

SMART DEVICE FOR CLOSE-MONITORING IN ELDER CARE

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Abstract - Elder care is an area in modern society where a series of issues are encountered. There is a feasibility to find solutions pertaining to the issues of elder care by using wearable sensors and telemonitoring devices. This paper will discuss monitoring of critical diagnosis parameters of the elders who are bedridden using Internet of Things (IOT). A survey was conducted to identify the environmental factors which affect the elder care service and the management of sudden accident and making alarm under conditions of emergency. It was identified from the survey that blood pressure, body temperature, pulse rate, heart rhythm and Electro Cardio Graph (ECG) are highly important for diagnosis procedure by doctors. In the same way this parameter can be obtained via telemedicine even though the doctor is a long distance away from the patient. Further, elder care service providers can monitor many elders from a long distance by checking critical environmental factors such temperature, humidity and fall detection by using IOT. All these requirements can be fulfilled by confining all sensors in a wearable jacket.

Keywords - eldercare, IOT, wearable sensors

I. INTRODUCTION

With the rapid development of medical science, desire to live and living restorative standard of human has been expanded in present day society. The dominant part of individuals in the last phase of their life have been living longer with various and frequently complex wellbeing conditions (Han, Ma and Oyama, 2016). Like other nations, elder care in Sri Lanka has been met with numerous basic issues. This paper will talk about the

essential issues existing in the elder care and handle the issue with ease using technology available today. Through study it was recognized that IOT and wearable sensors can be used to answer the issues related to elder care. Before presenting the outline plan, this paper will talk about gathering information and essential surveys led by the research group. In the last stage, square outlines, the design of the device and specification will be presented.

II. OUTLINE OF DEPLOYMENT

A. Identification of the required parameters

With the help of wearable sensors network and wireless communication technology, it's conceivable to transmit imperative signs, for example, circulatory strain, beat, body temperature, ECG parameters, and fall recognition cautions starting with one area then onto the next long goal. Further, ecological parameters, for example, temperature, mugginess and gas spillages additionally can be transmitted in same way. These two innovations have been opened a field to new ideas in the restorative science such telemedicine telemonitoring. Before examining the best possible outline framework, it is required to recognize the issues and fundamental parameters for telemonitoring. Along these lines, following advances were brought down amid the underlying phase of the exploration.

Step 1: Identify the Problem

We followed the following two data analysis methods to identify the problems. Those were,

- a) Collecting the primary data

- b) Conduct the interview with resource personnel.

Some elder care homes (Kottawa, Pannipitiya and Homagama) were visited, conducted interviews with professional expertise in the field. Further, conducted an interview with Dean, Faculty of Medicine, General Sir John Kotelawala Defence University, Ratmalana (KDU); this lead to develop a conceptual paper through assistance of the consultants who are professionals in that field.

Step 2: Literature search and review

Research team went through websites, books and papers that were published by researchers from other parts of the world regarding the Wearable Sensor Network (WSN) technology. It encouraged to work together the recognize issue. After distinguishing issues with the realities found amid the writing review, it was discovered that there is a probability to give an answer for the issues happening in the elder care.

Step 3: Design requirement analysis

Having analysed the primary data and factors collected through the interviews of professional expertise, following issues have been identified by the research team which pertains in the elder care service.

- 1 Requirement of continuous health monitoring for elders.
- 2 Elders are highly vulnerable to sudden accidents in the homes.
- 3 Elders need more nursing care which is comparatively a high cost.
- 4 Elders always require comfortable and safety surrounding which is difficult to make possible always.
- 5 Elders require daily reminders from an assistant to fulfil their daily needs.
- 6 To ensure the mental relaxation and high standard of mental health conditions have been met with lot of difficulties due to their confinement to beds.
- 7 Elders have always been lacking in communication with others due to loneliness.

