

HEALTH MONITORING SYSTEM

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ABSTRACT

The health monitoring system is a combination to monitor several health parameters at once: body temperature, diet intake and fall detection. This is achieved by a temperature sensor, accelerometer and vibration sensor. The collected data from sensors which is in analog form is processed and then sent to the smartphone application for further segregation via a Bluetooth module. The obtained results are then displayed and also sent in a message form or alarm form to the concerned doctors and relatives. The health monitoring system is a technology which will enable the hospital staff and also the relatives to constantly monitor the ward without actually being present physically. The processing of primarily collected analog signals is done in the embedded hardware consisting of microprocessor and other necessary components.

Keywords: Bluetooth module, message, alarm, Sensor

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I. INTRODUCTION

The most challenging field for technological innovations today is the medical field. Everyday a new technology, a new medicine surfaces like a boon for millions of people in the world. Many attempts are made to increase the life expectancy of the humanity. A crucial category in the medical field is that of the bed ridden patients because they need constant monitoring and any mishap can cause them their lives.

The health monitoring system is a system which provides a solution for this problem. It enables the doctors, nurses to monitor some vital health parameters of the patient and prevent and hazard. This is done by monitoring the body temperature, fall detection and the diet intake. The timely recorded data can be used for further references by the doctors while operating the patient. The alarm and message system will immediately inform the doctors and relatives if any problem occurs and this will help them concentrate on other work and will eliminate the constant need of presence.

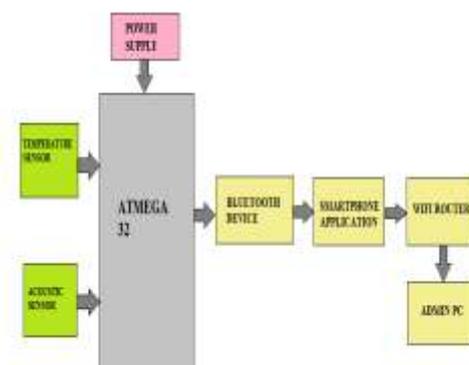
II. SYSTEM ARCHITECTURE

The basic function of this system is to monitor the diet and health of a bed ridden patient.

The system consists of an Admin PC, Embedded System Unit, Android based smartphone application and a wearable Sensor.

SENSOR: The sensor performs two functions.

1. Vibration Sensing : It recognizes the vibrations taking place during the chewing event
2. Temperature Sensing: It senses the human body temperature.



EMBEDDED SYSTEM UNIT:

It performs Data Acquisition and Signal Pre-Processing.

1. When acoustic data are collected from the throat microphone and input from Mic In, they are amplified and filtered for better signal quality.
2. Then the analog signals are converted to digital signals for later steps.
3. The digital signals are then sent to a micro-controller via the I2C interface.
4. Sound signals are segmented into frames for later processing.
5. The data frames are sent to a Bluetooth module through UART using the SPI transport protocol, and further sent to the smartphone by the Bluetooth module.

SMARTPHONE APPLICATION UNIT:

It performs food type recognition by implementing the main algorithms and it also communicates the data to the concerned Doctor by transmitting over Wi-Fi to the Admin PC.

1. Food type recognition takes the continuous sound frames during eating as input and produces a recognized food type for each identified chewing or swallowing event, which is realized by three consecutive steps.
2. In the first step it detects chewing or swallowing events from the continuous sound frames.
3. In the second step, each event is processed to extract the key features that best distinguish different food types.
4. The last step takes the feature values for each event and evaluates them with prior knowledge.

ADMIN PC:

All the data is transferred to the Admin PC. The data is also stored in the Database. The diet timetable of the patients is also set by the Admin/Doctor.

