



A SMART CHAIR WITH POSTURE RECOGNITION AND TEMPERATURE MONITORING SYSTEM

DR.A.Udhaya Kumar¹ ,P.Karuppasamy² ,J.Kavinkumar³ ,V.Neelakandan⁴

1.Associate Professor,2.3.4.UG Scholar

1.2.3.4 Department of Electronics And Communication engineering

Hindusthan College Of Engineering And Technology, Otthakalmandapam, Coimbatore, India

ABSTRACT--Sitting is the most common status of modern human beings. Some sitting postures may bring health issues. To prevent the harm from bad sitting postures, a local sitting posture recognition system is desired with low power consumption and low computing overhead. The system should also provide good user experience with accuracy and privacy. This project reports a novel posture recognition system on an office chair that can categorize seven different health related sitting postures. The system uses six flex sensors, an Analogy to Digital Converter (ADC) board, The system achieves 97.78% accuracy with a floating-point evaluation and 97.43% accuracy with the 8-bit fixed-point implementation. The ADC control logic are constructed with a maximum propagation delay of 8.714 ns. The dynamic power consumption is 7.35MW when the sampling rate is 5 Sample/second with the clock frequency of 5MHz. Here we proposed a model smart sitting chair for reduce health issues and stress of humans who are all working long in sitting, this project gives the solution to avoid back pain stress of humans.

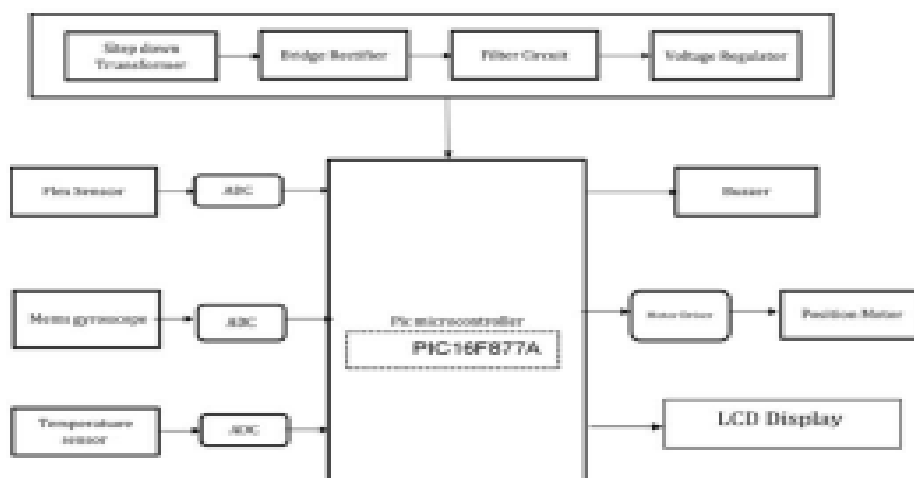
KEYWORDS – Sitting posture recognition system, Human body temperature monitoring system, Cloud system, Real time system, Smart chair system.

I.INTRODUCTION -- The most common status of modern human beings is sitting and poor postures may cause head /neck posture and cervico-thoracic muscle activity, brings health problem specially longtime working men and women. For example, Keeping up a neutral lumbar position is very important for health. However, the bad sitting posture for comfortability causes more flexed lower lumbar spine, this may increase health risks. According to a survey, people are sitting for 13 hours a day on an average. However, along period of sitting may increase the risk of obesity and metabolic diseases. With bad postures, it brings health problems like postural pain and increase the risk of hyperflexion injury, Musculo skeletal disorder such as back pain with deteriorating lung function, low backpain or injury, pains in muscle and connective tissues of tendons, increasing spine load, changing cervical spine position, neck pain, pressure ulcers in some patients and shoulder pain. The long-time sitting posture cause heart disease problems, wearable sensors were fixed to monitor the status of the heart. The warning systems were created to prevent delayed treatment, such as the wireless transceivers, the integrated Ultra- wideband (UWB) communication system using Frequency- shift Keying (FSK), and the system with Delta- sigma encoder. Though, these solutions help people to avoid serious conditions, considering user experience, privacy, reliability, and hardware resource over head, allow- power local implemented real-time monitoring system for directing sitting posture is in need. Thus, the sitting posture recognition system has become a novel technology. The current sitting posture recognition systems proposed in the literature can be categorized by the sensor types.

