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Accountabilities of Digital Image Processing in Biomedical Imaging

Snehasish Bera[1], Koushik Pal[2], Saynee Paul[3], Suniket Pradhan[4], Chandrima Banerjee[5], Aritra Das[6], Sayani Saha[7], Sneha Samanta[8]
Department of Electronics & Communication Engineering, Guru Nanak Institute of Technology, Kolkata, India

Abstract: ***once a time, when we got any injuries we want to know where the particular cells or bones are damaged or also where any kind disease that takes place. Now, from that century, we leant a lot about it that's why the next generation is trying to instead a global step through the visibility of that particular image of cells, bones or any types of diseases. So, in that way the image is processed is known as Image Processing. I want to talk about the biomedical field where the image processing majorly takes place where we want to know about that how x-rays or digital x-rays can work through the image processing. Then, we want to know about M.R.I where M.R.I gets a major infrastructure in the medical field. After that, 3D images of C.T scan which identifies the lung cancer cells and the effect on tumors and in surgeries image processing.***
Keywords: C.T, M.R.I, anatomy, telescope, laparoscopy, thermionic emission, FMRI, etc.

I. INTRODUCTION

When a human body encompasses the uses and exploration between the datasets of the 3D image then it is called biomedical image processing. It is most commonly obtained from a C.T scan (Computed Tomography), M.R.I scanning (Magnetic Resonance Imaging) in pathology diagnosis or intervened in medical guidance for surgical planning and research purpose. Radiologists, Engineers and Clinicians carried out this image processing for understanding individual patterns of the anatomy or population groups.

A. Benefits of Biomedical Image Processing

The main benefits of this image processing allow in-depth or non-invasive exploration of the internal anatomy. To achieve more informed diagnosis, medical field improve their treatments and created a 3D model to get some interest of the anatomy to develop in medical devices and delivery systems of drugs.

Accurate digital reproduction of anatomical structures at varies scales allows to be coupled with advanced types of software tools through the image quality improving technique. They have some large varying properties where soft tissues and bones are included. For real anatomical geometries there have some measurement scale of the statistical analysis and simulate the creativity of the models to understand the opportunities of these anatomical geometries. Patient anatomy and medical devices have some interactions between them.

B. Working principle of Biomedical Image Processing

To process the medical image processing, a suitable format are used to capture relevant software to acquire some raw data from C.T and M.R.I images and reconstructs them.

The image volume is processed for segmentation and editing interest of anatomical techniques used for medical users. In 2D and 3D levels, different image processing can be carried out in Synopsys Simple ware Software which includes

1) To remove some unwanted noise from image filters.
2) For faster image processing input data cropping and resampling is done.
3) To apply the image data from the different parts is measuring and the statistical tools want to quantify like centerlines.
4) For physics based simulation and design work they have to export the processed models.
5) To interact with individual anatomies they can import CAD models to implants and medical devices.

In the medical image processing there have some challenges exist through the image display and filtering, to feature detection and pattern recognition, to archive some images by the interchanging , manipulation, compression and short term storage. There have some technical advantages in this field which includes DICOM, tele radiology, lossless compression standard and Picture Archiving and Communication Systems (PACS).

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C. Applications of Medical Image Processing:

Medical image processing applied in the C.T, M.R.I scanning, some types of surgeries which is discussed later and complex x-rays systems are encompasses the exploration of the datasets of the human body through the 3D image.

1) Effect of X rays in Image Processing

To extract quantitative information, Digital x-ray images are suppressed the irrelevant details and enhanced diagnostic information. The x-ray projection of radiography are discussed and defined through the basic concepts and the terminology of the image processing. The image processing involves more points in local and global operations. The operations of the algebraic point are presented in some linear and non-linear gray scale. Linear filtering, nonlinear filtering, misregistration corrections and distortion corrections are included in the local operations.

2) Producing x-rays in Image Processing

To produce x-rays in the Image Processing, we have to know from the beginning which is

1) A hot filament is discharging the electron at the cathode or negative terminal. It is called as Thermionic Emission. It happens in the metals where thermal energy transferred to the electrons by large amount and discharging the electrons from the metal.
2) The positively charged anode aimed towards the electrons beam.
3) 200 kiloelectronsvolts occurs between the two electrodes.
4) At high speed electrons 1% of their energy is losing around the main impacts which lose x-ray photons. In the lower energy levels, the outer shell electrons released the energy.
5) Converting the remaining energy into heat and minimised overheating, the tungsten anode rotates at 3000 rev. per minute for cooling purpose.

