The University of Nottingham

Smartphone Apps and Truck Sensors for Network Assessment

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Content

Smartphone apps

- Measuring roughness
- Locating surface defects

Truck sensors

- Safety investigations
- Other ideas

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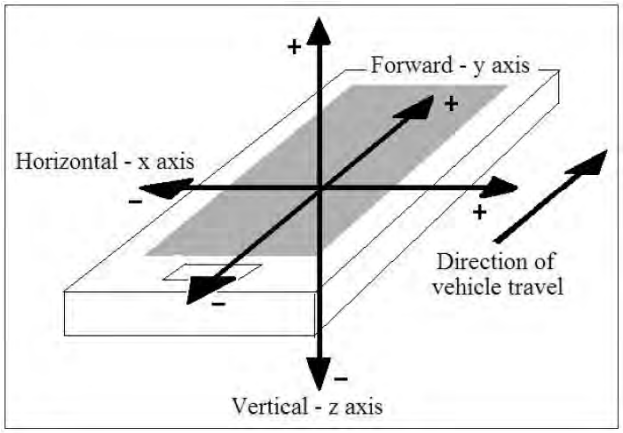
Smartphone Apps

Can Smartphone accelerometers and GPS capabilities be used for monitoring?

- Frequently?
- Cheaply?
- Acceptable accuracy?



Taped in position between front seats

Bluetooth GPS added

Records accelerations about 25/s (depends on ‘listeners’)

App stores these records and outputs text file

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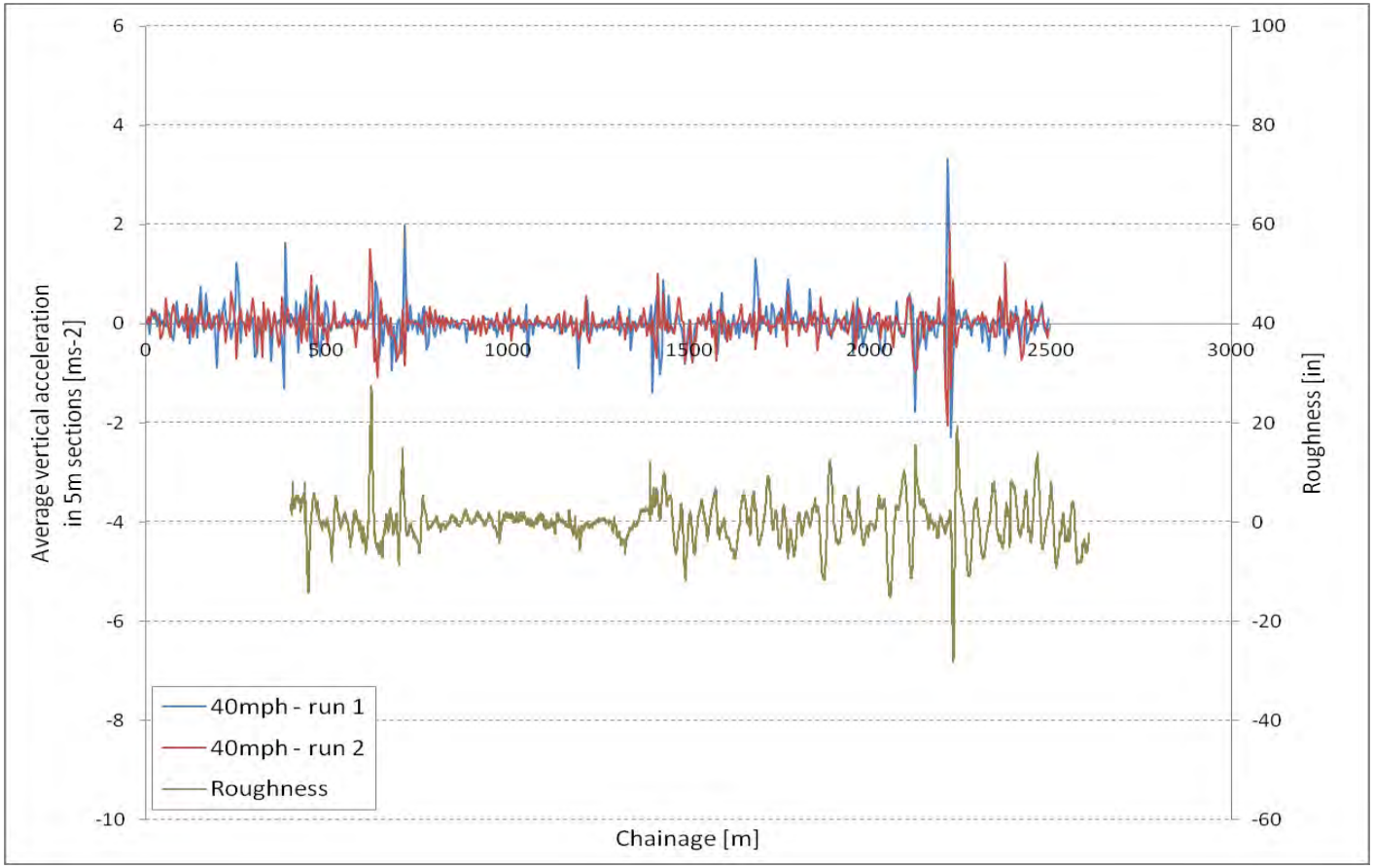
Accelerations (z) and IRI



