Intelligent Brain Hemorrhage Diagnosis System

Ushani Balasooriya
Dept of Computing
Informatics Institute of Technology
Colombo, Sri Lanka
e-mail: ushanib@gmail.com

M.U.S Perera
Dept of Computing
Informatics Institute of Technology
Colombo, Sri Lanka
e-mail: udayangi@iit.ac.lk

Abstract— **Diagnosing brain hemorrhage, which is a condition caused by a brain artery busting and causing bleeding is currently done by medical experts using a CT scan. Periodic examination of scans enable the accurate prediction of disease and the extraction of reliable and robust measurement for patients in order to describe the morphological changes in the brain as the recovery progresses. Prior attempts to use medical image processing techniques to extract relevant information from a CT scan has shortcoming due to the low accuracy level in the current methods and algorithms, coding complexity of the developed approaches, impracticability in the real environment, and lack of other enhancements which may make the system more interactive and useful.**

This research investigates the possibility of diagnosing brain hemorrhage using an image segmentation of CT scan images using watershed method, feeding of the appropriate inputs extracted from the brain CT image to an artificial neural network for classification. The output generated as the type of brain hemorrhages, can be used to verify expert diagnosis and also as learning tool for trainee radiologists to narrow down the errors in current methods.

Keywords-component; Medical Image Processing, Neural network, Watershed, fuzzy c means, Intelligent Brain Hemorrhage Diagnosis

I. INTRODUCTION

Brain hemorrhage is a type of a stroke which is caused by an artery in the brain bursting and causing bleeding in the surrounded tissues. This is also known as cerebral hemorrhages, intracranial hemorrhages or intracerebral hemorrhages by their types. "The Dana guide to Brain Health" (2007) says, in each year cerebral hemorrhages are affecting 7 people out of every 100,000 in the west while 220 out of every 100,000 in Asia. The statistics have shown that there is a higher risk for brain hemorrhages to Africans, Asians and Hispanics in the United States than the Whites. It also says that women tend to be affected more than men by a ratio of 3 to 2. High blood pressure, alcohol usage, and smoking are known risk factors while heredity also plays a major role in causing brain hemorrhage. Additionally more than 80% of people are suffering due to being born with weak spots in their major brain arteries. (Mohr and Stapf, 2007).

However according to medical specialists' early diagnosis of the condition and obtaining immediate and relevant treatment can be a lifesaver for affected patient. The main techniques and tools which helps in diagnosing of this disease is the human brain Computed Tomography (CT) image obtained from the CT scan and an expert such as an experienced doctor who will be able to extract the important symptoms of the disease from the image by naked eye.

Aim of this research is to design, develop and evaluate an easy to use, intelligent and accurate system which enables users like radiologists or medical students as well as doctors to feed brain CT images and to diagnose whether there is a hemorrhage and specify the type of hemorrhage if one exists using Fuzzy C means and Watershed Algorithm along with neural network. The product prototype developed using Matlab can be used by medical students to practice the related concepts they learn using an image guide with examples for surgeries and surgical simulation.

II. RELATED RESEARCH

With the technological improvement in artificial intelligence, image processing, neural networks and genetic technology etc universities and other research centers all around the world, started doing research on integrating this medical expertise with a computer aided system. Thus, much research was done in brain image segmentation using (Magnetic Resonance) MR and CT scan images in order to diagnose brain hemorrhages since past three decades up to date. Delo *et al*. (1985) has used a thresholding and a region growing method to study on brain segmentation on CT data. The Fuzzy C means algorithm (FCM) algorithm was used by Li *et al*. (1993) to segment brain MRI scan while Bayesian classification was used by Laidlaw *et al*. (1994) to identify the distribution of different materials in MRI volumetric datasets of the brain. Wells *et al*. (1996) was able to propose EM segmentation for MR brain images for the first time. (Ganesan & Radhakrishnan, 2009) . Again, Ham and Prince (1999) extended the traditional FCM used by Li *et al*. (1993) to represent the quality of MR images obtaining process while in the same year Loncaric and Majcenic (1997) did a multi-resolution simulated annealing for brain image analysis.

In the next decade starting from 2000, frequent approaches in brain image segmentation for diagnosis of brain hemorrhages and strokes were taking place. Maksimovic *et al*. (2000) used a common approach which

978-1- 61284-704-7/11/$26.00 ©2011IEEE