Novel Algorithm for 2D To 3D Conversion Of HD Medical Images Using Depth Fusion Technique

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***Abstract*: Three-dimension (3D) technology increases the visual quality as compared to two-dimensional (2D) technology. The depth information is needed for the generation of 3D from 2D content. Therefore, conversion of 2D image into 3D has become an important issue in emerging 3D applications. This work presents a novel algorithm using depth fusion unit for 2D to 3D conversion of HD medical image, which is automatically convert 2D content into 3D content.. According to that algorithm, there is three different depth map are generated. After generation of all depth map apply depth fusion process which is generate real depth map. Generated depth content is pass from depth image based rendering (DIBR) process for generation of right and left view. Here we will use Matlab 2014b tool for conversion of 2D medical into 3D HD medical image.**

***Keywords*: HD, 2D to 3D, DIBR, Depth, SCTSCAN, MRI, XRAY Image.**

I INTRODUCTION

Nowadays and even long time ago, there was a big demand to 3D volumetric medical images. Many medical imaging applications involve aligning 2D images, e.g. X ray imaging. X-ray imaging has many pervasive applications in the surgery, both preoperatively or intra operatively. 3D images are useful in understanding the state of the patients. The physician, surgeons and radiologists need for the 3D image to extract information and diagnosis the case. With the recent advancement in 3-D displays, 3-D content visualization has become very popular in our daily life. Recently, 3-D contents are being used in 3-D photography, 3-D broadcasting system, 3-D movie, etc. In contrast to the traditional 2-D content visualization, 3-D content provides an impressive visual experience and heightens a sense of realism with depth perception of the observed scene. 3D video is getting massive public attention recently because of clear stereo visual experience over conventional 2D video. There are several methods to produce 3D content, such as active depth sensing, stereo camera recording, and 3Dgraphics rendering using of this approach 3D content is generated. There are many area which require 2D to 3D conversion like medical, entertainment and in industr . There are some different medical images such as XRAY, CTSCAN and MRI.

Medical Images

Medical imaging is the technique and process of creating visual representations of the interior of a body for clinical analysis and medical intervention, as well as visual representation of the function of some organs or tissues (physiology). Medical imaging seeks to reveal internal structures hidden by the skin and bones, as well as to diagnose and treat disease. Medical imaging also establishes a database of normal anatomy and physiology to make it possible to identify abnormalities.

Magnetic Resonance Imaging (MRI)

Magnetic resonance imaging (MRI) of the body uses a powerful magnetic field, radio waves and a computer to produce detailed pictures of the inside of your body. It may be used to help diagnose or monitor treatment for a variety of conditions within the chest, abdomen and pelvis. If you're pregnant, body MRI may be used to safely monitor your baby. Tell your doctor about any health problems, recent surgeries or allergies and whether there's a possibility you are pregnant.

Computed Tomography (CT)

Computed tomography (CT) of the body uses sophisticated x-ray technology to help detect a variety of diseases and conditions. CT scanning is fast, painless, noninvasive and accurate. In emergency cases, it can reveal internal injuries and bleeding quickly enough to help save lives. Tell your doctor if there's a possibility you are pregnant and discuss any recent illnesses.

X RAY

X-ray imaging is the most widespread and well-known medical imaging technique. It dates back to the discovery by Wilhelm Conrad Röentgen in 1895 of a new kind of penetrating radiation coming from an evacuated glass bulb with positive and negative electrodes. Today, this radiation is known as short wavelength electromagnetic waves being called X-rays in the English speaking countries, but "Roentgen" rays in many other countries. The X-rays are generated in a special vacuum tube: the X-ray tube, which will be the subject of the first subsection. The emanating X-rays can be used to cast shadows on photographic films or radiation sensitive plates for direct evaluation (the technique of planar X-ray imaging) or the rays can be used to form a series of electronically collected projections, which are later reconstructed to yield a 2D map (thus, a tomographic image). This is the so-called CAT or CT technique.

II.LITERATURE REVIEW

Comparative Study on 2D to 3D Medical Image Conversion Techniques, 2019: The main purpose of this article is to compare the practice of five methods used to convert 2D images into 3D images. The 2D to 3D conversion technique plays an important role in 3DTV development and promotion as it supplies high quality 3D writing equipment. This article analyzes five methods and compares their results to the best ways to create high-quality 3D images. The first method to convert 2D images to 3D based on the depth information map with edge information. The second method uses information for a map of depth based on merger. The third method generates 3D images with random action algorithms. The fourth method creates 3D images using a combination of motion, edge detection, and image breakout, depth estimation, and relocation algorithms. Finally, the fifth method generates 3D images based on the deep nano scale method. Many performance metrics are used to analyze the performance of these approaches. This file uses PSNR, SSIM, MSE and RMSE for operational analysis. Experimental results suggest that random way works better than the other two ways.

Conversion of 2D medical scan data into 3D printed models, 2014: This work deals with the possibility of using 2D medical image data acquired from computed tomography (CT) and magnetic resonance imaging (MRI) for 3D design and modeling of implants and other medical applications. In this project the latest medical data processing software Mimics from Material is was used to generate the 3D models of spine vertebrae which was converted with CAD software into standard triangulated (STL) files. These highly accurate 3D models of anatomical structures in STL format served to create realistic tissue models using rapid prototyping Technology

A novel 2Dd-to-3D conversion system using edge information, 2010: This work displays a novel calculation that consequently changes over 2D recordings into 3D ones. The proposed calculation uses the edge data to section the video into article gatherings. A Depth outline at that point appointed dependent on an estimated Depth inclination demonstrate. Next, the Depth delineate square based doled out by coordinating with a cross respective channel to produce outwardly agreeable Depth maps productively and furthermore lessen the square ancient rarities. A multi view video can be promptly created by utilizing a Depth video based rendering technique.

A real-time 1080p 2D-to-3D video conversion system, 2011: In this paper, a 2D-to-3D video conversion system capable of real time conversion of 1920×1080p 2D video to 3D video is presented. System fuses global and local depth generation modules to generate depth image, and use depth image based rendering(DIBR) algorithm to render 3D video. The system is implemented both on software and hardware. Software is based on multi-core system with CUDA platform. To optimize performance, several techniques are proposed, including unified streaming dataflow, multi-thread schedule synchronization, and CUDA acceleration. Real-time 1920×1080p 2D-to-3D video con- version system running at 30fps is achieved.

III.PROPOSED METHADOLOGY

Proposed approach initially take image size of 720x1280 (720p) as an input. For reduction in memory and time complexity point of view approximation is applied. Here approximation is done by shrinking of video from 720X1280 to 700X1280. Here basically we generated three types of depth images and after that we use depth fusion approach. Generated shrink RGB input is converted into YCrCb. Now for reduction in hardware & latency complexity input Y (8 bit) color is converted into 6 bit. Here three different depth map is generated which is smooth and edge, segmentation based, feature and color transformation based depth. Blurring effect and energy minimization is applied to generated face depth. For edge depth generation input is passed from edge detection process after this generated output is passed from blur effect with energy minimization. Here energy minimization is done by subtracting the input pixel with some constant value. At the last step of depth map generation merge/blending process is applied. Both generated depth map is converted in final depth map and bit size of 6 bit is changed into 8 bit.

Depth image based rendering:

In this stage generated depth map is produced right & left image by using of camera configuration .In previous approach for reduction of hardware complexity in DIBR (1/Depth) is replaced with (256-Depth)/256, for parallelism it requires large hardware unit. For reduction of this problem some changes are applied in the previous DIBR formula and that change is interchange of left & right video formula. Hence replaces (256-Depth/256) with (Depth/256) at a same time left and right offset is calculated by same hardware & at parallel process pre right video is generated. Here Pos = (Screen Width/32). Now at last stage right image and left image is generated with that offset value.

Hole Filling:

Due to depth map and DIBR process generated left & right view are having very small holes. In this proposed approach hole size is very small so there is no need of Laplace filter, edge based filter & interpolation hence smooth filter is used. This filter requires a small hardware unit with less computation time compared to other approaches. Now generated left and right image is resized in original size of 720 X 1280. Here for resize image into original format bicubic interpolation approach is used. Generated left and right video are combined with Cb and Cr content and it is passed to accurate YCbCr to RGB conversion unit. Now the generated right and left video becomes 1280 X 720 X 3, while YCbCr to RGB conversion is not a part of proposed algorithm it is a generalized one.

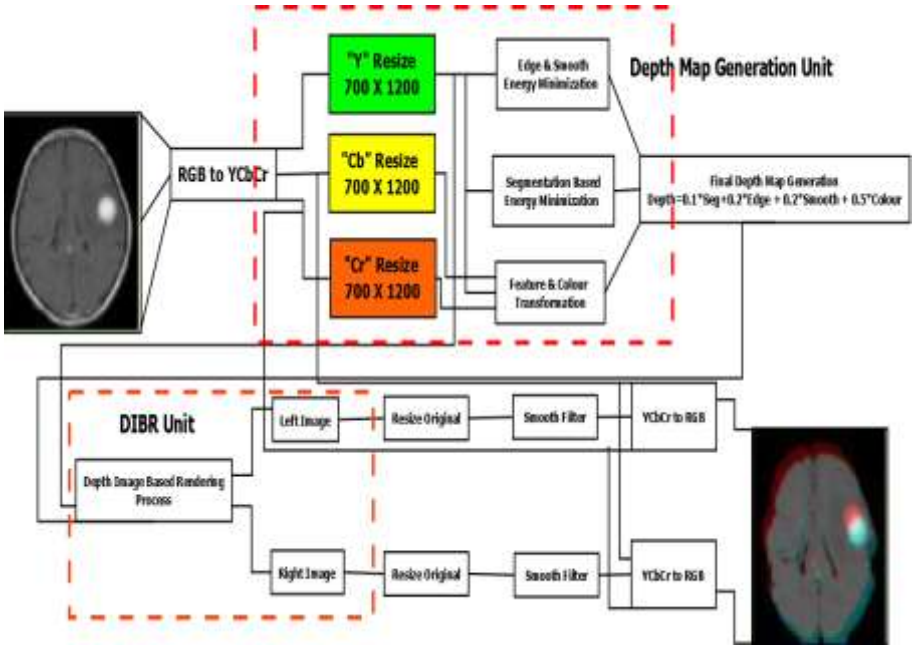


Fig.1 Block Diagram of Proposed System

IV.EXPERIMENTAL RESULTS

The proposed algorithm 2D to 3D conversion of HD video is implemented by using of matlab and subjective & objective analysis is done for different type of depth perception with have different test images. Here we have different depth perception images are taken and according to that result are generated. Memory complexity problem is reducing which results in improvement of 39%. Time complexity problem is reducing which results in improvement of 35%.

Here four different image quality parameters are used. Here structural information, structural similarity index metric (SSIM) parameter is used this is a new parameter. this parameter will check structure similarity between main image and reference image and according to that it will give score. According to proposed design is based on parallelism

MRI Image

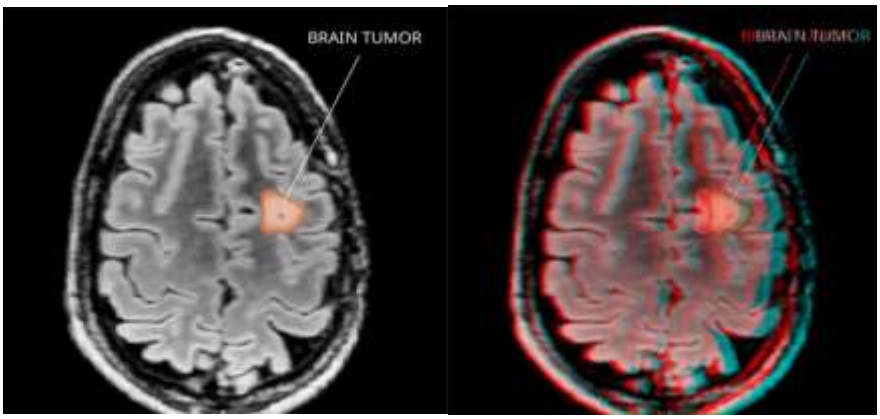
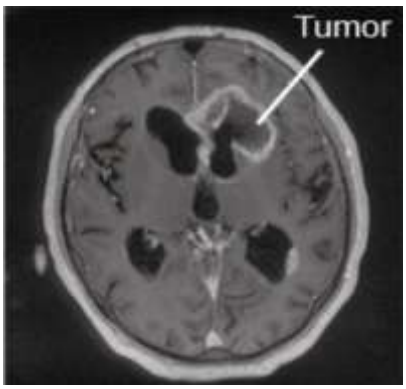


Fig.2(a) Basic MRI 2D Image **Fig.2 (b) 3D MRI Output Image**

Table I Objective analysis MRI result

Parameter	Edge Based(12)	Proposed
Memory(M Byte)	9.352	4.421
Time(sec)	12.33	6.42
PSNR	14	27.42
SSIM	0.4081	0.9629
FSIM	0.6327	0.9615
AD	56.4099	72.7786

CTSCAN Image



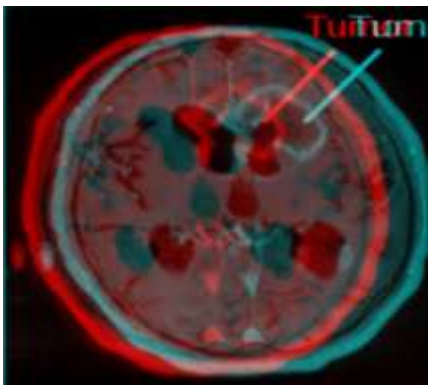


Fig.3 (a) Basic CTSCAN 2D Image **Fig.3 (b) 3D CTSCAN Output Image**

Table II Objective analysis CTSCAN result

Parameter	Edge Based(12)	Proposed
Memory(M byte)	9.352	4.421
Time(sec)	12.7	6.1
PSNR	11.67	24.95
SSIM	0.3116	0.8818
FSIM	0.6347	0.9825
AD	49.4972	60.9

XRAY Image

Fig.4 (a) Basic XRAY 2D Image **Fig.4 (b) 3D XRAY Output Image**

Table III Objective analysis XRAY result

Parameter	Edge Based(12)	Proposed
Memory	9.352	4.421
Time	12.67	5.98
PSNR	14.35	25.58
SSIM	0.323	0.8713
FSIM	06.718	0.9861
AD	52.25	68.3

V.CONCLUSION

Proposed algorithm of 2D to 3D conversion is a combination of depth map, DIBR and hole filling. For depth map generation edge detection, Gaussian filter, image shrinking and color map conversion process are require. Depth image based rendering process is

initially implemented at algorithm level and calculated processing time results 50% reduction. For per frame time calculation proposed DIBR algorithm is implemented PSNR, SSIM, FSIM, absolute similarity are image quality parameters. All these parameters are used for image quality measurement. Overall proposed 2D to 3D conversion approach is implemented on the algorithm level. At algorithm level all analysis is done in matlab. Generated 3D content from proposed algorithm is analyzed by subjective and objective analysis. At objective analysis the proposed algorithm achieves reduction in time complexity. It requires 245 msec per frame. Image applications require large memory unit so this proposed algorithm reduces the problem of the large memory unit. Proposed approach requires only 4.421 Mbyte. The proposed approach achieves 39% reduction in memory complexity as compare edge based [16] process. Similar generated 3D content is passed from different image parameters, which results small degradation in image quality. At subjective analysis of proposed 3D content results visualization of 3D output is at comfortable zone and depth of 3D output is at good zone

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