**POSTURE CORRECTING DEVICE**

**ECB4333 DESIGN PROJECT-3**

***Submitted by,***

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**ABSTRACT:**

The last two decades have witnessed an exponential growth and tremendous developments in wireless technologies and systems, and their associated applications. Posture is the way people carry themselves, in the way they stand, sit, walk and perform tasks, and this posture has a substantial effect on their health. Maintaining a good posture allows the vertebras of the spine to be correctly aligned. Poor posture has been linked with bad health as well as lower performance. A study showed that having a slouched posture impacts the transverses abdominis muscle. It was shown that the thickness of the transverses abdominis muscle is significantly less when a person maintained a slouched posture. This transversus abdominis dysfunction is directly associated with low back pain.

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**1.INTRODUCTION**

complex effects of illumination, occlusion, and imaging condition on the live images. It is a

combination of face detection and recognition techniques in image analyzes. Detection

application is used to find position of the faces in a given image. Recognition algorithm is used

to classify given images with known structured properties, which are used commonly in most of

the computer vision applications. Recognition applications use standard images, and detection

algorithms detect the faces and extract face images which include eyes, eyebrows, nose, and

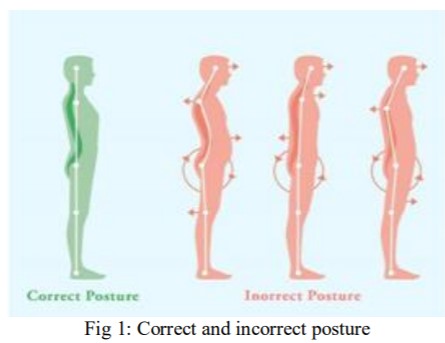
mouth. That makes the algorithm more complicated than single detection or recognition

algorithm. The first step for face recognition system is to acquire an image from a camera.

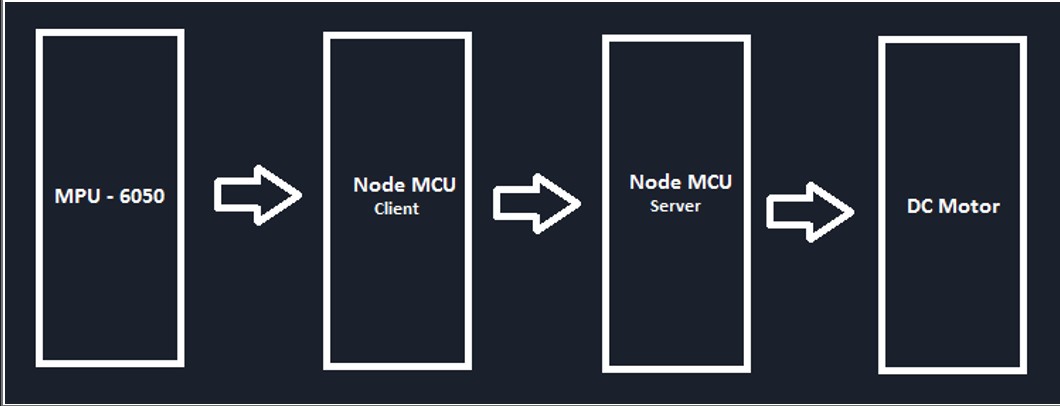
Second step is face detection from the acquired image. As a third step, face recognition that

takes the face images from output of detection part. Final step is person identity as a result of

recognition part

Incorrect posture is a wide spread bane in today’s world. It can cause back problems due to long term pain and can lead to depression. Wearable technology often provides a way to realize this aim by measuring the body posture of the wearer and giving feedback to him on correct or incorrect posture. Therefore, to correct one's posture, a correct sitting and standing position has to be established and trained gradually. The posture monitoring device alert the user just in case of poor posture by sending a message on the smart phone and powering up the vibration motor which is attached on the hardware device. The device is low cost and works for people of every age group. Around 50 billion dollars is spent yearly on therapy for low back pain in the United States alone. Low back pain is one of the most common reasons for doctor visits. Having poor posture has been found to be a main cause of lower back pain as it impacts the transverses abdominis muscle. Maintaining a good posture and changing one’s position from time to time is considered to significantly improve and maintain one’s health. The world has witnessed a vast amount of smart monitoring devices that are used to enhance the quality of life by providing different types of support. Smart wearable technology has been the main focus of this century, specifically in the medical field, where the advances range from heartbeat monitors to hearing aids. This report highlights the design, development and validation process of a compact wearable device that uses multiple sensors to measure the back posture of a user in real time and notify them once poor posture is detected.

