

Development of a low cost, sensing device to assist in the physiotherapy and day-to-day treatment of incorrect posture due to the tightening of pectoral muscles and hip-flexors or Kyphosis and Scoliosis

Gupta G, Smith MR

Abstract

The failure to maintain correct posture can have drastic effects; the more severe a curvature in the spine becomes, the more likely that the afflicted person will need either a back brace or, have to undergo corrective surgery¹. Permanent deformity and muscle strain can occur, as prolonged effects². In an attempt to avert these issues, physiotherapists often prescribe stretches and exercises to patients, that can be practiced throughout the day in order to correct the spinal position and improve overall posture³. The patient however, may forget or become too tired to continue practicing proper posture. With this in mind, a potential solution that could be implemented would be a device that detects movement in the back. It would alert the patient if they slouch their shoulders or arch the lower region of their back to an extreme degree, for example. This alert would be the vibration of a pad on the patient's stomach, or a vibration or beeping sound from the patient's phone. In order to create this mechanism, familiarization with the ADXL 345 accelerometer and how to interface it with a processor, was necessary. After the program was complete, examination of the acceleration values obtained was done. Observed anomalies led to the need for calculation of angular movement. The approach of using equations involving 3-dimensional movement, and derivatives of these equations were implemented into the program. Calibration of the accelerometer at rest was needed as well. Both of these would allow for more accurate detection of twists and tilts in a human's back. Introducing a second or third accelerometer into this device is a valid option that may be explored in the future. This modification would allow for increased accuracy in values obtained, as well as for continuous calibration while the device is in use.

References

1. Hans-Rudolf Weiss & Deborah Goodall, Rate of complications in scoliosis surgery - a systematic review of the Pub Med literature, Scoliosis (Biomed Central) <http://www.scoliosisjournal.com/content/3/1/9>, 2008.
2. Keltie Wattie, M.Sc., P.T. Co-Owner, Calgary Youth Physiotherapy
3. Linette Lahey, B.Sc., P.T. Co-Owner, Calgary Youth Physiotherapy