Abstract

Smooth Route - Cyclist Routing With Crowd-Sensed Road Metrics

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The quality of a road is of great importance to cyclists, affecting their comfort and safety as well as the condition of their bicycle. Defective road segments lead to reduced safety and comfort, causing cyclists to swerve to avoid obstacles such as potholes and cracks that can cause punctures. Long stretches of uneven, deteriorated roads cause vibrations which can damage the bicycle.

Existing approaches to automate road assessment focus on using only a smartphone, these are not accurate, can be difficult to set up and they immobilise the users phone for the duration of the journey or they uses expensive embedded computers.

The aim of this project was to investigate if attaching a dedicated sensor to bicycles could accurately classify sections of roads. This approach attaches a custom 3-axis accelerometer in a 3D printed case to a bicycle that connects over Bluetooth Low Energy to the users phone where acceleration and GPS location data is stored. Data from the cyclists is uploaded to a central server where sections of roads are clustered and classified. The data is visualised and the user is can automatically find the smoothest route for their journey. The approach in this project allows for a simple set-up without heavily relying on a smartphone. 437 rides were recorded with 10 different users, this was done over a 5 month period, covering 3500 km and including 600 unique roads. This procedure was able to find anomalies to within under a meter of their true location and classify road segments into 3 distinct categories based off their average smoothness. A 93% agreement was found between ranking of roads with this system and the participants opinion.