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Real-time data collection: Experiences of long-term traffic observations and future developments

Human Factors

TNO | Knowledge for business



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Context of video analysis

Traffic behaviour research

Observation of real world

Instrumented vehicle

Driving simulator

Mathematical simulation



History

- Conflict studies (70s, 80s)
- Railway crossings (90s, 00s)
- Various 'before and after' studies



and trend

- Increase of use of camera's for several purposes in traffic by national and regional government

Long-term traffic observation for traffic safety research (TNO research project)

- Observation of 8 blackspots in 2-yr period (4/yr)
- Rough data: 8 years of video material
- selection data: 80 collisions (30 police-reported?) and ? x 100 conflicts

Goal

Develop automatic video analysis to extract data from video-data necessary for the specific research goal

Example of a location for observation



Development of Automatic video analysis

Development in three steps

1. Data storage
2. Event detection (roughly)
3. Detailed analysis

Requirement: every step should make *the process* more efficient

Step 1: Data storage

Requirements:

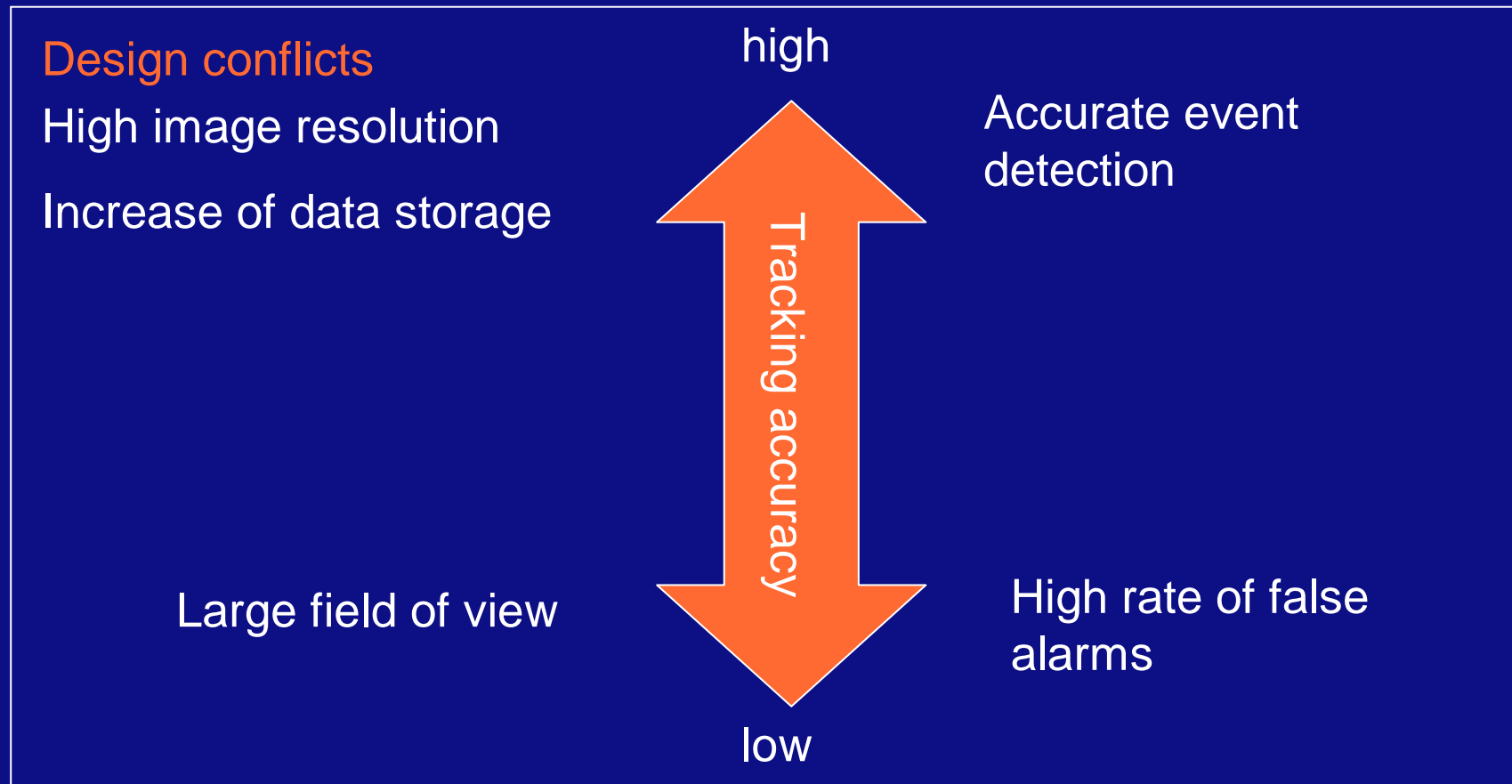
- Useful for manual event detection of events
- Storage over approx. ½ to 1 month continuously
- No off-the-shelf technology available
- Developments
 - Digital recorder (software + hardware, based on JPEG)
 - Swappable disks (to one tera byte)
 - Data reduction techniques

Step 2: Event detection

- Tracking of road users
- Algorithms for event

Developments

- Demonstrator of tracking
- Coordinates transformation



Example of preliminary result of step 2



Step 3: Detailed analysis

- Based on geometric models of road users combined with tracking (step 2)
 - High resolution needed for acceptable accuracy
- useful for fully automatic analysis
- useful for real-time applications like early warning

Practical Issues of Video observation

- Camera point of view
- Power supply
- Location for equipment
- Obscurance traffic
- Weather
- Darkness / lights

Camera Viewpoint



Camera Viewpoint



Power Supply



Location for equipment



Obscurance of traffic (and bad weather)



Darkness / lights



Future developments in data collection

- Video is a rich sensor, but there are limitations
- Combination of video with other sensors (radar, Infra red) → data fusion

- Where do we need / use video for?
 - Is it for physical measures (speed, lateral position, etc) or is it for understanding of a specific situation?

Physical measures



Understanding of specific situation (1)



Understanding of specific situation (2)



Understanding of specific situation (3)



Question

- What other applications of video for traffic observation are there and is it worth the investment / effort?