RESEARCH ARTICLE OPEN ACCESS

Rect-O-Back

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Abstract
This document presents an approach towards developing an electronics device and a software application to maintain the correct body posture which is a mobile solution to keep our back strong and healthy. It presents the designing and functioning of equipment and software.
IndexTerms—Body posture, Baud rate, Accelerometer, Gyroscope

I. Introduction

In this work, Rect-O-Back is developed which is a posture correcting and maintaining device for health care facilities. Primary purpose of the device is to achieve health panacea by taking care of patients back problem.

There is a massive problem - back pain, about 80% of the population will experience significant back pain sometimes in their lives. It is a leading cause of missing work days, visits to the doctor, and disability claims. It is outnumbered only by the common cold. In our research, we learnt a scientific correlation between back pain and posture, and this is the inspiration behind Recto back. This device can measure both upper and lower back posture.

One important thing here is that it changes our relationship with technology and our phones. With recto we are now wearing a code, and this, extends the powerful computing power of our phone to rest of our bodies turning it into a new platform for innovation.

Recto back is a combination of this thin, flexible sensor device which user can put on their back or can wear it with their belt. It connects the user with their phone, and it measures their posture in real time. It helps people avoid injuries, get stronger and be healthier.

Presently, most of the devices that are used for maintaining posture are manual. They do not have any technology, so they are not reliable and those available with any technological element are costly.Lumo lift and lumo back are some other products for correcting body posture but, they cannot measure both upper and lower body posture. Lumo back is for lower body posture and Lumo lift is for upper body posture. Whereas, Rect-O-Back can measure both upper and lower back posture.

Rect-O-Back is a simple device which will vibrates gently whenever user slouches reminding him to sit straight, stand tall, and feel healthier. It is a reliable system which can be used by common masses.

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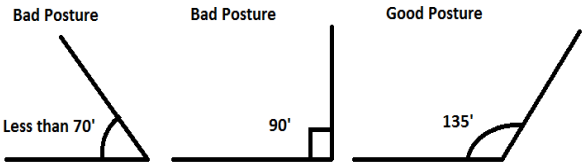

Figure 1

Figure 1 shows the good and bad posture which forms the basis of our work.

II. DEVICE

Device consists of following components: -
1) Microcontroller
2) Accelerometer
3) Gyroscope
4) Bluetooth module
5) Vibrator motor
6) Lithium-ion battery
7) Battery charger

Microcontroller is the processing unit. Accelerometer and Gyroscope are used for measuring posture value. Vibrator motor is used for providing alert. Bluetooth module is used to send posture values to the mobile phone software application.

Lithium-ion battery provides power to the device.

I. FLOW CHART

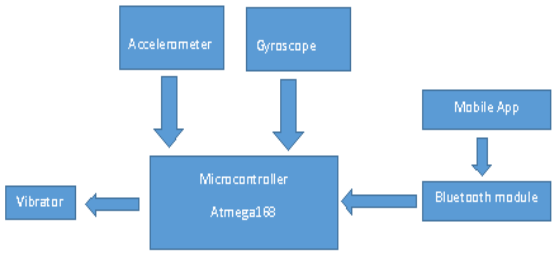

Figure 2

Device consists of a microcontroller as brain of the system along with two sensors, Accelerometer and Gyroscope for measuring posture values as shown in figure 2. These values are processed by the microcontroller using a designed algorithm. If these values do not represent correct posture then, the microcontroller will generate a signal for switching on the vibrator motor indicating that the posture is not correct. These values are consistently transferred to the mobile phone application via Bluetooth present in the device. Software will create a daily report regarding posture that the user can see.

III. ELECTRONICS COMPONENTS USED

A. Arduino Pro Mini (containing atmega 168 microcontroller)

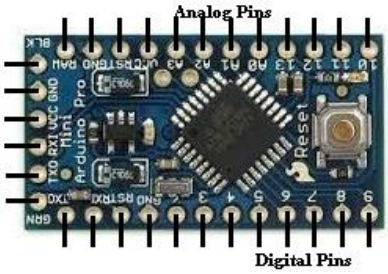

Figure 3

(Image source - http://arduino.cc/en/Main/ArduinoBoardProMini)

The Arduino pro mini is a microcontroller board having Atmega168 microcontroller. It has 14 digital input/output pins. Eight pins are analog input pins. Six pins can be used as PWM (pulse width modulation) pins. For USB power, a six pin connector can be connected to FTDI cable.

