Data Analytics - Measuring Habit Variations to Identify Drivers

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Objective and Background
- Chronic illness is increasing and impacts driving.
- Clinicians must report driving concerns
- No agreed standardized tests for driving risk.
- In-car “black box” data provides new data source
- Vehicles are typically shared by multiple drivers
- This project explores the identification of a driving signature to distinguish between drivers and to provide a foundation for future analysis of driving signature change as a predictive tool of driving ability.

Methodology
- Collaboration with Candrive project at OHRI:
  - Candrive is in the 5th year of collecting GPS and Engine Computer data
- Analyze for attributes that distinguish drivers
  - Trip measures: Time of day, Distance, Duration
  - Driver choices: Road types (city, highway)
  - Driving habits: Velocity, Acceleration, Throttle use, Speeding
- Techniques and goal
  - Use signal processing and data analysis
  - Identify features that distinguish drivers
  - Build towards a driving signature tool

The Data Set
- Over 1000 drivers enrolled in program in Canada, Australia and New Zealand.
- For Ottawa drivers – now collecting the 5th year data. On average ~1000 hours of driving collected for each enrolled vehicle
- Global data set ~1TB

Analysis
- Histogram of trip durations for the 100 trips for each of the participants shown on two different scales. Driver 1 - dark blue, 2 - light blue, 3 - yellow, 4 - red.

Summary demographic information for the Ottawa Candrive participants at entry to the project.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measure Value</th>
<th>Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Date/time (second)</td>
<td>GPS</td>
</tr>
<tr>
<td>Location</td>
<td>Latitude/Longitude</td>
<td>GPS</td>
</tr>
<tr>
<td></td>
<td>Fix accuracy</td>
<td></td>
</tr>
<tr>
<td>Velocity</td>
<td>km/hr</td>
<td>GPS</td>
</tr>
<tr>
<td>Speed Limit</td>
<td>km/hr</td>
<td>GPS/GIS mapping</td>
</tr>
<tr>
<td>Alerts</td>
<td>text (e.g., school zone)</td>
<td>GPS</td>
</tr>
<tr>
<td>Trip Data</td>
<td>Trip counter</td>
<td>OBDII recorder</td>
</tr>
<tr>
<td>Engine</td>
<td>Engine RPM</td>
<td>OBDII recorder</td>
</tr>
<tr>
<td></td>
<td>Absolute throttle position</td>
<td></td>
</tr>
<tr>
<td>Speed</td>
<td>Vehicle speed sensor (dashboard)</td>
<td>OBDII recorder</td>
</tr>
</tbody>
</table>

Information captured by Candrive sensor system. All data captured at a 1Hz sampling rate.

Results
- Preliminary results show how the various analysis techniques create features that distinguish the differing driving habits and tendencies of drivers.
- Specifically the analysis shows differentiation potential of:
  - road choice (highway avoidance)
  - time of day of travel (night/high traffic times)
  - velocity and acceleration (driver habits)
  - velocity/posted limits (speed limit compliance)

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