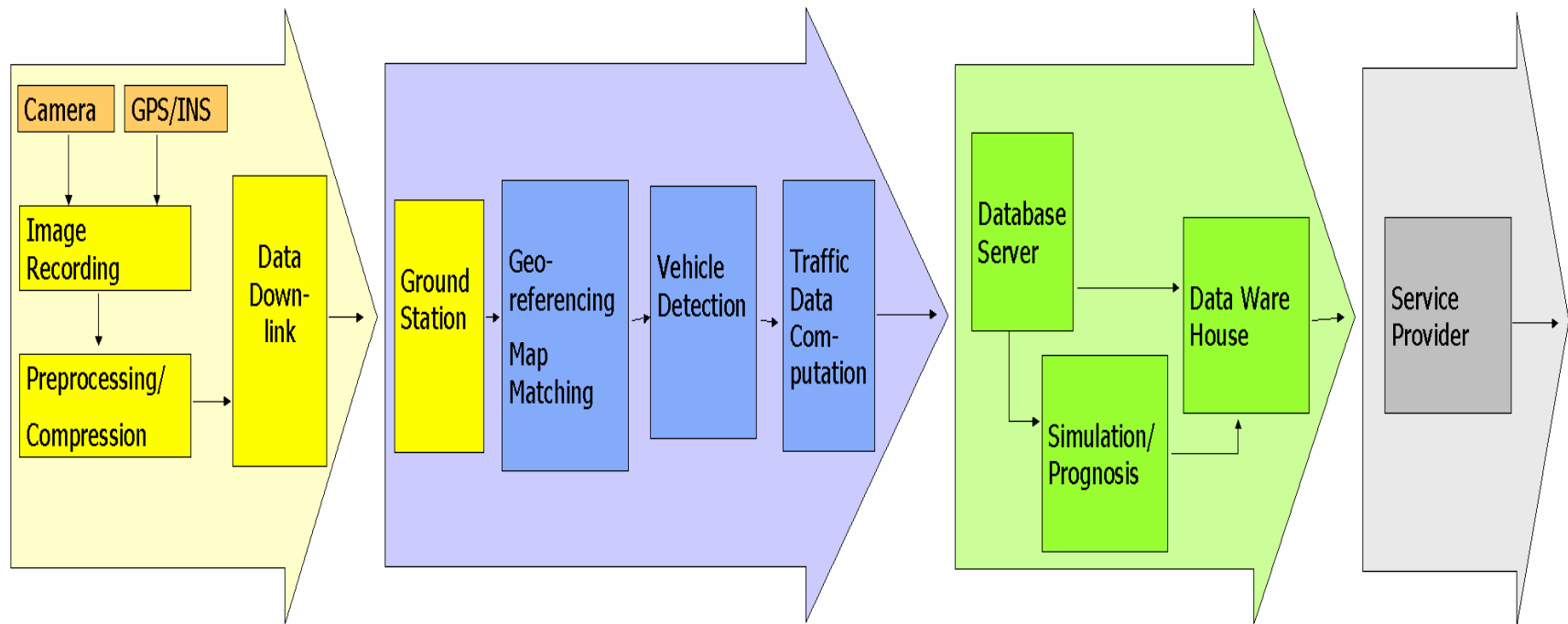
Soccer

- Content of the project is the development of a complete system for traffic data collection, data fusion, and generating traffic information.
 - The air borne sensor system connected with automated picture processing for traffic flow measurement is the main module.
 - The use case was the soccer championship 2006 at its places Stuttgart, Cologne and Berlin.
 - It is an approach of remote sensing with online geo-referencing.
 - The information at the end of the processing chain is a live stream of pictures, a geo-referenced picture map, a dynamic level of service of the current traffic situation and traffic forecast, and the dynamic monitoring of the flight path of the aircraft.
 - The users are the Ministry of Internal Affairs (Ba-Wü), the Police Department of Cologne and the drivers in Berlin via radio broadcast information.

System Architecture

Flow Chart

- The approach of real time air borne traffic flow measurement contains three major steps of processing: Time synchronous recording of pictures and navigation data, the automated data processing for car detection and measurement of velocities, last generating traffic parameters.