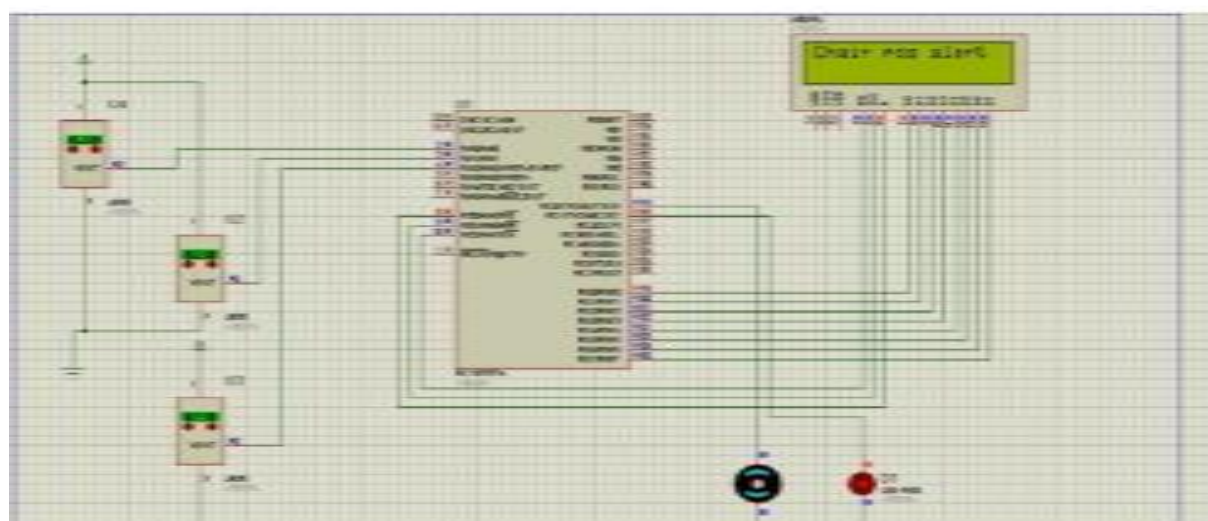
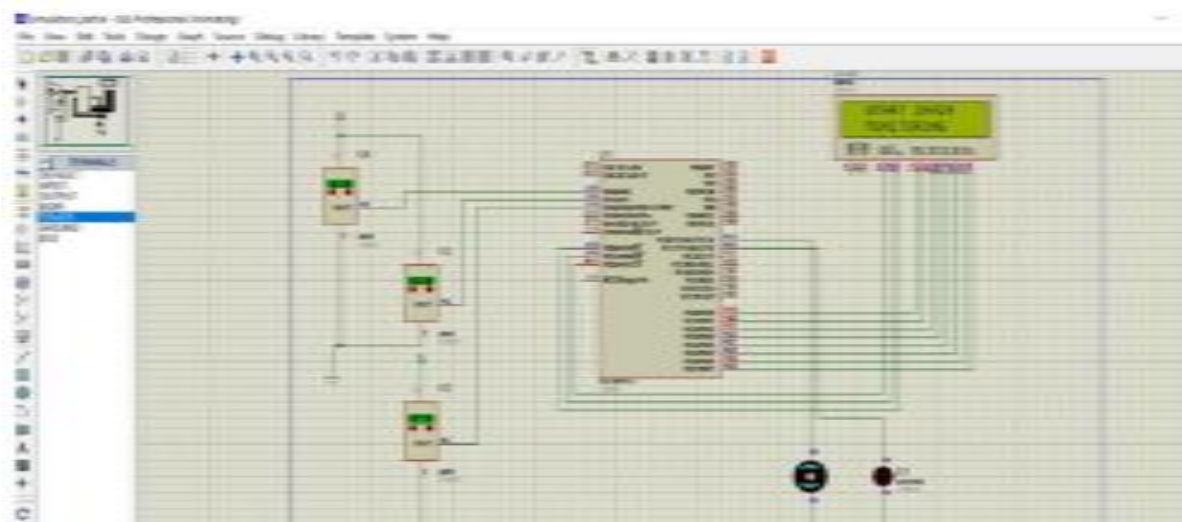
The main types of sensors include accelerometer sensors, pressure sensors, and textile sensors. Moreover, the feeling of being monitored results in a bad user experience. Furthermore, background clutter and occlusion cause challenge to the vision-based sitting recognition system. In contrast to the sensor, pressure sensor and textile sensor can provide an acceptable user experience with reliable results. However, these methods usually apply a large sensor array. For instance, 1176 sensors (42x28) were deployed in and 96 sensors were consumed. This aggravates the processing complexity and hardware resource overhead that is usually associated with a short battery life. A hardware friendly sitting detection solution was reported in, which applies force-sensitive resistor (FSR) sensors and the processing algorithm is implemented on a micro controller. However, it only detects whether someone is sitting on the chair, but cannot classify different sitting postures. Besides, the systems that uses personal computers to process real-time data which bring privacy issues. The main research contributions of this project are: The proposed system reduces the number of sensors and computation complexity compared with previous systems that use pressure and textile sensor, which results in less hardware overhead. This energy-efficient, private, and reliable continuous sitting posture recognition system will play a valuable role in preventing people from getting affected from musculoskeletal disorders while protecting the dignity of the users.