**2.BLOCK DIAGRAM**



**Fig 2.1**

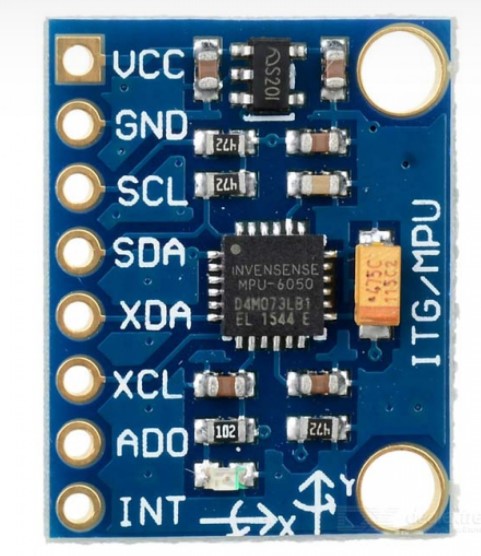
**3.COMPONENTS REQUIRED:**

1. Node MCU ESP8266

**Fig 3.1.1**

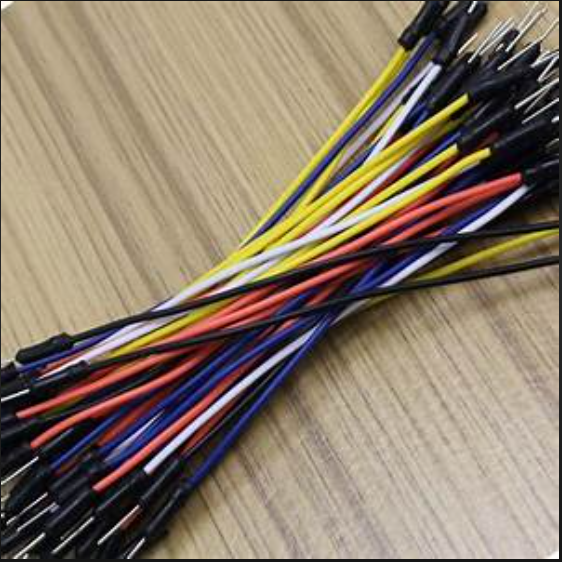
1. Vibrating motor

**Fig 3.1.2**

1. Gyroscope mpu6050

**Fig 3.3.1**

1. Connecting wires



**5.COMPONENTS DESCRIPTION**

* **NodeMCU ESP8266**

## NodeMCU is an open source IoT platform. Which includes firmware which runs on the ESP8266 Wi-Fi Module. The ESP8266 is a low-cost Wi-Fi chip.

## Fig 5.1 Pin diagram layout of NodeMCU esp8266

## 

### ESP8266 Feature:

* Open-source
* Interactive
* Programmable
* Low cost
* Simple
* Smart
* WI-FI enabled
* USB-TTL included
* Plug & Play

**NodeMCU DEVKIT 1.0 Specification:**  
**Developer :** ESP8266 Opensource Community  
**Type :**  Single-board microcontroller  
**Operating system :** XTOS  
**CPU :** ESP8266  
**Memory :** 128kBytes  
**Storage :** 4MBytes  
**Power By :** USB  
**Power Voltage :** 3v ,5v (used with 3.3v Regulator which inbuilt on-Board using Pin VIN)  
**Code :** Arduino Cpp  
**IDE Used :** Arduino IDE  
**GPIO :** 10

#### **Advantages**

* Low energy consumption
* Integrated support for WIFI network
* Reduced size of the board
* Low Cost

#### **Disadvantages**

* Need to learn a new language and IDE
* Less pinout
* **Vibrating DC motor**

Vibration motor is a coreless [DC motor](https://www.elprocus.com/dc-motor-basics-types-application/) and the size of this motor is compact. The main purpose of this motor is to alert the user from receiving the call by without sound/vibrating.

