SMART HEALTH MONITORING SYSTEM

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AbstractIn this paper, a real-time health monitoring systemis developed considering the cost, ease of application,accuracy, and data security.The proposed system here consists of various medical devices such as sensors and web based or mobile based applications which communicate via network connected devices and helps to monitor and record patients' health data and medical information.The proposed outcome ofthe paper is to build a system to provide world-class medical aid to the patients even in the remotest areas with no hospitals in their areas by connecting over the internet and grasping information through about their health status via the wearable devices provided in the kit using a Arduino Uno microcontroller which would be able to record the patient's heart rate, blood pressure. The main purpose of this study is to facilitate the remote cardiac patients in getting latest healthcare serviceswhich might not be possible otherwise due to low doctor-to-patient ratio. The collected information can be used to analyze and predict chronic disorders or other diseases such as heart attacks in preliminary stage itself using the data mining techniques that will also provide the approach advantageous for decision making.The developed monitoring system is then evaluated for40 individuals (aged between 18 and 66 years) using wearable sensors while holding an Android device.This work presents a smart health monitoring system that uses biomedical sensors to check patient's condition and voice recognition uses internet to inform the concerned. The biomedical sensors here are connected to Arduino UNO controller to read the data which is in turn interfaced to an LCD display/serial monitor to see the output.

1.INTRODUCTION

The Internet of things is the inter-connection of devices, apps, sensors and network connectivity that enhances these entities to gather and exchange data. The distinguishing characteristic of Internet of Things in the healthcare system is the constant monitoring a patient through checking various parameters and also infers a good result from the history of such constant monitoring. Also there might be hurdles in sharing the data and information with the specialist doctors and the concerned family members and relatives. The technology that enhances these features is already available but is not accessible and affordable by most of the people in developing countries such as India. Hence these solutions to these problems can be just a simple extension to the current devices which don't have these facilities. In this paper, a system is designed to continuously monitor the vital parameters such as blood pressure and body temperature. The information is stored on a mysqldatabase and can be displayed through desktop application by authorized personally. The system would be smart to intimate the patient's family members and their doctor about the patient's current health status and full medical information in case any medical emergency arises. The collected information can be used to analyze and predict chronic disorders or other diseases such as heart attacks in preliminary stage itself using the data mining techniques that will also provide the approach advantageous for decision making.The idea might not be very new, but we propose an absolute and cheap method for the system using machine learning and IoT. The main objective of this system is to monitoring the data at real time, send and alert to the patients. Also predict if the patient is having any disease. The former is accomplished by using MySQLdb module to link Arduino to the database whereas the latter is achieved by the combination of Arduino and GSM module and the web interface. This system has much future scope as the data collected by monitoring is so valuable and can be used for any kind of research by the medical community. The major aim of the paper can be summarized as following:

1.1. To obtain the real-time medical information about a patient via IoT.

1.2. Processing and classification of information gathered about the patient.

1.3. To interpret and predict any disease or disorder in preliminary stage itself using the data mining techniques that will also provide the approach advantageous for decision making.

1.4. To provide Internet of Things based healthcare solutions at anytime and anywhere.

2. Literature Survey

According to a survey on ageing population by United Nation in 2005 [1], the world population of the elderly is expected to double from the year 2010 to 2050 from 350 million to 1500 million. As such, with technological advancement, increasing research effort has expended in the field of elderly health care. The growing aging population will lead into several challenges for the health care system as well as for the society. An example is the increase in Alzheimer's or Parkinson's disease for which presently there is no cure. Increase in health care costs such as for hospitalization, travelling, and daily check-ups are also expected to increase. Due to lack of caregivers, high number of IIUM Engineering Journal, Vol. 15, No. 2, 2014 *Arshad et al.* dependencies, and individuals who will be unable to live independently, will cause economic concerns to increase on society. Considering the fact that 89% of the elder people like to be in their homes, and looking into the expenses of nursing home care [2], it is essential to make some advancements in the technologies that assist elder people to age in their place. This paper is organized as follows. In Section 2, different types of monitoring technologies are introduced. Five different categories of monitoring approaches are discussed. Finally, Section 3 concludes the paper with future directions of the research. In recent years, researchers have developed a variety of health monitoring technologies to assist elderly citizens. In this work, different categories of detection systems are first identified and then a classification of detection methods is build according to their use and principles for better understanding of the existing approaches. This work further contributes toward a detailed discussion on the strength and limitations of the existing detection methods for health monitoring. Existing health monitoring approaches can be explained and categorized into five different classes to distinguish different detection methods.

The monitoring approaches can be divided roughly into five categories: wearable device based, wireless based, ambience device based, vision based and floor sensor / electric field sensors based. Q1The result data are then displayed as statements in a web application where doctors and patients can interact with each other. Evaluation is of two parts:

2.1. Qualitative interviewing and Quantitative Survey

The main challenge is to make elders equipped with for growing newtechnologies and to become familiarity towards Smartphone, computer, etc. IoT based Smart healthcare with the help of smart devices and objects improves the healthcare monitoring system effectively, thus by reducing the in efficiencies of existing healthcare system. Smart devices with new and upgraded technologies enhances the data accuracy to be collected, real-time accessibility of patient's condition, intelligent integration of data collected, maintaining the integrated data smartly through cloud service, etc. IoT along with smart devices reduce complexity and complications in the healthcare system. The penetration of mobile technologies and smart devices over healthcare system cause huge impact on the world. The full-fledge utilization of M-health and E-health applications in today's world is made aware to the people for improving and maintaining the good quality of life. Apart from regular monitoring of patients condition through M-health system, the main objective is to educate them through recommendations of healthy eating habits and effective workout routines for improving their quality of healthy life. In remote mobile health monitoring system, the patient health parameters are recorded by a smart phone by eliminating an additional hardware and transmit data through a web interface. It facilitates end to end monitoring screen through three steps. Firstly, the real time health parameters are measured through wearable sensors and transmitted to a smart phone which shows the patient health status in graphical interface. Secondly, this system provides a data to family member and doctor through web interface for further monitoring. Thirdly, I provides real time alarm if the patient is at emergency situation such as heart attack, etc.

