Chapter 7
An Analysis of Algorithms and Methods Based on Image Processing for Medical Applications

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ABSTRACT

Image processing has become more crucial in medical applications due to its ability to collect and evaluate data from medical images. This book chapter provides an overview of various image processing techniques used for medical applications, including deep learning algorithms, segmentation techniques, and a combination of both. Additionally, the authors discuss other studies that analysed X-rays and used image processing to identify cancer, brain tumours, and other disorders. The results of the study demonstrate how image processing techniques have the potential to significantly improve sickness detection speed and accuracy, facilitating early diagnosis and treatment. The planning of therapies and the accuracy of diagnoses can both be enhanced by the use of image processing tools. Healthcare workers' ability to recognise and manage a variety of medical conditions will undoubtedly increase.

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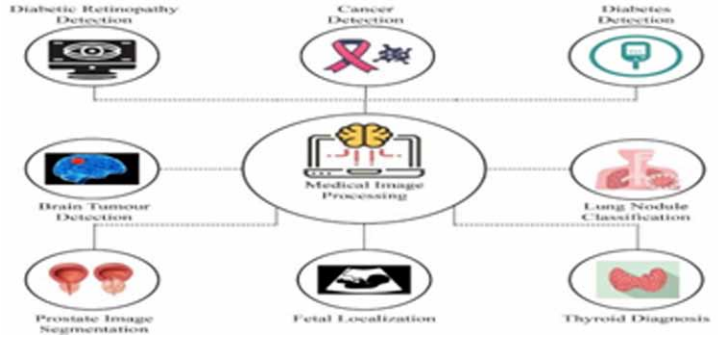
Figure 1. Applications of image processing in healthcare



1. INTRODUCTION

Image processing (Pandey, B. K. et al., 2021) has transformed healthcare by enabling accurate, efficient, and non-invasive diagnostic and treatment alternatives. The quality of medical pictures (Singh, S. et al., 2023) and their interpretation have substantially increased thanks to image processing techniques, which are essential to patient care. The uses of image processing in healthcare (Pandey, B. K. et al., 2022) and how they affect patient care will be covered in this article. Healthcare has greatly benefited from image processing, which has given physicians cutting-edge tools for diagnosis and treatment planning. Medical imaging in the past was mostly restricted to conventional modalities like X-rays and CT scans. However, with the advent of image processing techniques, these images (Raghavan, R. et al., 2022) can now be enhanced and analyzed with greater accuracy and precision (Meslie, Y. et al., 2021), providing clinicians with more detailed information about a patient's condition. Figure 1 shows various applications of image processing in healthcare (David, S. et al., 2023).

One of the most significant applications of image processing in healthcare is in the diagnosis of cancer (Gupta, A. et al., 2021). Medical imaging plays a critical role in cancer diagnosis, and image processing techniques can improve the accuracy of cancer detection and diagnosis. Image processing techniques could improve the detection of breast cancer on mammograms, reducing the number of false positives and false negatives. Image processing techniques (Pandey, D. et al., 2021) are to analyze CT scans of lung cancer patients and found that this approach could predict treatment outcomes and survival rates. Figure 2 shows steps involved for detecting cancer using image processing.

Image processing techniques (Tripathi, R. P. et al., 2023) are also used in treatment planning for cancer and other diseases. For example, radiation therapy relies on accurate imaging to target tumors while minimizing damage to healthy tissue. Image processing techniques can be used to create 3D models of organs and structures, allowing radiation oncologists to precisely plan and deliver radiation therapy. Image processing techniques to develop a personalized treatment planning approach for cervical cancer patients, improving treatment outcomes and reducing side effects.

In addition to cancer diagnosis and treatment planning, image processing techniques are also used in the diagnosis and management of neurological disorders. For example, MRI scans are used to diagnose and monitor conditions such as multiple sclerosis and Alzheimer's disease. Image processing techniques can be used to analyze these images (Pandey, D., & Pandey, B. K., 2022) and identify structural and functional changes in the brain that may indicate disease progression. Image processing techniques were

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