The main feature of this motor is, it has magnetic properties, lightweight, and motor size is small. Based on these features, the motor performance is highly consisten. The vibrator motor specifications mainly include type, max operating torque, max.centrifugal force, weight range, rated current and output.

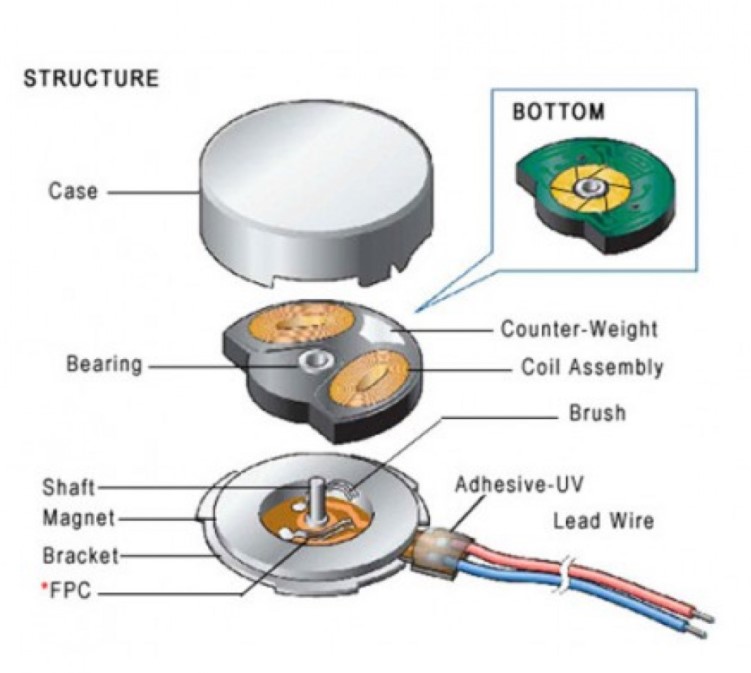
  **Structure**

Fig 5.2

**Applications**

The applications of the vibrator motor include the following.

* These motors are extensively used in a range of applications like handsets, cell phones, pagers, etc
* These motors are used in numerous material handling devices like conveyors, feeder, and vibrating screens.
* These are also utilized on hoppers, silos to stop blocking of the flow of material.
* These are used in compacting machines & foundry shakeouts for quick & proficient operation.
* Vibrator motor Arduino can be used to control the motor
* Processing
* **Gyroscope (mpu-6050)**

The MPU6050 is a Micro Electro-Mechanical Systems (**MEMS**) which consists of a 3-axis Accelerometer and 3-axis Gyroscope inside it. This helps us to measure acceleration, velocity, orientation, displacement and many other motion related parameter of a system or object.

