Ilkogretim Online - Elementary Education Online, 2020; Vol 19 (Issue 2): pp. 2040-2047
http://ilkogretim-online.org
doi: 10.17051/ilkonline.2020.02.696788

Post Surgery Pain And Position Monitoring Alert System

[1A]Bharkavi T , [1B]Srimathi M , [1C]Yazhini K , [2] Dr. Kanthimathi M

1.Students, Electronics and Communication Engineering, Sri Sairam Engineering College, Chennai.

2.Associate professor, Electronics and Communication Engineering, Sri Sairam Engineering College, Chennai.

Abstract: Blockchain has an interesting use in biomedical research and education. In clinical trials, blockchain can help to eliminate falsification of data and the under-reporting or exclusion of undesirable results of clinical research. Blockchain makes it easier for patients to grant permission for their data to be used for clinical trials because of the anonymization that is inherently encoded in the data. Patients after an operation usually go through the recovery/ rehabilitation process where they follow a strict routine that will be done by sensors. After the major surgery as per instruction from surgeon, patient should maintain a fixed position or else the patient may have internal bleeding. The position will be monitored by MEMS (Micro Electromagnetic System) Sensor. Position is generally determined in three position x, y, z. If the patient continuously changes the position, it will be updated through web server. With the help of this updation, nurses or ward in-charge can get alert without direct monitoring. Strong emotion can cause stimulus to the sympathetic nervous system. Due to this condition one can able to know the pain or stress level using Pain Sensor which arises after surgery will be viewed through the web page and alerts through buzzer also.

Technology or Method: Blockchain technology has the great potential in creating secure and effective healthcare ecosystems with its inherent unique properties. Overall, blockchain has a wide range of possibilities in healthcare, which invites many research opportunities in this space.

Results: On the basis of readings recorded from the sensor, the pain level around the suture region and posture change of the patient can be monitored.

Keywords — Arduino Microcontroller, Arduino IDE Software, Post intensive health care system.

I INTRODUCTION

This project aims at monitoring the patients who have been shifted from intensive care unit to general ward after a major surgery. It mainly concentrates on people who have

Post-intensive care syndrome (PICS). PICS comprises of impairment in cognition, psychological health and physical function of the intensive care unit (ICU) survivor. The main objective is to eliminate the chance of undergoing surgery again by monitoring pain level and in-bed posture of the patient. In current method, doctors directly meet the patients and check the vitals like Heartbeat, BP at particular time. This method is not useful to understand the patient pain level. Till now no machine had been found to understand the pain level of the patient. Frequent changes in the posture of the patient can increase the risk of internal bleeding and suture removal which delays the healing time of the wound. After a major surgery as per the instructions of the surgeon, patient should maintain a fixed position otherwise the patient is supposed to face consequences like removal of surgical sutures and increases the risk of internal bleeding. The position will be monitored by MEMS Sensor(shown in Figure 2). If there are frequent changes in the posture of the patient then it will be updated to the system through web server which alerts the nurses or ward in-charge without direct monitoring. Pain level can be monitored by using GSR sensor (shown in Figure 1) by measuring electrical conductance of the skin. The changes in the pain level will be viewed through the web page and is also given alert through buzzer when it exceeds normal level.

Figure 1. MEMS Sensor which monitors the in-bed posture of the patient.

Figure 2. GSR Sensor which records pain level of the patient.

II. METHODOLOGY

The body sensor network (BSN) technology is one of the vital technologies in the development of IoT concerning healthcare developments, where a patient can be monitored using a collection of tiny-powered and lightweight wireless sensor nodes. BSN is a collection of low-power and lightweight wireless sensor nodes that are used to monitor the human body parameters. The security and privacy issues that are commonly found in most healthcare applications are combated using body sensor networks. The collaboration of IoT and cloud offers an efficient healthcare monitoring systems in which medical information can be transferred safely with the consent of the patient. A network is built among all the entities participating in healthcare, which improves communication among the entities in turn delivering better care and services. Object hyper linking is a new age technology that aims at extending Internet to objects and locations around the world. The huge data generated from various sources resides in the cloud, which requires greater processing power to retrieve information in a secure and reliable manner. A pervasive surveillance system comprises of sensors, actuators, and cameras. Due to its myriad advantages mesh topology is used in this surveillance system. An application layer protocol like the Constrained Application Protocol (CoAP) is used for the data compression and transferring, and the Scalable High-Efficiency Video Coding (SHVC) is used for the video compression and transferring. The system constitutes three layers: the home environment, the router, which acts as a gateway and the remote environment. The home environment comprises of a home IPv6 over Low power Wireless Personal Area Network mesh network which incorporates sensors, actuators, cameras, an edge router and a local server, the gateway which consists of a router and a local database and the remote environment or cloud platform where data and video are stored and analysed. The real time data is stored in the cloud server. Any change detected in the data, automatically causes all data to be updated. This allows the concerned entities involved in providing the healthcare to give the necessary advice and instructions to the patients after studying the real time data . Data analysis is of primary importance in the successful realization of IoT devices and services. The anomalous regions are the segments in sample health parameter data that are of practical interest to the medical professionals. This area of research is of substantial importance and is of profuse benefit to humanity. To illustrate, when some individual's smart health monitoring device suddenly shows a considerable change in critical

