

UNIVERSITI TEKNOLOGI MARA

**OPTICAL TACTILE SENSOR FOR
ROBOTIC ASSISTED SURFACE
CHARACTERIZATION**

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Thesis submitted in fulfilment
of the requirements for the degree of
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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 16th October 2015 to conduct the final examination of Amir Bin Abd Latif on his Master of Science thesis entitled “ Optical Tactile Sensor for Robotic Assisted Surface Characterization” in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The panel of Examiners recommends that the student be awarded the relevant degree. The panel of examiners was as follows:

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I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

Tactile sensory information is an important design criterion in designing algorithm for robotic manipulation or physical interaction with surrounding environment. Nowadays, several basic sensing principles are commonly used in tactile sensor such as piezoelectric sensor, capacitive sensor, inductive sensor and opto-electrical sensor. However, there are still lack of information that can be obtained from these tactile sensors especially for surface characterization. The aim of this research is to develop a new automated technique for an optical tactile sensor in measuring normal and shear force for surface characterization. A new mathematical modelling and computer algorithm is developed and calibrated which are based on image processing methods. The forces were calibrated by analysing the captured deformation image of the silicone tactile sensor inner dome using camera, fibre-scope and light source. The tactile sensor is designed similarly like a human finger and it was made from silicone rubber. Then, the tactile sensor is attached to the end effector of the CRS Catalyst 5 Robot arm for surface characterisation. Based on the information of the processed images, the result of the surface characterisation with respect to the force value is obtained. The result of this research work will improve the use of silicone based optical tactile sensor in robotic manipulation for surface characterization. The tactile sensor can characterize the surface condition with forces information of soft, hard, smooth and rough surface which is non-existent in the previous tactile sensor.

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