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Research paper

An Autonomous Health Monitoring and Fall Detection Using Wban

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Abstract

Abstract—Over the last couple of decades, the walkable patients who are all using the wired sensors are bedbound and also they suffer from psychological stress. In order to overcome this inconvenience, our project made this as wireless. This is based up on the communication devices like mobile phones and WBAN for the real time analysis of the patient health [1].We have two section, one is transmitter and another one is receiver. In transmitter side, the basic essential sensors like temperature sensor, BP sensor, heartbeat sensor,SPO2 sensor(measures glucose level), MEMS sensor(detects the fall) and GPS module are connected to Node MCU(Microcontroller Unit).In receiver side all the sensors and the GPS module are connected to cloud storage through node MCU. The status about the patient's health will be continuously updated on the cloud storageand in the case of abnormal values, the location of the patients will be send as a mail to the medical practioners and concern person.

Keywords: *IOT, wireless body area network (WBAN), Node MCU, GPS, MEMS*

1. Introduction

The Internet of Things (IoT) is a network of smart devices other than computers that are linked to each other via internet and can exchange data among them[2].The two different type of IoT namely Customer IoT and Industrial IoT. Customer IoT touches every aspects of human life and Industrial IoT also have serious impact on every sector like smart cities, agriculture, automobiles and especially in healthcare industry. One of the vital application of IoT is remote health monitoring. Today, most of the patients suffers due to lack of timely attention and medical assistance. As per WHO report, among patient's falls are major associated concern. With the fast advancements of wireless communication and semiconductor technologies the realm of detector network has full grown considerably upporting a variety of application as well as medical and tending systems. The wireless body space network could be a special purpose detector network designed to work autonomously to attach varied medical detector and appliances, located outside of the human body. A WBAN system can offer two significant advantages compared to current electronic patient monitoring system. The first advantage is that the quality of patients because of use of moveable watching devices. Second advantage is the location independent monitoring facility. A WBAN node being an autonomous device can search and notice an acceptable communication network to transmit information to a distant information server for storage. It is also possible that a WBAN will connect itself to the internet to transmit data in a non-invasive manner. The health care sector is increasingly looking for advanced ICT (Information & Communication Technology) systems to efficiently administer the healthcare delivery for a range also in their homes and workplaces so providing value savings, and up the standard of lifetime of patients. A WBAN will consist of a number of tiny sensor nodes and a gateway node used to connect to the external database server. The entree node may connect the detector node to a variety of telecommunication networks. These communication networks could be either a standard telephone network, mobile phone networks, a dedicated medical centre/hospital network or using public WLAN (Wireless Local Area Network) hotspots also known as Wi-Fi. A WBAN can also take advantage of widely deployed mobile data networks such as the 3G/4G data networks to transmit patient data. A WBAN could allow a use to store its collected data on his/her PDA (Personal Digital Assistant) or iPod or any other portable devices and then transfer those information to a suitable computer. Future applications of WBAN introduce numerous possibilities to improve the health care and sports training facilities[5-11].

2. Proposed system

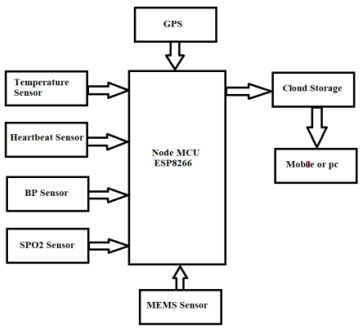

Fig 1: Block diagram autonomous health monitoring

Wireless devices have invaded the medical house with a decent vary of capability. To observe the patient details in periodic interval is on overhead victimization existing technologies. To beat this we've got modified recent wireless sensing element technologies mistreatment WBAN and enclosed fall detection mechanism by mistreatment MEMS sensing element. Easy and lightweight weight module. Wearable by the patients. The health care professionals will simply access the physiological parameters of a patient. Moveable real time module shown in fig 1&3.

Table1: specification of node mcu

Developer	ESP8266 Opensource Community
Type	Single-board microcontroller
Operating system	XTOS
CPU	ESP8266[1](LX106[2])
Memory	128kBytes
Storage	4MBytes[3]
Power	USB
Website	www.nodemcu.com, API reference: nodemcu.readthedocs.io

