MEASUREMENT OF ROAD PAVEMENT SURFACE UNDULATIONS USING A LOW-COST ACCELEROMETER SENSOR

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Degree of M.Eng in Highway & Traffic Engineering

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DECLARATION

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis/dissertation, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

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Signature of the supervisor: Date:

ABSTRACT

Pavement roughness measurement is one of the four parameters of measuring the pavement condition evaluation, i.e., Pavement roughness measurement, distress condition evaluation, skid resistance, and structural capacity evaluation.

This research aims to improve IRI measurement accuracy by smartphone method using a low cost, off the shelf accelerometer without compromising the cost aspect. This method collects data from an accelerometer fixed to a vehicle axel. Since the vehicle's shock absorbers do not damp the measurement, the readings are much more realistic. Data is then forwards to a machine-learning algorithm to analyze the collected data and predict the road condition. This algorithm should be trained using a training data set before using, which involves collecting and labelling data according to prior knowledge and previously collected data. The training was done by collecting data using a smartphone application and manually marking the data points. Then this data was separated as training and testing data as appropriate, and training data was fed into the algorithm with the manually labelled data as a reference. After training the algorithm, the testing dataset was provided to the model to measure the accuracy.

The second part of the research was carried out to train the algorithm on detecting potholes without human involvement. For this, the data collection application was slightly modified to label the pothole data points. Then the previous training and the testing method were carried out.

Accurate results were observed during both instances regarding the labelled data. It was found that more training data makes the prediction model more accurate.

Since this is a low-cost method to determine the road surface condition, local road authorities can implement this as a network to collect real-time data and carry out future road maintenance works effectively.

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