Swapnali Dhulap, et. al. International Journal of Engineering Research and Applications
www.ijera.com
ISSN: 2248-9622, Vol. 11, Issue 8, (Series-III) August 2021, pp. 01-06

RESEARCH ARTICLE OPEN ACCESS

Iot Based Smart Wearable Posture Detection & Alert System

Swapnali Dhulap, Ashwini Patil, Shriya Kamble, Sapana Gaikwad, Pranavi Mhatre
SIES Graduate School of Technology (SIES GST), Nerul Navi Mumbai
Department Of Electronics and Telecommunication

ABSTRACT
Low back pain treatment costs a billion dollars every year. One of the most common causes for doctor visits is low back pain. Lower back pain is frequently caused by poor posture, which affects the transverses abdominal muscle. Regularly altering postures and maintaining excellent posture are supposed to help enhance and to maintain one's fitness. A wide range of smart monitoring systems have been built around the world to assist people in improving their lives .enhancing one's quality of life by delivering a variety of services a helping hand. Wearable smart technology has become the standard the century's main focus, especially in the medical sector, where breakthroughs range from pulse to Hearing aids to monitors The procedure for creating, developing and testing a small wearable interface uses a variety of sensors to keep track of a user's back posture in real-time and notify them when their posture is bad identified is described in this article..
Keywords: Node MCU, IMU, IOT, Wireless Monitoring

Date of Submission: 24-07-2021 Date of Acceptance: 09-08-2021

I. INTROUDCTION

The way people hold themselves, in terms of how they stand, sit, move, and perform activities, is known as posture, and it has a significant impact on their health. The vertebrae of the spine can be aligned properly by maintaining good posture. Poor posture has been related to both poor health and poor performance. A study found that slouching has an effect on the transverses abdominis muscle. When an individual maintains a slouched pose, the breadth of The transverse abdominis muscle has shrunk substantially.Low back pain has been attributed to intransitive abdominis dysfunction. Low back pain is one of the most common causes of disability worldwide, with an estimated 80% of people suffering from it. It is projected that 80 percent of the population will experience it at some point. Back discomfort costs about $50 billion per year.In the United Arab Emirates, 62 percent of the young population reports suffering from back pain.

Back discomfort can be caused by ordinary actions such as hunching over in a chair. According to Dr.Hilali Noordeen of Burjeel Hospital in the United Arab Emirates is an orthopaedic surgeon. may have serious long-term consequences. Furthermore, a study found that subjects who were asked to sit in a hunched position registered more stress and therefore lower performance. Even with good posture, staying in the same position for an extended period of time is a harmful postural habit because the muscles in the spine can stop producing substances required for appropriate biological function. As a result, maintaining good posture and changing positions on a regular basis is considered critical, if not essential, for maintaining good health.

1.1 NEED OF SMART WEARABLE POSTURE DETECTION

As far as concerning the need of the project two major parts are very important in this design and those are, controller board with wireless connectivity feature and IMU to give more than 6DOF data to process the position of the user in different conditions of movement. Thus we used Node MCU as our central control board and MPU-6050IMU unit for angular data measurement and positional data measures, also we fixing the flex sensor to measure the spine moment for achieving more correct and accurate response to raise an alert signal and make and corrective actionable decision before making and alert via notification and vibration motor. The system needs 3.7V power to operate. Additional requirement for implantation of this device is the access to the electronic testing platforms like, CRO setup and multi-meters for carry out testing and troubleshooting work. Soldering desk with solder Iron and solder gun is needed as a part of major working kits for fixing the assembly wires. For software part we just need a

laptop enabled with internet and Arduino IDE installed onto it, with suitable library files accessible for handling IOT operations.