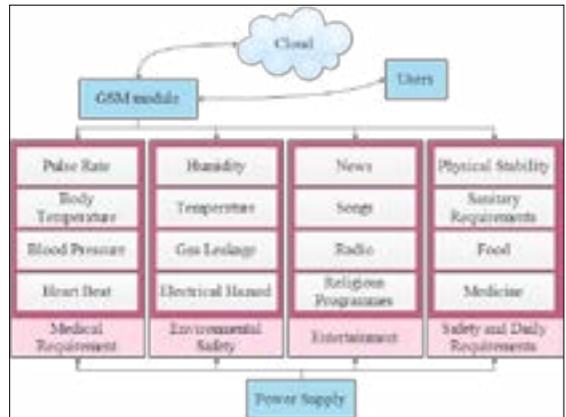


Figure 1. Basic circuit block diagram

B. Design of the monitoring systems

Vital parameters were recognized and specified in the subsystems. Further, it is conceivable to outline a wearable jacket that can be embedded with sensors, control supply and flag handsets. Having met with medical officer, circulatory strain, body temperature, heart beat rate, ECG and Heart Rhythm were chosen to be identified. Further it was necessary to install falling alert, natural moistness and gas spillage recognitions. Each subsystem can be controlled by one power supply through cell phone. At that point the flag handset likewise implanted in the jacket and the flag can be transmitted to the handling interface to change over constant information. Created programming and applications will be utilized by specialists, senior care specialist co-ops another required client for telemonitoring senior care benefit.

C. System components

Eldercare monitoring jacket consists with three subsystems as mentioned in Figure 2. Apart from those, it comprises a unique pneumatic pump which controls movement of the sensor at predefined interims. These predefined interims can be modified by the prerequisite of the clients. The general arrangement incorporates with the cloud server to have database to assist in diagnosis. The pneumatical unit comforts the elder while discharging the sensor during non-checking time. The aggregate schematic chart of the jacket is shown in Figure 2.

1. Health care monitoring system

The monitoring system consists sensors to monitor the blood glucose level, blood pressure, body

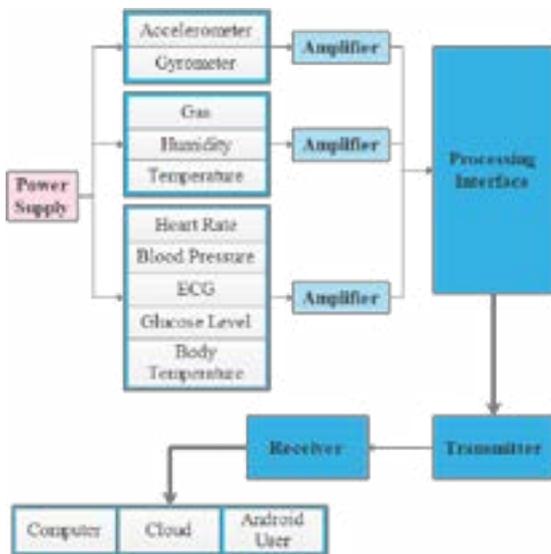


Figure 2. Narrowed circuit block diagram

temperature, pulse rate, heart rhythm and for obtaining ECG. Signals from sensors are required to be amplified and fed to the processing interface. Then processed signal can be provided to the user.

2. **Environment and safety monitoring system**

This consists two sensors that monitor the temperature and humidity in the environment and two sensors to monitor any gas leakages. For this ultrasonic sensor and gas detecting sensors are used.

3. **Fall emergency alarm system**

Elders have the vulnerability of falling. An emergency alarm is made to reduce the high risk of fallen elder. Gyro sensor and accelerometer are used to make emergency alarm.

4. **Processing interface**

This functions as a converter of electrical signal to a meaningful data. Signals from the sensors are fed to the processing interface. Then this data is fed to the transceiver for telemonitoring. That processing function can be performed by the mobile app. For this, mobile app (software) is designed.

5. **User interface (Software)**

This consists with software which is developed using Android, JAVA. The users who monitor the system will be able to gather the required information and receive emergency alarms.