Aircrafts and Operation Areas

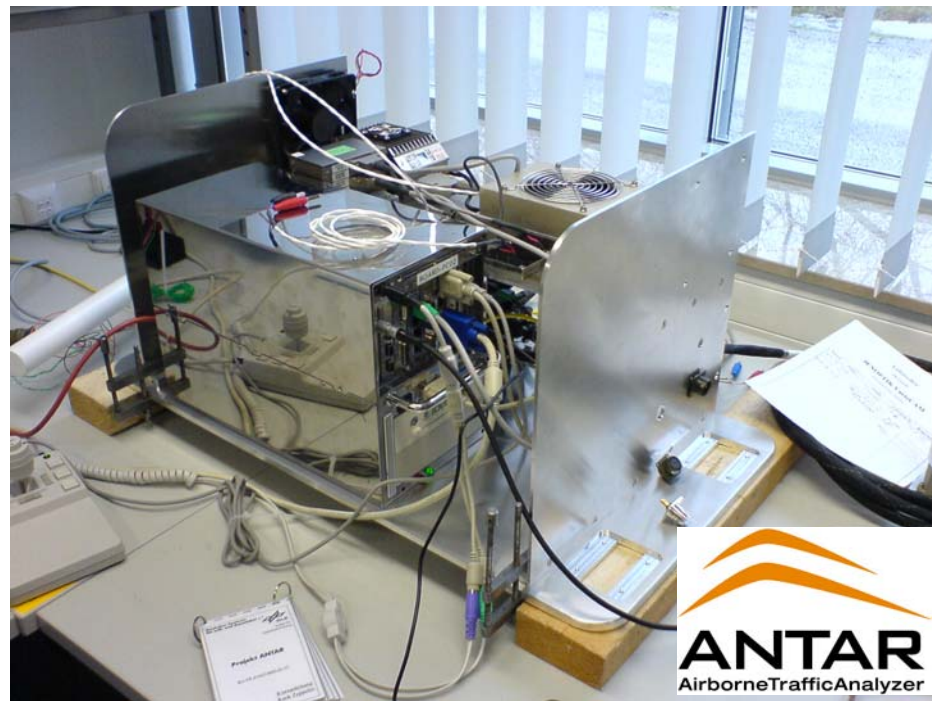
Stuttgart

- Ministry of Internal Affairs of Baden-Württemberg with ist Police. The system was integrated in a helicopter type MD 902.
- Since the 1.6.2006 the ANTAR sensor system is in a daily operation. Flown by the Police.



