VESTURE SCRUTINY AND ADMONITION OF RACHIS CURVITY USING AN CONGENER APPLIANCE SENSOR

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ABSTRACT- *Improper posture of the spinal cord causes various problems in present and future life. This is due to the long time usage of smart phone and laptop by youngsters, IT professionals and working staff which leads to neck pain and low back pain and in turn leads to spinal related disorders. Best way to prevent this is by keeping a good posture as a daily routine. The focus of this paper is to build a wearable device to detect wearer's bad posture and alert the user to return back to the erect position. As well as provide a feedback through buzzer and LCD display. In this we use accelerometer sensor for detecting the bending angle once poor posture is detected, and it is processed through PIC16F877A. Through this project we can train the user to maintain a good posture through its continuous use and we also provide massager to the user and it is used whenever the user experiences an ache in the low back. Since the proposal of such devices various prototypes capable of measuring spinal posture have been proposed.*

Keywords: Spine, ADXL335 Sensor, PIC16F877A, 5V DC Motor, Warmer

I. INTRODUCTION

The spinal cord is the most important structure between the body and the brain. The spinal cord is 40 to 50 cm long and 1 cm to 1.5 cm in diameter. Two consecutive rows of nerve roots emerge on each of its sides distally to form 31 pairs of spinal nerves. The human spinal cord is divided into segments where pairs of spinal nerves (mixed; sensory and motor) form. The spinal cord is a cylindrical structure of nervous tissue composed of white and gray matter, is uniformly organized and is divided into four regions: cervical (C), thoracic (T), lumbar (L) and sacral (S), each of which is comprised of several segments. The 8 cervical segments forming 8 pairs of cervical nerves ,12 thoracic segments forming 12 pairs of thoracic nerves, 5 lumbar segments forming 5 pairs of lumbar nerves, 5 sacral segments forming 5 pairs of sacral nerves and 1 coccygeal segment.

Fig1.1Region of spinal Cord

Posture is the way that a person can sit, stand, walk and perform tasks, it also reflects one's effect on their health. Poor posture leads to poor health conditions like neck pain and low back pain. Maintaining a correct body posture is significant to lead a healthy life which helps in proper functioning of organ and proper blood circulation throughout the body. A good posture allows the vertebrae of the spine to be correctly aligned. Good posture should be maintained whether moving or still. It ensures the muscles supporting the skeleton and organ functioning are not impaired. A bad posture reflects the bad health and gives bad structure to the body. When a person is maintaining a bad posture, the stress on the curvature of the spine is increased which causes muscle fatigue. Bad postures are formed by bad standing, sitting, and moving habits and inaccurate implementation of body alignment. Bad posture not only detracts from a person's appearance, but also may lead to chronic injury and pain in muscle, joint, and ligaments, or even disability. The four most common bad standing postures are Kyphosis-lordosis, Flat-back, Sway-back, and Scoliosis. In order to avoid this, a posture corrector is used.