1.2.Existing System and proposed system

The back pain relief systems and back posture corrective safety gadgets are readily available in bulk in market as shown in figure(1) & figure(2), but all are not supported for continues uses as well their dimensions are differently designed which may results in variable results which tries to fulfill the basic need of the person in curing him/her from back pain and get relief, but these designs may have magnetic strips for providing magnetic therapy is suggestible for using limited time not on continues basis. In that too, becomes difficult to correct the posture in many cases as these belts are having no smart functioning system which can gives and alert when goes in wrong posture for longer time, thus few of the researches goes into this direction and some of the belts were served as a result of this studies and they have electric vibration therapy and some physical alert mechanism involved into it which improves results, thus our interest goes into this field and we found a lack of accuracy into correction mechanism which delays the results and thus user needs to wear the belt for longer period thus we come up across a study in which the

Fig1. existingsystem-1

Fig2. existingsystem-2

electronics based system can be implemented which can present the data as well as the alert via wireless connectivity using IOT concept and physical signals too as an alert to the user, where as in this user has the control of monitoring his posture during daily basis and correct it to the allowable and scientifically correct manner with the help of data notified by the system on his mobile device. Here the making the improvement in older posture mechanism is taken place with use of belt design and its dimension points though the electronic system is involved inside the package which can drive entire mechanism. Thus result can be achieved comparatively in shorter period of time.

Fig3.Electrically operated existingsystem-3

II. BLOCK DIAGRAM

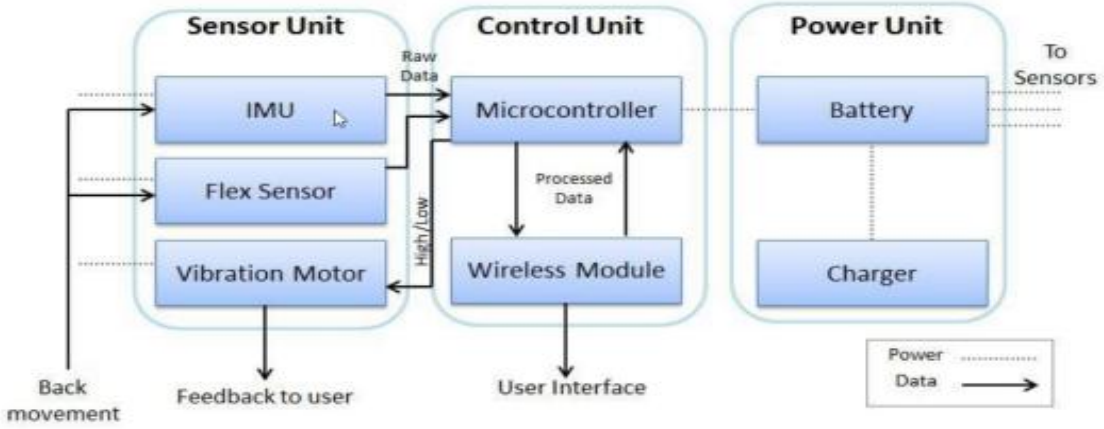

Fig 4: Block Diagram of Smart wearable posture detction and alert system

The sensor unit mainly collects data based on the user's movement of the back or more specifically, the spine. This data is then sent to the control unit for data processing. The control unit makes decisions based on the rotational data along with flex sensor data obtained from the sensor unit. Both sensing units and control units are powered by the power unit. It is responsible for supplying power to the whole system though a battery and a charger

III. FLOW CHART

The data flow and the decisions taken by the microcontroller is explained in the figure below and it's followed by a description that will clarify each case in the chart.

