Automated Health Monitoring System Using Advanced Technology

Amgad Muneer, Asia Pacific University of Technology & Innovation (APU), Kuala Lumpur, Malaysia
Suliman Mohamed Fati, Information Systems Department, College of Computer and Information Sciences, Prince Sultan University, 11586, Riyadh, Saudi Arabia

ABSTRACT

Coma or unconsciousness is a state wherein the patient cannot respond to any internal or external stimulus. In this situation, the patient has no physical control over his entire body. Such cases require a serious attention and continuous monitoring to save patient’s life. Currently, monitoring coma patients critically is very expensive and needs more manpower. Besides, such continuous intensive care by a paramedical assistant are error-prone, which may lead to further complications. Thus, the need for automated healthcare systems still exist. These automated systems help in continuously monitoring and recording all the vital information of a particular subject by maintaining all the comatose records. In this article, a health monitoring system for the coma patient based on the global system for mobile (GSM) and the Internet of Things (IoT) is proposed. IoT as a new technology which facilitates the process of extracting, analyzing and sending data with high efficiency. In this proposed system, four health parameters, temperature, heartbeat, accelerometer and eye blinks are monitored. By integrating these four parameters with live monitoring module and/or a GSM module, the need for clinical staff and accompanying persons will be less as the systems allows relatives and staff to monitor the coma patient online via mobile phones or receive notification based on the patient’s status changes. The results achieved by the system shows real time reading of body temperature and the heartbeat. Finally, the results obtained by the MPU-6050 gyroscope and the eye blink sensor were very satisfactory.

KEYWORDS
ComatoseESP-8266 Thingspeak, Eye Blink Sensor, GSM, Heartrate Sensor, IoT, LM35 Sensor

INTRODUCTION

Coma or unconsciousness is a medical state wherein the patient cannot respond to any internal or external stimulus (Kansal & Dhillon, 2011). Actually, the coma patient’s heart is still beating however he/she is unaware of his surrounding environment and has no physical control over his/her entire body. Such cases require a serious attention and continuous monitoring to save the patient’s life. Such continuous monitoring needs to measure the vital parameters at least for every 15 seconds until the patient’s condition becomes stable. Furthermore, Konganti, Suma and Abhishek (2015) stated that monitoring of coma patients is different from monitoring the normal

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patients as it is very tough job for the paramedical staff to continuously monitor each patient’s 24 hours since the proportion of staff to patient is very low. Thus, it is not an easy task to monitor each and every patient regularly. Nowadays, having someone to watch critically ill person is very costly and needs experienced staff. In addition, such a continuous supervision using a paramedical assistant are error prone, which may cause further complications. According to World Health Organization (WHO) statistics in 2015, about 6.9 million children under 5 die from treatable and preventable diseases each year due to lack of number of health workers. Furthermore, about 55% of 57 different countries face health workforce crisis. Hence, it is important and necessary to propose an automated health monitoring system for a coma patient.

Such healthcare systems are needed to continuously monitor and record all the vital information of a particular subject by maintaining all the comatose records manually. In Patient Monitoring Systems, a surgeon can continuously monitor more than one patient, for more than one parameter at a time in a remote place (Patel et al., 2016). The technical brilliance and development in different fields has led to a drastic change in our lives, one among them is embedded systems and telecommunications. The advances in information and communication technologies technically enable the continuous monitoring of health-related parameters with wireless sensors anytime anywhere once needed. They provide valuable real time information enabling the physicians to monitor and analyze a patient’s current and previous state of health. However, the current systems for this monitoring are prohibitively expensive and can be only found at certain hospitals as well as the systems used in hospitals are complex and only certain people can use them.

Furthermore, in the existing healthcare systems, the medical world today faces two basic problems when it comes to patient monitoring. The first problem is the need of health care providers present bedside the patient, while the second one is the patient is restricted to bed and wired to large machines. In order to achieve better quality patient care, the above cited problems have to be solved. As the technologies are advancing it has become feasible to propose health monitoring system based on Global system for mobile (GSM). Lastly, according to aforementioned challenges it helpful and necessary to proposed system that can eliminate the burden of continuous supervision and send SMS (Short Message Service) to the doctor or person in charge only when attention is needed. Therefore, the aim of this paper is to develop a prototype at a low cost that monitors the health condition of a critically ill patient/person in a coma. This aim can be achieved by the following objectives:

1. Design an appropriate circuit for GSM patient health monitoring system.
2. Test, implement and establish communication between the microcontroller, sensors, and GSM.
3. Develop a Graphical User Interface (GUI) for live monitoring of the heart rate and temperature of the patient and physical body movements.
4. Develop a system that is able to send SMS alert messages in case of emergency.
5. Develop a system that can monitor patient condition online and store data on cloud.

This proposed system will be helpful in assisting the doctor in monitoring the health condition of unconscious patient and alerting the doctor whenever care is required. This alarm will be sending SMS message about the health condition of the patient, when the set of vital signals recorded are out of the normal range. This system is beneficial to relatives or guardians that are taking care of the patient whereby all the parameters results are displayed on the mobile application or in special website. This will let the coma patient’s family to check their relative patient online without any need to stay in the hospital or calling the doctor.

The remainder of this paper is organized as follows: section 2 investigates the literature review of health monitoring systems, section 3 presents the system design and implementation of the proposed system, section 4 discusses the findings and results, and finally section 5 concludes the paper.
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