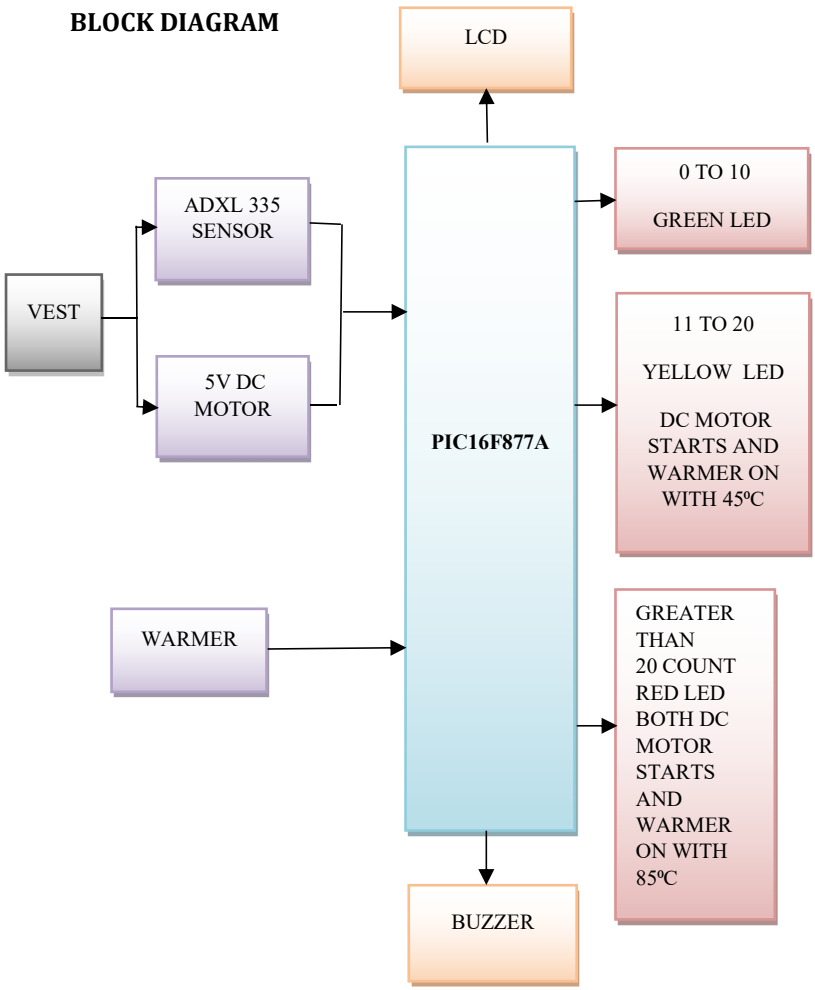
II. EXISTING SYSTEM

There are many of wearable devices is used for measuring the spinal cord posture monitoring. Some accelerometer-based prototypes were developed to monitor human posture. However there are bulky and complex with much instrumentation on the body. The good posture defined as ears aligned with the shoulders blades, the posture of the head especially the neck should be constantly same with the posture of the lumbar spine. The increment of every angle flexion and extension of the neck will increase the weight of the head and directly increase the stress on the cervical spine and causes neck pain. The lumbar spine is where the back pain occurs due to most of the strain is placed. The lumbar spine also experienced more motion compared with thoracic spine and most likely to injured if the posture is not correct.