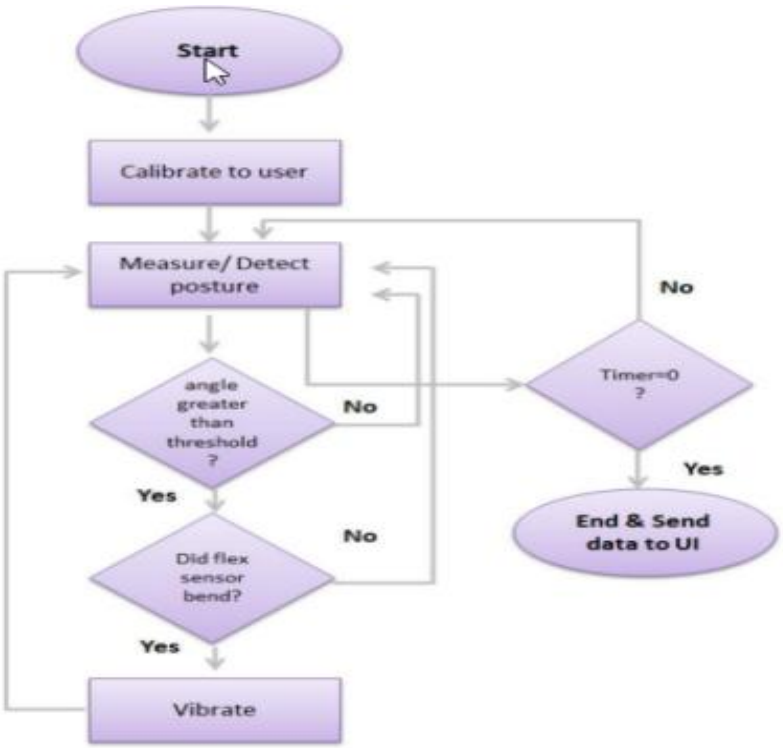

Fig 5 : Flow chart of smart wearable posture detction and alert sysytem

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 Wifi - The calculated angles will be sent to the Wifi 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.

IV. METHODOLOGY

The proposed system is operates on 3.3V power supply, initially when its turned on after wearing the system will get initialized by the nodeMCU and the connectivity will be established and checked by sending the handshaking signals between user mobile and our system, once the connectivity is established, the IMU and flex will be functioning and on varying the posture by user more than said minimal timer set the nodeMCU will get input signals from sensors whose data get compared with prestore data set of ideal postures and if the comparison found inappropriate or not accordingly the signal and alert notification for correcting the posture of user is sent on app and displayed as well as the vibrational motor will actuated which make user aware about improper.

