

UNIVERSITI TEKNOLOGI MARA

**SEMI-AUTOMATIC CORTICAL BOUNDARY
DETECTION**

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Thesis submitted in fulfillment of the requirements
for the degree of
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CANDIDATE'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of University Teknologi MARA. It is original and is the result 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 other degree or qualification.

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ABSTRACT

The main aim of this thesis is to presents an algorithm to automatically detect the outline of the inner and outer cortical from hand radiographs images. The purpose is to obtain the cortical thickness and calculate the geometric measurement of the metacarpal bone radiograph. Radiographs images are often fuzzy and thus the main challenge is detect the outer cortical (OC) and inner cortical (IC) of the bone for the measurement of the inner diameter (ID) and the outer diameter (OD) of the cortical. For this purpose, two algorithm are has been developed to automatically detect the OC and IC. The first is Line Profile Histogram Approximation (LPHA) and the second is Fuzzy Particle swarm optimization algorithm (FPSO). LPHA is developed by tracking the highest gradient of the hills and valley on line profile histogram of a horizontal line across the metacarpal. FPSO incorporates fuzzy edge detection technique as the initial population and the optimum membership value as the fitness function in the particle swarm optimization algorithm. Tests are performed with a hundred and thirty retrospective hand radiographs images of normal human patients of the age of 20 to 80. The cortical thickness of the hand radiographs images of normal human patients have been manually measured by radiologist using micro-callipers. These images are used to determine the normal cortical width for different age groups. The results of the experiments are analyzed visually and statistically. The statistical analysis are done by counting the number of pixels that are detected as edges, the outer and the inner diameter of the metacarpal, the left and right cortical width and the cortical thickness. These measurements are then compared with manual measurements done by radiologist to determine the accuracy of the measurements acquired from both the system. LPHA proves to be an efficient edge detector evaluation algorithm and FPSO is proven to be an effective edge detection algorithm.

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