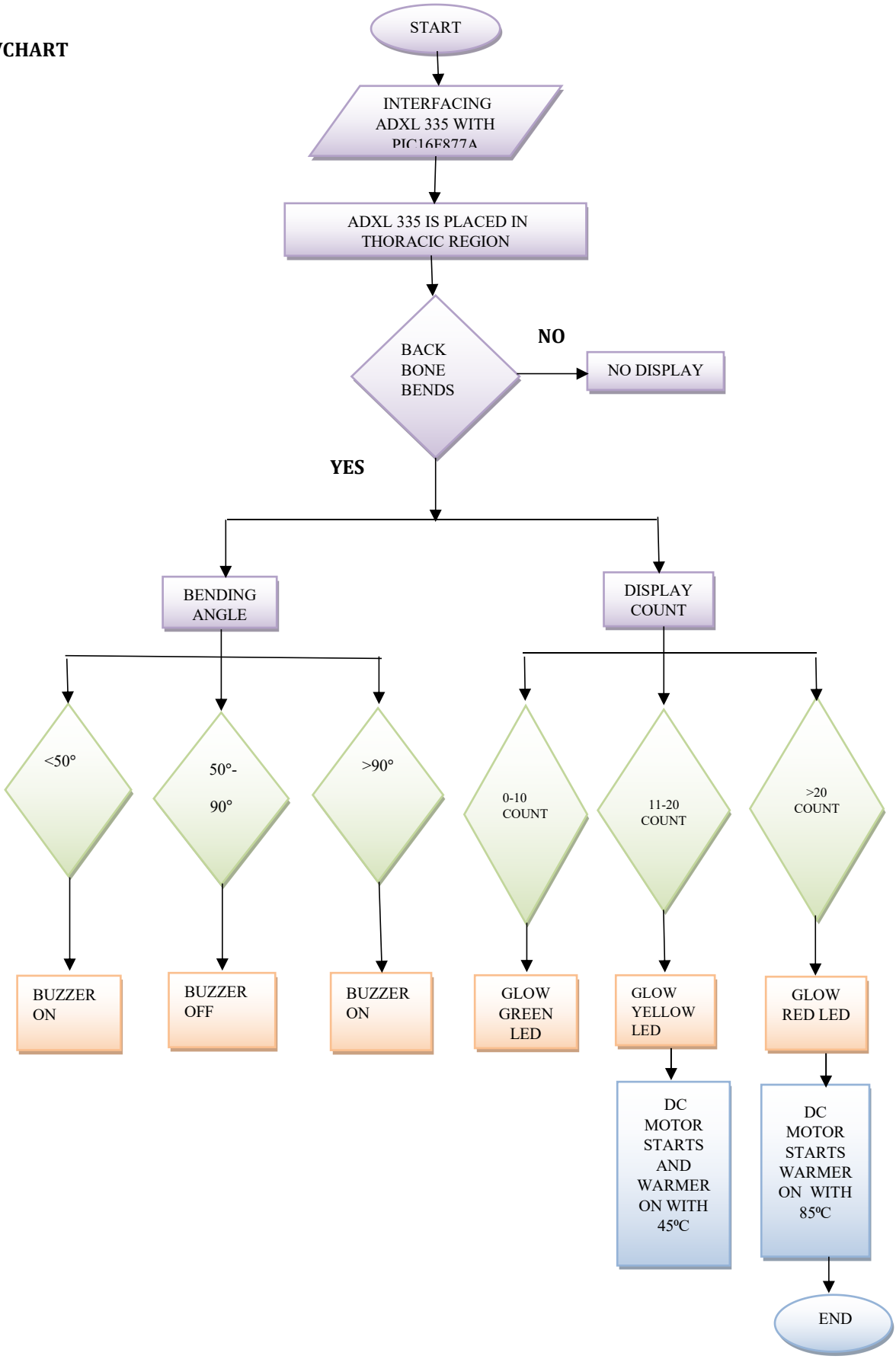
III. PROPOSED SYSTEM

A wearable Vesture Scrutiny and Admonition posture system was developed by using ADXL 335 accelerometer and an **PIC16F877A** microcontroller. By interfacing the accelerometers with the **PIC16F877A** are measured the bending angle of deflection streamed through LCD display. accelerometers with the **PIC16F877A** are measured the bending angle of deflection streamed through LCD display. The accelerometer sensor must be utilised to get the desired angle for the process of posture detection. The LED act as an indicator for the user based on bending count. The buzzer gives the sound while the spinal cord of the body has been bent.

BLOCK DIAGRAM



FLOWCHART


START
INTERFACING ADXL 335 WITH PIC16F877A
ADXL 335 IS PLACED IN THORACIC REGION
BACK BONE BENDS
NO
NO DISPLAY
YES
BENDING ANGLE
DISPLAY COUNT
<50°
50°-90°
>90°
0-10 COUNT
11-20 COUNT
>20 COUNT
BUZZER ON
BUZZER OFF
BUZZER ON
GLOW GREEN LED
GLOW YELLOW LED
GLOW RED LED
DC MOTOR STARTS AND WARMER ON WITH 45ºC
DC MOTOR STARTS WARMER ON WITH 85ºC
END

METHODOLOGY

The accelerometer sensor for detecting the bending angle once poor posture is detected, and it is processed through PIC16F877A. It is an Software Component and its programmed with C and C++.

There is an three ways for the user to bend his/her Spine i.e, Straight, Forward and Backward. For an Straight Position an angle should be 90^0 and there is no problem for user. If the user can bend his/her body there should be deflection from 90^0 it can be fall or raise and it will leads to cause some pain.

