

A fully automatic curve localization method for extracted spine

ABSTRACT

The automation of scoliosis positioning presents a challenging and often understated task, yet it holds fundamental significance for the automated analysis of spinal morphological anomalies. This paper introduces a novel spinal curve localization model for precisely differentiating the spinal curves and identifying their concave centers. The proposed model contains three components: i) custom spine central line model, to define the spine central line as a combination of several secant line sequences with different polarities; ii) custom curve model, to classify each spinal curve into one of 11 curves types and deduce each its concave centers by several custom formulas; and iii) adapted distance transform and quadratic line fitting algorithm coupled with custom secant line segment searching strategy (DTQL-LS), to search all line segments in the spine and group consecutive line segments with identical polarity into line sequence. Experimental results show that its positioning success rate is close to 99%. Furthermore, it exhibits significant time efficiency, with the average time to process a single image being less than 30 milliseconds. Moreover, even if some image boundaries are blurred, the center of the curve can still be accurately located.