

**ASSIGNMENT SUBMISSION FORM**

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<b>Student Number:</b>	<b>SPO ID Number (Office use only):</b>	
<b>Course:</b>		<b>Level:</b>

MODULE	
<b>Module Code:</b>	<b>Module Title:</b>
<b>Lab / Assignment:</b>	<b>Deadline:</b>
<b>Lab group (if applicable):</b>	<b>Date Stamp (Office use only):</b>
<b>Academic Responsible:</b>	
<b>Administrator:</b>	

**Please note:** that detailed feedback will be provided on a feedback form.

✂.....

RECEIPT SECTION (Office Copy)	
<b>Student Number:</b>	<b>SPO ID Number (Office use only):</b>
<b>Student First Name:</b>	<b>Student Last Name:</b>
<b>Module Code:</b>	<b>Module Title:</b>
<b>Lab / Assignment:</b>	
<b>Lab group (if applicable):</b>	<b>Deadline:</b>
<b>Academic Responsible:</b>	<b>Number of Days late:</b>

DECLARATION	
I have read and I understand the guidelines on plagiarism and cheating in the Handbook and I certify that my contribution to this report fully complies with these guidelines. I confirm that I have kept a copy of my work and that I have not lent my work to any other students.	
<b>Signed:</b>	<b>Date Stamp (Office use only):</b>

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BRUNEL UNIVERSITY LONDON

COLLEGE OF ENGINEERING, DESIGN AND PHYSICAL SCIENCES  
DEPARTMENT OF ENGINEERING AND DESIGN

ASSIGNMENT  
WORKSHOP EE5571

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# Embedded Systems

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Year of Submission: 2018

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## Abstract

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# 1 LapOps

## 1.1 Introduction



## 2 System Analysis

### 2.1 Use Cases

## 3 Mathematical Models of Identifying Sections

### 3.1 DataModification

#### 3.1.1 DataModel

#### 3.1.2 Smoothing

#### 3.1.3 Savitzky-Golay Filtering

## 3.2 Section Identification

The following section will describe the solution for the identification of sections. And is split into two parts. The first explains the rough identification of sections. These sections will then be given to a classification method that clearly identifies the type of section, be it a curve or a straight line.

### 3.2.1 Identification

The identification is split into three parts that will be executed serial. After smoothing and filtering of the dataset. The x-axis acceleration values will be split into two groups. This split is happening with a singular x value representing a threshold. In the positive and negative acceleration range. A visual representation of the threshold can be seen in figure 3.1. in this case, the threshold is set to 3.5. All points below the lower bound and above the upper bound will be grouped inside a dataset, while all the points in between are grouped in another.

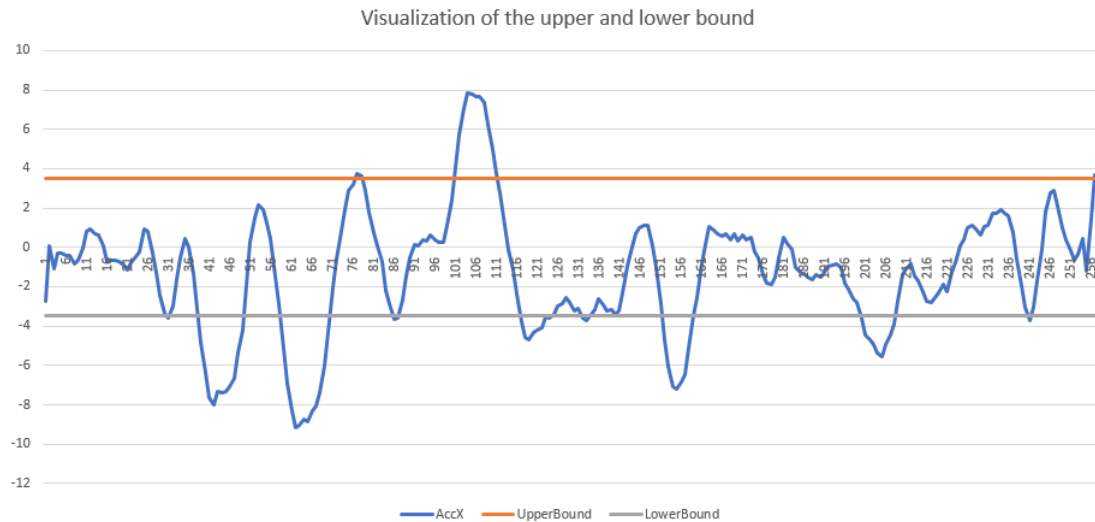


Figure 3.1: Visualization of the thresholds for the upper and lower dataset

After separating the datasets with the threshold, the points above the threshold are considered as expected curves. Therefore it is cleaned in a second step. Because a curve cannot be created with only one point above the threshold, single points will be put back into the dataset in between the thresholds. The last step is grouping the points into sections. The points in between are created

as new sections with ten points. A section, that is above the threshold will be created with the first point above and the last point above.

### **3.2.2 Classification**

## **3.3 Section Rating**

Because the focus of our project was the identification of sections, the section rating part contains a simple implementation. The core principle is determining the fastest lap and comparing the time footprint of the other sections to the sections of the fastest lap. The following

# 4 LapOps Application

## 4.1 How to use it

## 4.2 Additional Information

## 5 Conclusion