OPTICS BASED LOW COST FULL-FIELD IN-PLANE DISPLACEMENT MEASURING TECHNIQUE

A. Diluxshan 168018G

Master of Science of Engineering

Department of Civil Engineering

University of Moratuwa

Moratuwa

Sri Lanka

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A. Diluxshan 168018G

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Supervised by Dr. H.M.Y.C. Mallikarachchi

Department of Civil Engineering

University of Moratuwa

Moratuwa

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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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…… Date: October 23, 2017
Dr. H.M.Y.C. Mallikarachchi

ABSTRACT

Optics Based Low-cost Full-field In-plane Displacement Measuring Technique

Displacement/strain measurement plays a significant role in understanding structural and material behaviour. In the local context, commonly used contact based systems have a major limitation when it comes to measuring deformation of a surface. A measuring probe can record the displacement/strain only at a single location and hence require a larger number of pre-defined measuring points in order to calculate the deformation of the surface. Furthermore, the comparative stiffness between the measuring probe and the object under consideration has to be significantly larger. A non-contact optic based system is an ideal candidate for overcoming the problems encountered in such systems.

This research attempts to utilize image processing techniques in order to develop a low cost non-contact based deformation measuring technique to measure the in-plane deformation of an object. A set of pre-defined measuring points (targets) were marked on specimen surfaces and a series of images with a commonly available camera was taken while applying a load. The images were then processed using the image processing tools available in MATLAB software to track the motion of predefined targets. The calculated displacements were validated against the physical measurements taken during the bending test.

Key Words*: digital image correlation, DIC, image processing, non-contact measurements, pattern matching*

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

DIC	Digital Image Correlation
ROI	Region of Interest
DOF	Depth of Field