ANTAR Helicopter

Integration of the System in a MD 902



Aircrafts and Operation Areas

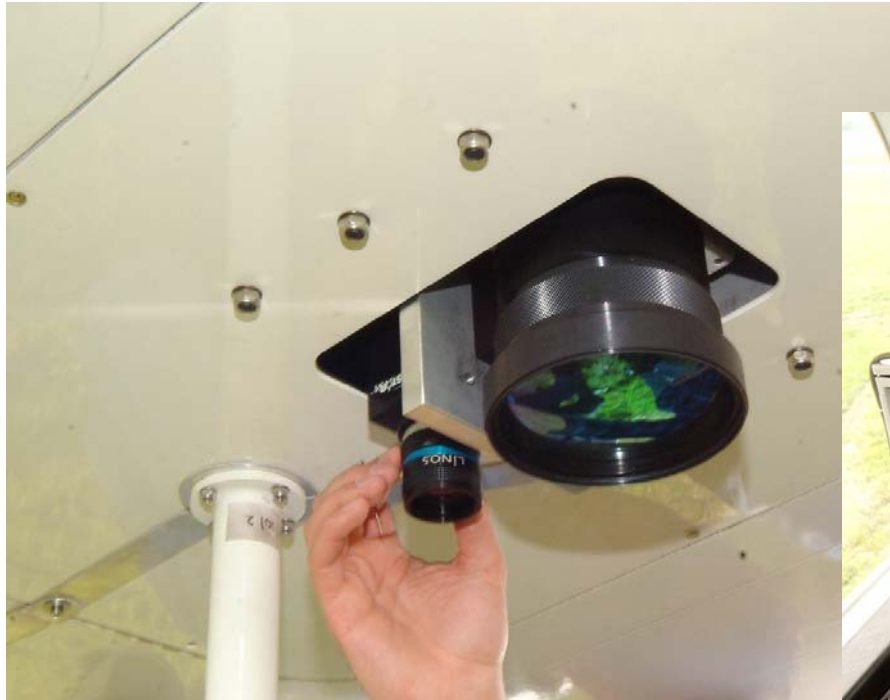
Cologne

- The system was integrated in the airship Zeppelin NT of the German Zeppelin Manufacture. It was operated in cooperation with the Police Department of Cologne. It was a „police-aircraft“.
- There were very good experiences from the world youth day 2006.



ANTAR

System Integration - Airship



Aircrafts and Operation Areas

Berlin

- The ANTAR system was integrated in a small airplane of the private company „Air Service Berlin CFH“. In Berlin the generating and dispensation of traffic information is made by private companies.
- Air Service Berlin produces already traffic information for drivers. The information are provided by radio broadcast.



ANTAR

Airborne Traffic Analyzer

- The sensor is a combination of a CCD camera, a thermal infrared camera and an INS for the online geo-referencing.
- The onboard system includes a computer for synchronization of the different data sets and a digital data downlink.



Sample-Sequence

BAB 10

- Five frames per second
- Geo-referencing
- Region of interest by masking the streets
- Detection of cars
- Measurement of velocity



Traffic Parameter

From Single Car to Average

List of vehicles for
each frame and
street section:

$[(x,y), v, \text{Class of size}]$

Average of density and velocity

Traffic parameters of
frame and street section:

$[\text{strID}, (t_0, t_1), [\rho_1, v_1], [\rho_2, v_2], [\rho_3, v_3]]$

Average over several frames

Traffic parameters for
each seen street section:

$[\text{strID}, \% \text{seen}, [\rho_1, v_1], [\rho_2, v_2], [\rho_3, v_3]]$

Average over several street sections

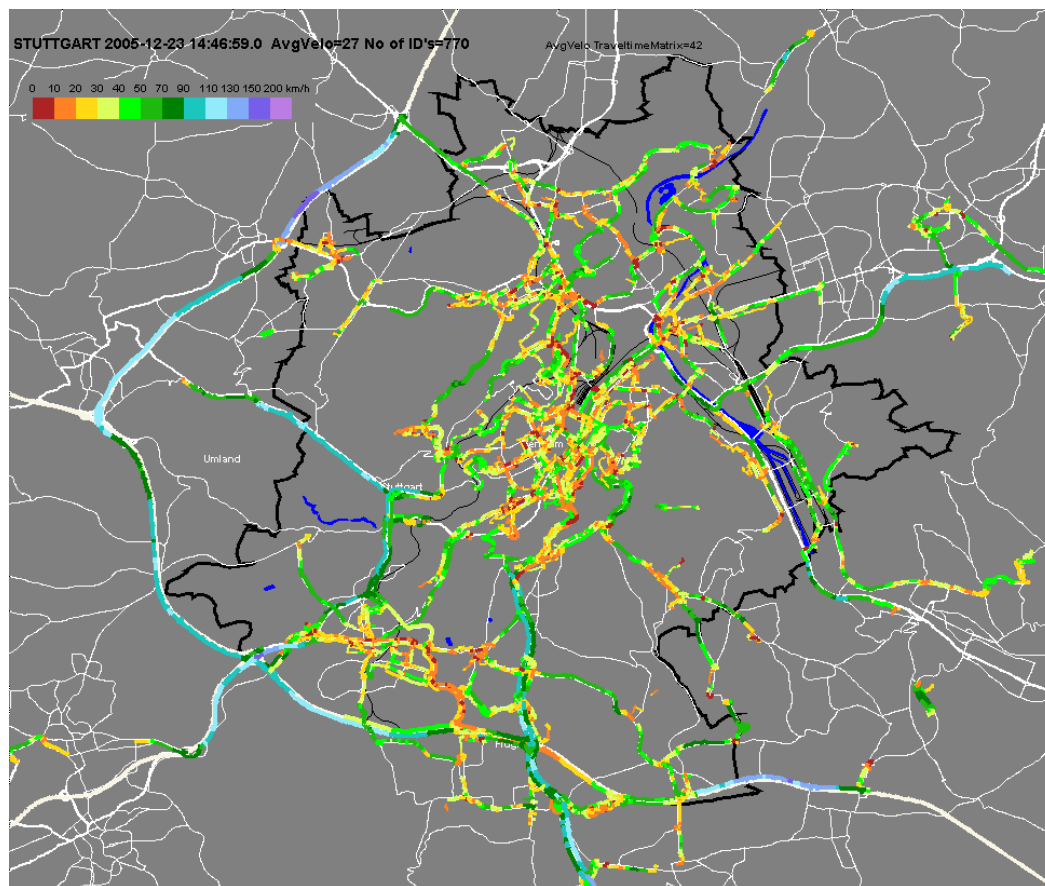
Traffic parameters for
each NAVTECH-edge:

$[\text{timestamp}, \text{edgeID}, \% \text{seen}, [\rho_1, v_1], [\rho_2, v_2], [\rho_3, v_3]]$

Data Fusion

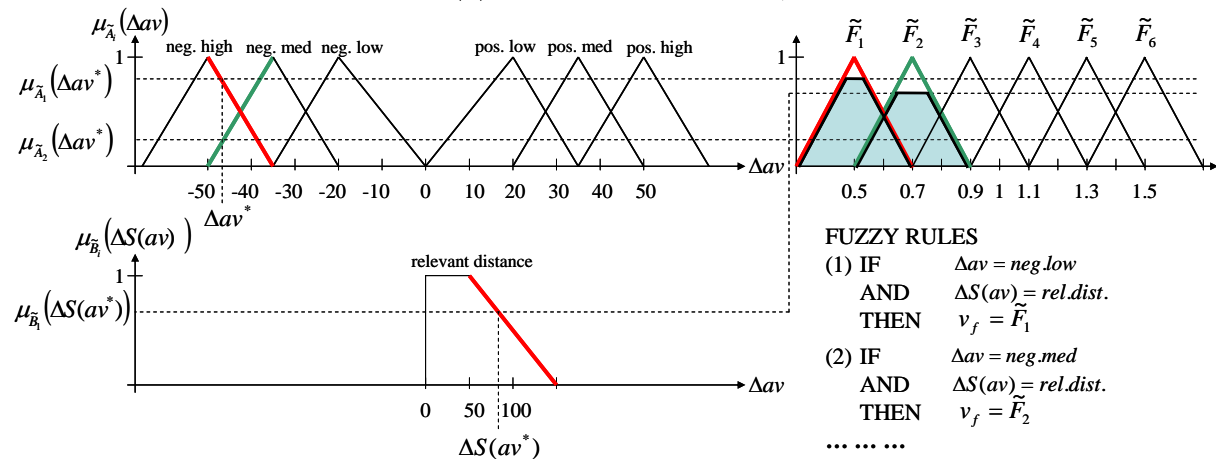
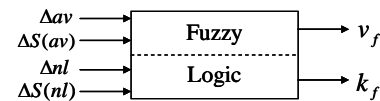
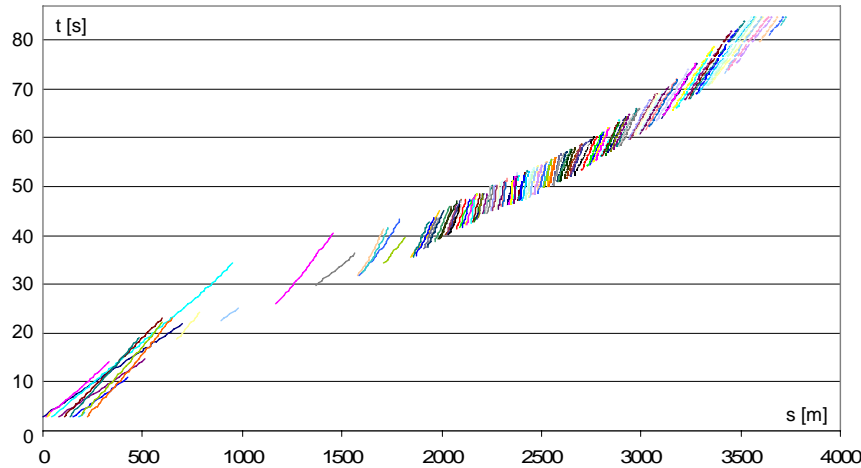
Sample Taxi-FCD

- Current Travel Times
Time: 14:46
Day 23.12.2005
Covert are BAB8,
BAB81 and B27.
- This data and
induction loops
were used for
level of service.