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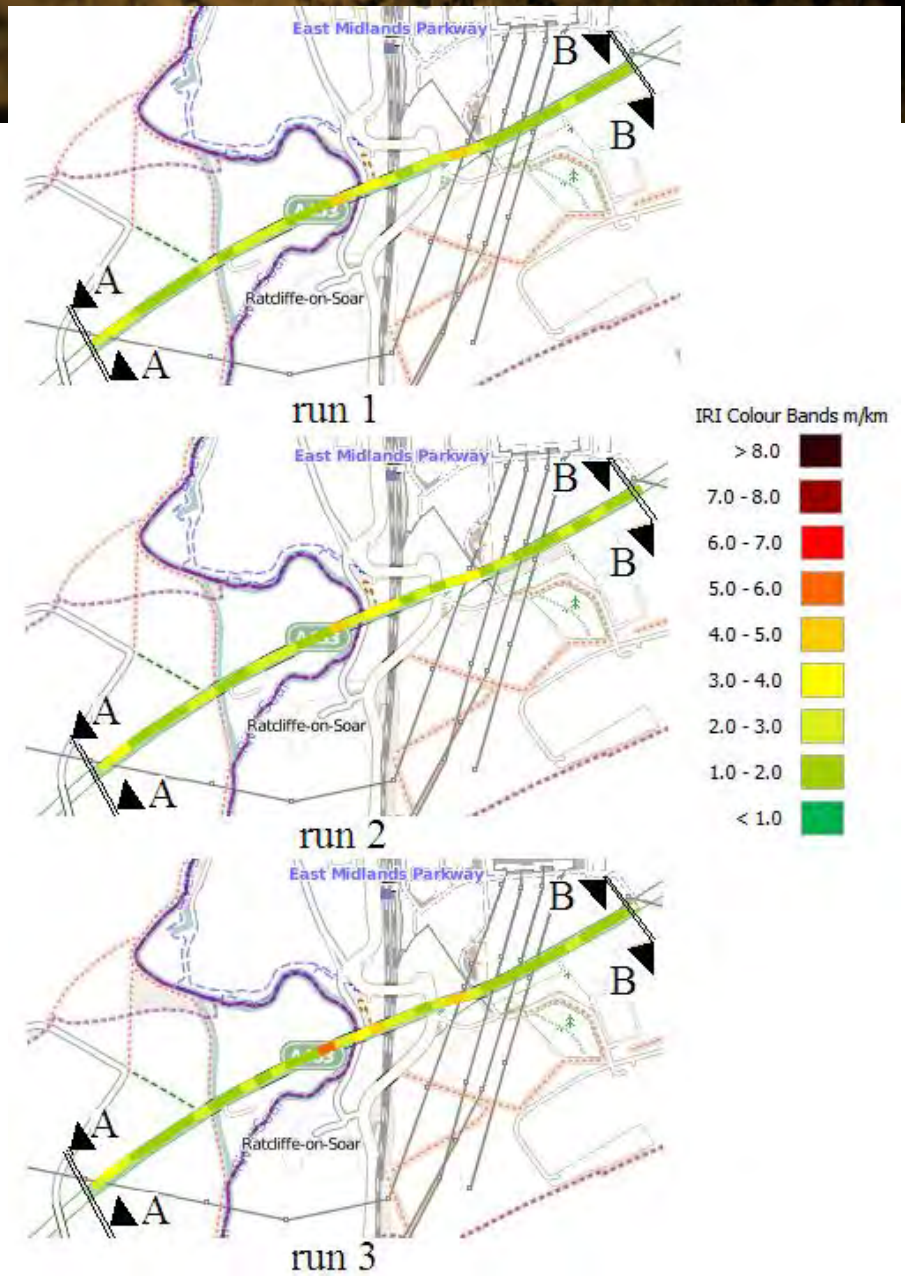
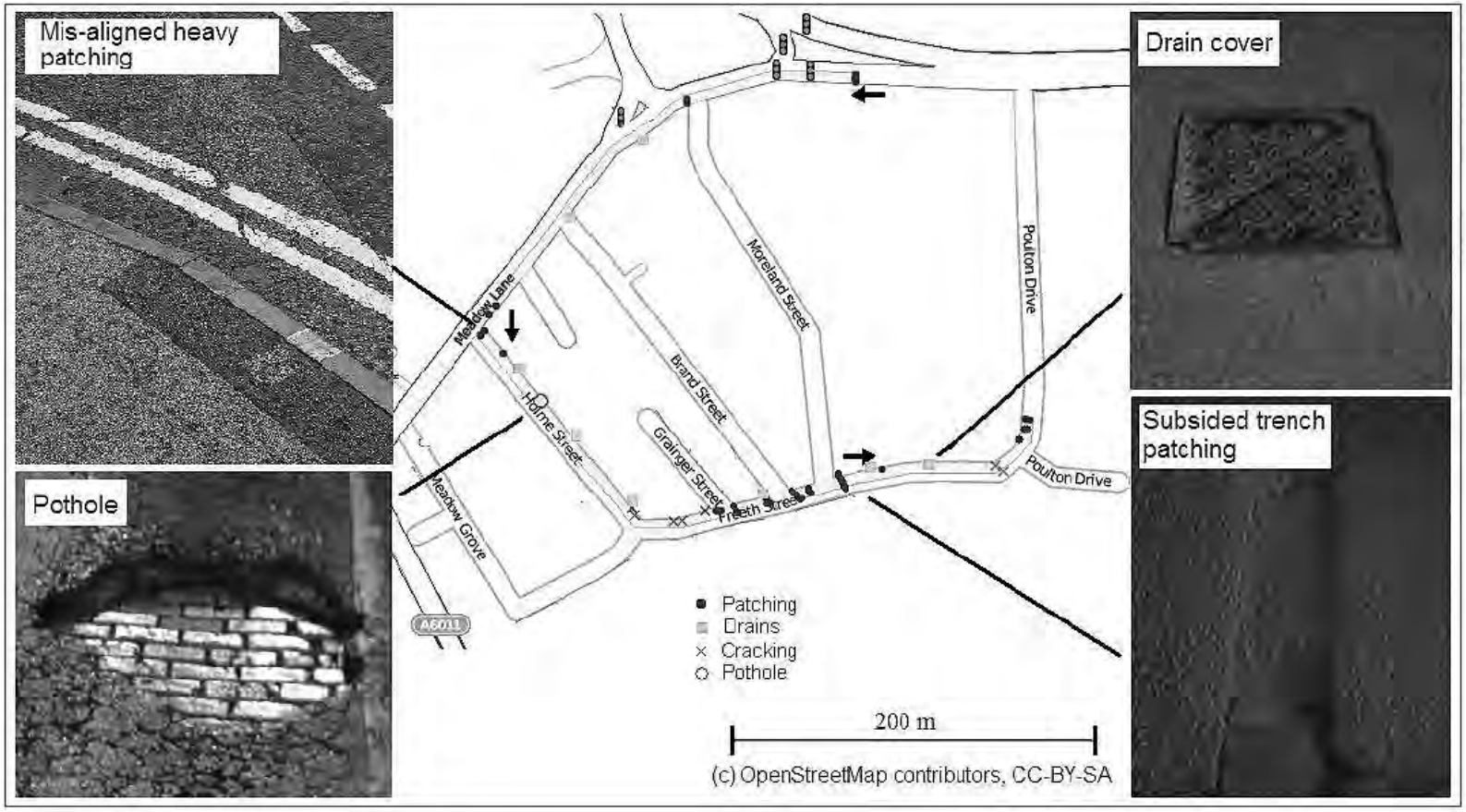
Roughness

