Key road safety and telematics data

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Introduction

- Road traffic injuries are a leading cause of death for people of all ages and the number of road fatalities in several countries remains unacceptable
- However, budgets for road safety measures are limited, and decision makers and road safety stakeholders worldwide have to decide about the most effective use of available funds
- Quantitative road safety analysis methodologies have been developed over the years, to enhance evidence-based decision making
- Common ground of most such methods is the necessity of high quality data on:
  - road crashes and related casualties
  - traffic attributes
  - infrastructure geometric characteristics
  - naturalistic driving metrics through smartphone applications and On-Board Diagnostics (OBD) systems

Research Projects

www.nrso.ntua.gr/i-safemodels/ www.smart-maps.gr www.besmart-project.gr www.ecodrive-project.com www.idreamsproject.eu https://phoebe-project.eu/

Crash Data

- The Hellenic Statistical Authority maintains the official road crash database in Greece
- Data collected by the Police in standardized templates and checked and codified by the Hellenic Statistical Authority
- The database includes road crashes in which at least one involved road user was injured (slightly/seriously) or killed (e.g. property damage only (PDO) crashes)
- The variables included in the database are grouped by:
  - Crashes' characteristics (e.g. year, month, date, hour, location, area type, road code, number of fatalities, serious or slight injuries, pavement type, weather conditions, night lighting, etc.)
  - Involved road users' characteristics (e.g. road user type, gender, age, nationality, use of protective equipment, injury severity, position in vehicle, purpose of trip, etc.)
  - Vehicles' characteristics (e.g. vehicle type and usage, vehicle plates nationality, year of registration, technical inspection, number of drivers and passengers, result of alcohol test, driving license, etc.)

Traffic Data

- No official national database in Greece for traffic data, either Annual Average Daily Traffic (AADT) volumes or traffic synthesis
- Regularly updated datasets exist only for some urban areas and for toll-operated motorways (not always available to researchers and practitioners)
- Traffic data on national and/or regional rural roads are collected on a per-case basis by regional road authorities (Olympia Odos Operation SA), commonly using spot traffic counts
- The lack of traffic data is an important obstacle in road infrastructure safety research and safety analysis
- The characteristics on traffic synthesis (e.g. passenger cars, buses, light trucks, 2 or 3-axes heavy trucks and heavy trucks with trailers) may also provide qualitative information for the causes of road crashes during the road safety inspections
- On toll-operated motorways, toll stations data can provide a very comprehensive and detailed dataset for traffic volumes and synthesis

Geometric Data

- The development and application of crash prediction models and road safety assessment techniques is closely related to the availability of geometric design data:
  - horizontal and vertical alignment
  - cross section elements
  - roadside conditions
  - other road features and equipment

- The correlation of geometric design data with crash data, while also considering exposure (i.e. traffic data) is a fundamental element of quantitative road safety analysis

- Potential road geometric design data sources commonly include:
  - national road authorities databases
  - data from vehicle mounted cameras and road survey vehicles
  - data from High Definition (HD) maps
  - Open GIS road geometry data, CAD, Google Earth

Telematics Data

- Naturalistic driver behavior data are recorded via a smartphone application and processed in the platform, both developed by OSeven
- Drivers install the application developed by OSeven on their smartphones and subsequently engage in normal driving activities
- The application engages automatically when driving is initiated and records different data types, such as vehicle location, average speed, speeding, duration of average speeding, count of trips with speeding, acceleration, deceleration, duration of engagement with the mobile phone, etc.
- These data are further processed to develop metrics to describe driver behavior
- Apart from such characteristics, in recent years, increased attention has been given to Surrogate Safety Measures (SSMs), which are parameters that describe attributes of the network or of the vehicle movement on roads and do not stem directly from or rely on crash data

OBD Data

State-of-the-art technologies and OBD systems are utilized to monitor driving performance indicators:

- The Mobileye system is as a sensor network that measures parameters, like headway distance, lane and pedestrian detection collisions, etc.

- Driven telematics using smart digital dash cameras located inside the vehicle (e.g. road-facing cameras) allows the kind of data insights to be gleaned that can improve driver safety and performance

- The Cardio gateway is designed as a plug & play connection hub and customized Internet of Things (IoT) edge processing unit that allows continuous aggregation of data from the driver's state monitoring sensors, driving/vehicle parameters, road/context monitoring devices, via CAN and serial interfaces

Discussion

Several computer science, telematics and societal advancements aid road safety data collection:

- Rollout of 5G/6G technologies facilitates data transmission and manipulation
- Internet of Things (IoT) progressively brings new opportunities and possibilities (cross-device connectivity)
- Affordable On Board Diagnostic (OBD) systems
- Wide penetration and adoption of smartphones
- Powerful cloud computing, computer hardware and analysis tools
- Competition and a wide market offers sustainable pricing

Conclusions

- Consideration of road safety on a global level
  - Address knowledge gaps in the generalization of road safety research results
- Improvement of decision making practices
  - Development of models to be used as quantitative tools in decision making
  - More effective exploitation of available funds for road safety, e.g., selection of more promising countermeasures
- Reduction of road casualties
  - Improved road infrastructure safety management

Future Challenges

- Enhance the integration of crash prediction modeling techniques at various levels (macro -, meso -, and micro-scopic) to enable advanced road safety modeling internationally
- Improve road safety data collection and management, particularly at the microscopic level
- Encourage Road Authorities and Operators to use Crash Prediction Models as a decision making tool for road safety

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