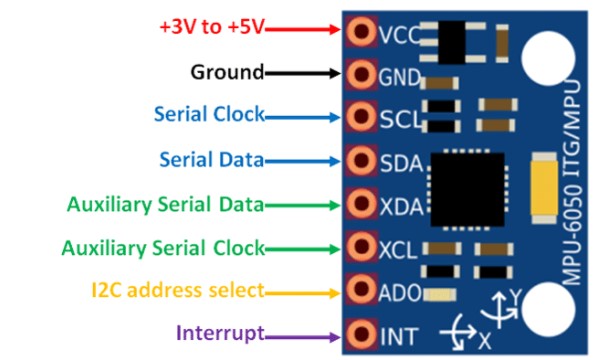
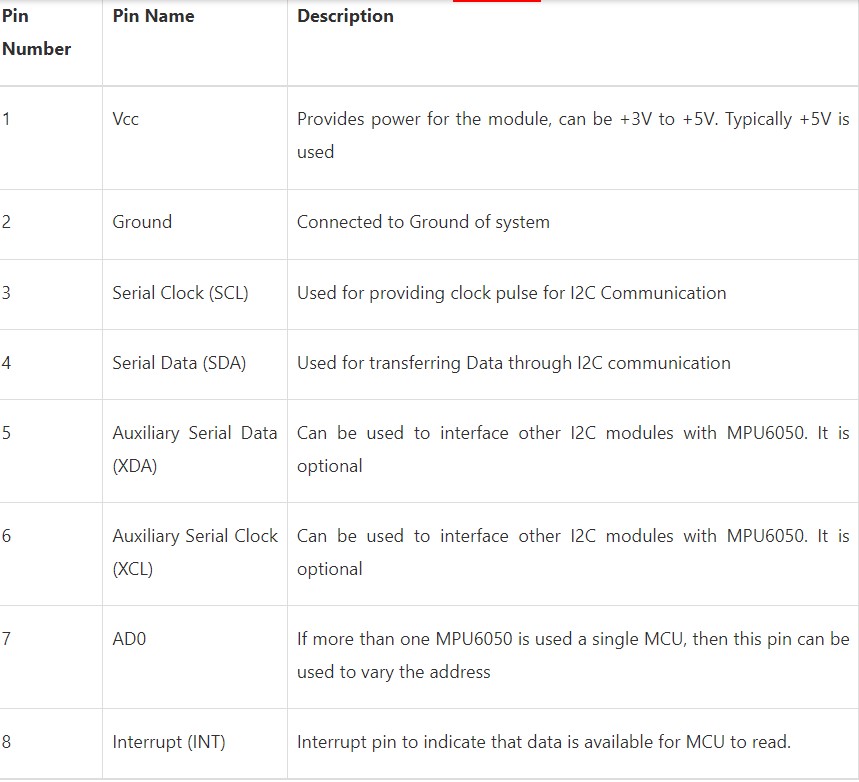
 This module also has a (DMP) Digital Motion Processor inside it which is powerful enough to perform complex calculation and thus free up the work for Microcontroller.

Fig 5.4Pin description fig 5.3 pin diagram

* 1. **METHODOLOGY**
* Using Node MCU to Node MCU communication protocol the data is transferred to the server Node MCU
* Which then interprets the Gyroscope data. Upon the relative angle going over the threshold the vibrator would be turned on.

**ALGORITHM**

1) Start – Device is turned on.

2) Calibrate to User - The microcontroller will create a reference in the first 10 seconds the user wears the device and stands still for calibration.

3) Measure/Detect Posture – The angle is being calculated by the microcontroller.

4) Send to Bluetooth - The calculated angles will be sent to the Bluetooth to be sent to a user interface

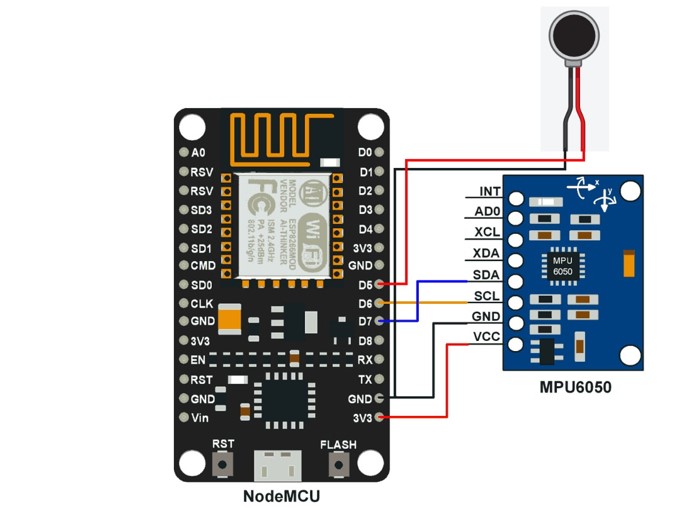
. 5) Angle Greater Than Threshold? - Microcontroller compares between the measured angle with the reference angle and based on that and the next case it will decide if the user is having a good posture.

6) Did Flex Sensor Bend? - Microcontroller checks if the flex sensor bent. If it did, then it means that the user is slouching, but if it didn’t, it means that the user is bending.