Consistent recording of locations of higher accelerations and roughness for three runs at 40mph



Defects

- Can develop quickly
- Difficult to predict

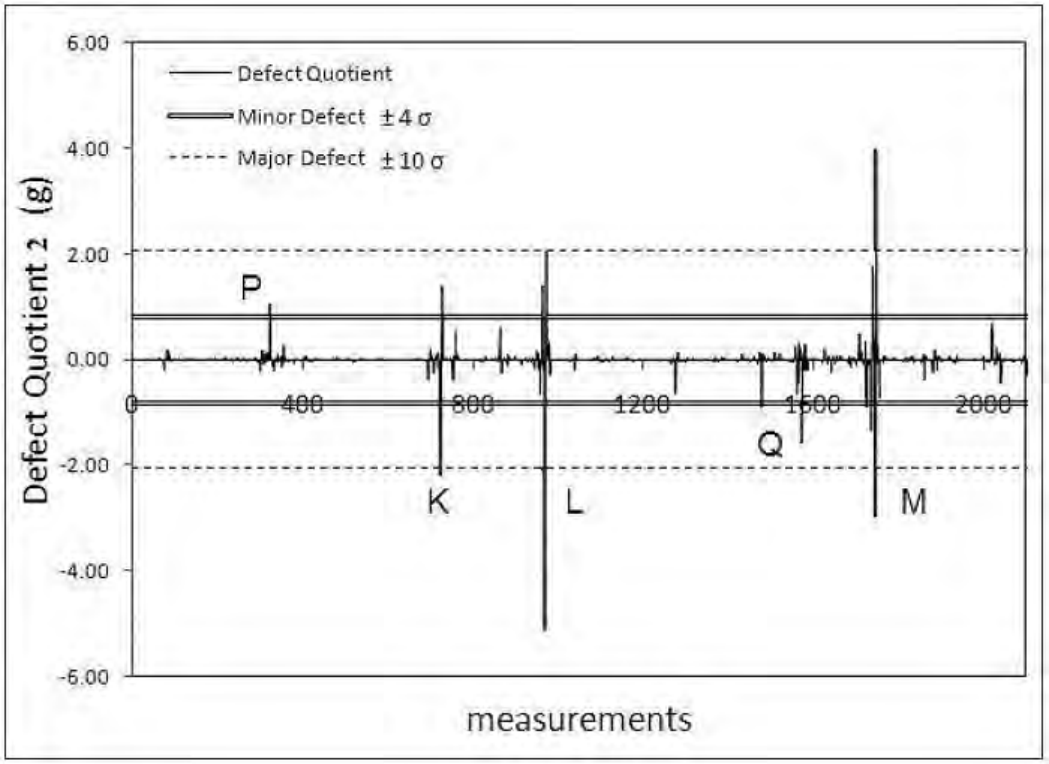


Data treatment

Low and high pass filtering

Defect quotient to create ‘spikes’ (filtered x . filtered z^2)

Apply thresholds (allows ‘learning’)



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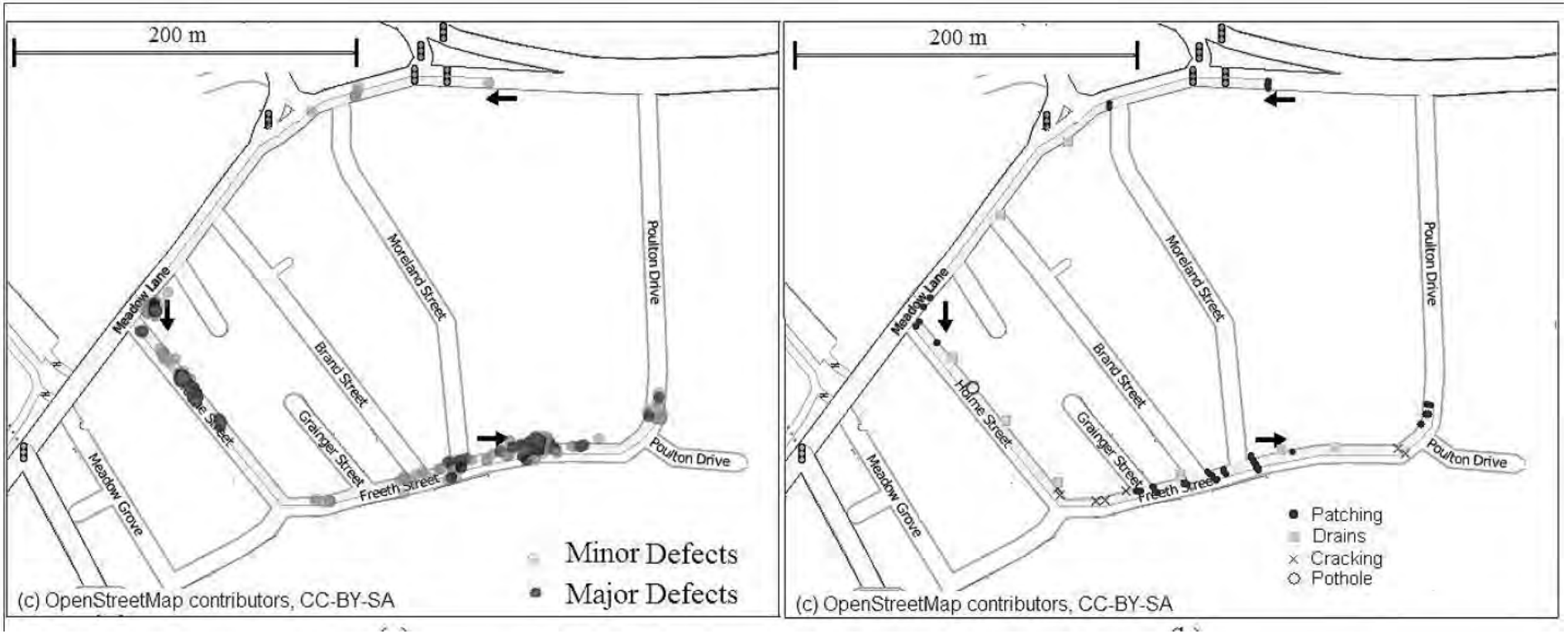
Defect Results