Different Approach

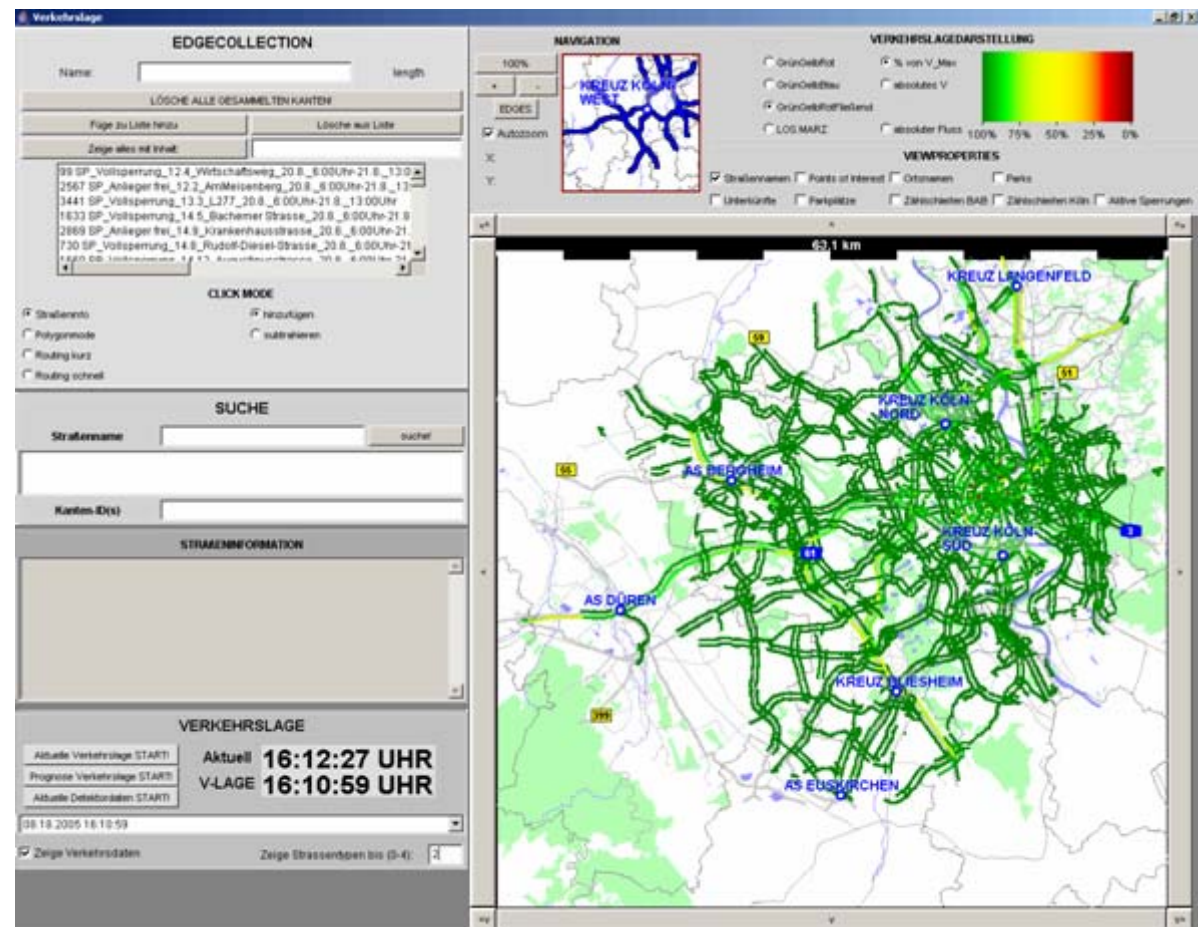
Traffic Forecast by Fuzzy Logic



Information for Decision Makers

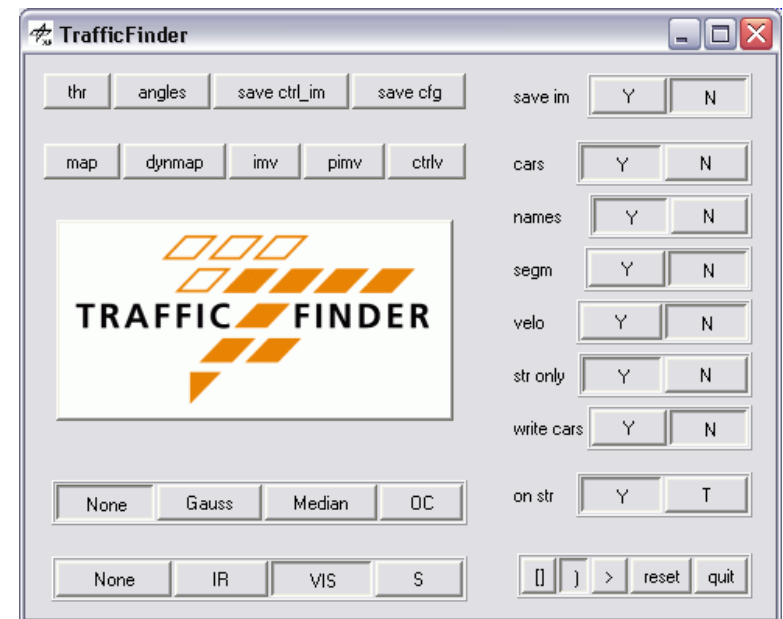
