Neural Network Based Augmented Reality for Detection of Brain Tumor

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Abstract: The development in technology opened the door of fiction and reached reality. Major medical applications deals on robot-assisted surgery and image guided surgery. Because of this, substantial research is going on to implement Augmented Reality (AR) in instruments which incorporate the surgeon's intuitive capabilities. Augmented reality is the grouping of virtual entity or 3D stuffs which are overlapped on live camera feed information. The decisive aim of augmented reality is to enhancing the virtual video and a 3D object onto a real world on which it will raise the person's conceptual understanding of the subject. In this paper we described a solution for initial prediction of tumour cells in MRI images of human brain using image processing technique the output of which will be the 3D sliced image of the human brain. The sliced image is then virtually embedded on the top of human head during the time of surgery so that the surgeon can exactly locate the spot to be operated. Before augmenting the 3D sliced image Artificial neural network is used to select the appropriate image that contains tumor automatically in order to make the system more efficient.

Keywords: Tumour detection, MRI image, 3D slicing, Image processing, Augmented Reality (AR).

I. INTRODUCTION

Human heart consist of 4 chambers with two Latest improvements in computer processing capability, innovative 3D tools, and well-organized image processing skills have unlocked the gateway for real-time systems with exhaustive computing such as the augmented reality (AR) system, which desires to process huge amount of input information from a photographic sensor and give reactive user interface. Exploration in augmented reality systems has been aiming on enlightening the technologies in such application fields as education, defense, medical operations, robotics, manufacturing industries, maintenance, entertainment, assisted driving and mobile assistance. AR aided system helps in diagnosis with adequate information of 3D medical models which are generally built from the computed tomography (CT) or magnetic resonance images (MRI) [5].

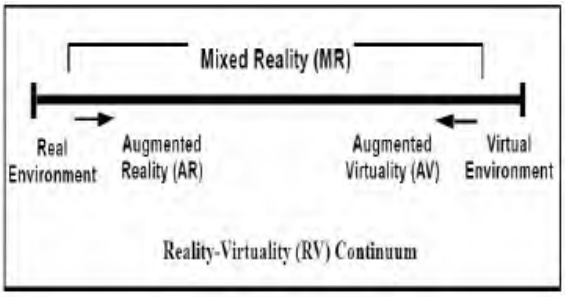

Fig 1: Virtuality continuum

Augmented reality is defined by the live camera feed data of a regular surroundings whose mechanisms are augmented by the common techs like GPS manoeuvre, animation, video...etc. Augmented reality has the following three characteristics:

i. Merge the active and simulated origins, in real environment,

ii. Real-time communication,

iii. 3D indexed i.e the computer engendered objects are blended with three dimensional real world. Paul Milgram and Fumio Kishino enlightened the Milgram's Reality-Virtuality Continuum as a band that lies between the actual and simulated world [1].

Substantial discovery is made in medical imaging for example endoscopic camera which records video images inside the patient and present it on the monitor. Yet these discoveries will have limitation on physician's direct 3-D vision, natural view of the human anatomy as the physician has to deal with virtual data that is additionally added which will be shown in monitor (Bichlmeier C et al 2006). AR can be used to like procedural task while surgery is progressing.(Bichlmeier C et al 2006) designed an AR system that can view real skin through virtual anatomy by polygonal surface model which can be used for real time visualization as soon in Figure 2. Even Bichlmeier designed a system which can use the directed medical tools to enhance the surgeon

vision with in the human body. Remote controlled robot assisted surgery will give physician an extra pros with dexterity, visualization and precision. Still enforcing feedback is limited by feelings and it is subjected to physician skills .if there is a lack of feedback then the performance of operations will be affected (Bethea BT et al, 2004).In (Akinbiyi T et al 2006) the writer insisted a solution for sensory substitution which provides a feedback to the user .The strength applied by the physician is graphically characterized and superimposed on a streaming live video by means of a system of circles that separately change colours through three programmed ranges (green, yellow, red) permitting to the quantity of winding forces noticed by strain devices. It necessary to decrease surgical processes is not the only one to hinge on seeing medical imaging data on the patient in real time, the need to develop medical analysis also depend on it. In this research field, the ICAR-CNR group of Naples (Giuseppe De Pietro) is functioning on an AR cooperative system for examinating patient's hand for swelling by superimposing in real time 3-D.

