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| SMART INDIA HACKATHON – 2020 |
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| January 15  Team Name Here |

Automatic Assessment of Pavement condition based on road photographs

# Automatic Assessment of Pavement condition based on road photographs

Smart India Hackathon – 2020

Problem Statement Description

Works constructed under the PMGSY scheme are to be maintained by the contractor as per the PMGSY guidelines. Pavement Condition Index is required to be performed to identify the road condition and further to take the maintenance or upgradation of the work. Through EMARG and PMGSY-III, NRIDA has collected a vast collection of pictures of roads. These pictures are collected while doing inspection of roads or collection of PCI through visual inspections. An AI assisted module would be able to automatically assess the picture and identify common issues such as shoulder clearance, potholes, road furniture etc. Requirement is of a solution where there should be a provision to capture the chainage wise pavement condition index. Use of open source software and existing neural network is encouraged. Train a machine learning model, computer vision etc. which is able to identify common issues with pavement based on photograph(s) per road alone.

PS Number: MK199

Datasets: Annotated images by NRIDA

**Abstract**

Various research on damage detection of road surfaces using image processing techniques has been actively conducted, achieving considerably high detection accuracies. So far, most studies focus only on the detection and labelling of the type of damage present in the image. However, in real-world scenarios, road inspection performed by the government for maintenance requires parameters like Pavement Condition Index (PCI) which is identified by surface condition, riding comfort, and Normal Driving Speed.

In this project, we accomplish the following two tasks to address this issue. Firstly, we use a pre-trained model to detect and localize different types of surface road damage with high accuracy. Second is to find the PCI for the road with the help of detected damages.

**Introduction**

• Pavement Condition Index (PCI)

The pavement condition index (PCI) is a simple, convenient and inexpensive way to monitor the condition of the surface of roads, identify maintenance and rehabilitation (M-and-R) needs as well as ensure that road maintenance budgets are spent wisely. The PCI provides a numerical rating which ranges from 0-100 for the condition of road segments within the road network, where 0 is the worst possible condition and 100 is the best.

• How is PCI calculated?

A PCI is developed based on visual inspection and observation. An inspector notes down the frequency and severity of specific surface defects on the checklist. Each type of surface distress is given a weight to reflect its importance in a rehabilitation strategy and the weighted average is used for numerical rating. The inspector also rates the Comfort Rating at posted speed, assigning it a numerical rating between 0 and 10.

**Approach**

* First step is to explore the dataset and experiment various pre-processing techniques
* From the results of various research paper, we conclude that among the state-of-the-art object detection methods, the **SSD using Inception V2** and **SSD using MobileNet** are those with ***relatively small CPU loads*** and ***low memory consumption***, even while maintaining ***high accuracy***. We also train our custom object detector using other DL architectures like the YOLO v3, VGG – 16 to identify which framework results in high accuracy on the test set.
* To develop an algorithm to calculate PCI for a sample of road images taken over a fixed distance as mentioned by the PSMGY scheme.
* We deploy the model using a mobile application that allows the road inspection officials to feed in the captured video of roads and obtain the results without any hassle.
* We also propose a completely new system integrated with **GPS**,in which the users will be able to view the quality of roads in real time thus and will be **warned in real time**, thus decreasing the cases of fatal accidents.

Reference: