

UNIVERSITI TEKNOLOGI MARA

FEATURE IDENTIFICATION IN
AREAL SURFACE METROLOGY
ANALYSIS BY MEANS OF DOUBLE
ITERATION SOBEL (DIS)

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of the requirements for the degree of
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AUTHOR'S DECLARATION

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.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The study of areal surface metrology analysis focuses on feature identification to assist feature extraction procedure is crucial since it will help to enhance the essential features found on the surface. Although there are many feature identification and feature extraction procedures to identify and extract the features on the surfaces based on segmentation methods as presented in previous studies, problem arises when most of them are unable to fulfil the requirements when being implemented on a particular surface topography such as unable to point out at which exact data points the edges features are actually located. Thus, an approach of Double Iteration Sobel (DIS) has been introduced and highlighted by considering the effects of existing surface feature identification and feature extraction procedures. The aim of this development is to increase the accuracy and stability of the edges features identification to be close to human perception on the actual edge location. The process of development and implementation of DIS is carried out using MATLAB software and the image of the surface topography is then analysed to retrieve the results. In this case, the algorithm of the DIS operator is embedded with the Marker-based Watershed segmentation as the assistance of Marker-based Watershed Segmentation is effective in extracting the individual significant edges features produced by DIS operator. The system algorithm is verified and validates on two sloped bumps surface topographies that have been simulated using MATLAB software and measured using the Alicona Infinite Focus Measurement (IFM) device, respectively. The results of the verification of the system algorithm on the simulated 3D areal surface topography of a sloped bumps shows that the system algorithm can effectively identified the edges features and segmented them following the shape partem of the surface features of the sloped bumps. Besides, from the results of validation of the system algorithm, it is proven that the DIS system algorithm is also suitable to be used on the measured areal surface topography of bumps features to segment and isolate the synthesized edges from its surrounding. Hence, the development of DIS algorithm has successfully help in producing the edges features on a particular surface topography that are accurate and in line with what has been agreed based on human perception.

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