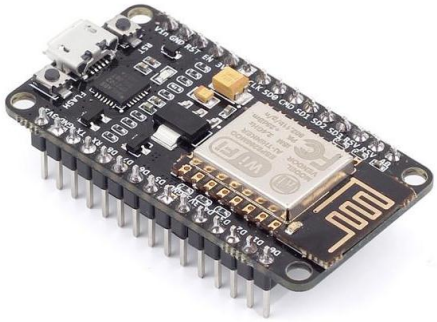

Fig 2:NODE MCU

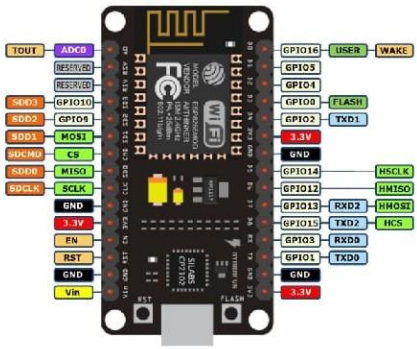

Fig 3: PIN CONFIGURATION

2.1.Temperature sensor

LM35 is designed specifically to measure the temperature. It collectively possesses low self-heating and does not cause quite zero.1 ℃ temperature rise in still air. Its operative temperature vary is from -55°C to 150°C.The LM35's low output electric resistance, linear output, and precise inherent activity build interfacing to readout or management electronic equipment particularly simple.

2.2. Heart beat sensor

The heartbeat sensor (KY-0395V) used here, gives digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the LED flashes in unison with each heartbeat. It works on the principle of sunshine modulation by blood flow through finger at every pulse.

2.3. Bp sensor

The pressure level detector employed in this work may be a non-invasive detector designed to live human pressure level. It measures pulsation, pulse and mean blood pressure utilizing the oscillometric technique. Pulse rate is reported.

- Pressure range: zero pressure unit to 258 pressure unit
- Maximum pressure while not permanent damage: 1550 pressure unit
- Typical accuracy: ± one pressure unit
- Temperature compensated: –20°C to 85°C
- Sensing element:SSCMRRN005PGAA5
- Response time: one unit of time

2.4. Spo2 sensor

SPO2 sensor is used to measure the glucose level. Large choice of SPO2 sensors are single-patient use and reusable references. Get SPO2 with any of the adult TruSignal finger sensors. SPO2 sensor is one sensor, multiple parameters. All adult TruSignal finger sensors provide SPO2 multi-parameter monitoring.
Infrared Emitter:

- Peak emission:950nm
- Centroid wave:940nm
- Spectral bandwidth:42nm
- Radiant intensity:2mW/sr

Red Emitter:

- Peak emission:660nm
- Centroid wave:655nm
- Spectral bandwidth:17nm
- Radiant intensity:2.6mW/sr

2.5. Mems sensor

Micro-Electro-Mechanical System is shortly termed as MEMS sensor and the main use of this sensor is to detect the fall of the patient. The physical dimensions of MEMS device will vary from one micron to several millimetres. MEMS may be a method technology accustomed produce small integrated devices or systems that mix mechanical and electrical parts.

2.6. Gps module

The patient's mobile device receives patient's health information (temperature, vital sign and blood pressure) sporadically. Also, it receives the GPS signals, using internal GPS receiver, in order to register patient's location in terms of latitude and longitude value as a mail.

2.7. Cloud storage

The data are actually generated and stored in the cloud and the cloud was connected with different types of devices. After detecting that the patient in fell down, the data stored in the cloud will be sent through email, message, webpage, etc.., to the caretaker person.

3. Experimental result

Fig 4: Experiment of Health Monitoring and Fall Detection

We have two section, one is transmitter and another one is receiver. From the transmitter side, all the biomedical values (temperature, BP, glucose, heartbeat and angle of patients with respect to ground) that are detected by the sensors like temperature sensor, BP sensor, SPO2 sensor, Heart beat sensor, MEMS sensor and GPS module are continuously updated onto the cloud storage in the receiver section shown in fig 4. After reaching the fixed threshold value (abnormal range of biomedical parameters), mail is send to the medical practioners and concern person about the patient's name, ID and location in terms of latitude and longitude. The graphical representation of all the datas can be viewed using Thing speak. Fig 5(a) shows the measurement of temperature. In fig 5(b, c, d) the fall of the patient is detected, it has x-axis, y-axis and z-axis. Fig 5(e) shows the blood pressure of the patient which is measured. Fig 5(f) shows the measurement of heart rate. Fig 5(g) shows the measurement of the patient's glucose level. SPO2 is a Saturation of Haemoglobin with Oxygen as Measured by Pulse Oximetry.SPO2 sensor measures the oxygen saturation of haemoglobin in arterial blood and the pulse rate of the patient.

