Chapter 3

A Novel Kernel-Based Fuzzy Clustering Approach to Identify Masses in Mammograms

Arnab Chattaraj
University of Calcutta, India

Arpita Das
University of Calcutta, India

ABSTRACT

Detection of breast cancer in form of masses at initial stage becomes difficult because of obscured nature of mammograms by surrounding tissues. This poor visibility of masses addresses to the necessity of accurate contrast enhancement method. This study introduces a novel kernel-based fuzzy clustering approach to enhance the contrast of masses. Novelty of the proposed technique is incorporation of two important features of mammograms that convey the properties of masses. Local entropy and intensity mean of each kernel position play the key role to enhance masses. A kernel is moved across the mammograms to collect all possible values of those features, and hence, they are exploited as the input data of fuzzy clustering technique. Performance of the proposed approach is compared with two other conventional contrast enhancement techniques. Both subjective and objective evaluations of the proposed technique show an evidence of improvement in compare to other methods. Moreover, unwanted enhancement of obscured tissues is also suppressed in the proposed approach.

DOI: 10.4018/978-1-5225-5149-2.ch003
INTRODUCTION

Cancer is considered to be a major public health problem in the world, specifically in the developed countries. It refers to the uncontrolled multiplication of a group of cells in a particular location of the body (Schulz, 2007). For years, it has become one of the large threats to human life and it is expected to become the leading cause of death over the next few years also (WHO, 2009). According to the data from the World Health Organization (WHO), cancer accounts for 13% of all deaths in the world in recent time and deaths due to this disease are expected to increase in the future—with an estimation of 12 million people dying from cancer in 2030 (Sampat et al., 2003). Cancer is potentially fatal disease caused by different environmental factors which mutate genes encoding critical cell proteins (Malcolm, 2001). A group of these rapidly dividing cells may form a lump, micro-calcifications or architectural distortions which are usually referred to as tumors. In cancer cells the normal control systems that prevent cell overgrowth and the invasion of other tissues, are disabled. These things change normal cell division and growth procedure. Physical changes occur due to the effect of cancer and its treatment may include-

- Loss of body parts, physical stamina, hair, weight.
- Swelling of the face, arms, or other parts of body.
- Skin change, including rashes and burns.
- Decrease of physical skills, including athletic abilities, balance, and agility etc (Cueva, 2006).

Among different types of cancers, Breast Cancer is a major concern among women even men also. It is a form of benign/malignant tumor which develops from breast cells (Akay, 2009) and now it is becoming a leading cancer-related death among the women. Primary prevention of this cancer seems to be impossible since the actual causes of this disease still remain unknown. However, treatment of breast cancer in early stages is more successful; so early detection is an essential step to improve breast cancer prognosis and also to significantly reduce the mortality rate. In recent days, though a lot of advanced imaging techniques exist: including MRI, Ultrasound imaging, Positron Emission Tomography (PET) imaging, Computerized Tomography (CT) imaging, Optical Tomography/ Spectroscopy etc. Among them, Mammography is considered to be one of the best radiological screening methods for early detection of Breast Cancer (Haus et al., 1993).

Basically most important symptoms of this disease are masses and microcalcifications – which are generally different types of tumors. Spatial resolution obtained from mammography is capable of indicating any architectural distortion of the breast as well as early stage presence of masses or microcalcifications in the breast.
Related Content

Biocompatible Carbon Nanodots for Functional Imaging and Cancer Therapy: Carbon Nanodots for Imaging and Cancer Therapy
[www.igi-global.com/article/biocompatible-carbon-nanodots-for-functional-imaging-and-cancer-therapy/204399?camid=4v1a](www.igi-global.com/article/biocompatible-carbon-nanodots-for-functional-imaging-and-cancer-therapy/204399?camid=4v1a)
Healthcare Collaborative Framework Based on Web 2.0, Grid Computing and SOA
Wail M. Omar (2010). Ubiquitous Health and Medical Informatics: The Ubiquity 2.0 Trend and Beyond (pp. 190-212).
www.igi-global.com/chapter/healthcare-collaborative-framework-based-web/42934?camid=4v1a

A Multi-Functional Interactive Image Processing Tool for Lung CT Images
www.igi-global.com/article/a-multi-functional-interactive-image-processing-tool-for-lung-ct-images/96824?camid=4v1a

Improved Patient Safety Due to Catheter-Based Gas Bubble Removal During TURBT