Magnetic Resonance visualization data straight on upper part of the patient's hand. Since swelling disabilities are powerfully related with pain, so need a straight operation of the hand region to be identified, the system may back physicians by permitting them to do morphological analyses at the similar time Gallo L,Minutolo A et al 2010). AR could also be used to manage client's bio chronicle. Guess if all Physicians crisscross a patient's health record by engaging an H MOUNTED D and urge the patients to see a computer-generated label disclosing the patient's previous history of illnesses and injuries. In this paper we used Augmented reality along with Image processing and Artificial neural network in surgerical application.

Fig 2: Bichlmeier et. al. system.

II. METHODOLOGY

DICOM image records are maintained separately for individuals. At first the MRI image of an individual is middle sliced and the color is changed by adding intensity following that sliceomatic tool is used to acquire 3D visualization of the MRI image

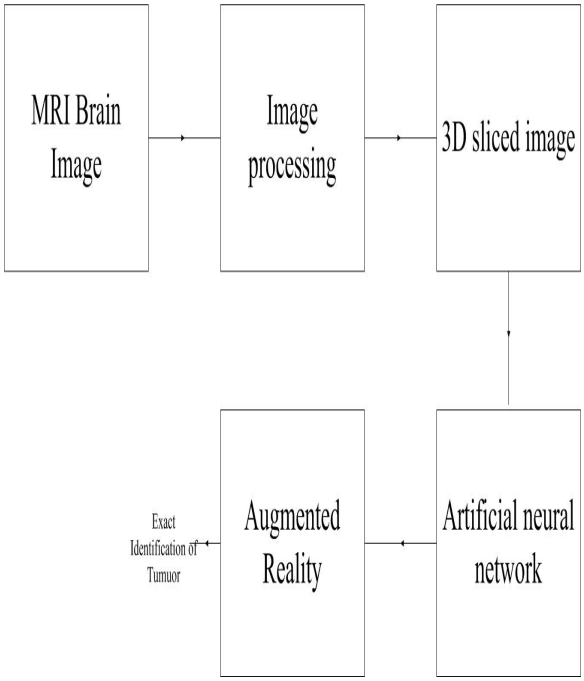

Fig 3: General architecture

Artificial neural network is used to identify the tumor in the sliced image automatically to make the identification easy and improve the system efficiency. The slice of the image containing tumour is then augmented on the patient's head during the time of surgery. This gives the clear view to locate the exact location of the tumour.

III. RESULTS AND DISCUSSIONS

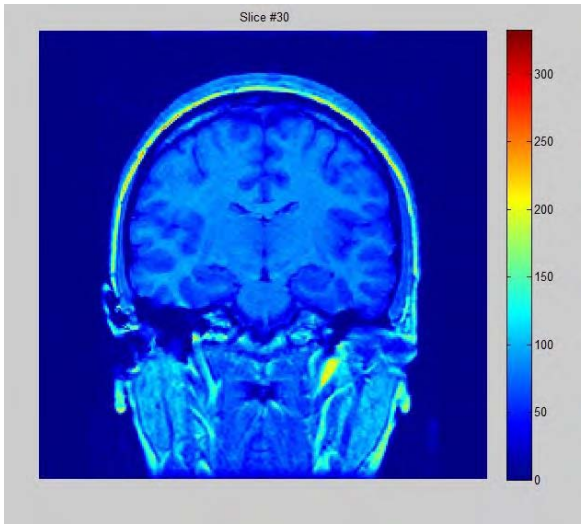

Fig 4: Input image

Figure 4 shows the input image chosen to be sliced for the detection of of tumour cells in human brain

