Crack Detection on Pavement Range Images

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in case of any questions)

Introduction

Every year, billions of dollars are spent on the maintenance of the nation’s highways. Maintenance operation decisions are based on the condition of the roads (technically called pavements), which are surveyed regularly. With emerging sensing technologies and faster computers, many state DOTs are pushing towards automated methods of determining pavement condition.

Potholes are one of the important distresses found in pavements. Using accelerometer vibration to detect potholes is an active research topic. This homework will help you get an idea of the kind of signal processing work you could be involved with in our research team. It will also help you get familiar with the research problem and test your critical thinking abilities. Your task will be to process a noisy accelerometer signal to detect potholes as accurately as possible.

The tasks have been designed to be completed in MATLAB. MATLAB is available free for Georgia Tech students here. If you are not familiar with MATLAB, the video tutorials in the link are a good starting point to quickly learn MATLAB. If you do not have access to MATLAB, let us know and we will try to arrange an alternative.

The Data

A smartphone was attached to a vehicle. The vehicle was then driven on a road with potholes. The readings from the accelerometer of the smartphone was recorded. We would expect the potholes to appear as features in the accelerometer data. The figure below plots the linear acceleration in the upward direction and the features created by potholes. Study the figure carefully to infer the properties of features created by potholes and how these properties can be exploited to detect them.

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| The data has been provided in a CSV format. The table below gives a description of the columns. Column | Description |
| X | Linear Acceleration towards the right side of the vehicle (m/s2) |
| Y | Linear Acceleration towards the front side of the vehicle (m/s2) |
| Z | Linear Acceleration towards the upward direction + g (m/s2) |
| t | Time between this record and the previous record (ms) |