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Digital Image Processing for Medical Diagnosis

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Abstract: *A precise analysis of medical image is an important stage in the contouring phase throughout radiotherapy preparation. Medical images are mostly used as radiographic techniques in diagnosis, clinical studies and treatment planning. Medical image processing tool are also similarly as important. With a medical image processing tool, it is possible to speed up and enhance the operation of the analysis of the medical image. This paper describes medical image processing software tool which attempts to secure the same kind of programmability advantage for exploring applications of the pipelined processors. Digital image processing plays a pivotal role in modern medical diagnosis, enabling accurate analysis and interpretation of medical images. This abstract provides an overview of recent advancements in digital image processing techniques and their applications in medical diagnosis. The abstract explores various image processing methods, including image enhancement, segmentation, feature extraction, and classification. Furthermore, it discusses how these techniques are utilized in different medical imaging modalities such as X-ray, MRI, CT, and ultrasound. Additionally, the abstract highlights the challenges and future directions in this field, emphasizing the importance of interdisciplinary collaboration between medical professionals and computer scientists to develop innovative solutions for improved healthcare outcomes.*

Keywords: Image Processing

I. INTRODUCTION

Image Processing is a form of information processing where the input and output are images, such as photographs or frames of video. Image Processing techniques usually process images as 2D signals and apply standard signal processing techniques to them. In general, image processing can be divided into digital image processing and medical image processing. This paper will focus on medical image processing tools. In medical fields nowadays, medical imaging and processing tools are playing crucial roles in many applications. Such applications take place throughout the clinical track of events; not only within diagnostic settings, but prominently in the area of preparation, carrying out and evaluation before surgical operations , therefore, the pros and cons of the medical image will directly influence the result of the diagnosis from a doctor to the patient. Digital image processing plays a crucial role in medical diagnosis by enhancing, analyzing, and interpreting medical images such as X-rays, MRI scans, and CT scans. It involves techniques like image enhancement, segmentation, feature extraction, and classification to aid in the detection and diagnosis of various medical conditions. These processes help healthcare professionals extract valuable information from images, leading to more accurate diagnoses and treatment plans.

II. LITERATURE SURVEY

Saik Naseera, G. K.
Research focus:A Review on Image Processing Applications in Medical FieldPublished in: 2017 Description: Biomedical signal/image processing and the related imaging modalities is a very vast growing and upcoming field. This paper presents the promising image processing techniques used in medical field. Methods: Application of image processing techniques has played a vital role in assisting the surgeons and physicians in diagnosing the diseases and performing the surgeries for the patients. Clinical medical devices has erupted through combination of hardware and image processing techniques which has a giant leap in medical field.

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Lay Khoon Lee and Siau-Chuin Liew

A Research focus: A Survey of medical Image Processing Published in: 2015 Description: A precise analysis of medical image is an important stage in the contouring phase throughout radiotherapy preparation. Medical images are mostly used as radiographic techniques in diagnosis, clinical studies and treatment planning. Medical image processing tool are also similarly as important. With a medical image processing tool, it is possible to speed up and enhance the operation of the analysis of the medical image. This paper describes medical image processing software tool which attempts to secure the same kind of programmability advantage for exploring applications of the pipelined processors.

III. METHODOLOGY

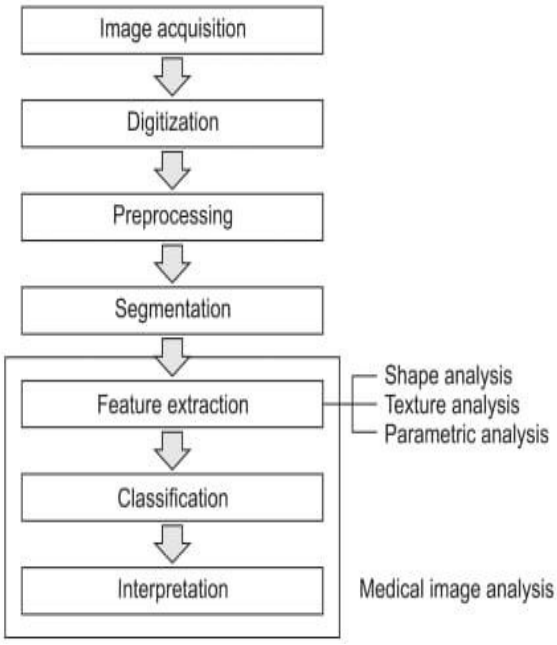

Fig 1: Block Diagram

- Image Acquisition: The process begins with acquiring digital images through various medical imaging modalities such as X-ray, MRI, CT scan, ultrasound, etc. Each modality has its own characteristics and produces images with specific properties.
- Pre-processing: Raw images often contain noise, artifacts, and inconsistencies. Pre-processing techniques like filtering, noise reduction, and image enhancement are applied to improve image quality and make it suitable for analysis.
- Segmentation: Segmentation divides the image into meaningful regions or structures, separating areas of interest from the background or irrelevant structures. Techniques like thresholding, edge detection, and region growing are used for segmentation.
- Feature Extraction: Once the regions of interest are identified, relevant features are extracted from these regions. Features could include texture, shape, intensity, and other quantitative measurements that characterize different anatomical structures or abnormalities.
- Classification: In this stage, the extracted features are used to classify or identify specific anatomical structures, lesions, or diseases. Machine learning algorithms, such as support vector machines, neural networks, or decision trees, are commonly employed for classification tasks.
- Post-processing: Post-processing involves refining the results obtained from classification, such as removing false positives, smoothing boundaries, or further enhancing the visualization of specific features.
- Interpretation and Diagnosis: Finally, the processed images and analysis results are interpreted by medical professionals for diagnosis and decision-making. The processed images may aid in detecting diseases, planning treatments, monitoring disease progression, or assessing treatment efficacy.

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IV. CONCLUSION

The imaging modalities play a vital role in acquisition of signals and images from human body which involves invasive and non-invasive methods. The process of medical image processing begins by acquiring raw data from CT or MRI images and reconstructing them into a format suitable for use in relevant software. A 3D bitmap of greyscale intensities containing a voxel (3D pixels) grid creates the typical input forimage processing. Being mostly noninvasive, biomedical imaging offers precise tracking of metabolites that can be used as biomarkers for disease identification, progress, and treatment response. One among them is CT scan, which is an important tool in medical imaging to supplement X-rays and medical ultrasonography.

V. FUTURE SCOPE

It takes great effort to improve the performance of classification or diagnosis of diseases using multiple methods of medical images.In future work, we will try to present new research directions that can be further exploited in disease diagnosis through medical image processing techniques.We will compare the most common methods that are used in the diagnosis systems and select the most effective methods that introduce higher accuracy to the diagnosis for the medical image database that we use to build a new diagnostic system for diseases.AI has the potential to revolutionize the advanced medical imaging industry. Already, AI is being used to help physicians sift through large volumes of scans and return diagnostic insights, giving them more time to oversee treatments and work directly with patients.The transition from 2D to 3D medical image segmentation is an evolving frontier.

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