

Spine Deformity Assessment for Scoliosis Diagnostics Utilizing Image Processing Techniques: A Systematic Review

Abstract

Spinal deformity refers to a range of disorders that are defined by anomalous curvature of the spine and may be classified as scoliosis, hypo/hyperlordosis, or hypo/hyperkyphosis. Among these, scoliosis stands out as the most common type of spinal deformity in human beings, and it can be distinguished by abnormal lateral spine curvature accompanied by axial rotation. Accurate identification of spinal deformity is crucial for a person's diagnosis, and numerous assessment methods have been developed by researchers. Therefore, the present study aims to systematically review the recent works on spinal deformity assessment for scoliosis diagnosis utilizing image processing techniques. To gather relevant studies, a search strategy was conducted on three electronic databases (Scopus, ScienceDirect, and PubMed) between 2012 and 2022 using specific keywords and focusing on scoliosis cases. A total of 17 papers fully satisfied the established criteria and were extensively evaluated. Despite variations in methodological designs across the studies, all reviewed articles obtained quality ratings higher than satisfactory. Various diagnostic approaches have been employed, including artificial intelligence mechanisms, image processing, and scoliosis diagnosis systems. These approaches have the potential to save time and, more significantly, can reduce the incidence of human error. While all assessment methods have potential in scoliosis diagnosis, they possess several limitations that can be ameliorated in forthcoming studies. Therefore, the findings of this study may serve as guidelines for the development of a more accurate spinal deformity assessment method that can aid medical personnel in the real diagnosis of scoliosis.

Keywords

Image Processing; Medical Images; Scoliosis Diagnostic; Spine Deformity