Evaluation of Floating Car Data Systems by Field Trials

3rd International Symposium NETWORKS FOR MOBILITY
Stuttgart, October 5 - 6, 2006

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Floating Car Data (FCD) from Taxis
Two research projects

- **ORINOKO**
  - founded by German government
  - optimizing traffic management for urban corridors
  - FCD from 700 taxis in Nuremberg
  - position reporting interval: ≈ 30 sec

- **DYNASTY**
  - founded by European commission
  - bringing TMC to China
  - FCD from 2000 taxis in Beijing/China
  - position reporting interval: ≈ 20 sec
Accuracy of FCD approach
An open field of research

- causes of inaccuracy in FCD systems
  - statistical bias due to low sampling rate
  - positioning error due to GPS inaccuracy, wrong map matching
  - misinterpretation (jam ↔ rest)
  - time delay between measurement and publication of derived traffic information

- two FCD usages, two field trials:
  1. travel time estimation (addressed in ORINOKO)
  2. incident detection (addressed in DYNASTY)
Travel time estimation (1)
Field trial

- travel time observation by license plate recognition
- Regensburger-, Hain-, Münchener Strasse, ≈ 2 km
- 2005, Sep. 13th and 14th outbound
- 2005, Sep. 15th and 16th inbound
- 7–11 a.m. and 3–7 p.m.
- bi-modal transit time distribution
Travel time estimation (1)
Results of field trial

![Graph showing travel time estimation results](image-url)
Travel time estimation (1)

Results

- measurement campaign delivered good reference dataset
- multimodal distribution of transit times. Reason: signalized intersections
- high standard deviation (about 45 sec) of individual travel times

Quality Taxi FCD

- estimated travel times mostly inside variation limit of observed transit times
  - variation coefficient individual travel times to 15 min average: 19.4%
  - variation coefficient Taxi FCD estimation to 15 min average: 17.7%
- incident detection at given penetration (≈0.7 %) with stochastic time delay
- not suitable as stand-alone sensor for traffic light optimization
Incident detection (2)
Field trial

- self-defined TMC location table →
- creation of TMC messages
- broadcasted by a Beijing radio station
- about 100 messages simultaneously

Measurement campaign:
- one probe vehicle using 2nd and 3rd ring road (freeway)
- one day, 6 a.m. to 8 p.m.
- comparison of observed incidents with TMC
Incident detection (2)

Results

19 incidents observed, there from …

- 11 reported correctly
- 5 reported imprecisely
- 3 not reported
- + 2 wrong TMC

- satisfying result …
- … but test not very significant; more extensive reference data needed
Conclusions

- Taxi FCD is a valuable traffic sensor for urban regions
- travel time information on a low-cost basis
- reporting frequency should be less than 120 sec
- penetration crucial for accuracy and time delay
- for traffic management purposes
  a high penetration (>1%) or
  combination with other sensors needed