Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 120 (2017) 580–587

Procedia Computer Science

www.elsevier.com/locate/procedia

9th International Conference on Theory and Application of Soft Computing, Computing with Words and Perception, ICSCCW 2017, 24-25 August 2017, Budapest, Hungary

Brain tumor segmentation based on a new threshold approach

Umit Ilhan[a]*, Ahmet Ilhan[a]

[a]*Department of Computer Engineering, Near East University, P.O.BOX:99138, Nicosia, North Cyprus, Mersin 10, Turkey*

Abstract

Brain cancer is an abnormal cell population that occurs in the brain. Nowadays, medical imaging techniques play an important role in cancer diagnosis. Magnetic resonance imaging (MRI) is one of the most used techniques to identify and locate the tumor in the brain. Images obtained by medical imaging techniques may become a better quality image thru applying image processing techniques. In this study, we aim to develop a method for clearly distinguishing the tissues affected by the cancer. The proposed approach is used to obtain a segmented tumor region clear enough to be observed by the medical practitioner and give them more detail about the tumor in their diagnosis. In the proposed approach, morphological operations, pixel subtraction, threshold based segmentation and image filtering techniques are used. The proposed approach is based on obtaining clear images of the skull, brain and the tumor. When compared, the proposed approach gave a better result than the other approach.

© 2018 The Authors. Published by Elsevier B.V.
Peer-review under responsibility of the scientific committee of the 9th International Conference on Theory and application of Soft Computing, Computing with Words and Perception.

Keywords: Brain cancer; image processing; threshold; MRI; segmentation.

1. Introduction

Cancer, which is increasing in proportion in the aging population, has become a worldwide health problem. Based on the latest statistics of the World Cancer Research Fund, cancer is the deadliest disease in the world. Approximately 12.7 million people are diagnosed with cancer each year and 7.6 million people die from this disease (Gao et al., 2009). Every year the number of people die from cancer is increasing.

There are many subtypes of each cancer and it is difficult to give detailed information about most of them. Brain cancer is the fifth cancer type with the highest incidence and mortality, just behind stomach cancer, uterine cancer,

*Ümit İlhan. Tel: +90 392 64 64; Fax: +903922236622.
E-mail address: umit.ilhan@neu.edu.tr

1877-0509 © 2018 The Authors. Published by Elsevier B.V.
Peer-review under responsibility of the scientific committee of the 9th International Conference on Theory and application of Soft Computing, Computing with Words and Perception.
10.1016/j.procs.2017.11.282

breast cancer and esophageal cancer (Gao et al., 2009). Based on the statistics of World Health Organization (WHO), brain tumors have more than 120 varieties. Brain tumors are categorized according to the region, tissue type, non-cancerous or cancerous (benign or malignant) cells, site of originate (primary or secondary) and other important factors (Lois et al., 2007).

For diagnosing of brain tumors, medical imaging techniques such as Computed Tomography (CT), Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI) are used (Ozols et al., 2006). CT uses the radioactive rays to penetrate the human body, and the imaging is based on the different characteristics reflecting the rays of different tissues. PET, injects with radioactive drugs to the human body, and the drugs flow to all the cells, tissues and organs with the blood in the whole body (Prince and Links, 2006).

In the MRI process, there are neither instruments inserted nor any medication injected into the human body. There is no radiation damage to the human body, and the whole process is quite safe. In addition, MRI has high-resolution and accurate positioning of soft tissues and is sensitive to the characteristics of diseases, thus it is especially suitable for the diagnosis of brain diseases (Xuan and Liao, 2007).

In addition to medical imaging techniques, tools that have become popular in the medical field also play an important role in the diagnosis of diseases. Image processing is one of the most used and most efficient tools in the medical field. Medical image processing is aimed at developing systems to solve the medical diagnosis problems using computerized systems (Mishra et al., 2014).

Medical image processing can be carried out in four stages. The first stage is to use a set of images collected from the patients to be investigated. The second stage is to apply image enhancement techniques to obtained better quality images. The third stage is to apply image segmentation methods which are the most important part of image processing procedures. The last stage is to extract the necessary features from enhanced and segmented images which give important information of normality or abnormality of images (Mishra et al., 2014).

Taheri et. al (2010) presented a threshold-based approach called TLS for 3D tumor segmentation in brain MRI images. Ali et. al (2014) used Enhanced Thresholding Algorithm to area calculation of tumor. Vijayarangan (2014) represented a method for the Brain Tumor Detection in MRI images using segmentation and histogram thresholding. Anandgaonkar and Sable (2014) implemented an algorithm for detection and identification of brain tumor in brain MRI, based on Fuzzy C-Means clustering to divide the MRI in number of clusters and adaptive thresholding to extract the tumor then deciding the type of tumor on its area. Sujan et. al (2016) presented a method based on thresholding along with morphological image analysis techniques to detect brain tumor from MRI image. They convert the MRI image to grayscale and then remove noises with different filtering techniques then convert this new image to binary with the Otsu's threshold method for segmentation and afterwards morphological operations were performed to detect the tumor that contains the brightest part of the image.

The aim of this study is to develop a new threshold method that is more efficient and easier to implement than the existing threshold methods. The proposed threshold method is compared with the OTSU which is one of the most popular threshold methods. The rest of the study is organized as follows. Section 2 presents the proposed approach, Section 3 describes the methodology, Section 4 presents the results and the conclusions addressed in the final section.

2. Proposed approach

In this section, the proposed approach is described. The proposed approach can be summarized in three stages. First stage is the pre-processing which enhances the brain MRI image and make it more suitable to analyze. Second stage is the segmentation which separates the region of the tumor from the enhanced image. Last stage is the filtering which removes noise from the segmented image.

Download English Version:

https://daneshyari.com/en/article/6901929

Download Persian Version:

https://daneshyari.com/article/6901929

Daneshyari.com