IOT Based Health Monitoring Device for Patients

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Abstract— **In this fast pace of life, it is difficult for people to be constantly available for their near ones who might need them while they are suffering from a disease or physical disorder. So also constant monitoring of the patient's body parameters such as temperature, pulse rate, position, heart rate sensor etc. becomes difficult..Hence to remove human error and to lessen the burden of monitoring patient's health from doctor's head, this paper presents the methodology for monitoring patients remotely using GSM network, GPRS network and Very Large Scale Integration (VLSI) technology. Patient monitoring systems measure physiological characteristics either continuously or at regular intervals of time.**

Index Terms— **ARM7 Microcontroller, ECG Sensor, Humidity Sensor, GPS, GSM/GPRS Module, MEMS Sensor, Pulse Sensor, RFID Reader, Temperature Sensor.**

I. INTRODUCTION

Recently, the health care sensors are playing a vital role in hospitals. The patient monitoring systems is one of the major improvements because of its advanced technology. So we are here, just connecting the temperature sensor, humidity sensor, MEMS sensor, pulse sensor, heart rate sensor and GPS so that simultaneously we can monitor the patient's condition and hence ruling out the use of the thermometer and other devices to check the condition of the patient. This project describes the design of a simple, microcontroller based pulse rate & body temperature measuring device with LCD
output. The device alarms when the pulse rate & the body temperature exceed the provided threshold value. This threshold value is defined by the programmer at the time of programming the microcontroller. The threshold value given for the project is as 18°C to 38°C for temperature. This information i.e. the Heart Rate & the Body Temperature is then transmitted wirelessly to the doctor which in not in the vicinity of the patient through GSM technique. The sensors measure the information and transmit it through GSM Modem on the same frequency as on which cell phones work. Also we can access this data using GPRS. The data collected by a controller is placed on web server and we can access this data by anyone and anywhere.

II. LITERATURE SURVEY

Alice M. Kwan, Alexander G. Fung, Peter A. Jansen, Michael Schivo, Nicholas J. Kenyon, Jean-Pierre Delplanque, and Cristina E. Davis."Personal Lung Function Monitoring Devices for Asthma Patients." [1] In this proposed system", ECG sensor is used to measure the pulse rate. A typical fall event ends with the person lying on the ground or leaning on walls or furniture that will cause a significant change in trunk angle. In this case, it is advantageous to consider changes on the trunk angle to detect whether the detected acceleration was due to a fall event. The set values of acceleration and pulse provides the accuracy of the system avoiding false detection. This system is connected to GPS to measure the latitude and longitude values .Various fall-detection solutions have been previously proposed to create a reliable surveillance system for elderly people with high requirements for accuracy, sensitivity and specificity.
Dinco Oletic Faculty of Electrical Engineering and Computing, University of Zagreb Unska 3, Zagreb HR-10000."Wireless sensor networks in monitoring of asthma .",[2] Is a paper based on wireless sensors along with a smart phone application. Asthma is one of the widespread chronic diseases.Rising prevalence increases the burden of personal disease management, financial expenditures and workload, both on sides of patients and healthcare systems. Firstly, the medical background of asthma is given. Pathology and symptoms are present. Afterwards, the problem of persistent asthma management is introduced with a short overview of traditional disease management techniques. A review of approaches to asthma telemonitoring is made. Effectiveness of home peak flow meter is analyzed. Employment of low power wireless sensor networks (WSN) paired with smartphone technologies is reviewed as a novel asthma management tool. Using the technology, the aim is to retain the disease in a controlled state with minimal effort,invasiveness and cost, and assess patient's condition objectively.WSN-s for sensing of both asthma triggers in the environment,and continuous monitoring of physiological functions, in particular respiratory function are reviewed. Sensing modalities for acquiring respiratory function are presented. Signal acquisition prerequisites and signal processing of respiratory sounds are reviewed. Focus is put on low-power continuous wheeze detection techniques. At the end, research challenges for further studies are identified.
Prabhavati Mr. s. Sankar M.E. "Sankarsed self monitoring system for asthma patients"..[3] The research paper deals with the development of personal lung function monitoring and telemetry device that can be able to monitor and track asthma symptoms and lung function over time. Asthmatics experience difficulty in breathing and airflow obstruction caused by inflammation and constriction of the airways. Home monitoring of lung function is the preferred course of action to give physicians and asthma patients a chance to control the disease jointly. Thus, it is important to develop accurate and efficient asthma monitoring devices that are easy for patients to use. While classic spirometry is currently the best way to capture a complete picture of airflow obstruction and lung function, the machines are bulky and generally require supervision. Portable peak flow meters are available, but are inconvenient to use. There also exist no portable, inexpensive exhaled breath biomarker devices commercially available to simultaneously measure concentrations of

