Monday
15
May
at 14:00

Workshop

in the framework of the

FOURTH UNITED NATIONS GLOBAL ROAD SAFETY WEEK
8-14 May 2017

Save Lives
#SlowDown

The future of road safety research

NTUA Zografou Campus, Athens
Railways Amphitheatre of the
Department of Transportation Planning and Engineering

Monitoring Driver Behaviour Through Mobile Phones

OSeven

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Together with:
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Scope

The development of the OSeven Smartphone application (http://www.oseven.io/) was initiated by the need for **collecting and analysing driving behaviour data**:

- from naturalistic driving conditions
- of a large-scale
- through cost effective solutions
- and transmit them in real time

Started in late 2014 and continuously progressing.

Past limitations

Limiting barriers existed so far:

- Mobile phone technology
- High cost of:
  - In-vehicle data recording systems (e.g. OBD)
  - Data plans
  - Cloud computing
- Low penetration rate of smartphones and social networks
- Inability to manage and exploit Big Data

...have now been eliminated.

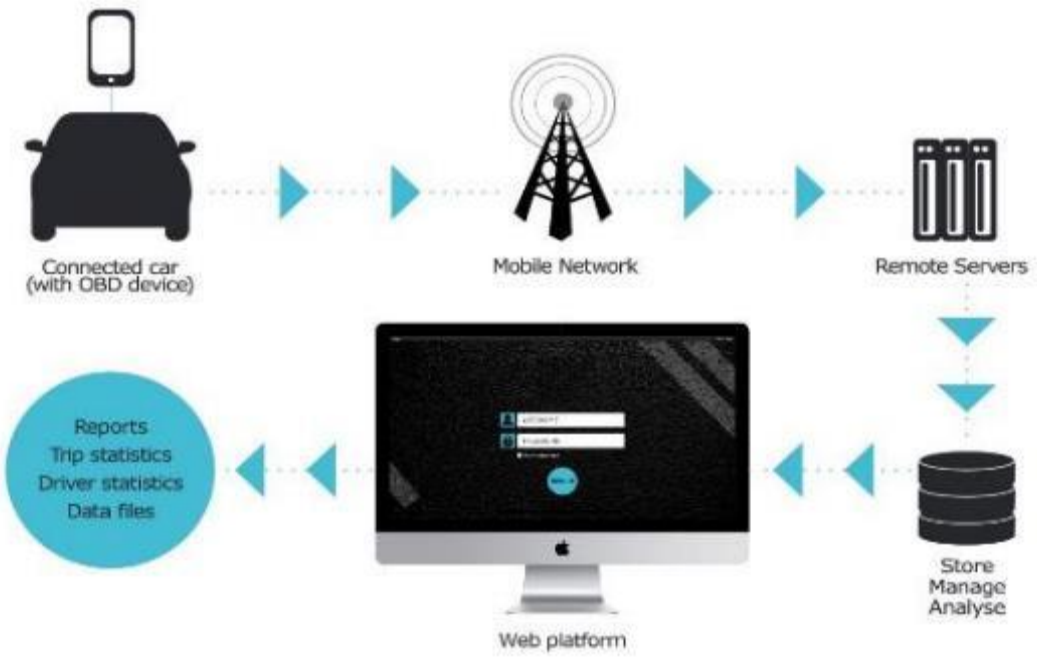
Current **technological advances** make it substantially easier for experts to collect and exploit data easier and more accurately through mobile phones.

