AN IMPROVED METHOD FOR AUTOMATED EVALUATION OF CRITICAL ROAD SURFACE DISTRESSES USING VIDEO IMAGE BASED TECHNIQUES

by

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Submitted

in fulfillment of the requirements of the degree of

DOCTOR OF PHILOSOPHY

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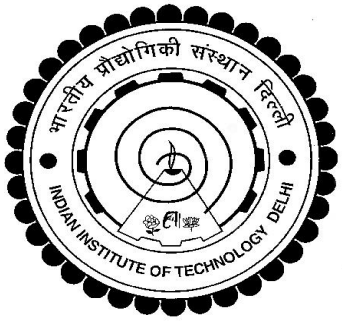

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DEDICATION

This thesis is dedicated to my father (late) **Sh. Huidrom Mangi Singh** who couldn't be here to see this day……

CERTIFICATE

This is to certify that the thesis entitled ***" An Improved Method for Automated Evaluation of Critical Road Surface Distresses using Video Image based Techniques"*** being submitted by Huidrom Lokeshwor Singh to the Indian Institute of Technology, Delhi, for the award of the degree of **Doctor of Philosophy** is a record of bona-fide research work carried out by him.

Mr. Huidrom Lokeshwor Singh has worked under our guidance and supervision, and has fulfilled the requirements for the submission of this thesis, which to our knowledge has reached the requisite standard.

The results presented in this thesis have not been submitted in part or in full, to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

The assessment of road surface distresses is an essential part of a road maintenance management system for developing repair and maintenance strategies. Cracks, potholes and patches are some types of bituminous road surface distresses whose evaluation is essential in India. In the current field practices, road distress data collection is increasingly being automated by using various imaging systems. However, the analysis of the collected road video data for distresses evaluation is still largely being done manually. This is slow, expensive and limits the road maintenance management. The key challenges before us are the automated segmentation and classification of road surface distresses from real life video clips of Indian road surfaces.

This thesis proposes an improved method for automated detection, measurement and classification of critical road surface distresses from real life video clips of Indian highways having bituminous or asphalt pavement. The video clips are captured by different camera based imaging systems without any artificial lighting. Through a heuristic examination of video clips, a decision logic is developed. This decision logic is based on three distinctive visual properties of cracks, potholes and patches that appear in bituminous road surface video image viz. image texture, shape factor and dimension. The logic is used for developing a set of computational methods for identifying stretches of road that are distressed and further automatically detailing the distress into cracks, potholes and patches. To validate the developed method, the computational results obtained by implementing the developed method is evaluated and compared with the methods presented by earlier researchers as well as current practice in the field. This doctoral research has led to the development of an automated critical distress evaluation system for assessing road condition more economically, efficiently and accurately. This thesis outlines, discusses and details the methodology and the techniques that led to the analytical computational procedures that encompass the automated improved method.

TABLE OF CONTENTS