Accuracy Requirements and Benchmarking Position Solutions for Intelligent Transportation Location Based Services

Scott Stephenson

Dr. Xiaolin Meng, Prof. Terry Moore,

Nottingham Geospatial Institute,

The University of Nottingham, UK

Dr. Anthony Baxendale, Tim Edwards
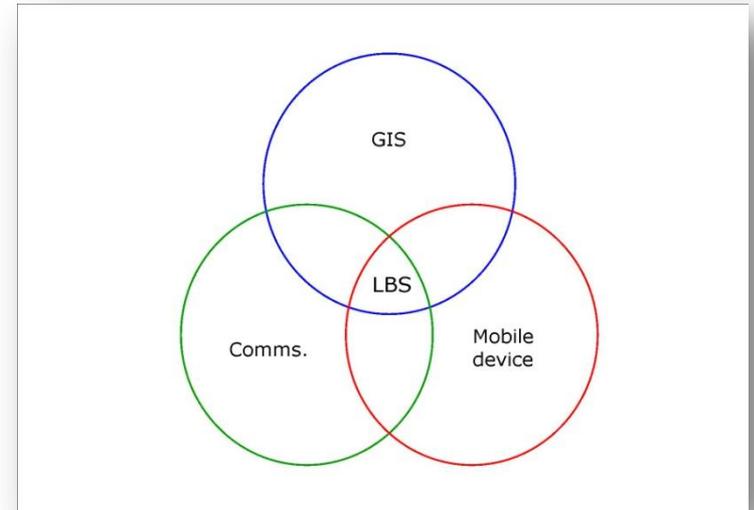
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ITLBS

Intelligent Transport Systems and Services (ITSS)
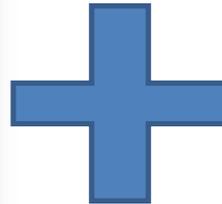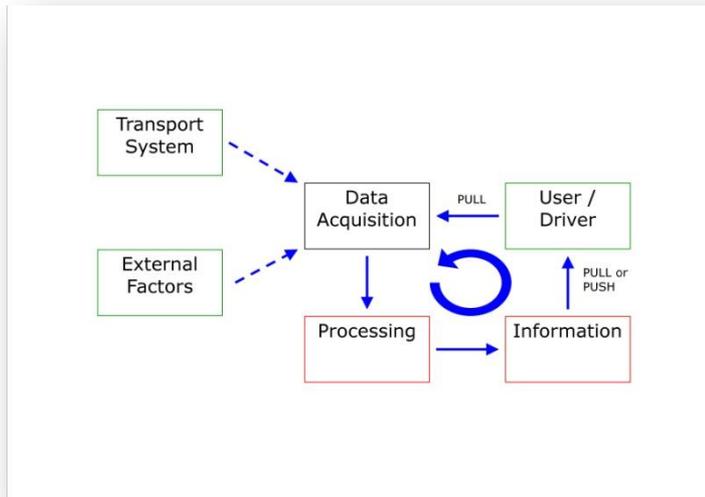
Location Based Services (LBS)

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**=** **Intelligent Transport Location Based Services (ITLBS)**

Existing Standards & Organistations

- International Organization for Standardization (ISO)
  - ISOs

- European Committee for Standardization (CEN)
  - Implementation standards

- Open Geospatial Consortium (OGC)
  - Voluntary technical agreements

- PIARC ITS Handbook
  - The World Road Association
  - (formerly the Permanent International Association of Road Congresses)

- ITS Organisations
 - ITS America
  - ITS-UK
  - ITS Sweden
  - Etc.

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Accuracy requirements in ITLBS

- ## Alves et al (2010)
  - – Which Road?
  - – Which Lane?
  - – Where in Lane?
- ## Further classification
  - – Active control
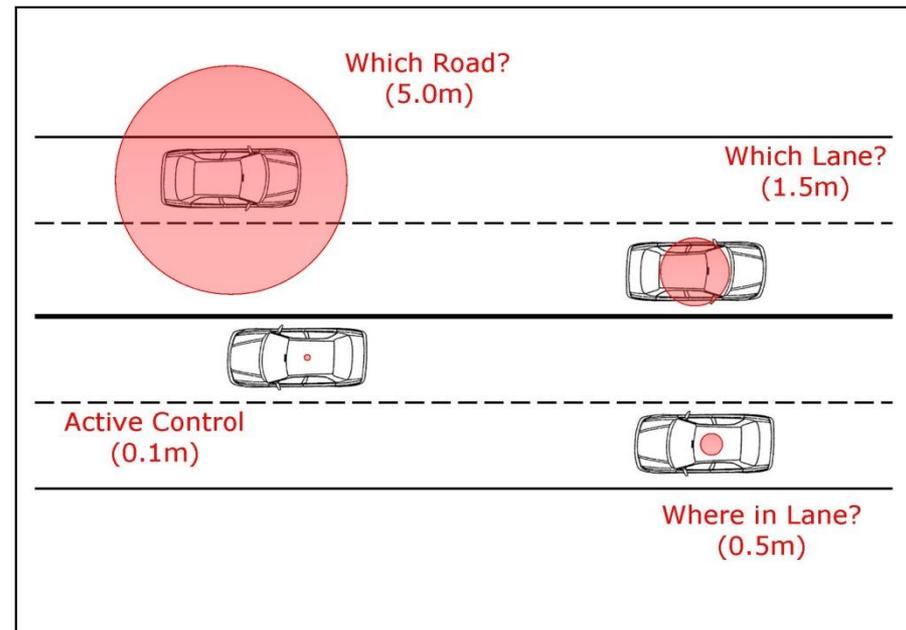
Accuracy requirements in ITLBS

