Pixida I

Science Hack 2019 - Team Greta TUMberg
Problem Statement

• How can we make driving more eco-friendly?

• What makes a car ride detrimental to the environment?

• How can we use complex algorithms, gamification and user-friendliness to encourage good driving behaviour?

➡ Create a web app allowing users to track, share and compare their driving behaviours and examine methods to improve based on a calculated *Eco Score*
Software Stack

React JS

Python

Mongo

Here

Flask
Approach

• Calculate *Eco Score* per trip

• Examine *Eco Score* trend per user

• Social network enabling statistical comparison of *Eco Score* amongst friends and others

• Live track an ongoing trip:
  • Calculate live *Eco Score*
  • Communicate speeding, breaking and accelerating behaviour
  • Give live recommendations for improvement
The Algorithm (1)

- Sharp accelerations (AS) - \( a(t) > 1.1 m/s^2 \)
- Sharp deceleration (DS) - \( a(t) < -1.1 m/s^2 \)
- Long-Time Accelerations (LA) - \( T_a > 5 s \)
- Long-Time Idling (LI) - \( T_i > 60 s \)
- Low Speed (LS) - \( \text{avg}(v(t), \ldots, v(t - 59)) \leq 23 km/h \)
- Frequent Start and Stop (SS)
The Algorithm (2)

• High-Speed Cruising (HS)

(i) \(\text{avg}(v(t), v(t-1), v(t-2), v(t-3), v(t-4)) \geq 60km/h\)

(ii) \(\text{max}(a(t), a(t-1), a(t-2), a(t-3), a(t-4)) \leq 0.28m/s^2\)

• Starting Moderately (SM)

(i) \(10km/h \leq v(t) - v(t-4) \leq 20km/h\)

(ii) \(\text{max}(a(t), a(t-1), a(t-2), a(t-3), a(t-4)) \leq 1.1m/s^2\)

• Breaking Moderately (BM)

(i) \(-25km/h/s \leq s(t) - s(t-4) \leq -15km/h/s\)

(ii) \(\text{min}(a(t), a(t-1), a(t-2), a(t-3), a(t-4)) \geq 1.1m/s^2\)
\[ \text{Score}_E = 80.549 - 6.927F_1 + 1.455F_2 + 0.565F_3 \]

\[ F_1 = 0.181N_{\text{AS}} + 0.184N_{\text{DS}} + 0.187N_{\text{LA}} + 0.167N_{\text{LI}} \]
\[ + 0.195N_{\text{LS}} - 0.172N_{\text{HS}} - 0.01N_{\text{SM}} \]
\[ + 0.088N_{\text{SS}} + 0.06N_{\text{BM}} \]

\[ F_2 = 0.155N_{\text{AS}} + 0.227N_{\text{DS}} - 0.038N_{\text{LA}} - 0.175N_{\text{LI}} \]
\[ - 0.068N_{\text{LS}} + 0.138N_{\text{HS}} + 0.375N_{\text{SM}} \]
\[ - 0.322N_{\text{SS}} + 0.592N_{\text{BM}} \]

\[ F_3 = 0.145N_{\text{AS}} + 0.217N_{\text{DS}} - 0.129N_{\text{LA}} - 0.183N_{\text{LI}} \]
\[ - 0.136N_{\text{LS}} + 0.270N_{\text{HS}} - 0.681N_{\text{SM}} \]
\[ + 0.367N_{\text{SS}} + 0.369N_{\text{BM}} \]
Tweaking the Algorithm