CAIRO UNIVERSITY

FACUALTY OF ENGINEERING

# FETAL ULTRASOUND IMAGE SEGMENTATION USING WAVELETS

By



Nourhan Mohamed Hassan Zayed

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE

in

Systems and Biomedical Engineering

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# Abstract

Previous studies suggested that wavelet-based image analysis techniques could occupy a leading position in medical imaging. The proposed approach to segment fetus ultrasound image was motivated by the ability of wavelets to discriminate different frequencies and to preserve signal details at different resolutions. For this ultrasound noisy, speckle nature, textured images, the main difficulties are the definition of a homogeneity measure in mathematical terms. Since wavelets transform presents adequate tools to characterize different scales of textures effectively, then we will use multiresolution techniques based on the wavelet transform to extract feature vector on each area. This thesis presented a novel method combining wavelet analysis and fuzzy c-means clustering method.

An efficient algorithm for segmentation of fetal ultrasound images using the multiresolution analysis technique is introduced in this thesis. The proposed algorithm decomposes the input image into a multiresolution space using different two-dimensional wavelet transform families (Harr, Daueb., B-spline, ....etc.). The system builds features vector for each pixel that contains information about the gray level, moments and other texture information. These vectors are used as inputs for the fuzzy c-means clustering method, which results in a segmented image whose regions are distinct from each other according to texture characteristic content. Different enhancement methods are first used to enhance fetal ultrasound images before wavelet decomposition. Experiments indicated that this method can be applied with promising results to improve the segmentation of fetal regions in comparison to classical segmentation techniques.

*TO MY PARENTS*

*WHOM I OWE EVERY SUCCESS OF MY LIFE*

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