

# **Boundary Extraction of Breast Mass on Ultrasound by Gibbs Sampled Hidden Markov Model**

Gopal R. Karemore\*<sup>1</sup>, Rajagopal KV<sup>2</sup>, Devdatt Kawathekar<sup>3</sup>, Mohan AY<sup>1</sup>, Santhosh C<sup>4</sup>

<sup>1</sup> Manipal Center For Information Science, Manipal. <sup>2</sup> Dept. of Radiology, KMC, Manipal.

<sup>3</sup> Philips Medical Systems, Bangalore, India. <sup>4</sup> Manipal Center for Laser Spectroscopy, Manipal, India.

\*AUTHOR FOR CORRESPONDENCE

Gopal R. Karemore

Center for Laser Spectroscopy

Manipal Life Sciences Centre

Manipal University, Manipal-576 104.

Tel: +91-820-2922526

Fax: +91-820-2571919, 2570062

E mail: [gopal.raghunath@gmail.com](mailto:gopal.raghunath@gmail.com)

## Abstract

This study introduces a new method for computerized detection of malignant and nonmalignant breast masses from ultrasound. Although breast masses or abnormalities are found in Mammogram, Ultrasound proves to be good for characterizing the lesion on the breast. But segmentation of ultrasound breast images has its unique challenges because these images contain strong speckle noise and attenuated artifacts (lymph node & tissues). Moreover boundary edges are usually incomplete, being missing or weak at some places. In this paper, we propose a system to address these challenges in two steps. First, using morphology operations preprocesses the ultrasound images then to segment a desired lesion in a breast sonogram, Hidden Markov Model (HMM) is used. A segmented image is then discriminated between benign and malignant on the basis of jag count which was calculated based on the derivative of curvature of the segmented image. A total of 30 patients with breast sonograms (15 benign and 15 Malignant Biopsy tested) samples is taken as a training set from Radiology Department, KMC, Manipal, India. Experimental result will exhibit and evaluate the accuracy rate of the proposed method. High rates of agreement (>80%) between our Computer aided detection technique and Radiologist results are obtained. The primary aim of this project is to show that this method can efficiently detect breast cancer (Benign or Malignancy) in ultrasound imaging.

**Keywords:** Breast cancer, Ultrasonogram, Hidden Markov Model, Gibbs Sampling, Boundary Extraction.