III. PROCESSING STEPS

Monitoring and recording of various medical parameters of patient outside hospitals has become widespread phenomenon. The reason behind this project is to design a system for monitoring the patient's body at any time using internet connectivity. The function of this system is to measure some biological parameter of the patient body like temperature, heartbeat, blood pressure, by using sensors and the sensors will sense the body temperature, heartbeat and blood pressure of the patient and sends the values to Iot cloud platform through WiFi module. All information about the patient health will be stored on the cloud, it enables the doctors to monitor patient's health, where the doctor can continuously monitor the patient's condition on his smart phone. The results showed that this project can effectively use wifi technology to monitor patient health status. The power consumption of wifi module (ESP8266) can be reduced as much as possible. Thus, the designed system provides low complexity, low power consumptions and highly portable for healthcare monitoring of patients.

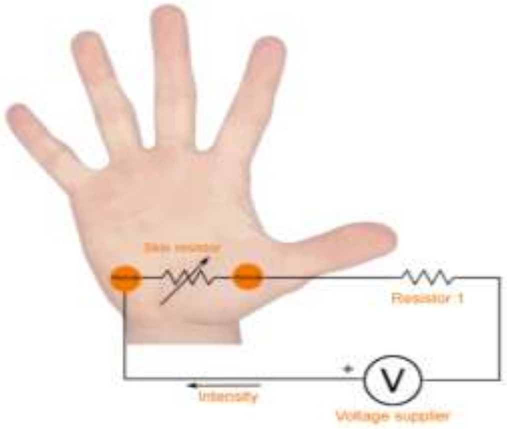

Figure 3. GSR sensor connection

Now, the data formats from the sensors are interfaced to the Arduino. The Arduino is programmed with the Arduino IDE software. The input for the Arduino IDE are given through serial communication.

A. Pain level monitoring

The pattern below given is obtained by the GSR sensor (pain detection sensor). GSR measurements work by detecting changes in electrical (ionic) activity resulting from changes in sweat gland activity. It is noteworthy that both positive ("happy" or "joyful") and negative ("threatening" or "saddening") stimuli can result in an increase in arousal – and in an increase in skin conductance. Its waveform are recorded as shown in Figure 4a.

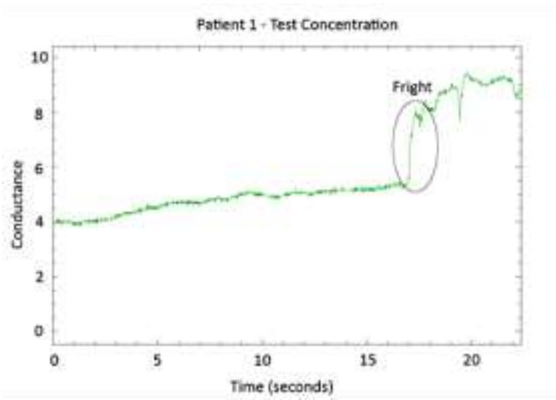

Figure 4a. Waveforms acquired from GSR sensor record.

B. Position Monitoring:

MEMS inclinometers and accelerometers are low-cost, high precision inertial sensors that serve a wide variety of industrial applications. It is a chip-based technology, known as a Micro Electro-Mechanical System, that is composed of a suspended mass between a pair of capacitive plates. This device combines small mechanical and electronic components on a silicon chip. The functional block of MEMS sensor is shown below in Fig 4b. It enables the combination of accurate sensors, powerful processing and wireless communication (for example, Wi-Fi or Bluetooth) on a single IC.

Bluetooth transmitter and receiver has got paired. The Bluetooth transmitter is inbuilt and the receiver Bluetooth is connected to the PC from which the waveforms from the sensor is sent accordingly. Then the analog waveforms are converted into data packets using MATLAB code.

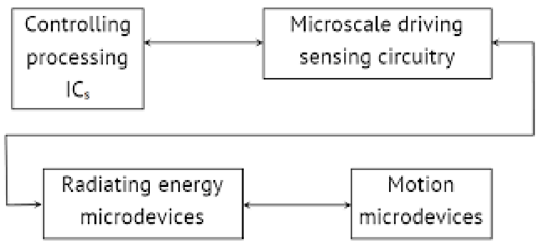

Figure 4b. Functional block of MEMS sensor.

C. Software usage

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards.

Operating system: Windows, macOS, Linux

The MATLAB software is installed and the input from the brainwave sensor (neurosky headset) is obtained from the Bluetooth receiver. The code is programmed according to the waveforms from the brainwave sensors. Then through serial communication the output from the MATLAB is given to the Arduino IDE software.

D. Hardware usage

Arduino microcontroller (shown in Figure 4c) is used for further process. As per programmed, the output is obtained. For example if the pain waveform goes to peak, the output is programmed to switch on the buzzer followed by the alert system to the attender/doctor.

