3D Brain Tumor Detection

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***Abstract*— Brain tumor detection using image processing is meant to identify the cancerous growth and its intensity in the human brain. The proposed system in addition to identifying the cancer lesions, also keeps a record of the patient's treatment history. This helps the medical practitioner in proceeding with the treatment of that particular patient. The scan images of a patient are given as input. Using Partial Voluming algorithm and expectation maximization algorithm in image processing, the cancer lesions are projected out.**

***Index Terms*— Edge detection, ImageJ, Magnetic resonance, Partial volume, voxel**

I. INTRODUCTION

Based on statistics, tumors are the second cause of cancer-related deaths in children (both male and female) and adults. This facts increase the importance of the researches on the tumor detection and this will present the opportunity for doctors to help save lives by detecting the diseases earlier and perform necessary actions. Varieties of image processing techniques to be applied on various imaging modalities for tumor detection that detect certain features of the tumors such as the shape, border and texture. These features will make the detection processes more accurate and easier as there are some standard characteristics of each feature for a specific tumor [1-2]. All tumors will start small and grow with time. As they grow, they will become conspicuous and increase the probability of showing their characters.

Imaging technology has progressed immensely in recent years. Image processing is the study of any algorithm that takes an image as input and returns an image as input. Information is conveyed through images. Image processing is a process where input image is processed to get output also as an image. Main aim of all image processing techniques is to recognize the image or object under consideration easier visually. MRI (magnetic resonance image) is commonly used in the medical field for detection and visualization of details in the internal structure of the body. It is basically used to detect the difference in the body tissues which have considerably better technique as compared to computed tomography [3].

In this paper, we introduced a new high level 3D visualization framework for Image J. The framework provides an interactive 3D scene for image volume visualization, annotation, segmentation and transformation. The framework has been very well received by the ImageJ user and developer community and it is currently in use by numerous Image J based applications. In this system we identify the presence of the cancer by verifying the presence of its characteristics in the scan images.

II. SYSTEM DESIGN

The MRI scanner gives an input of MRI image of the patient. Using the brain tumor detection system , we detect the tumor and using the ImageJ, view of the detected area in 3D.

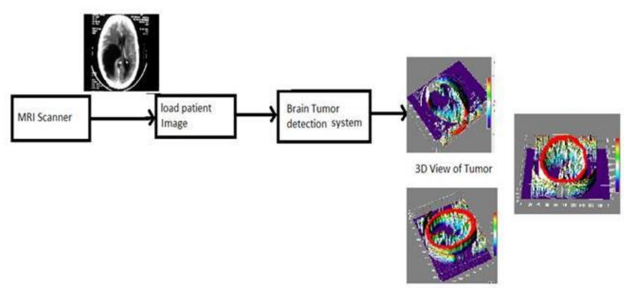

Fig 1: General concept for proposed system

III. DETAILED DESCRIPTION

Our framework is integrated into ImageJ. The ImageJ software libraries greatly reduces the complexity.Java3D provides a fine-grained representation of a virtual scene as a directed acyclic graph.

A. Brain Image from MRI

The input to the system would be MRI images of the brain .It have mainly three types of MRI sequences. (a)Diffusion MRI. It measures the diffusion of water molecules in biological tissues. If molecules in a particular voxel diffuse principally in one direction, then the majority of the fibers in this area are going parallel to that direction. (b)Fluid Attenuated Inversion Recovery (FLAIR). Here inversion recovery pulse sequence is used to null signals from fluids. (c) Susceptibility Weighted Imaging (SWI).It detects traumatic brain injuries that may not be diagnosed using other methods.

B. Brain Tumor Detection

It includes result processing of the MRI, methods for data processing and models in the form of graphs and 3D model. Here we can identify the cancerous part efficiently along with its intensity. The intensity is to be displayed accurately using histogram. The software should be secure from the access of unauthorized users. The system accepts the details of the patient and the MRI scan image. Edge Detection algorithm is used, which would clearly highlight the edges of the image. Then, Segmentation is applied to the scan image in order to project the cancerous spot in the image. The result is recorded in a report.

C. Patient Database

Registered doctors are allowed to use, after they log into the system with their respective login id and password. The database of patients can be updated according to the doctor's need. All the reports generated are kept in the database for future reference.

D. 3D Visualization

This is the last phase in creating a 3D image. In this module, we are creating a 3D model of the affected area. We present a platform-independent framework based on Java and Java3D for accelerated rendering of biological images. A low level hardware-accelerated software library.Java3D has the further advantage of being implemented for Java, thus enabling Java applications like ImageJ to interoperate with the graphics card of computer. Our framework is seamlessly integrated into ImgaeJ, an image processing package with vast collection of community-developed biological image analysis tools. It enriches the ImageJ software libraries with methods that greatly reduce the complexity of developing image analysis tools in an interactive 3D visualization environment. Java 3D provides a fine-grained representation of a virtual scene as a directed acyclic graph.

IV. COMPARISON

a. Existing System

In the existing system, MRI scan images are taken for initial analysis of the disease. Then from patient, tissues of the suspected region are collected and send to the pathologist for the confirmation of the disease. The pathologists manually inspect the tissues for the presence of malignancy. The report is sent to the doctor, who studies the report and decides on the treatment for the patient.

b. Proposed System

The proposed system identifies the tumor lesions and also keeps a record of the patient's treatment history. This helps the medical practitioner in proceeding with the treatment of that particular patient. Also we project out the 3D visualization of the affected area.

V. RESULTS

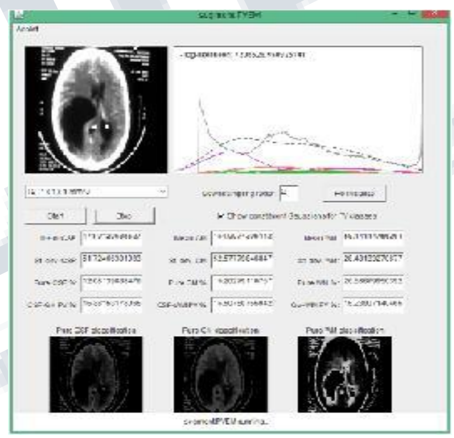

Fig 2:Partial image segmentation in 2D

The scanned image is processed using algorithms like expectation maximization and partial voluming algorithms.

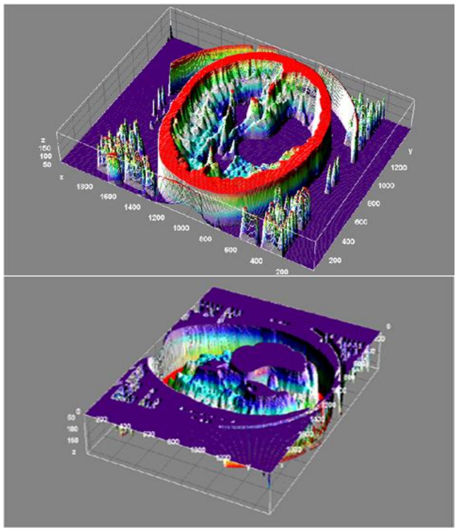

Fig 3: 3D Image Process

The 2D image is processed into 3D image. The affected area is segmented and processed into 3D image. The 3D image is viewed in ImageJ.

VI. CONCLUSION

The system identifies the presence of cancer by verifying the presence of its characteristics in the scanned images. A new high-level 3D visualization framework for ImageJ was introduced. The framework provides an interactive 3D scene for image volume visualization, annotation, segmentation and transformation. The framework has been very well received by the ImageJ user and developer community. It is currently in use by numerous ImageJ based applications.

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