V. RESULTS

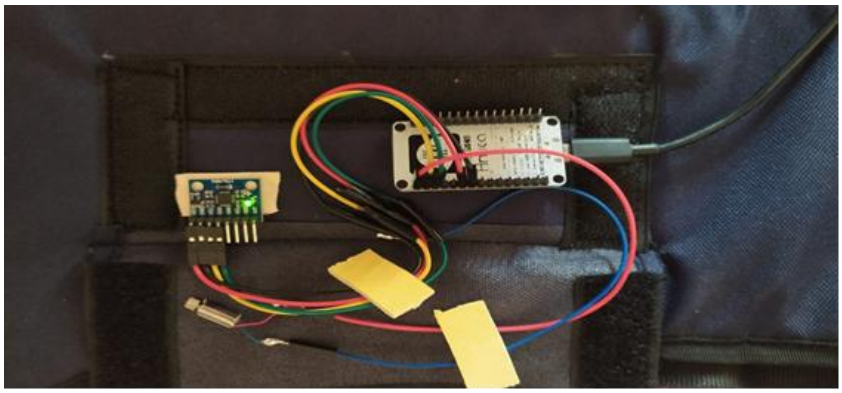

Fig 6 : Posture detection chip

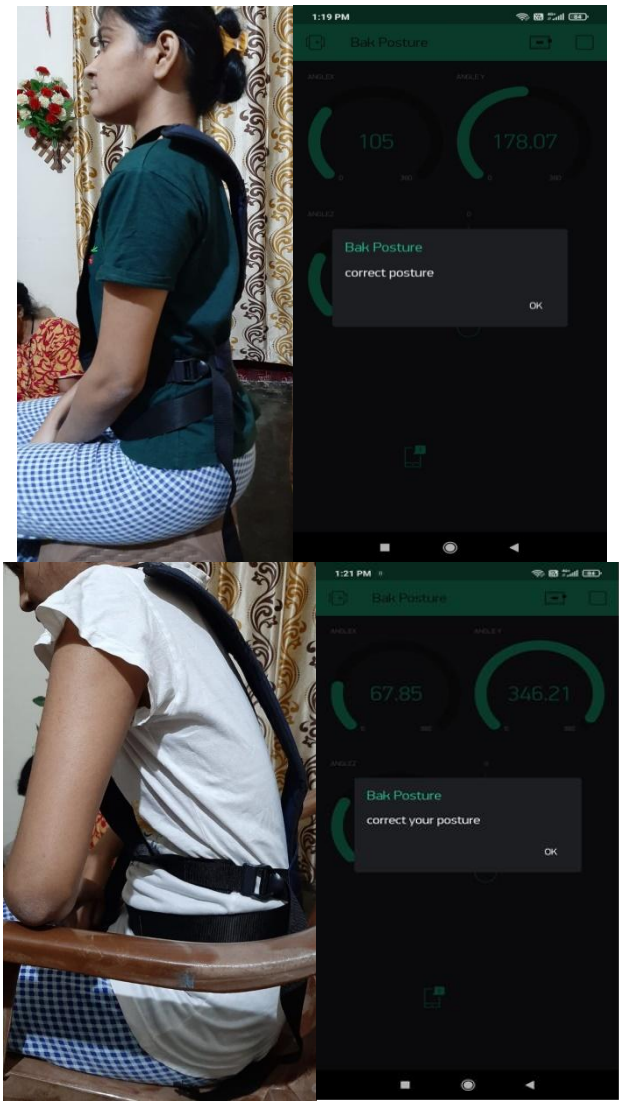

Fig 7: Evaluation result.

TABLE1 Tri-Axialreadingofposture.

Axis	Rangeofvalueobservedfor correctposture	
X	X >=90	X <=90
Y	Y >=140	Y <=180
Z	Z >=70	Z <=100

"Any other range observed below threshold & this range, will be stated as "incorrect posture." We, saw that while standing we got the correct reading of correct posture, now we'll see the readings in sitting position and observe the correct reading in sitting position .

Hereby in our project prototype design we have tried to sort out the problem of back issue causing due to improper posture of body maintained for longer duration. Thus, while implementing our objective we tried to implement using IMU unit which gives us a tri-axial angular measurement which help us to determine the correct posture. we worked to fulfillthe basic need of title and chosen the devices which can help us to drive our concept which can be derived in depth further in future. making use of IOT based technology for providing the solution instead of bluetooth and expanding the range of monitoring that we achieved.

VI. CONCLUSION

After studying various types of existing systems available for back posture correction we came to the shortcomings of those and with the help of literature that we have gone through during the study of available technologies at present to make more accurate system which can improve the results of system with little modified approach, which can make people more hassle free during their back issues and help to improve the curing time cycle and correct their posture in effective manner.

REFERENCES

[1]. A. Lindegard, C. Karlberg, E. WigaeusTornqvist, A. Toomingas and M. Hagberg,“Concordance between VDU-users’ ratings of comfort and perceived exertion with experts' observations of workplace layout and working postures”. Applied Ergonomics 2005; 36: 319- 325

[2]. Dunne, L. E., Walsh, P., Hermann, S., Smyth, B., and Caulfield, B. Wearable monitoring of seated spinal posture. Biomedical Circuits and Systems, IEEE Transactions on 2, 2 (2008), 97–105.

[3]. L. Dunne, S. Brady, B. Smyth, and D. Diamond. Initial devel- opment and testing of a novel foam-based pressure sensor for wearable sensing. J NeuroEngineeringRehabil, 2(4), 2005.

[4]. R. M. Shubair and H. Elayan, “In vivo wireless body communications: State-of-the-art and future directions,” in Antennas & Propagation Conference (LAPC), 2015 Loughborough. IEEE, 2015, pp. 1–5.

[5]. H. Elayan, R. M. Shubair, and A. Kiourti, “Wireless sensors for medical applications: Current status and future challenges,” in Antennas and Propagation (EUCAP), 2017 11th European Conference on. IEEE, 2017, pp. 2478–2482

[6]. "Lumo Lift - Workrite Ergonomics", Workrite Ergonomics, 2016. [Online]. Available: http://workriteergo.com/lumo-lift/. [Accessed: 27- Aug- 20

[7]. Q. Wang, W. Chen, A. Timmermans, C. Karachristos, J. Martens and P. Markopoulos, "Smart Rehabilitation Garment for posture monitoring", 2015 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2015.

[8]. D. Giansanti, V. Macellari, G. Maccioni and A. Cappozzo, "Is it feasible to reconstruct body segment 3-D position and orientation using accelerometric data?", IEEE Trans. Biomed. Eng., vol. 50, no. 4, pp. 476-483, Apr. 2003.