ESTIMATE CHARACTERISTICS OF OPEN GRADED FRICTION COURSES BY DIGITAL IMAGE ANALYSIS

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DECLARATION

I declare that this is my own work and this thesis 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.

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The above candidate has carried out research for the Master of Science under my supervision

Name of the supervisor: Prof. W. K. Mampearachchi

Signature of the supervisor: Date: 17/12/2021

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ABSTRACT

The application of Open Graded Friction Courses (OGFC) as a pavement material has become a suitable solution for areas with high rainfall intensities. Since, OGFC material can act as a function-oriented pavement material to enhance permeability, reduce noise, and introduce more friction, improving the properties OGFC asphalt material to meet the requirements has drawn the attention of researchers in the last few decades. It is evident that the existence of a complex interconnected void network in OGFC has directly affected the durability and the permeability of the mixture. Further, the interconnected void network entirely depends upon the internal aggregate arrangement. Therefore, the identification of the internal arrangement of aggregates is very important to understand the void structure and improve the performance of designing OGFC. The lack of availability of quality controlling tools in the industrial construction stage leads to the occurrence of defects at the service stage and most of these issues can be minimized by investigating the internal structure of OGFC. This study presents a cost effective, rapid Digital Image Processing (DIP) method to determine the internal aggregate structure and the gradations of a core sample during the design and construction stages. Further, the proposed method enables the identification and quantification of segregation variation, internal voids and material distribution along the depth of the specimen. Experimental program of the study majorly included permeability test and durability test to compare the analytical results obtained for validation and justification. The internal aggregate structure data was collected by capturing cross section images in order to introduce a feasible way of implementing a gradation analysis. The cross sectional details were analysed to obtain details of areas, lengths and coordinates by developing an algorithm in MATLAB software. MATLAB was also used to obtain 2D aggregates structures and 3D models of specimens were constructed by using the python tool “plotly” on “Anaconda” platform. This research provides fundamentals to interpret and analyse data using DIP to construct the internal aggregate structure of OGFC specimens to identify and quantify deviations by the means of gradation, segregation and voids.

Keywords: Digital Image Processing, Gradation, Internal Structure, MATLAB, OGFC

LIST OF PUBLICATIONS

Conference Publications

1. Title: Analysing the Durability and the Lateral Drainage Characteristics of Open Graded Friction Course Pavement

   Conference: International Conference on Civil Engineering and Applications 2019

Journal Publications

1. Road Materials and Pavement Design (Under Review)
   Title: Analysis of the Spatial Distribution of Aggregate Gradations of Open Graded Friction Courses by Digital Image Processing

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