Fig.1 Image of X-ray in L.S Spine LAT view

3) M.R.I in the Image Processing

M.R.I is a non-invasive imaging technology which is known as Magnetic Resonance Imaging which can produces 3D anatomical images. It's also used for disease detection, diagnosis and monitoring some treatments. M.R.I detects and excites by some sophisticated technologies allows the rotation axis of protons that makes in the living tissues and found in water.

A strong magnetic field force protons to employ powerful magnets for aligning magnetic field then MRIs allows that. To process this, a radiofrequency passes through the body of the patient and simulates and spin out of the equilibrium and against the pull of the magnetic field. The magnetic field is able to detect the energy which s released from the MRI sensors while it is turned off. In that time, the protons take the realign with the magnetic field where an amount of energy went and converts those energies depending upon the environment and the molecules chemical nature. But there is always a difference between the various types of tissues that based on the properties of the magnetic elements which only detects by a physician.

MRI scanner captures the non-bony parts or soft tissues of the body. Computed Tomography differs, not to damage the ionizing radiation o f x-rays. In MRI scanning, spinal cords, brains and nerves which are as well as muscles, ligaments and tendons are clear than the regular x-rays and CT scan. Image of knees and shoulder injuries is scanned by MRI.

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Fig.2 MRI scanning of Brain

To get a difference between the white matter and gray matter, MRI is used for tumors and aneurysms diagnosis purpose. M.R.I does not depend on the x-rays. MRI is more cost effective for x-ray imaging and C.T scanning.
Especially for Functional Magnetic Resonance Imaging (FMRI), is used to observe the structure of the brain where the brain is particularly active during various types of cognitive tasks. By using this, we can advance the level of MRI through the Neurological status and the Neurological risk and get some good potential for understanding the brain organization.

4) C.T scans using Biomedical Image Processing

Now a day, lung cancer cells get some momentum in recent days. To prevent this disease, C.T scans image processing technique adequate in the breakdown in lung cancer cells. Computed Tomography (C.T) is using Computer Aided Diagnosis (CAD) system is helped in the early diagnosis of the lung cancer where they can distinguish between the benign and malignant tumors.
There are two types of lung cancer i.e. Small cell lung cancer and Non-small cell lung cancer. These types of cancer can include with chest pain, blood coughing, loss of appetite, weight losing, shortness of breath and sick feeling etc. if we can detect those disease early, we can get improvement rate beyond as 15% to 50%. Also, the survival rate is needed to increase more than the current values.

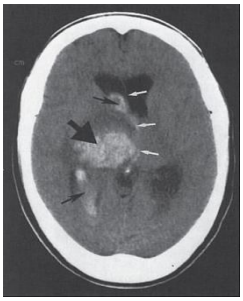

Fig.3 Images of C.T scan

C.T scans projected a 3D image of the lungs, that's why it's get a recommendation everywhere. By early detection and treatment, the rate of mortality can be reduced of the disease. To stop spreading this cancer cells, early detection made a key role for preventing the cancer cells. However, other technique does not provide accuracy towards lung cancer.
C.T scan is able to provide an images of bone, blood vessels at the same time during scanning. This have less sensitive to the patient movement during MRI. It is painless, non-invasive and accurate also. And during C.T examination there is no radiation stay in the patient's body. Those are the key advantages of the C.T scans.

5) Effects in surgeries through Image Processing:

Laparoscopy is one of the surgeries which are done by image processing. This is a minimally-invasive surgery inserting the tools and telescope which conduct the surgical operation. The main applications are categorized for the image processing technique whereas laparoscopic surgeries are including video processing by laparoscopic image enhancement. Laparoscopic video contains telescope related applications; surgical instrument related application and soft tissue related application and high power level of applications which are contain safe action. Here, laparoscopic videos are using fusion technique for recognizing and extracting surgical task.

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II. FUTURE SCOPE

Image processing has some key advantages for our future generation. Medical students involve themselves by using telescope technology. And during lung cancer they want early detection devices which can detect or any other types of diseases more than now by MRI scanning. I sincerely think that there is a way where we can develop MRI scanning system in this way where we can not only detect the disease we can also dissolve the particular disease from the depth like cancers or tumours etc. X- Rays also digitalised by some extraordinary inventions and taking action in so many things like security checking purpose in airlines and super market highly developed offices. Narcotic department widely used x-rays in airline or any security purpose. Now a day not only laparoscopic surgery is happened by using image processing other so many things are directly involve in this topic. That's why in biomedical field, Image processing is developed generation by generation where everything is near aside of us.

