

## **AN ADAPTIVE HISTOGRAM EQUALIZATION ALGORITHM FOR ENHANCE MAMMOGRAMS**

A.S. Amarasinghe\* and D.P. Abeysooriya

*Department of Information Technology, Middlesex University The Burroughs, London  
NW4 4BT, United Kingdom*

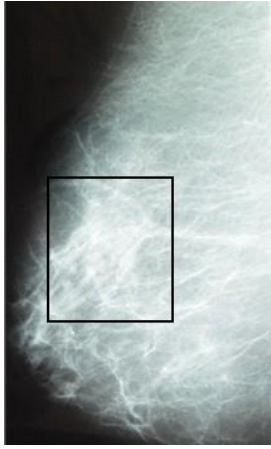
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Corresponding author: amilaamdj@gmail.com

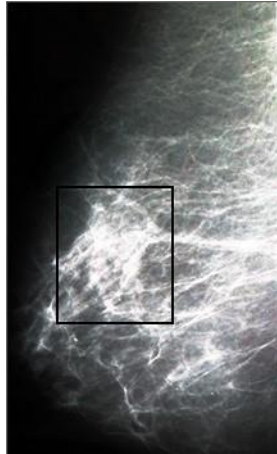
### **ABSTRACT**

Breast cancer is one of the leading cancers in the female population and most of them are lethal; to save lives breast cancer should be identified in its early stage. In Sri Lanka 25% of the detected cancers are recognized as breast cancers in each successive year between 2000 to 2005. Mammography is the most successful method to diagnose breast cancers. Mostly mammograms are poor quality images, and doesn't provide any hard evidence to diagnose cancers although it has the accuracy of 80% - 90%. And this is where the mammogram enhancement is essentially needed. Among various image enhancement techniques, histogram equalization is the most convenient method to enhance images. But unfortunately many prevailing histogram equalization techniques are not suitable for mammogram enhancement, because they can't accurately separate noise from the image. Detecting cancers in a Mammogram is rather delicate process which needs fairly controlled image enhancement with noise reduction. The proposed histogram equalization technique can control the amount of enhancement and it intelligently separates the noise from the interested regions and enhances the suspicious areas. Many histogram equalization methods are available to enhance images. But the common problem with all these algorithms is they did not concern about the actual intensities of the pixels at all. In fact, this leads the whole image enhancement into failures by over enhancing the images. However, lack of controllability is the major obstacle to use histogram equalization in mammogram enhancement. Actual intensities of the pixels must be contributed to the process of enhancement to control the amount of enhancement and prevent destroying the valuable information. The proposed algorithm uses a set of candidate intensities to pick the most appropriate intensity for the enhancement just like a genetic algorithm. Newly taken mammograms were used to experiment the power of enhancement of the algorithm. The image samples were taken from the Karapitiya hospital, Galle, Sri Lanka, with the authorization from the

Director there. The major concerns were how well the algorithm can reduce the noise and highlight the cancerous areas of the images. Obviously this enhancement must assist the observers to find hard evidence to detect cancers. Following shows a mammogram image before and after the enhancement.



Original image



Enhanced image

Identifying a breast cancer is a tough job and it needs years of practice and some sophisticated technology. But still 10% of breast cancers are missed by radiologists. This happens mainly due to noise of the images and complex overlying and underlying structures in the cancer images. Almost every Mammogram is a poor quality image which doesn't provide enough hard evidence to pursue and diagnose cancers. This research led to produce an image enhancing algorithm which can be used to enhance mammograms to detect early stage breast cancers to support and assist in medical treatments.

**Key words:** Histogram equalization, mammograms, genetic algorithms