Australian Naturalistic Driving Study (ANDS): Using 20,000 trips to get a glimpse at locations and speeds where data was collected

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Abstract

The Australian Naturalistic Driving Study provides immense opportunities for further understanding driver behaviour. Data collection being now completed, and a large subset of the data becoming available to researchers, it becomes important to look at what is available in the data. This paper presents a first attempt to develop a scalable approach for analysing data, by looking at the particular case of vehicle speed and driving location. A preliminary spatial database was created using ~20,000 New South Wales trips, and GPS points were map matched to Australian roads. This approach provides opportunities for studying locations where NSW drivers over-speed.

Background

The University of New South Wales leads a consortium conducting a large collection of naturalistic driving in Australia, also known as the Australian Naturalistic Driving Study (ANDS) [1]. This study aims at better understanding how drivers behave by collecting continuous data from a set of private vehicles equipped with a Data Acquisition System (DAS) every time they are driven. This DAS is composed of a unique system of sensors and data loggers providing acceleration in multiple axes, gyroscopic motion, indicator status, speed, radar, and GPS position. The purpose of this paper is to present preliminary results obtained on a large subset of the ANDS dataset and highlight research directions that could be followed to investigate drivers' speeding behaviours.

Method

Data collection was conducted with 360 volunteer (half from New South Wales and half from Victoria) drivers for 4 months each. A random subset of 18,613 of the NSW trips (out of the 145,000 trips available as of September 2017) was downloaded from the servers storing the ANDS data. Sensor data were recorded at 10 Hz. A schema was developed with the database management system PostgreSQL [2]. The library of spatial database functions PostGIS [3] was added to the database in order to be able to create location-aware queries. Maps of Australian roads obtained from OpenStreetMaps [4] were also imported in the database, and used for map matching. Map matching was performed by finding the closest road which had a direction within 25 degrees of the heading of the vehicle, as described in Wu and McLaughlin [5].

Results

The 18,613 trips analysed provided a total driving time of 4,700 hours, equating to an average of 15 minutes of driving time per trip. Data was largely collected in urban areas (local government areas of type *City* using the ABS terminology), with a more limited amount of rural driving (*Areas*). The locations where data were recorded are shown on Figure 1 by postcode. Figure 1 also reports the speeds as measured in a selected area of the data collection. For visualisations, Figure 1 is presented as heat maps.

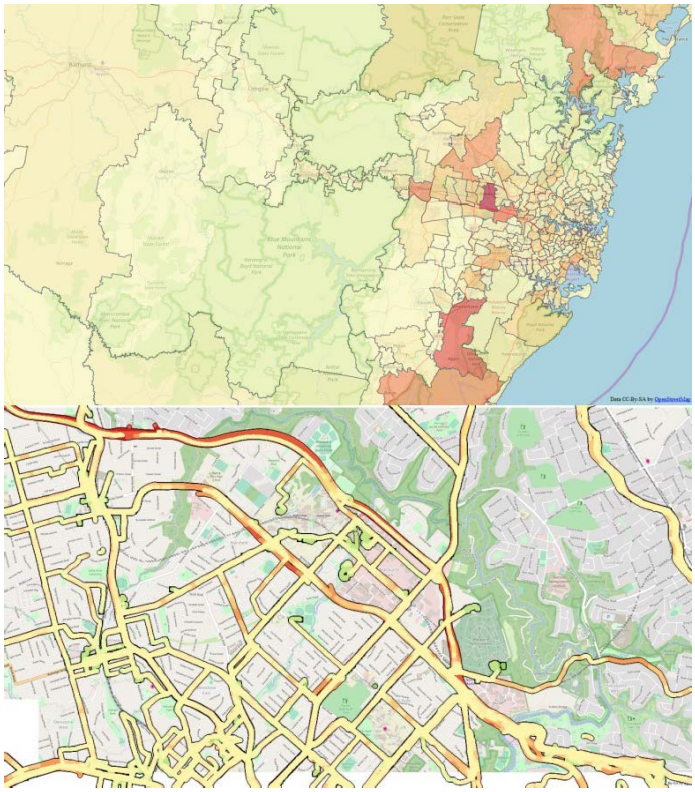

Figure 1. **View of where NSW data was collected by postcode and density (top), and speed profile of a selected Area close to Sydney (bottom)**

Conclusion

This paper presented a methodology to look at the ANDS data once all the data is available for research. The approach taken is scalable to the large amount of data recorded, and similar approaches have been already successfully applied by the American naturalistic study [6]. By combining the current results with speed limits obtained from OpenStreetMap, combined with the NSW speed zoning guidelines when data are missing, research can be conducted for understanding where and under which conditions driver over-speed. Adding the position of automated enforcement cameras, information which is also publicly available, provides opportunities for understanding further the effectiveness of such intervention.

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