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multiple chemical biomarkers. So, the proposed hardware will give the intimation to relatives, as well as a doctor and control center, and prescription from doctor also transferred to the relatives. If the doctor is not available there means prescription from the control room is also sent to the relative. By this, personal monitoring of the patient is achieved.

III. PRESENT METHODOLOGY

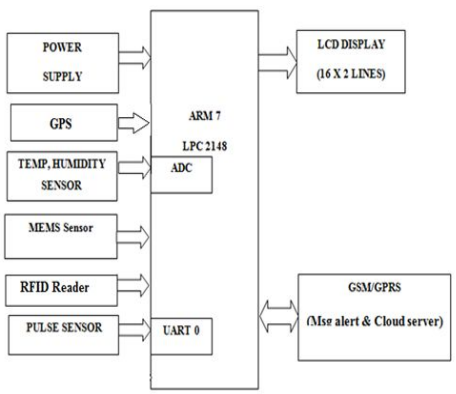
In this project we present a novel system using micro electro mechanical systems (MEMS), GPS, GSM, temperature sensor is used to measure temperature, blood pressure of the person. ECG is used to measure the heart beat rate of the person. GPS will turn on to find out the location in the form of latitude and longitude. Once the controller gets the information from these devices it sends fall detection information to specialist as well as family members using GSM and internet. Our system is designed by using ARM 32-bit micro processor and developing fall detection system for elderly people. The main advantage of this system is it reduces unnecessary wastage of memory storage as well as it saves power.

We use wireless communication protocols like GSM, GPRS this methods can be adopted to monitor the person continuously & informed the concerned person to provide the proper medication.In this proposed system, the sensors are connected to microcontroller in this process. The PULSE sensor provides the Pulse readings to the controller. These values are displayed on the LCD by the microcontroller. If the temperature, humidity and PULSE values exceed their threshold values an alert is given through sms with patient data. The data collected by the controller are placed on the cloud server by using the front end application in monitoring computer. The data placed in the web page can be accessed anywhere by the doctor and nurse.

A. Materials And Methods

1] System Workflow:

Pulse sensor provides pulse reading and ECG sensor provides heart rate of the person. GPS sensor provides an exact location longitude & latitude.MEMS sensor consists of temperature as well as motion sensor. It locate the exact movement of the person. These values are displayed on the LCD with the help of microcontroller. RFID Reader read the multiple tags. If all these values exceed their threshold level an alert is given through sms. The data collected by controller is placed on the cloud server. The data is displayed on web page which can be accessed from anywhere.



B. Sensors Specifications

1] Pulse Sensor-

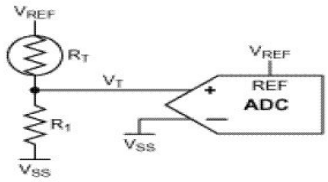
Pulse sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread with finger and detected by the detector. When the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more impervious and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulses. This signal is amplified through an amplifier which outputs analog voltage between 0 to and 5V logic level signal. It works on the principle of light modulation by blood flow through finger at each pulse.

2] MEMS Sensor-

The MMA7660FC MEMS sensor is a ±1.5 g 3-Axis Accelerometer with Digital Output (I2C). It is a low profile capacitive MEMS sensor featuring low pass filter, and conversion to a 6-bit digital value at a user configurable sample per second. The device can be used for sensor data changes, product orientation, and gesture detection through an interrupt pin (INT)

3]Temperature Sensor-

Temperature sensor used consists of high stability, high accuracy in resistance, operating Temperature Range -55 ~ 150 , small in size with two terminals. It is an analog sensor.



