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# Smart Spine Posture Detector & Monitoring System Using IOT

***Amulya G S[1], H L Kumar[2], Pruthvi P[3], Sushmitha N[4], Mrs. Deepthi Raj Assistant Professor[5]***

[1]Electronics and Telecommunication, DSCE- 560078 amulyags57@gmail.com
[2]Electronics and Telecommunication, DSCE- 560078 hlkumar.ktr@gmail.com
[3]Electronics and Telecommunication, DSCE- 560078 pruthviprakash46@gmail.com
[4]Electronics and Telecommunication, DSCE – 560078 sushmi1301@gmail.com
[5]Electronics & Telecommunication DSCE-560078 deepthi-tce@dayanandasagar.edu

**ABSTRACT**

On the body postures of standing, sitting, and fracturing. Weuse sensors to warn us when someon. The most critical aspects of human life are activities and body position. Most people are dependent on drugs and alcohol these days. iPads, computers, and mobile devices. Back, neck, and other pain are caused by it. We read the research papers, concentrating e is hunching over and they display a notification in the app or on the LCD display. The two formats stated above can both be used to accomplish it.the easily accessible gadget made to seem like a belt. The equipment is intended to promote healthy posture and human comfort. It is advantageous to both the mental and physical wellbeing of people.

**Key Words-** Arduino UNO, Flex Sensor, FlexSensor, IOT app, Accelerometer.

## Introduction

Young people regularly experience back issues as a result of spending extended periods of time crouched overcomputers, iPads, and phones. A recent study found that looking down at a phone is equivalent to wearing a 60-pound weight around one's neck. In truth, slouching to check Facebook or send a text on your smartphoneputs strain on your spine. Using computers and smartphones continuously can result in a number of back issues, including neck and low back pain. as well as kyphosis, if no steps are taken to maintain good posture. Kyphosis, or a rounding of the back, can affect people of any age, but adolescents are more prone to it. This syndrome results in an excessive spine curve because the upper back curves out unnaturally. On top of the vision cameras, several posture monitoring systems are constructed. These devices deliver live images that can be used to check someone's posture evolution. Systems can alert users when their posture is improper bycomparing images of the user's present posture with images of the proper posture.

The majority of people put off taking medication until they are in excruciating pain. Occasionally, take a break. Usually, the course of treatment includes a doctor's prescription. Medical treatment typically combinessurgery and physical therapy, depending on the severity of the issue. Due to this, vast sums of money are spent annually on treatments that would not be necessary if the proper precautions had been followed. One way to prevent such problems is to quickly check the position of the back. The Smart Posture Detector (SPD) employed in this study assists in achieving this objective. It detects bad back posture and warns the user. With feedback and posture statistics, the mobile device continuously reminds the user to modify their posture

## Review of Previous Work

### A. Posture Monitoring Systems Based on Tilt Angle information

The tilt angle in relation to gravity and linear acceleration is provided by the inertial sensors. Inertial sensors are used by researchers in the fields of industry, medicine, and aerospace. Inertial sensors are often used because they meet the need for portability. The sensors can be applied to garments because they are adhesive.Wai Yin Wong and Man Sang Wong propose a sitting position monitoring system. The system provides the tilt angles for the boot, thoracic, and lumbar regions. The system's inertial sensors are three gyroscopes and a3D accelerometer. The device keeps track of the posture curve as the boot moves. Q presents a system for tracking patient posture. Wang and associates. System is driven by a Smart Rehabilitation Garment (SRG). The inertial sensors are affixed to the patient's clothing.The thoracic angle of the slouched position is said to be defined by the inertial units positioned on the T4 and T5 vertebrae. The compensatory movement is the average thoracic angle in the vertical plane. The Arduino CPU receives the calculated angle data via wireless Bluetooth communication. In cases of hunching posture and poor patient posture, a feedback device with a vibration motor and a smartphone's visual and audio signal notifies the patient and enables him to improve hissitting posture. For sitting workers, Maheswaran Shanmugam et al. proposed a novel posture monitoring technique.The system calculates the bent posture angle by converting the gyroscope acceleration and acceleration angle using the map function. The device is equipped with gyroscopes and accelerometers mounted on the lower back or in the shirt pocket, as well as a warning system made up of led notifications and a vibrator unit. It also has a Bluetooth module to ensure communication between the system's various parts and an Android app running on a smartphone to record and analyze sensor data. The algorithm classifiesthe identified posture as either having poor posture or having outstanding posture based on the angle data.Thebody's tilt angle is used by the best posture monitoring equipment. These tools are able to show the spine's true shape and follow the spine's movements in real time. Yet how well the tilt angle is determined depends on where the sensors are placed. The sensors must be physically attached to the subject's body.