- Required Navigation Performance (RNP)
  - Originally developed by the International Civil Aviation Organisation

Accuracy | **Integrity**

Continuity | **Availability**

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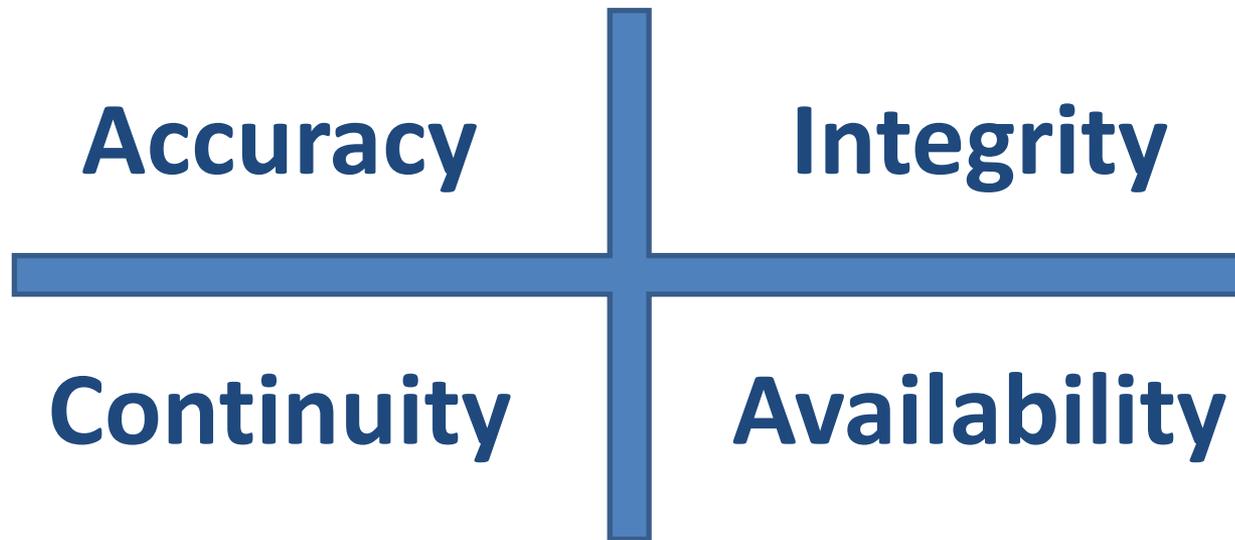
Accuracy requirements in ITLBS