B. Accelerometer MMA7631

Three axis accelerometer is used. Low power is required for the sensor. It is highly sensitive. Current consumption is low. Sleep mode is also present to save power.

It provides X, Y, and Z axis values of the body posture. The controller then processes these values.

Accelerometer interfacing with Arduino pro mini

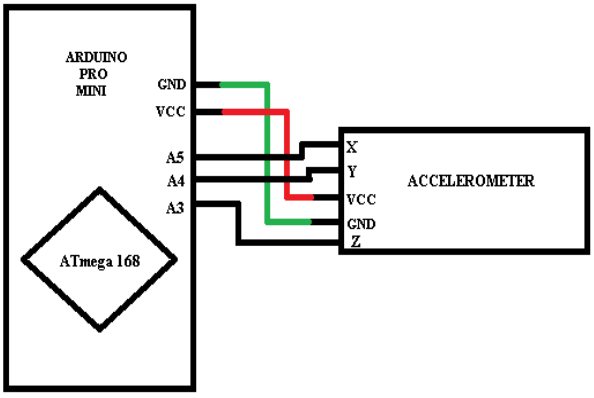

Figure 4

C. Bluetooth Module

Bluelink Silver, a class-2 bluetoothmodule is used to connect the device with mobile phone application wirelessly. It is a compact Class- It has seven pins - positive voltage, negative voltage, receiving, transmitting, clear to send, ready to send, reset.

Out of these seven pins, four pins are used for normal operation – VCC, GND, RX, TX. It is a serial transmitting device with baud rate varies from 9600 to 115200 bps.

Bluetooth module interfacing with Arduino pro mini

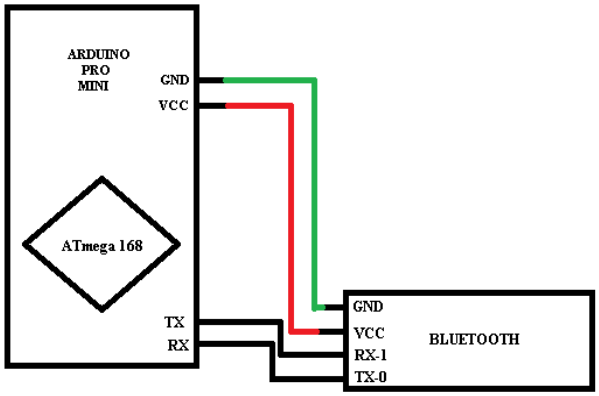

Figure 5

D. Gyroscope

ITG-3200 triple axis digital output gyroscope is used. It is a single chip sensor. It consists of three sixteen bit analog to digital convertors. It provides angular X, Y, and Z axis values of the body posture. The controller then processes these values. Vibrator Motor Vibrator motor provides vibrational alert whenever body posture is wrong.

Vibrator motor interfacing with Arduino

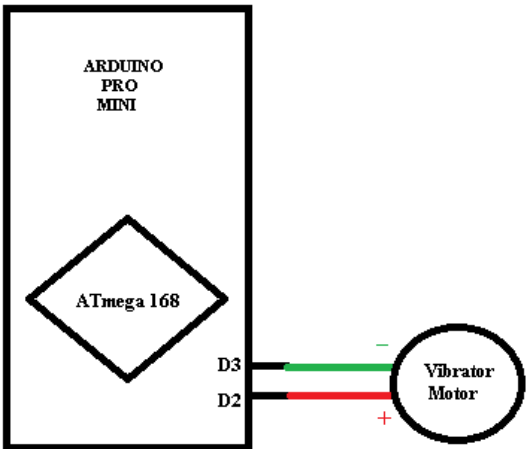

Figure 6

IV. BLUETOOTH CONNECTIVITY

To make the device portable, Bluetooth module is used for synchronizing device with the software. Bluetooth operates in the unlicensed ISM band which is 2.45GHz. Connectivity range is also appropriate.