Average response of a number of runs, at different speeds, detects most defects with good positioning



Byrne et al. Identifying road defect information from smartphones. Road and Transport Research, vol. 22 no. 1. (2013)

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Truck Sensors

So far confined to GPS position

Acquired for 40,000+ trucks in the UK for logistics

Output ‘harsh braking’ incidents above a threshold deceleration

Safety investigations:

- can no longer rely on previous accident rates (which is a good thing)
- incidents of harsh braking may reflect accident risk
- concentrations at some roundabouts

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Incidents and Accidents

Roundabout approaches (excluding mainline)

Three years of incidents (447)

Ten years of accidents (31)

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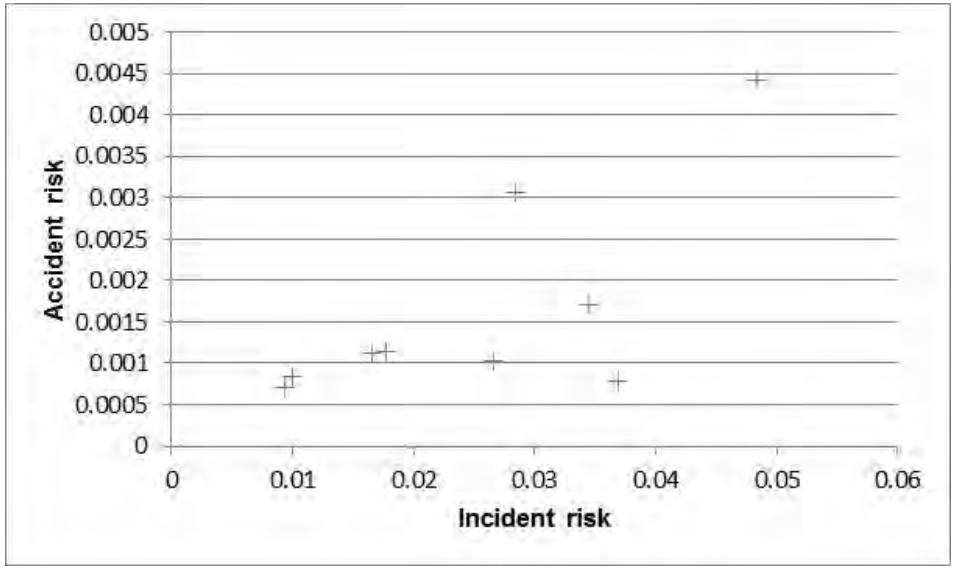
Incidents and Accidents

Relationship for nine roundabouts with high incident rates (normalised by truck traffic)

Is incident risk indicative of accident risk?

Could this be used in maintenance prioritisation?



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Other opportunities

Harsh cornering, in addition to braking

Buffering around incidents; consider trajectory during episode of increased accident risk

Comprehensive truck sensor capability with increasing uptake, including:

- Brake pressures
- Fuel consumption

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Closing remarks

Acceleration data (from Smartphones or fitted sensors) can give us frequent and low cost information about road and driving conditions – which should be investigated for network management

- extend to fleets (busses, trucks, taxis etc.) or public
- on board analysis and free download
- ‘learning’ analysis may reduce variability from different vehicles and phones/sensors

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Closing remarks

Crowd source data of these types is increasing, frequent and (potentially) low cost

Could be shared with Highway Authorities

Can provide additional information to engineering surveys

More closely related to level-of-service.

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