D. **Overall architecture**

The overall architecture of the proposed system is as follows and it consists with basically four connected units. Layer 1 consisted with sensors and Layer 2 consists with processing interface. Then Layer 3 consisted with the connecting devices and the communication link. The final layer that is Layer 4 consists with all the applications and software which provides required information to the users. Further, this layer provides access to cloud server for maintaining database in the future reference

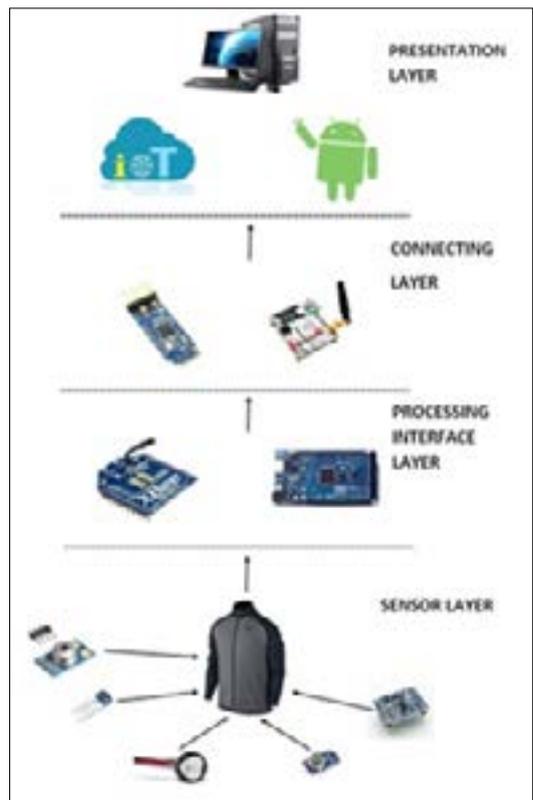


Figure 3. Architectural design for the proposed device

III. **PROBLEMS**

A. *Sensor reliability*

It's obvious that, any electronic segment or gadgets are at risk to breakdown or make inconveniences while working. At that point all sensors in the jacket additionally are helpless for any breakdown or risk. At that point, it causes to stop all the observing

frameworks. This can be overwhelmed by utilizing a few sensors for repetition.

B. *Users compatibility*

Since the system has embedded with four sub monitoring system it required comparably high-power consumption. Then it requires comparably battery with high capacity. Then it causes to increase the weight of the jacket which make uncomfortable to the user. Therefore, sharp designing techniques required to identify the parameters of the battery pack.

C. *Security Aspect*

The signal transmitting strength of the transmitter will be kept at the low level. Then the unauthorised access can be avoided, and the power consumption also will be at low level. Further, encrypted and decrypted data flowing will be ensured from transmitter end to the receiver end to ensure the security of the data and information.

IV. CONCLUSION

In this paper, it was discussed about some critical issues and problematic area in the elder care service providing in Sri Lanka. Further, it has given a few answers for distinguished most basic issues with the unique direction of restorative specialists and expert senior care faculty. Framework is required to experience with numerous research centre analyses and modern investigations. With aftereffect of that trial, there will be a chance to recognize most troublesome planning issues and it will be useful to discover answer for conquer this. The wearable sensor organizes innovation and telemedicine ideas are quickly creating step by step. With this improvement, this framework likewise can be created in numerous viewpoints and it can be acquainted with the market as a top notch mechanical item.

ACKNOWLEDGEMENT

This research was supported by General Sir John Kotelawala Defence University, Ratmalana. We thank our supervisor, Maj. AMC Priyashantha, Dean, Faculty of Engineering, Dr. (Mrs) WCDK Fernando, Head of the Department of

Electrical Electronic and Telecommunication Engineering, Capt. JU Gunaseela, Dean, Faculty of Medicine, Professor MHJ Ariyaratne of General Sir John Kotelawala Defence University, Ratmalana.

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