TJHSST Computer Systems Lab Senior Research Project
Automating Scoliosis Analysis
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Abstract

My program will take a scoliosis x-ray image file and automatically measure the angles of curvature and points at which to apply pressure for optimum treatment and then return this image to the user (presumably a doctor) to determine how to treat the patient.

Keywords: edge detection

1 Introduction

Scoliosis, or lateral curvature of the spine, is a health defect that starts showing signs often in early adolescence. Early and accurate diagnosis of this condition is most helpful in preventing its growth, and thus preventing the need for spinal surgery. One of the current processes to treat the curve is to manually measure the angles of the patients curve(s) and then determine pressure points.

My program will take an x-ray image file and automatically measure the angles and points at which to apply pressure for optimum treatment and return this image to the user (presumably a doctor). This will make optimum treatment of scoliosis a partially automated (and thus much easier) process for both the doctor and the patient.

2 Background

People have tried different approaches to problems similar to the one I am working on. For example, one group of researchers used moi images of patients. backs to detect if they had scoliosis. The program, in the end, had an 88.2 percent rate of accuracy. This tells me that using moir images could be one approach to my problem as well. If I can find out how the authors detected scoliosis through the images, I could perhaps convert the x-ray to one and make more observations from the same findings.

The primary approach I have used to solve my problem so far is edge detection. I have mostly been using two specific edge detection algorithms: horizontal differencing and Robert.s cross. In horizontal differencing, edge are determined by contrast from horizontally adjacent pixels.

3 Development

So far, the primary approaches I have used for my program are edge detection by horizontal differencing and with the Robert.s cross algorithm. Since these approaches have been mainly unsuccessful, I plan on trying simpler methods to achieve the same goal. Instead of attempting to trace out the spine with edge detection, I will simply remove the ribcage from the picture and then find the rightmost and leftmost points. These will be the points at which the spine curves and thus where pressure should be applied for optimal treatment. Another feature I could add to my program is calculating the angles of curvature. I would use this by approximating edge detection and then measuring the angle between the two resulting lines.

The input my program takes is the x-ray in a .pgm picture file format. In order to test my program, I just input the .pgm file I currently have and examine the final output using GIMP to view it.