The ADXL335 accelerometer sensor placed at the thoracic region is used to sense the curvature of the spine and measures the bending angle. Once back bone bends, the buzzer alerts the user by give a sound.

For visual alert LED and LCD display are used. Number of times our spine bends is counted, the count and bending angle with respect to the time(s) is displayed in LCD display.

When the count is in between 0 to 10, green LED starts to glow. If the count is between 11 to 20, yellow LED starts to glow simultaneously DC motor is switched ON and warmer ON with 45^0C automatically, which act as a massager for low back pain relief.

If the user doesn't feel pain, he/she can switch OFF manually. If the count is more than 20, red LED starts to glow at the same time warmer on with 85^0C automatically, which act as muscle pain reliever.

IV. RESULTS

Thus, we successfully created a wearable device that determines correct posture and indicates if a user is in bad posture. Only one Accelerometer sensor is fixed in the vest and it was placed on the thoracic region of the spinal cord to determine poor posture in on the spine. In addition to the simple prototype of detecting the wrong posture, we also succeeded in implementing an automatic posture correction system using simple DC motor, Vest and Warmer.

The Accelerometer sensor thresholds are set based on a certain angle that the user deviates from his or her good posture, and we tested this accuracy by displaying the outputted values from the Accelerometer sensor and ensuring that the motor and warmer turned on or off appropriately. The PIC is constantly reading values from the Accelerometer sensor, giving an accurate measurement of the user's posture, and the response time of the buzzer is almost immediate. This quick response is necessary to alert the user right away that he or she is in poor posture allowing him or her to correct him or herself.

V. EXPERIMENTAL SETUP

VI. DISCUSSION

To measure the bending angle, bending time and Count with the help of accelerometer sensor. The values are Calculated, tabulated the result values. Here we are Measure the spine angle and giving the alertness and provide Comfortable sitting position with the help of vest attached with warmer and Massager. The one Complete Count of bad posture was taken as bad to good posture of the patient. The buzzer installed in the system would ring as the accelerometer angle is not in normal posture. Then when the Count of bending angle is exist in the level of greater than 90 degree the green light will blink on that time the massager will turn on and warmer produce the mild heat to the person. When the person didn't need of warmer and massager they can turn off manually.

TABULATION

Subject	Age	Bending count	Colour	(ON/OFF)	(ON/ OFF)	(OFF/ ONWITH^{0}C)
Person1	25	6	GREEN	ON	OFF	OFF
Person2	28	12	YELLOW	ON	ON	45^{0}C
Person3	35	14	YELLOW	ON	ON	45^{0}C
Person4	24	5	GREEN	ON	OFF	OFF
Person5	31	22	RED	ON	ON	85^{0}C

VII. CONCLUSION

This paper present the portable and wearable posture identification system with automatic and manual warmer and massager for good sitting position is developed for monitoring and warning on students' sitting posture. Moreover, we place the automatic warmer and massager when the person got pain in hip region while they sitting in long manner our system is able to perform real-time analysis on monitoring the subjects' sitting posture. We provide several advantages to the persons who are used our device like automatic and manually warmer and massager then also if the person who used this device during that time the buzzer goes noisy they can turn off that manually and the alertness is given visually via LCD and LED.

The enhancement of the system can provide new methods in detecting seating posture with more advantages. The new system can works more perfectly and implement several devices that was helpful to the patient with the combination of the sensors, massager and heating pad.

VIII. FUTURE WORK

In order to improve this vesture scrutiny system by using the latest technologies and innovations, this can be carried out as more sophisticated and user friendly.

In future, this project has been developing by easiest portable system for benefits for the users.

The Wireless Bluetooth technology can be used, where the accelerometer sensors could communicate with the PIC without using the wires. We can also use a Smart Watch connected with wireless Bluetooth to help control the device and display and alert to the user.

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