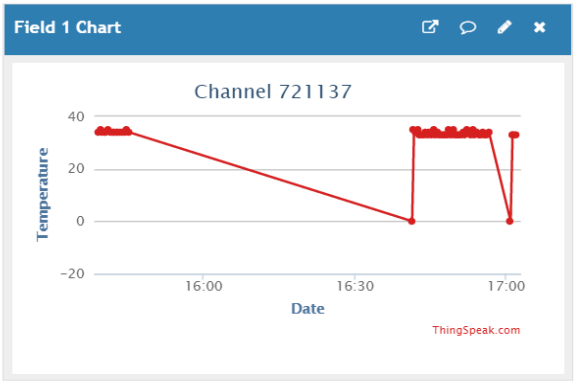

Fig5(a): TEMPERATURE

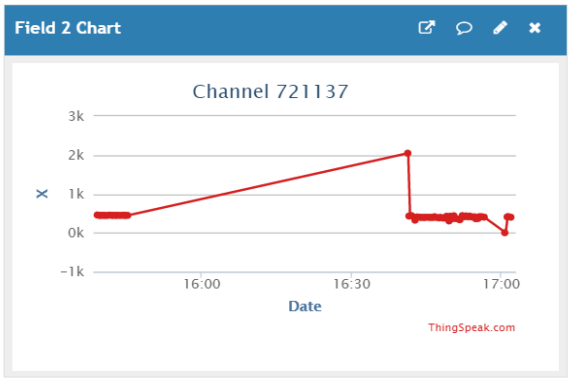

Fig5(b): X-AXIS

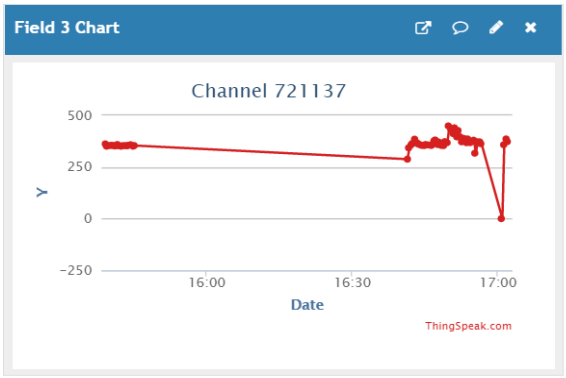

Fig5(c) :Y-AXIS

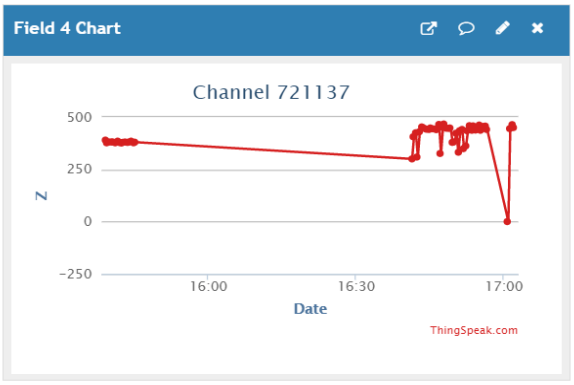

Fig5(d): Z-AXIS

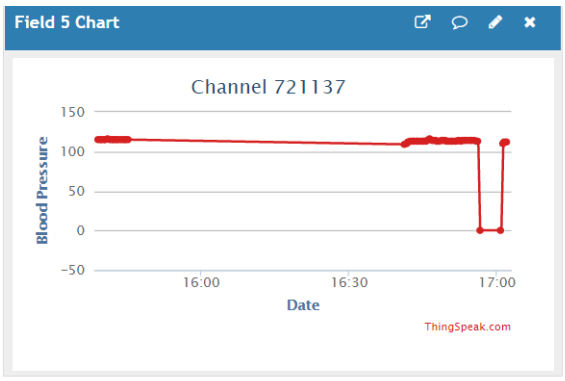

Fig5(e): BLOOD PRESSURE

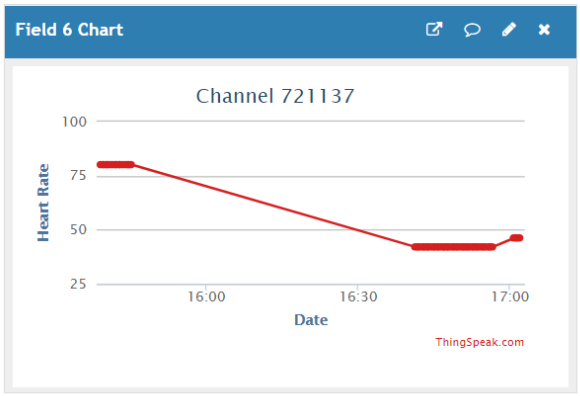

Fig5(f): HEART RATE

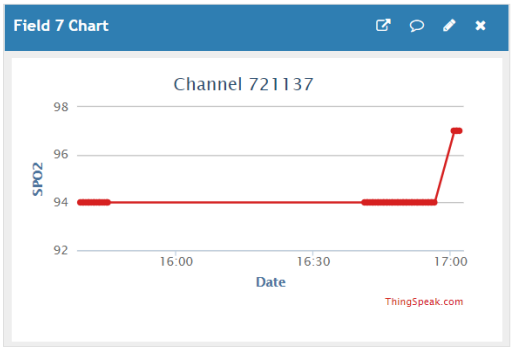

Fig 5(g): SPO2

4. Conclusion

The design will deal with critical issues faced by patients and this system will help to solve them with WBAN. This system can overcome the difficulties of patients who are sequentially bed

bound. It can be concluded that the system helps to support the patients to go anywhere without the need of others.

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