III.CONCLUSIONS

The entire document should be in Times New Roman or Times font. T Image processing is not only defined about the global medical services which made by centuries to centuries it's also illustrate about that generation which made modern medical service so easy and give durability to consist. Surgeries like laparoscopy and the other types of surgeries will execute in future which is renovating right now. Image processing is very much useful for engineers, radiologists and clinicians most of the cases. They are taking the maximum advantage from the biomedical field from C.T scanning, M.R.I scanning and multiple levels of x-rays and in the surgeries also. Now this is not only developed in the medical purposes but also take the major action in the other security purpose, research purpose and in many more things which develops and research in future. From where we can made our major health related problem or other types of problem so easier and less cost effective and make a global evolution for the people from this Biomedical Image Processing.

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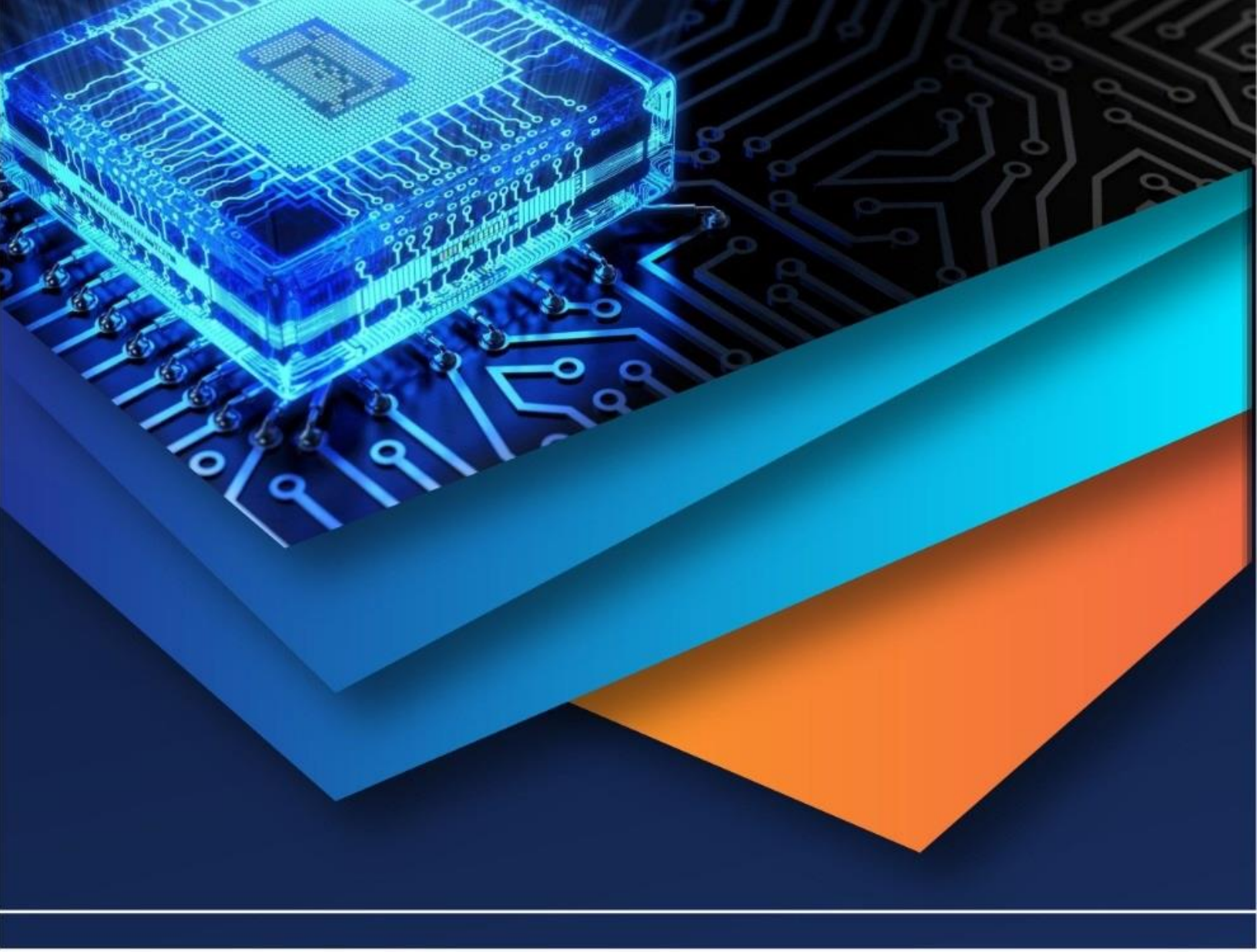

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