III. SMARTPHONE APPLICATION

The smartphone application processes and displays the processed information. It is both the processing and interfacing unit of the system. First in the processing part, the data collected from temperature sensor is processed and body temperature is analysed and stored in the database according to the database. The fall detection is recognized using the three axial system in the accelerometer and is compared with the standard data. If the deviation is a very sudden and in large numbers then the fall is detected. The data processed in case of fall detection need not be recorded. The diet intake is analysed by comparing the pre recorded values with the input values. Basically the distance algorithm is used in case of diet intake monitoring. The data is displayed in the following form-

1. User and the doctors are alarmed in case of fall detection.
2. Periodic body temperature data is collected and alarm is raised only when drastic change is occurred, otherwise only the measured temperature is displayed.
3. The diet is displayed in a periodic form and also if no diet intake is detected notification is sent.

A. Food Type Recognition

Food type recognition is done on the basis of prerecorded data according to the subscribed diet of the patient. In practical cases, this can vary according to the patient. The input data acquired from vibration sensor is compared with the pre-fed data by the distance algorithm. In the algorithm, the difference between pre-fed data and input data is measured and the entity with least difference is produced as the output. The parameter for least difference is also pre-recorded in the application.

B. Experimental data setup and data collection

Fig. 1

Fig. 2



Fig. 3

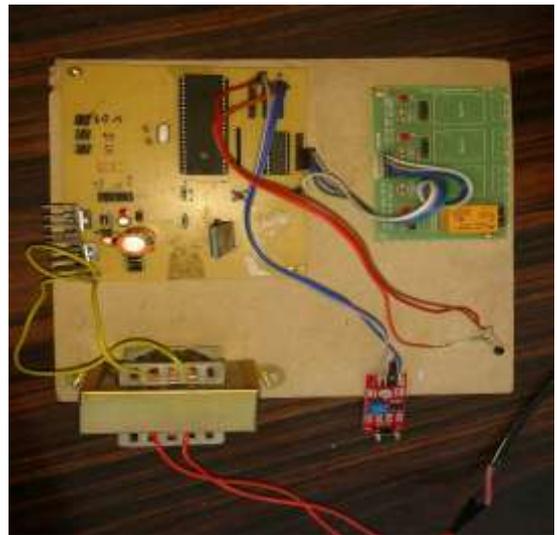


Fig. 6



Fig. 4

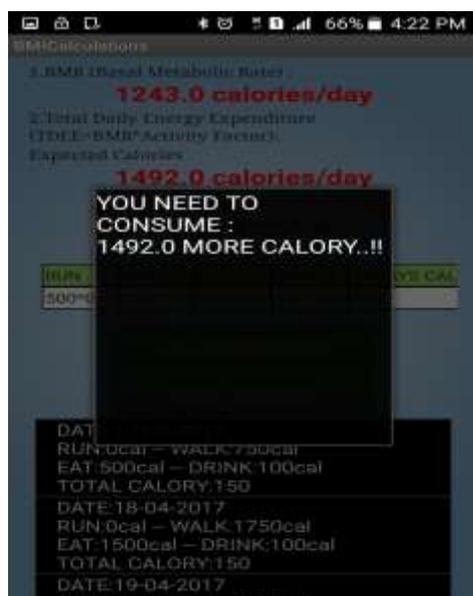


Fig. 5

IV. FUTURE SCOPE

Right now, the system implemented is not in a finished and compact manner. Hence, it can be difficult for the user to handle the system given that the targeted user is a bed ridden patient. In the future, the system can be made more compact and user friendly. Also, some more health parameters can be added for monitoring such as- pulse rate, nerve movement etc. the system can further be modified into a system compatible for normal and healthy user to monitor his/her diet and daily activity which will be similar yet more efficient than the currently used fitness bands.

V. EXTENT OF APPLICATION

The health monitoring system can be used primarily for the bed ridden patients. The targeted users are generally the ones in multispeciality hospitals as monitoring of patients there is a difficult task. This system can be implemented in such hospitals as a network which will also help the doctors for future references and billing purposes too. However, this system can also be used by patients who are been taken care of at a domestic level so the relatives do not have to stay at home constantly. It can also be beneficial to pregnant women.

VI. CONCLUSION

A health monitoring system made to continuously monitor the body temperature, dietary intake and hazardous movements has been implemented in a primary manner in this attempt and can be further optimized for a wider use and can be made feasible as far as user interface is concerned.

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