II. METHODOLOGY – A) In existing system sitting position can't be monitored because lack of technical background involved in chair. Only moving and bending approach installed in chairs. Also, we need to spend more money to get soft sitting chairs. Due to this problem companies some face productivity loss and employees stress level increases.

B) In Proposed system we are going to implement smart chair with low cost to avoid above mentioning problems, we place smart sensors for monitoring the sitting position and get the notification of abnormal values. Here we implement flex sensor to measure the bending level of chair in case if it goes to abnormal value state, we get immediate notification. Force sensor will alert if the persons sit more than 8 hours continuously and mems sensor is to monitor the position of the chair. We also added temperature sensor to monitor the human temperature which increases due to long sitting condition, Position motor will automatically turn back the chair in to actual sitting position. Any values goes to abnormal state buzzer will turn on and these values we can monitor through mobile Liquid crystal display.



III. RESULTS AND DISCUSSION –



CONCLUSION --Low-power private smart sitting posture recognition system was realized .The system achieved an accuracy of 97.78 % with floating point model and 97.43% with 8 - bit fixed-point model. The dynamic power consumption is 7.35 mW with sampling rate as 5 Sample/second and maximum propagation delay as 8.714 ns. The primary novelty of the paper is the new type of sensor combined with fixed-point two-layer ANN model to achieve high accuracy, low computing overhead, and power consumption. The proposed system brings longer battery life, better user experience ,an robustness compared to other types of sensing systems.

FUTURE SCOPE -- The comparison between our system and state-of the- art works. To the best of our knowledge, this work has achieved the lowest power consumption, the lowest hardware simplicity and the highest accuracy among the related works. The proposed system can be more energy- efficient and powerful. For example, the ADC board consumes the power upto100MW,which is over 91% of the power budge to the entire system. In order to reduce power consumption, an integrated ADC will be designed to replace the ADC board.

Besides, this recognition system will be a part of a smart health monitoring system which brings Challenges of processing large amounts of data with higher dimension and achieving high performance with complicated tasks. The algorithms with complicated architecture like Convolutional Neural Network (CNN) will be considered as a potential choice to meet the challenges. Besides, the system will be optimized with respect to the real-time processing, the user usability and acceptability as well as mobility and comfortability.

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