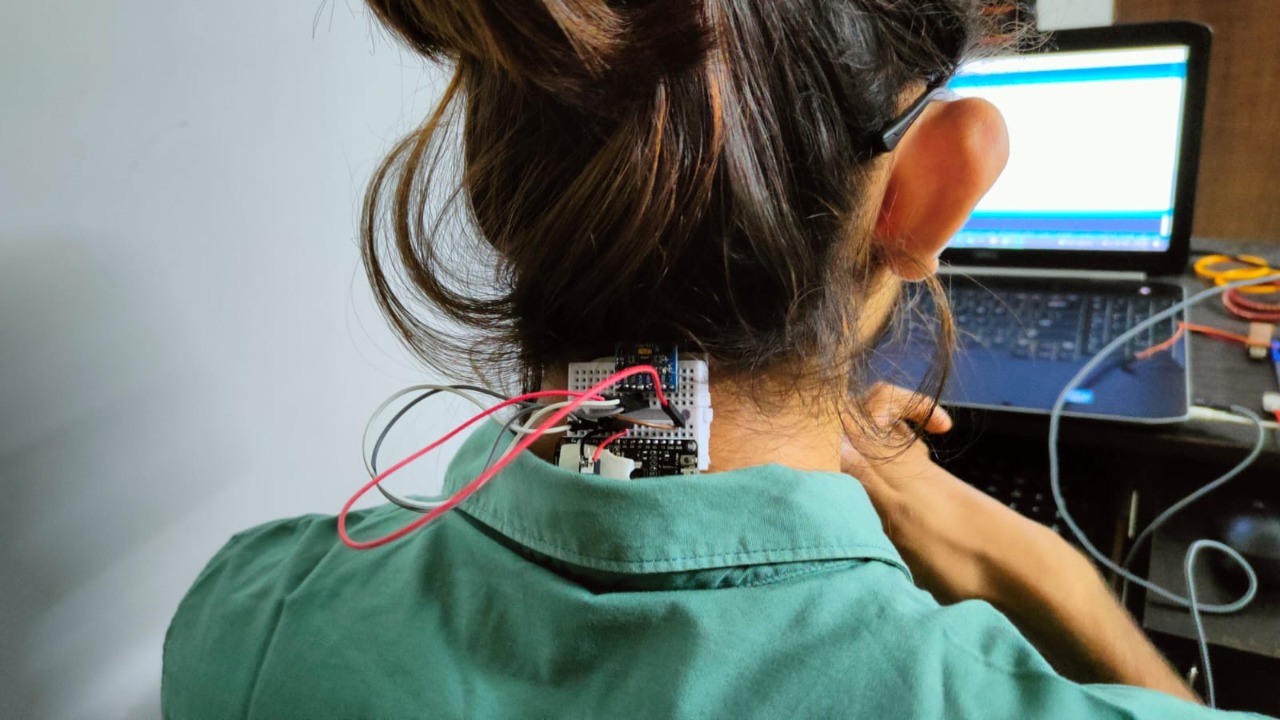
7) Vibrate - If poor posture is detected (based on the previous two cases), the microcontroller sends a high signal to the buzzer which will cause it to vibrate to notify the user to adjust their posture.

8) Timer = 0? – This means that previously calibrated posture doesn’t have to be maintained and the user can move.

9) End & Send to User Interface - The angular data will be sent to a use interface so the user can keep track with his progress.

**7. CIRCUIT DIAGRAM**

**LIVE MODEL**

****

**8.PROGRAM CODE**

#include <Adafruit\_MPU6050.h>

#include <ESP8266WiFi.h>

Adafruit\_MPU6050 mpu;

Adafruit\_Sensor \*mpu\_gyro;

sensors\_event\_t gyro;

const char\*ssid = "ClientEsp";

const char\* password = "123456789";

const char\* host = "192.168.11.4";

static const uint8\_t D5 = 14;

WiFiClient client;

const int sleepTimeSeconds = 2;

void setup(void)

{

pinMode(D5,OUTPUT);

Serial.begin(115200);

WiFi.begin(ssid,password);

while(WiFi.status() != WL\_CONNECTED)

{

Serial.print(".");

delay(500);

}

Serial.println();

Serial.print("IP Address (AP): "); Serial.println(WiFi.localIP());

Serial.print("values are:");

Serial.print(gyro.gyro.x);

Serial.print(","); Serial.print(gyro.gyro.y);

Serial.

