Analysis of Driving Behaviour Characteristics Based on Smartphone Data

Poster Number: 11253

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Introduction
Detect and analyze risky driving behaviour characteristics
Key driving risk indicators identified in literature:
- mileage
- acceleration (x,y axis)
- harsh driving events
- mobile usage
- speed

Data collection and processing procedure

Data flow:
- Mobile app detects the start and stop of driving, with no user involvement
- Data recording from smartphone sensors
- Data transmission to backend (WiFi or 3G/4G)
- Data analyzed using the OSeven algorithms to produce driving metrics

Experiment:
- 4-months naturalistic driving experiment
- 100 participating drivers
- Large database of 18,850 trips

Driving behaviour indicators exploited:
- distance travelled
- speed
- rotational speed
- acceleration
- braking
- harsh maneuvers (e.g. harsh acceleration, braking, etc.)
- mobile phone use
- collected from smartphone devices

Results (1/2)
The number of harsh events change can be predicting using (Table 1):
- percentage of mobile usage
- the average speed
- the average exceedance of the speed limit
- the driving period during a day (morning, afternoon rush)
- more frequent use of mobile phone is associated with fewer harsh events

Results (2/2)
Probability of mobile phone use during the trip is (Table 2):
- increased during the morning
- reduced during the afternoon
- not affected by trip duration
- negatively associated average speed per trip, confirming existing studies
- reduced by the average percentage exceedance of speed limits
- decreased as the number of harsh events per km is increased
- decreased as the angular speed (measured in o/s) is increased

"False positives" are a very minor share of the classified cases (Table 3)

Conclusions
- Mobile usage distraction has a serious impact on the number of harsh events that occur per kilometer and subsequently on the relative crash risk
- Drivers who are speeding more, are less likely to use their mobile phone during the trip
- Drivers reduce speed while distracted, and therefore are less prone to harsh events. This is also in accordance with literature
- Mobile phone use while driving may be accurately “detected” by smartphone sensors data in more than 70% of cases
- Driving metrics can very accurately identify “not talking on mobile phone” conditions, but not so accurately the “talking on mobile phone” conditions

Acknowledgements
This research has exploited data provided by OSeven Telematics, London, UK.