**B. Posture monitoring systems based on Spine curvature information**

The information on spine curvature can be used to determine whether a person has poor posture. This information can be used to explain how the shape of the spine has changed through time. Many sensing technologies are able to provide this information, which will aid posture monitoring systems in making moreinformed decisions on a person's posture. The three most common sensor technologies used in literature are flexible sensors, inductor sensors, and optical fibre sensors. The sensors' flexible polyvinylidene fluoride piezoelectric material allows them to characterise the spine's curvature. These materials can be lengthened without losing any of their qualities. The resistance variation of the flexible sensor provides important data for calculating the spine's curvature. These sensors are very reasonably priced and have a long lifespan. a posture monitoring system with flex sensors. The system consists of a flex sensor and a load cell. The flex sensor is positioned in the mid-thoracic area to define the person's posture.The load cell, which is used to determine the spine stress, is made up of weight sensors. Flex sensors rely on where the sensors are placed.A seated posture monitoring device that makes use of the Kinect's IR depth camera was recently unveiled. The device gathers visual information when there is poor posture and issues a warning. Users can alter their seating habits and enhance their posture with the aid of these solutions. Nevertheless, because these techniques makeuse of visual data, user privacy is compromised. Recently, the use of sensing technologies has changed and become more widespread, particularly in the fields of medicine and health care. The sensors are compact, lightweight, portable, and easy to use. Also, the information provided by these tiny devices can be used to define a person's posture.In many research, it has been recommended that sensors be included in posture monitoring systems for persons who are seated to characterise the structure of the spine. The sensors' data collection protects people's privacy. In this paper, we provide an overview of the sitting posture monitoring devices with an emphasis on the data needed to. Use sensing technology to describe the spine's shape. According to our classification of posture monitoring systems.

**C. Posture monitoring systems based on Optical Fiber Sensors**

Emilio Sardini et al. propose a posture monitoring system based on the knowledge of spine curvature provided by the change of inductance felt by inductor sensors. The body deformation causes the inductor sensor's shape to lengthen and straighten. In actuality, the impedance and elongation variations are useful. A readout unit collects and transmits the inductance fluctuation data to the computer. The computer analyses thedata and categories them based on the collected posture data. The feedback system that informs when poor posture is identified consists of two vibrio feedback sensors. The left or right bend of a posture cannot be detected by the inductance sensors.The spine's curvature can be measured using optical fibre sensors. The quantity of voltage detected between the light source and light sensor is the main piece of information needed to calculate the shape of the spine. According to Dunne and colleagues' study, a sitting posture monitoring system using fibre optical sensors is disclosed. Two optical fibre ends that are sewed onto garments make upthe system. The communication between the various system components is ensured by a serial Bluetooth unit. After analysing the information that has been gathered, a computer classifies the observed data. A software interface has been created to deliver alarms in the case of poor posture. The precision of the data gathered bythe optical fibre sensor is impacted by the sensor position. Each modification has the potential to harm the sensor's placement.

**D. Posture Monitoring Comparison**

The use of sitting posture monitors has recently become the subject of in-depth scholarly research. Due to the advancement of sensing technologies, sensors may now provide a variety of information. The sensor data has helped the advancement of posture monitoring systems. In this study, we look at various posture monitoring systems. We categorise the systems as follows based on the data used to characterise posture, as shown in Tables I and II below:Seven systems use tilt angle data, three techniques use spine curvature data, and three systems use weight data. The capacity to identify the most pleasant sitting positions is the fundamental criterion for assessing sitting posture monitoring systems. In actuality, weight-based sitting posture monitoring devices are the best at distinguishing between different types of sitting. Despite the variety of posture monitoring data, the sitting posture monitoring systems described in the literature are sensitive to the position of the sensors. Information that is erroneous during the sitting posture measurement is the result of any adjustments to the sensors' placements. The systems that are most responsive to sensor position are those based on tilt angle and those based on information about spine curvature. However, posture monitoring systems based on weight information are less impacted by the sensors' position movement because they are placed and fixed to a certain platform or chair**.** Different sitting postures can be defined using systems for assessing sitting posture that are based on weight data. The sensors are static platforms rather than mobile ones because they are fastened to the chair's legs, backrest, or seat plate. Although the systems based on tilt angle and spine curvature information are more easily portable, the sensors are mounted to the user's clothing.Current posture monitoring proposals detail a system that integrates two different forms of sensing data. To determine the sitting posture, the device uses weight and tilt angle data.Also, the approach recommended in is based on information regarding weight and spine curvature in order to determine the sitting positions. The complimentary nature of the sensory data collected defines systems. Maintaining the security of the data acquired and the privacy of individuals' data remains a problem as posture monitoring devices collect physiological and personal data. Systems must uphold moral and ethical standards and protect individual privacy. There has also been research done in the literature on the value of feedback systems in assisting users in correcting their posture. In fact, in the upcoming study, there is still space for advancement in the biological feedback.

## CONCLUSION

An overview of the current posture monitoring systems is provided in this study. With a thorough analysis ofthe sensor data offered for defining the person's posture, we looked at the [various aspects and architectural designs of the systems for monitoring sitting posture. These details are crucial for identifying human postures, spotting bad ones, and making decisions about the feedback system.In our upcoming work, we'll create and suggest a sitting posture monitoring system that satisfies the most crucial requirements, such as portability, usability, real- time response, and best posture accuracy.

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