Figure 4c. Arduino microcontroller

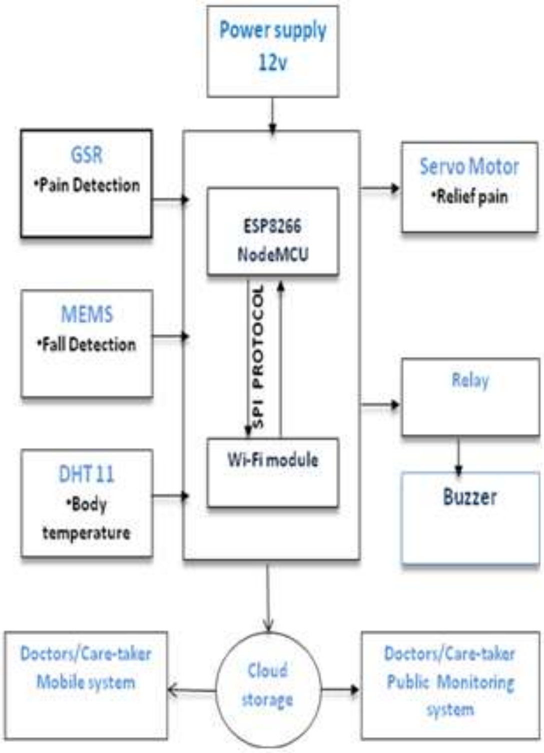

Figure 5. Basic block diagram of the proposed system.

Likewise the desired output behavior can be designed to accordingly obtained wave form. The basic block diagram of the proposed system is depicted above in Figure 5. This system can also be further extended with attachment of cloud accessing also. The Arduino is programmed according to our application as in Figure 6.

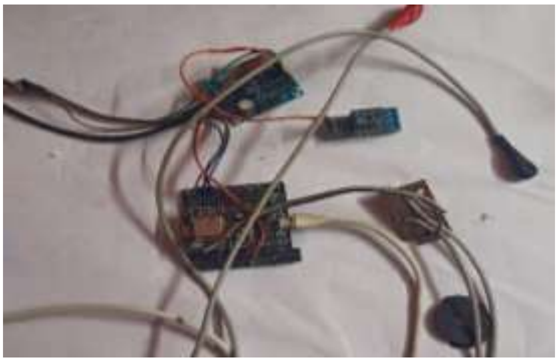

Figure 6. Demo model setup of the proposed system

IV. RESULT

This can be also be extended with many other applications. This system satisfies third Sustainable Development Goal. From the system, outputs of pain level, temperature along with the spatial position of the patient are obtained via webserver using BLYNK app as shown in Fig 7. From the Fig 7, the parameters are detected as follows in table 1.

Figure 7. The Output obtained while running MATLAB code.

The ranges of the pain level and position changes in the real time are shown in figure 8. The range is kept between 150 to 300 seimens for pain and position change angle extends from 70 degree to 90 degree. When position changes greater than 90 degree gives an alert.

S. no.	Parameters	Readings	Unit

1.	Pain	204	Microsiemen
2.	Position	0	Degrees
3.	Temperatur e	96	Fahreinheit

Table 1. Parameters recorded with units

V. REFERENCES

[1] Cheol Jeong, Member, IEEE, David Bychkov , and Peter C. Searson "Wearable Devices for Precision Medicine and Health State Monitoring ", DOI10.1109/TBME.2018.2871638

[2] Susan McGrath, Irina Perreard, Melissa Garland, Kelli Converse and Todd Mackenzie "Improving patient safety and clinician workflow in the general care setting with enhanced surveillance monitoring" DOI 10.1109/JBHI.2018.2834863.

[3] Viorel MIRON-ALEXE "IOT POWER CONSUMPTION MONITORING SYSTEM FOR OFF-GRID HOUSEHOLDS" 2017.

[4] Shalli Rani, "Smart Health: A Novel Paradigm to Control the Chickungunya Virus" DOI 10.1109/JIOT.2018.2802898.

[5] O. S. Albahri "Based Multiple Heterogeneous Wearable Sensors: A smart Real-Time Health-Monitoring Structured for Hospitals Distributor", DOI10.1109/ACCESS.2019.2898214.

[6] Lebar Bajec Ietal "Post Intensive CAre Monitoring System (PICAMS)" January 2003.

[7]BUDI SUMANTO "IOT BASED EPILEPSY MONITORING AND DETECTION USING AMBULATORY SYSTEM"IEEE.

[8] Qun Wei "Development of a Wireless Health Monitoring System for Measuring Core Body Temperature from the Back of the Body" Article ID 8936121.

[9] SumaRao-Gupta "Leveraging Interactive Patient Care Technology to Improve Pain Management Engagement" June 2018.

[10] Nurdina Widanti "Stress level detection using heart rate, blood pressure, and GSR and stress therapy by utilizing infrared" DOI 10.1109/IIC.2015.7150752.