Serial.println("Response: ");

while(client.available()){

String line = client.readStringUntil('\r');

Serial.print(line);

}

}

while (!Serial)

delay(10); // will pause Zero, Leonardo, etc until serial console opens

Serial.println("Adafruit MPU6050 test!");

if (!mpu.begin()) {

Serial.println("Failed to find MPU6050 chip");

while (1) {

delay(10);

}

}

Serial.println("MPU6050 Found!");

mpu\_gyro = mpu.getGyroSensor();

mpu\_gyro->printSensorDetails();

// Serial.println("ESP8266 in sleep mode");

// ESP.deepSleep(sleepTimeSeconds \* 1e6);

}

void loop() {

// sensors\_event\_t gyro;

mpu\_gyro->getEvent(&gyro);

/\* Display the results (rotation is measured in rad/s) \*/

Serial.print("\t\tGyro X: ");

Serial.print(gyro.gyro.x);

Serial.print(" \tY: ");

Serial.print(gyro.gyro.y);

Serial.print(" \tZ: ");

Serial.print(gyro.gyro.z);

Serial.println(" radians/s ");

Serial.println();

delay(2000);

if((gyro.gyro.y>0.25 || gyro.gyro.y<-0.25) || (gyro.gyro.z<-0.25 || gyro.gyro.z>0.25 ) || (gyro.gyro.x<-0.25 || gyro.gyro.x>0.25 ))

{

digitalWrite(D5,HIGH);

}

else

{

digitalWrite(D5,LOW);

}

}

**9.MERITS**

Reduce chronic pain that results from poor posture.

Decrease the stress and pressure on the spine.

Prevent musculoskeletal disorders and structural deformity of spine.

Train users to maintain good back posture until it becomes a daily routine.

**FEATURES**

Compact and light.

Wireless connectivity.

Calibrated measurements to various users.

Rechargeable battery

**10.DEMERITS**

Just as any system in the world, our system is not perfect and could be improved in many ways in the future. Our system has some limitations that need to be addressed in the future and these are listed below as follows:

• The current size of our system is larger than originally planned and this might cause some discomfort for the user as the components may be protruding. `This is mainly because of the large number of components that were used to build the system.

• During testing, we have noticed that the measured thoracic angle, although initially accurate, drifts by a small value with time. Therefore, after some time as the user continues to sit in an upright position, the system may detect a false positive.

• There is no way yet for the user to view their progress over time, or change the system settings such as sensitivity of angle. • Our system focuses only on a single region of the spine, which is the thoracic region. Users might suffer from problems from other regions such as the kyphotic or neck area

**11.FUTURE ADVANCEMENTS**

First, this system needs further verification and validation from experts in the medical field. Second, more work has to be invested into using more custom-made components in order to shrink the size of the system for added comfort to the user and make it even less intrusive. Moreover, we must explore different ways where more areas of the spine can also be covered by the device

In addition, the system could be expanded to add a user interface using a mobile application where users can track their day-to-day activities and progress and also be able to visually see their improvement.

sensor gives us a lot of various readings, therefore can enable us to do various other things along with postural tracking. This means that the wearable system can also detect the user’s activity such as running, walking, sitting or idle standing. This could help a lot with postural detection as it can vary according to the activity being performed. Moreover, the data received from the sensor can be used for fall detection and emergency situation detection, therefore it can be pretty useful for the elderly if developed accordingly.

**12. CONCLUSION**

In this report, we propose a system to help the user in correcting their posture by real-time feedback, which is done through our personalized mobile application. In terms of working, our device was able to work as expected. Through android application we can receive feedback on the posture, so that one can monitor his/her sitting posture. By giving such a feature, users will be able to correct posture as we would define the correct sitting posture in the app itself. This is how when a we reach in a bad posture, the vibration motor and our app would indicate the change in the values and that in the posture too correctly. This device is very simple to use and is wearable also it is low cost.

**13.REFERENCES**

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