- ## Typical applications
  - Intelligent Speed Adaptation
  - Driver monitoring
  - Weather/road condition monitoring
  - Congestion charging / road user charging
  - Incident detection and warning
  - Congestion relief
  - Evacuation route guidance
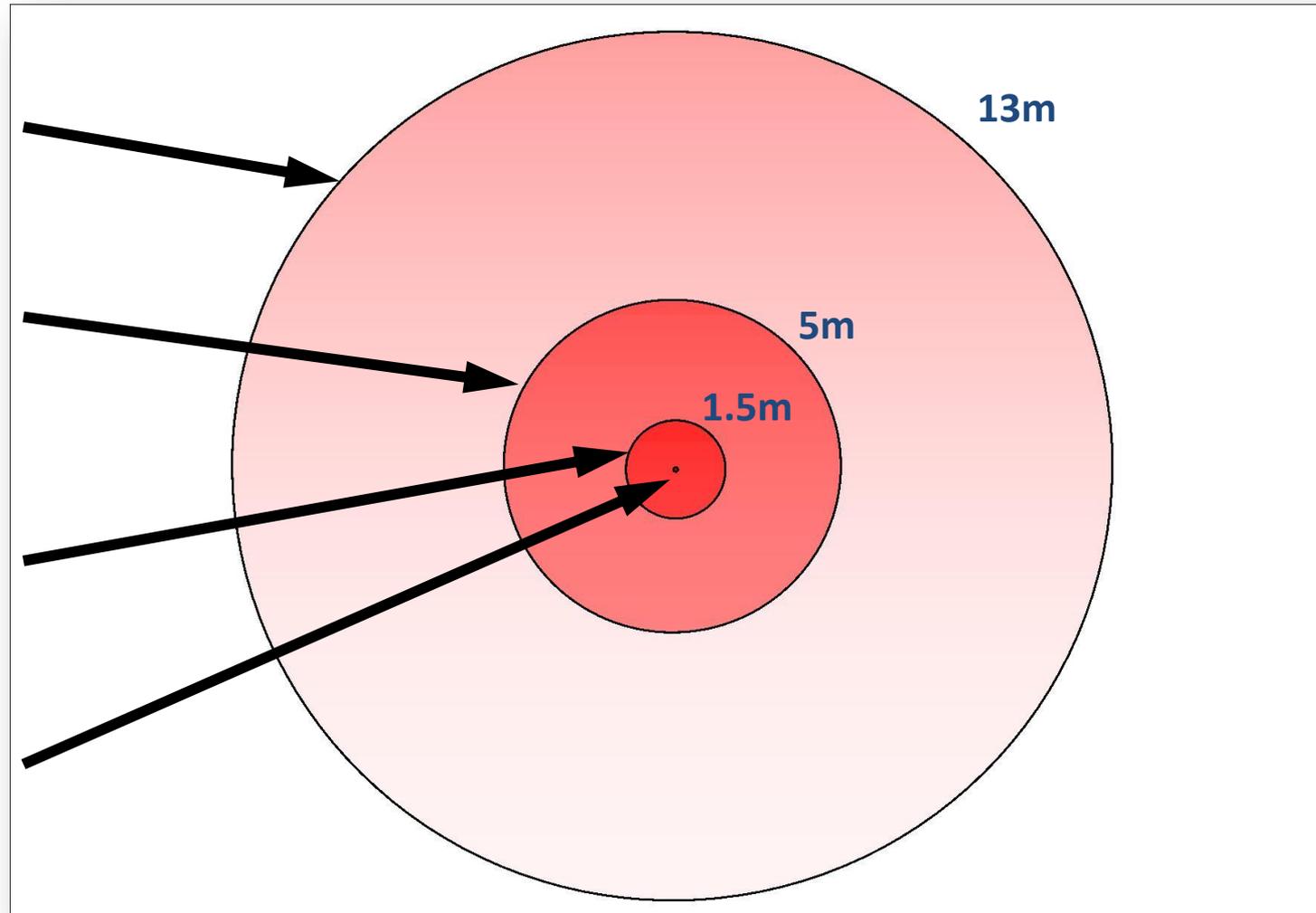 - Route guidance (Navigation)

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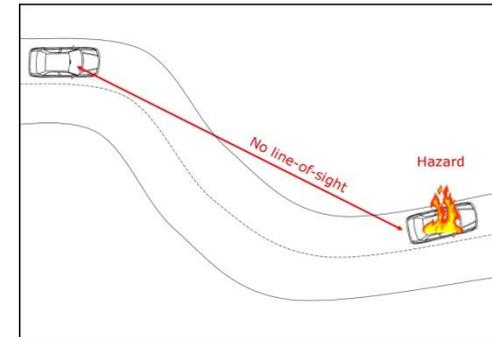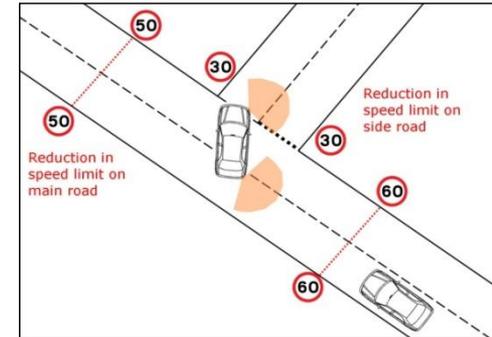
Current technology performance

Stand alone

Stand alone
(multiple systems)