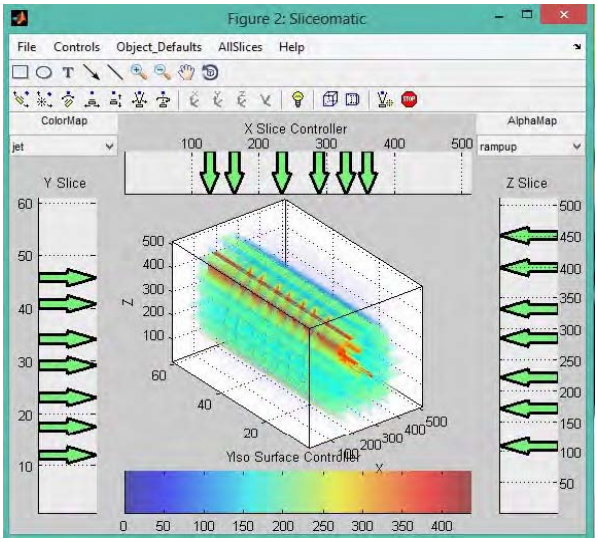

Fig 5: slicing process in MATLAB

Figure 5 shows the process of slicing the MRI image in MATLAB. Figure 6 shows the sliced output and figure 7 shows the detected tumour from the sliced MRI image

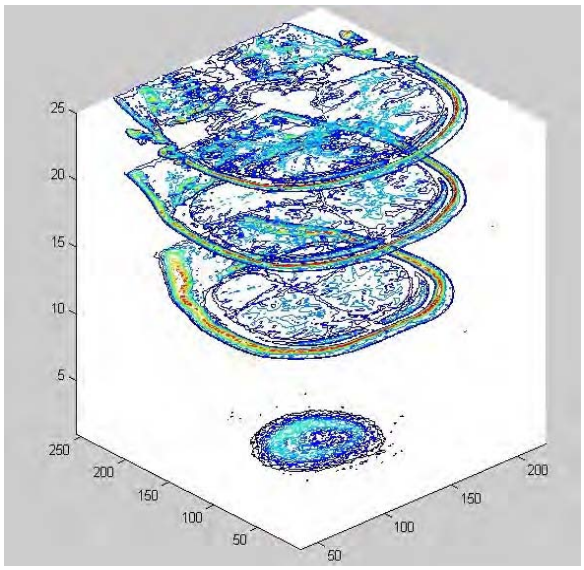

Fig 6 : sliced MRI image

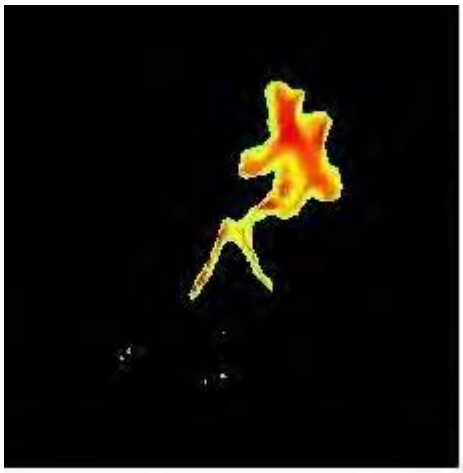

Fig 7: Detected tumour

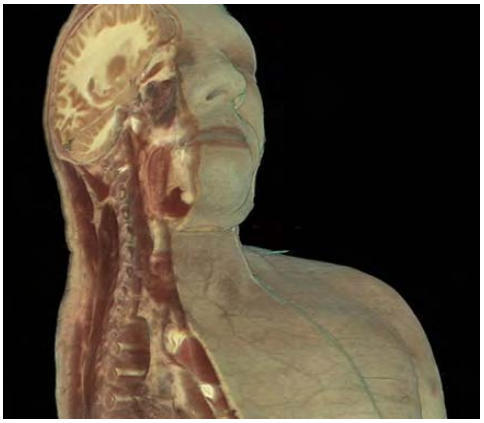

Fig 8:Simulated view of Augmented image on human

Finally figure 8 shows the simulated view of augmented 3D sliced image containing tumour on to the patient's head.

IV. CONCLUSION

The science fiction turned into reality is augmented reality. In the recent years AR attains its attraction in every fields. In this paper we proposed an interesting application of locating tumor using Augmented reality for the purpose of making the surgery easy and accurate and AR system using neural network for diagnosis of abnormal brain. Neural network plays a vital role in the automatic detection of tumor cells. From the event when our system uses extraction of features from the image, the reckoning process is economical and firm. Neural network plays a vital role in the automatic detection of tumor cells. The offline results simulated in MATLAB has been displayed.

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