Creating Textual Driver Feedback from Telemetric Data

Daniel Braun
Department of Computing Science
University of Aberdeen
Aberdeen, UK
r01db14@abdn.ac.uk

Abstract
Telematics car insurances are enjoying growing popularity. Although the data collected by these insurances provide detailed information about the driving style, this information is usually kept away from the driver and is used only to calculate insurance premiums. In this paper, we propose an NLG system, which uses these data to generate feedback on driving style in order to improve road safety.

1 Introduction
Modern cars are often equipped with numerous driving assistance systems. The majority of these systems give instant non-textual feedback on incidents like speeding, unintentional lane change etc. In contrast there is a growing number of so called telematics insurances, which collect data over a longer period of time. Insurance companies use these data to create individual risk profiles about customers, based on their driving style. However, the feedback they give to their customers, if they give any feedback at all, is often very general. AXA Drivesave\(^1\), for instance, gives feedback in form of scores (from 0 to 100) in general categories like “pace” or “smoothness”.

Although earlier work, like (Reiter et al., 2003), has shown that behaviour changes are difficult to achieve, we believe that concrete individual driver feedback, based on telematics insurance data, could contribute to a more secure driving style. Some projects with focus on ecological driving, like (Tulusan et al., 2012), (Boriboonsomsin et al., 2010) and (Endres et al., 2010) have already successfully used non-instant feedback on driving behaviour in order to influence the driving style.

2 Data Corpus
Insurance companies use two different approaches to collect their data: They either use permanently installed sensors, often called black boxes, or smart phone applications. In both cases GPS timestamp and position as well as acceleration data are logged. We decided to use a smart phone application to build the data corpus, as this method is less intrusive and therefore drivers are more likely willing to participate.

Our data corpus so far consists of about 400 road miles, driven by five different drivers in three different countries.\(^2\) Table 1 shows an example of the data logged by the acceleration sensor, table 2 shows data logged by the GPS receiver. Additional information that is needed during the evaluation, like street names, street types and speed limits, are obtained from OpenStreetMap, with the use of Nominatim\(^3\) for reverse geocoding.

3 Detection of Relevant Behaviour
In order to decide which behaviour is relevant and should be communicated to the user, we took different points of view into account. Insurance companies, for instance, are interested in speeding, the time of day, acceleration, braking, elapsed distance and other information (cf. (Handel et al., 2014)), whereas the police is mainly interested in speeding and driving instructors are interested in speeding and acceleration and braking behaviour.

We decided to concentrate on speeding, acceleration and braking. Although we try to follow the rating schemes used by the insurance companies, we also have to take into account how big the influence of the driver is on the different metrics. If someone, for instance, has to get to work early, it would be neither helpful nor motivating to tell

\(^1\)https://play.google.com/store/apps/details?id=com.mydrive.axa.drivesave
\(^2\)A subset of these data was already used in (Braun et al., 2011).
\(^3\)http://wiki.openstreetmap.org/wiki/Nominatim
Table 1: Data logged by the acceleration sensor

<table>
<thead>
<tr>
<th>date</th>
<th>time</th>
<th>x</th>
<th>y</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.01.2015</td>
<td>12:07:10.838</td>
<td>1.4939818</td>
<td>2.1068976</td>
<td>9.768343</td>
</tr>
<tr>
<td>08.01.2015</td>
<td>12:07:10.858</td>
<td>1.4556746</td>
<td>2.183512</td>
<td>9.730036</td>
</tr>
<tr>
<td>08.01.2015</td>
<td>12:07:10.879</td>
<td>1.6472107</td>
<td>2.1452048</td>
<td>9.653421</td>
</tr>
</tbody>
</table>

Table 2: Data logged by the GPS receiver

<table>
<thead>
<tr>
<th>compass</th>
<th>lat</th>
<th>lon</th>
<th>accuracy</th>
<th>timestamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>276.29852</td>
<td>57.16042614</td>
<td>-2.09462595</td>
<td>10.0</td>
<td>1420718831921</td>
</tr>
<tr>
<td>275.78833</td>
<td>57.1604265</td>
<td>-2.0946818</td>
<td>6.0</td>
<td>1420718832933</td>
</tr>
<tr>
<td>274.47893</td>
<td>57.16042663</td>
<td>-2.0946828</td>
<td>6.0</td>
<td>1420718833934</td>
</tr>
</tbody>
</table>

him, he should not drive too early in the morning, because that will raise his insurance premiums.

As we try to achieve a long-term behaviour change, we want to detect recurring behaviour patterns, rather than single incidents. Therefore we try to aggregate relevant behaviour by features like street name, street type, time of the day or speed limit. So that we can report recurring behaviour, like “You often speed in residential areas”, rather than report a single incident at a specific time and place.

4 Report Formats

At the moment we are planning to give feedback reports on a weekly base, containing feedback about the driving behaviour during the past week and a comparison to previous weeks.

These reports could be either plain text or could contain multimedia elements, like a map with a visualization of single incidents. As the reports will have a limited length, incidents will be ranked by importance and only incidents that exceed a certain threshold will be communicated.

5 Conclusion and Outlook

We presented the idea of an NLG system that provides textual driver feedback based on telematics insurance data. The goal of this system is to influence driving behaviour, regarding to driving safety.

At the moment we are only at the beginning of the development of such a system and we still try to design suitable metrics for the relevance ranking of different behaviours.

In the end, a user evaluation will have to show if this form of driver feedback is considered to be helpful and if the prospect of lower insurance premiums and saver driving is sufficient to motivate drivers to change their behaviour.

References


Christoph Endres, Jan Miksatko, and Daniel Braun. 2010. Youldeco-exploiting the power of online social networks for eco-friendly driving. In Adjunct proceedings of the 2nd International Conference on Automotive User Interfaces and Interactive Vehicular Applications (AutomotiveUI 2010), page 5.