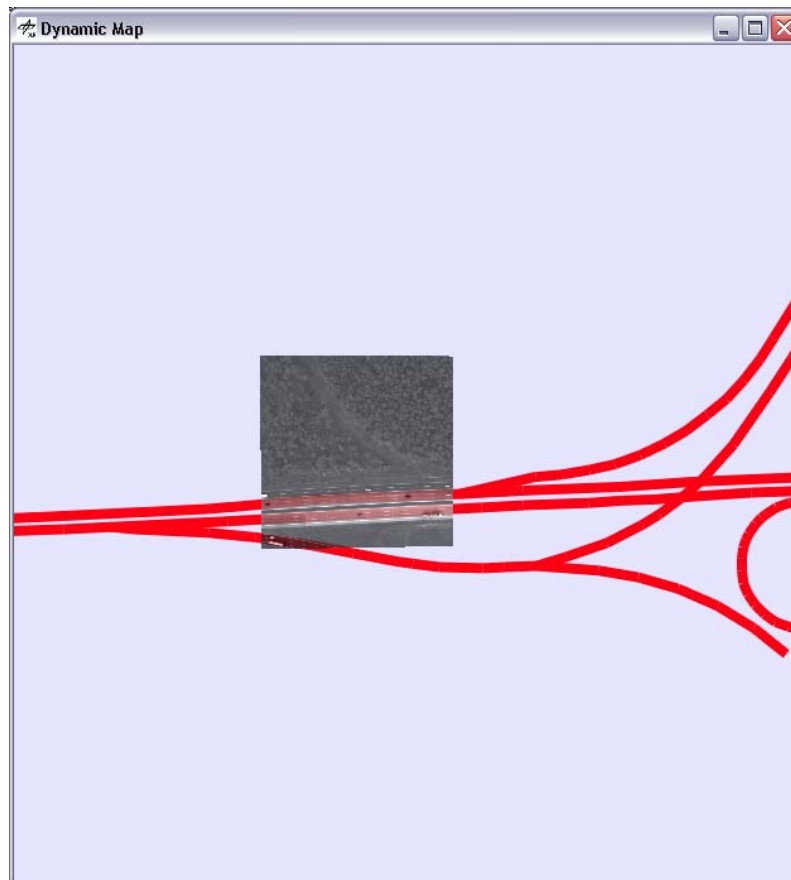
Dynamic Map of Level of Service

- Current traffic situation as Level of Service (LOS)