Data flow

- **A mobile App** recording user's behaviour using mobile phone sensors (automatic start / stop)

- **A variety of APIs** to read sensor data recorded and temporarily store it to mobile phone

- **Data transmission** from the mobile App to the central database via an appropriate communication channel such as:
  - Wi-Fi network (online)
  - Cellular network such as a 3G/4G network (online)
  - Bluetooth (offline)



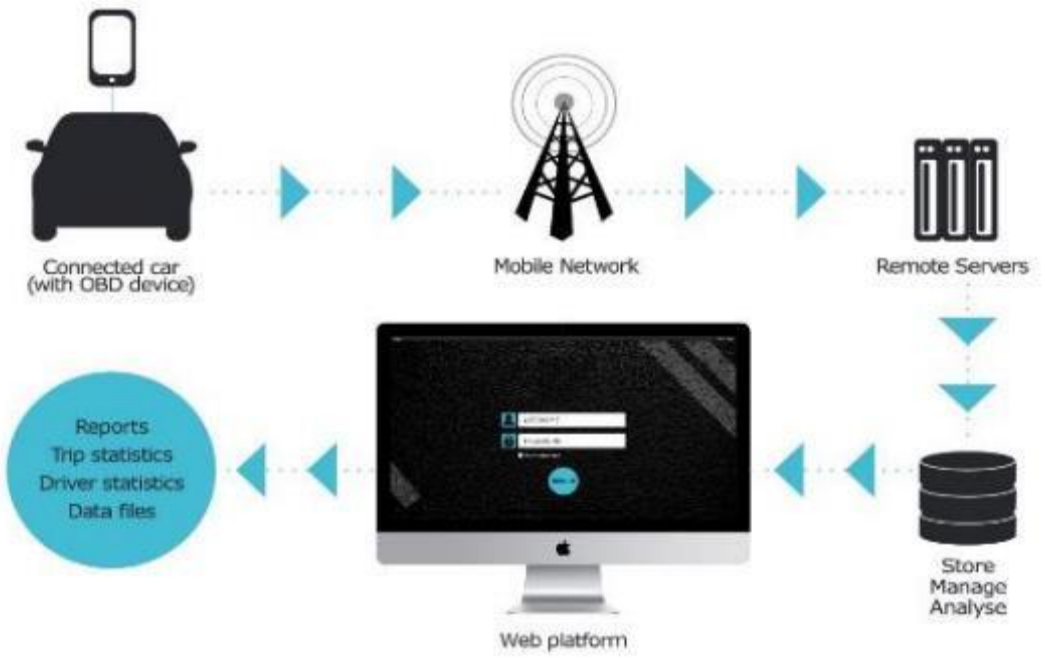
Source: OSeven Telematics

Data flow

- Data is stored in a sophisticated **database** where managed and processed

- **Indicators** result from the mobile phone data process using machine learning algorithms and data mining techniques