V. ALGORITHM (HARDWARE)

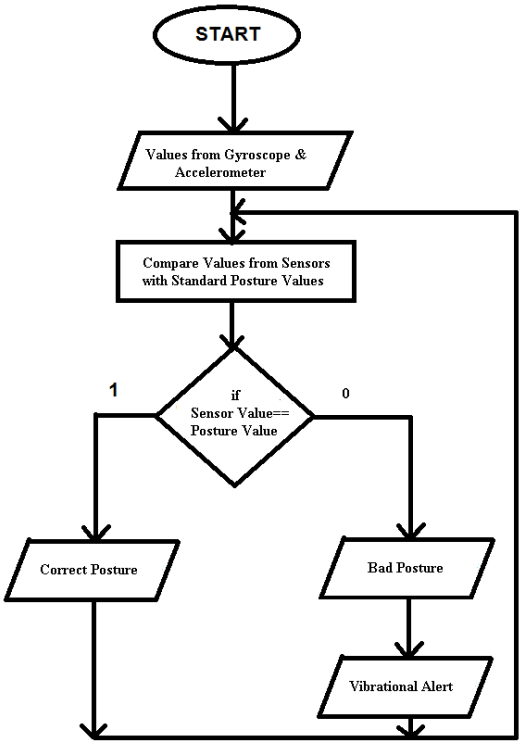

FIGURE 7

Algorithm for hardware programming is shown in Figure 7.

Values from gyroscope and accelerometer are compared with standard posture values in real time. If values are same then, posture is correct otherwise it is incorrect. Vibration alert is generated whenever posture is wrong.

VI. ACKNOWLEDGMENT

The authors would like to thank Mr. Umesh Dutta of the department of Electronics and Communication under whose aegis, this work is completed.

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CIRCUIT DIAGRAM

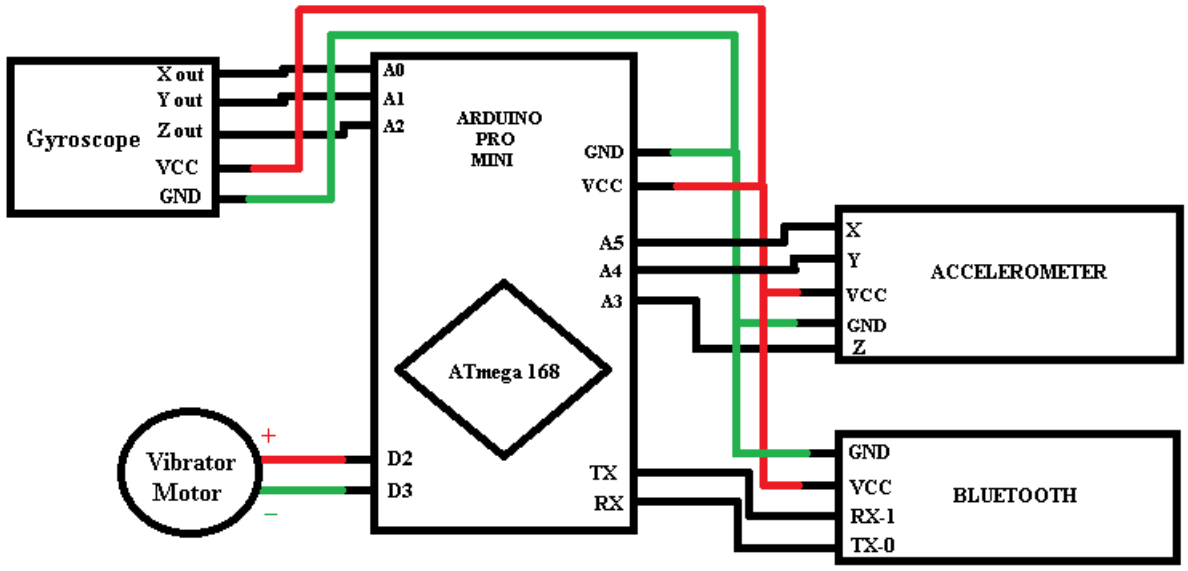

Figure 8

Circuit diagram is shown in Figure 8. Arduino pro mini board (atmega168 microcontroller) is connected with Bluetooth module, accelerometer, gyroscope, and vibrator motor.