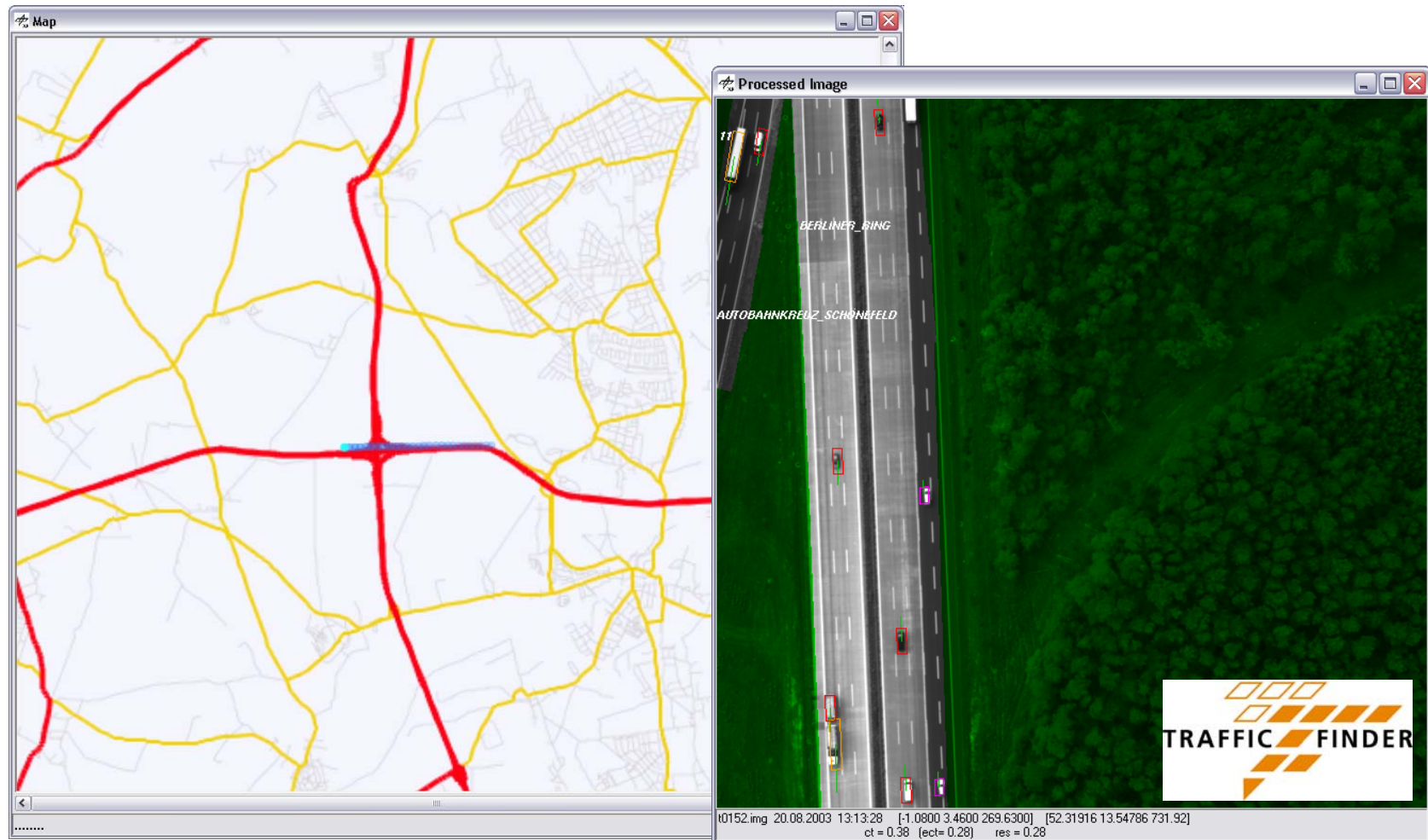
Interface for the Operator

User Interface and Control Screen



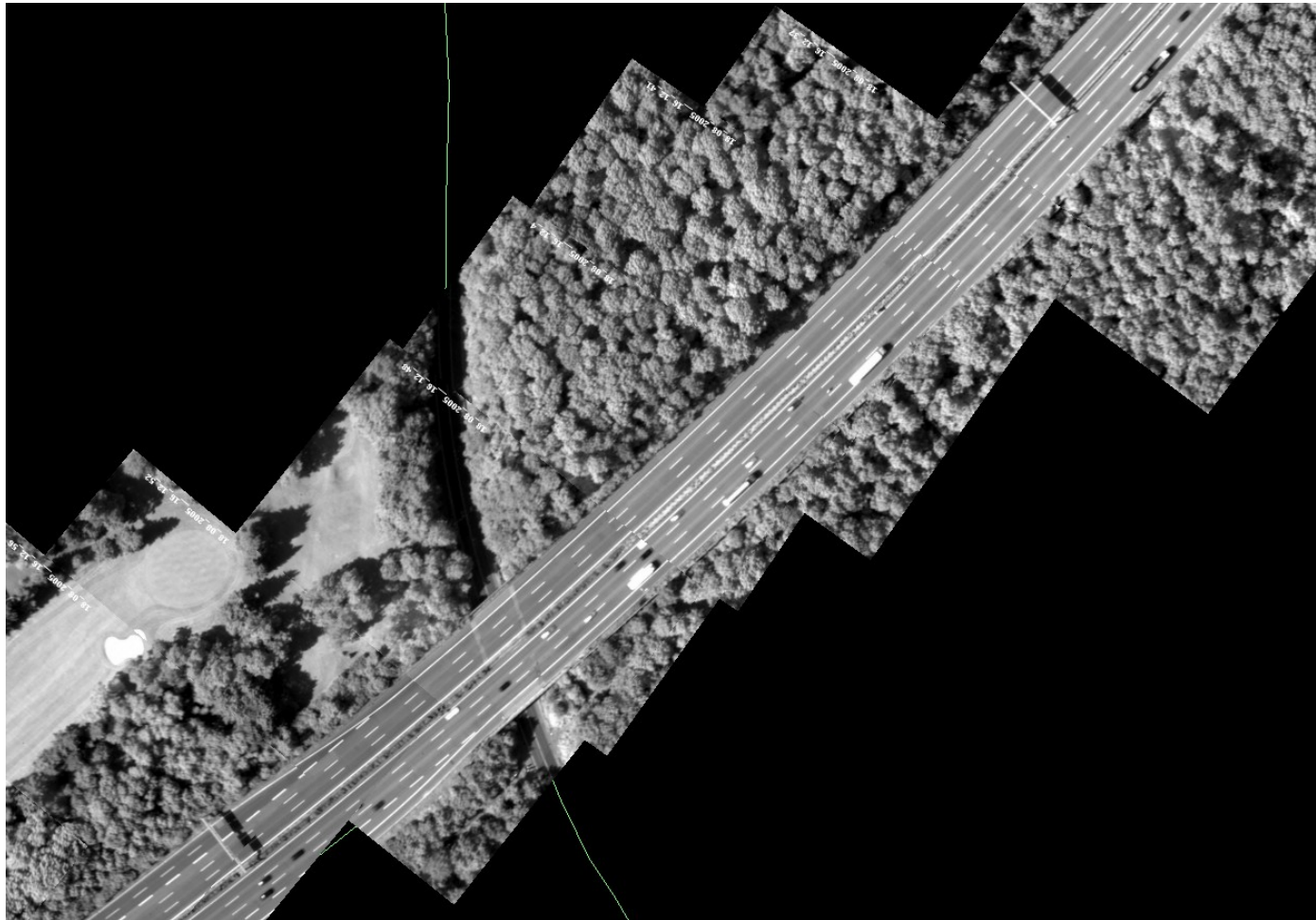
In the Centre

Current Flight Path and Live Stream



Geo Information System

Geo-tiff-mosaic of "historic" Pictures



Cooperative Traffic Management Centre

There the Results were shown



Contact

German Aerospace Center

➤ Project Management:

➤ Dipl.-Ing. Martin H.O. Ruhé
Rutherfordstr. 2
12489 Berlin
Tel.: 030/67055-207
Fax: 030/67055-202
martin.ruhe@dlr.de

➤ Director:

➤ Prof. Dr. Reinhart Kühne
Rutherfordstr. 2
12489 Berlin
Tel.: 030/67055-204
Fax: 030/67055-202
reinhart.kuehne@dlr.de

