DEVELOPMENT OF THE PORTABLE POSTURE TRAINING DEVICE

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INTRODUCTION

Clinically, an orthosis could be used to support and correct the spine mechanically when moderate abnormal curvature of the spine is detected. The conventional spinal orthoses have been confirmed to be effective in altering the natural history of adolescent idiopathic scoliosis (AIS) [1]. However, employing the orthosis requires the constant corporation from the patient and wearing the orthosis too long might induce muscle atrophy or motion incoordination by this passive correction approach [2].

The aim of this study was to develop a portable posture training system by applying an audio-feedback signal to promote the active correction of the abnormal posture from subject's muscle force [3] and to prevent continue deteriorated. This system could be used to detect a pre-set angle limitation of a joint and remind the patient adjusting to a suitable posture by audio warning when this angle limitation is violated.

METHODS

In order to achieve the portable objective, this posture training system needs to be light weight and low-power consumption. Therefore, the designed system consisted only two components: a flexible bend sensors (FSR, FLX-01 and Images SI Inc, Figure 1) and a self-developed data logger. The bend sensor, stick on the skin by the sport tape, is used to monitor the rotation (bending) on the joint thus detecting the patient posture on his/her activities of daily living. The design chart of the data logger is shown in Figure 2. This data logger used MSP430F169 microprocessor (Texas Instruments) as the MCU which incorporated the A/D function.

In order to prevent constantly calibration and degeneration of the bend sensor, a setting button was built within the data logger. By pressing this setting button, current bend angle of the bend sensor would be recorded into the data logger and used as a pre-set angle limitation of the joint.

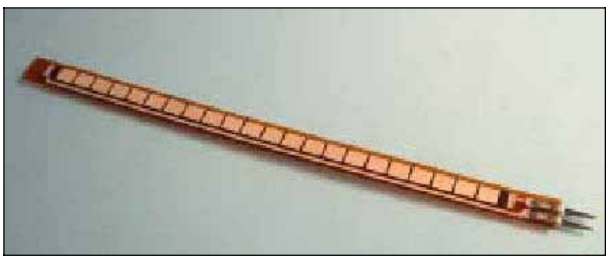

Figure1: Bend sensor

RESULTS AND DISCUSSION

Figure 3 shown the finial layout of the data logger circuit board. The weight of this data logger is less than 120g (including the box) and with two mercury batteries this system could operate up to 400 hours. To use this system after the bend sensor was stick on the target joint, the user needs to posture the joint at the limitation of the correct angle and press the setting button. If later, the angle of the target joint is larger or smaller (depends on the setting) than this angle limitation, system would provide with am alarm sound. The device provided two modes for alarming: the static mode, if the angle violate the limitation for more than 10 second; the alarm sound will be sent out. The second mode, the dynamic mode, would send out the alarming once the violation of the angle is detected. The current angle sampling setting of this system is set as 10 HZ, and theoretically, with 12 bits of A/D converting, the resolution of this system could up to 2 degree.

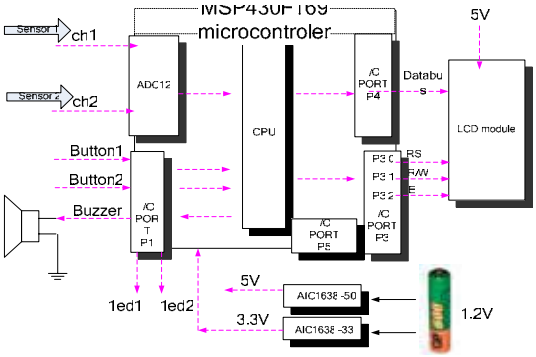

Figure 2: The Data logger design chart

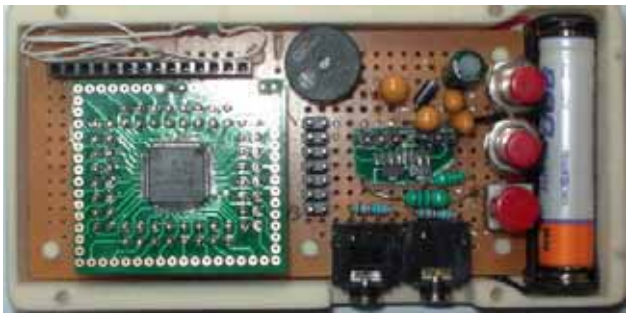

Figure 3: The circuit board of the data logger

CONCLUSIONS

A portable posture training system was developed with simple component design and easy to use. Clinical trails of this system are currently being evaluated.

REFERENCES

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