Thermistor circuit diagram

Vt = Vref (R1/(R1 + Rt))

Here Rt is decreasing with temperature, Therefore Vt increases with temperature, since Vt is inversely proportional to Rt

R1=10ohm, Rt =10k at Room temperature. ADC step sizes 5mV.

4] Humidity Sensor-

Humidity sensors (hygrometers) measure and report the air's relative humidity. They measure not only the moisture but also the temperature in the air and express relative humidity as a percentage of the ratio of moisture in the air to the maximum amount that can be held in the air at the current temperature. As air becomes hotter, it holds more moisture, so the relative humidity changes with the temperature. Relative humidity is the approximate value of the ratio of the actual to the saturation vapour pressure.

RH = (Actual Vapor Pressure) / (Saturation Vapor Pressure) X 100%

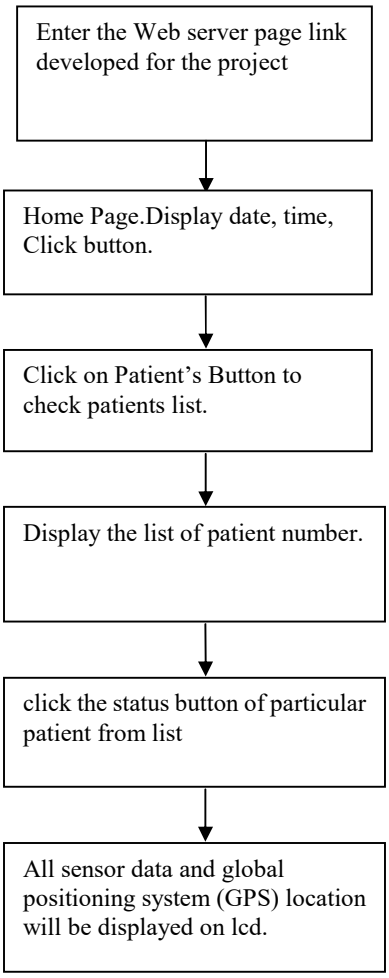
Here, RH= (Vout / Vin) * 100%

5] ECG Sensor-

Heartbeats are triggered with the help of bioelectrical signals of very low amplitude generated by a special set of cells in the

heart (the SA node). Electrocardiography (ECG) enables the translation of these electrical signals into numerical values, enabling them to be used in a wide array of applications. Our sensor allows data acquisition not only at the chest ("on-the-person"), but also at the hand palms ("off-the-person"), and works both with pre-gelled and most types of dry electrodes. The bipolar configuration is ideal for low noise. This sensor gives analog output.

6] Software Development Steps-



IV. RESULT

We have designed, built, and validated a personalized lung function monitoring device that utilizes GSM/GPRS technology to create a convenient, reliable, and user-friendly system.

The system is developed using various sensors. The results for various sensors are as follows:
Temperature sensor and Humidity Sensor-

Fig (a) Pulse Sensor and MEMS Sensor-

Fig (b) GPS-

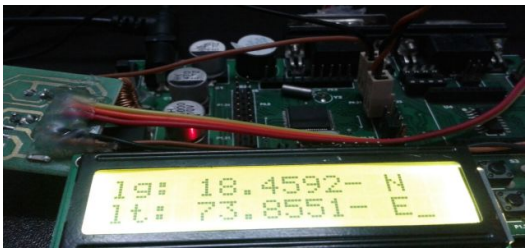


Fig (c) ECG-

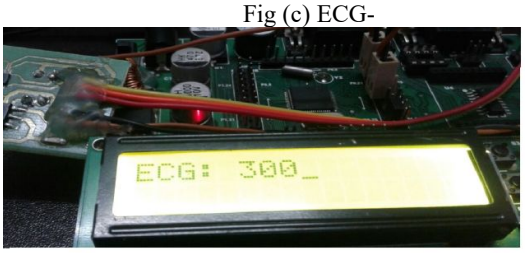


Fig (d)

V. FUTURE SCOPE

In order to detect the parameter MATLAB can be used to show the ECG signal & monitor. Fully integrated system in a box can be developed for commercial purposes. Also optimizing the hardware system by choosing a suitable GPS receiver.

CONCLUSION

In this paper an enhanced system based on body smart sensor is designed using software.

VI. AKNOWLEDGEMENT

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were directly or indirectly instrument in enabling me to stay committed for the project.

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