DGNSS

RTK or N-RTK
or PPP

13m

5m

1.5m

Current technology performance

Samsung Galaxy S2

- Android app
  - RF Signal Tracker

Good enough for 'Which Road?' applications
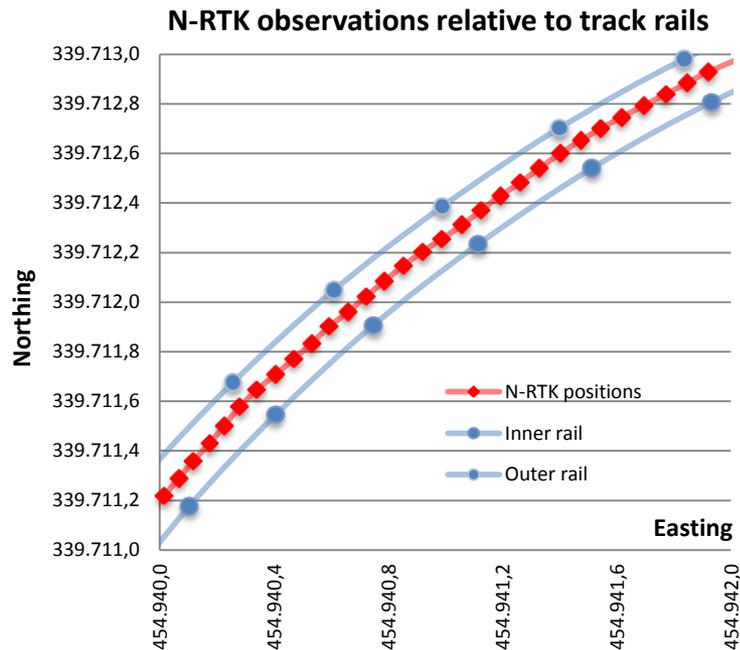
Current technology performance

Samsung Galaxy S2

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- Electric locomotive test facility
  - N-RTK observations providing 'Active control' level of accuracy

N-RTK observations relative to track rails
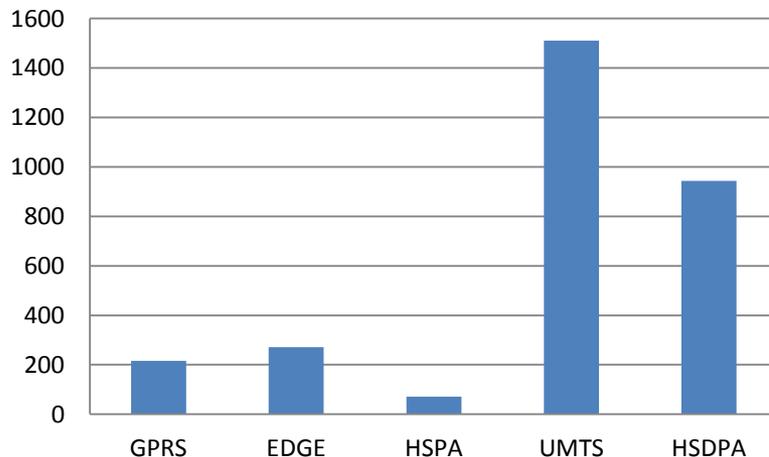
Testing and calibration at NGI

- Aponte et al (2009)
  - Real world testing of N-RTK
    - A mix of urban roads and motorway driving
  - Static tests
    - 5cm accuracy with 98% availability (3sd)
  - Kinematic tests
    - 5cm accuracy with approx. 50% availability (3sd)

- Highlighted two major limitations
  - Communication problems
    - GPRS coverage is not 100%
    - Future options:
      - 3G, 4G, satellite link, radio

  - Visibility problems (bridges, buildings, other vehicles)
    - Signal blockage & interference
    - Multipath effects
    - Cause problems with ambiguity fixing

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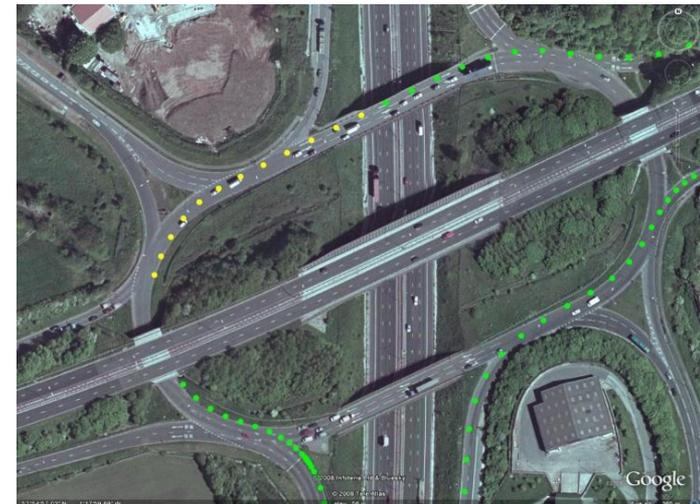
N-RTK technology hurdles

- Communications
  - 66 km test
    - Mostly M1 motorway
  - 77 Cell changes
    - Average 857 metres

Observations by Communication Standard

GPRS   EDGE   HSPA   UMTS   HSDPA

The Future?
- 4G, Satellite comms.,Radio

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Conclusion & further work

- Intelligent Transport Location Based Services (ITLBS)
  - Accuracy requirements
  - Current technology performance
  - Testing & calibration at NGI

- Future work
  - NGI test vehicle
  - innovITS ADVANCE

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Thank you

Any questions?

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