- Results **Visualization**
  - Mobile App
  - Web Portal



Source: OSeven Telematics

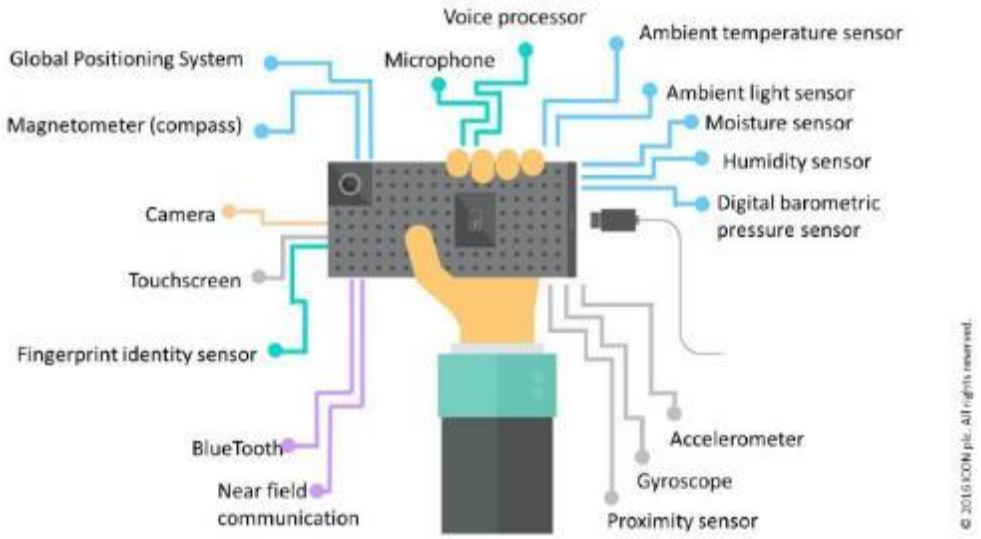
Smartphone data

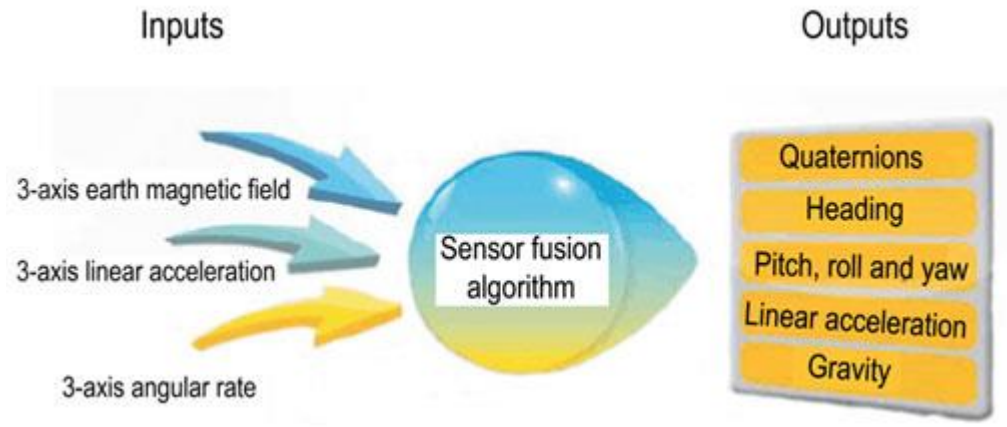
- Indicatively, mobile phone integrates **technology sensors**:
  - Accelerometer*
  - Gyroscope*
  - Magnetometer
  - GPS (speed, course, longitude, latitude)

- **Fusion Data** provided by iOS and Android:
  - Yaw, pitch, roll
  - Linear acceleration*
  - Gravity*

  *(x, y, z components)

- **Recording** at a maximum frequency of 1Hz





Methodological challenges (1/2)

Risk exposure indicators:

- Total distance (mileage).
- Driving duration
- Type(s) of the road network used (given by GPS position and integration with map providers e.g. Google, OSM)
- Time of the day driving (Rush hours, Risky hours)
- Weather conditions
- Trip purpose

combined with **other data sources** (speed limits and detailed accident maps).

Methodological challenges (2/2)

Driving behaviour indicators:

- **Speeding** (duration of speeding, Speed Limit exceedance etc.)

- Number and severity of **harsh events**
  - Harsh braking (longitudinal acceleration)
  - Harsh acceleration (longitudinal acceleration)
  - Harsh cornering (angular speed, lateral acceleration, course)

- Driving **aggressiveness** (e.g. braking, acceleration)

- **Distraction** from mobile phone use

Main findings

Speeding behaviour is found to be correlated with several other driving behaviour parameters:

- Frequency and severity of **harsh events**:
  - Acceleration
  - Deceleration
  - Cornering
- Driving **aggressiveness** during the trip (e.g. acceleration profile)
- **Mobile phone** usage

- Total **Mileage**
- **Traffic** conditions
- **Route** frequency

Future challenges (1/2)

Monitoring driver behaviour through mobile phones makes gradually possible the continuous driver assessment, opening **a new great potential for traffic and safety behaviour improvement**, used either:

- **Independently by the drivers** in order to:
  - raise awareness and engagement on safe and eco-driving
  - receive feedback and support on driving performance and risks

- Through **customized insurance schemes** by correlating driving exposure and behaviour with insurance premiums:
  - pay-as-you-drive (PAYD)
  - pay-how-you-drive (PHYD)

Future challenges (2/2)

Advanced **machine-learning algorithms**

Big data analysis – handling - mining

Correlation between accidents and driving indicators

Developing **user-friendly Apps** for driving recording

User **engagement**

Battery consumption

Personal data **privacy**

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