Table 1. Comparison of Methodologies used in the survey

References	Techniques/Methodology	Advantages	Disadvantages
1.	Wellbeing monitoring Through Wireless SensorNetwork and cloudcomputing using IoT.	Cost efficient technique and ubiquitous monitoring	Not easy to deploy WSNnodes compared to wirednetworks.
2.	Health monitoring through Wireless Body Area Sensor Network (WBASN)	Easy addition of new sensors to existing system.	Sensors should be low incomplexity, small in size,light weight and easyconfigurable.
3.	Cipher text Policy AttributeBased Encryption (CP-ABE) fordata security.	Access based policy towards data protection	Difficult to implement innon-interactive group ofnetworks.
4.	Technology AcceptanceModel.	Widely recognized technologies to be used for easyaccess.	Adoption of new technologies is difficult toequip with for elders.
5.	IOT with smart devices.	Real-time data access andintelligent data integration.	Constant updation and upgradation of devices is needed.
6.	Context Model through OWL and SWRL (SemanticWeb Rule Language).	Contextual recommendations Such as workout routine and healthy eating habits apart fromregular monitoring.	Recommendations are sogeneral and notpersonalized for eachtreatment.
7.	Monitoring through Smartphone by Indoor Localization Algorithm	Wifi-fingerprints are used tofind the location of patients inindoor environment during emergency situation.	Data may not be accuratealways due toenvironmental interference by Wifi-signals.

2.2. Inferences drawn from literature

As the title says, the result of Smart Health Monitoring systemis of extreme use to patients and doctors as well. The patientcan check their health status anytime from the comfort of their homes and visit hospitals only when they really need to. Thiscan be done by using our system whose result are broughtonline and can be seen from anywhere around the world.

Since it is a prototype model, our system shows the almostreal time values of various health parameters and emulateshow the same can be implemented in the real world. Thedoctors can also use the log of the patient body condition tostudy and determine the effect of medicine or other suchthings.The smart prediction module predicts the disease that thepatient is suffering from by asking them for various symptoms they may have and the options are based on the previoussymptom. The final conclusion is made after at least 3-4symptoms are identified. The result is most accurate if moreand more symptoms are identified.

2.3. PROPOSED WORK

2.3.1.Mainly three parts of the system are temperature sensor, voice recognition , transmitter and receiver.

2.3.2.Temperature sensor is used to measure body temperature. The transmitter transmits temperature of patient.

2.3.3.Voice recognition is used to convert the voice data into text input that is checked against the database.

2.4. MODULES

2.4.1. IoT and Machine Learning technologies are used here.

2.4.2.Arduino is used as a sensor.

2.4.3.We are adding an Android App for this system.

2.5.LM35 Temperature Sensor

LM35 is a 3 pin temperature sensor which gives 1 degree Celsius on every 10mVolt change. This sensor can sense up to 150 degree Celsius temperature. 1 number pin of lm35 sensor is Vcc, second is output and third one is Ground.
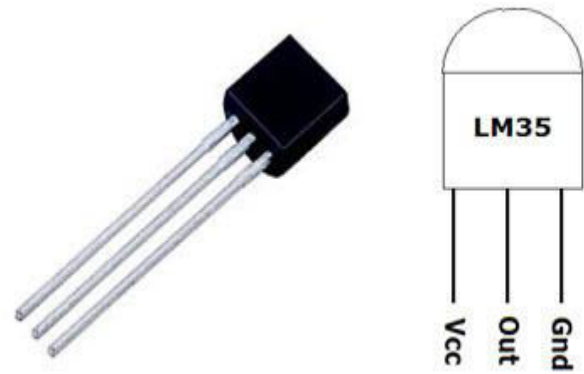

Fig.2.5Temperature Sensor

Pin No	Function	Name
1.	Supply voltage; 5V (+35V to -2V)	Vcc
2.	Output voltage (+6V to -1V)	Output
3.	Ground (0V)	Ground

Table 2.5. Function of Sensor

3.Conclusion

Wireless based technology has shown to improve the lifestyle of people by providing early detection, convenience and flexibility. Hence people who live far from hospitals, immediate and quick treatment during an emergency can be obtained. However the major drawback in this technique is the security and privacy of transferring data. Camera / vision-based techniques are considered to be one of the best ways for human monitoring. The ambience sensor based techniques, which use vibrations or sounds for monitoring are also restricted to indoor use and the signals obtained from the sensors are easily influenced by the excessive noise from the environments which degrades the signal received from the sensors. They are, however, very suitable

for a group of people and are also unobtrusive, like the camera / vision based approach. The floor-based approach has the most potential for future advancements for indoor

monitoring. It involves detection and monitoring of people more conveniently, the person being monitored does not have to carry or attach any device to their body or clothing.

portability, robustness, and reliability.

The study reported in this work will allow researchers to set a platform for them to design a monitoring system according to the requirements of the current health services in care centres or at home, hence motivating the elderly population to live in their own environment. Moreover, this platform will allow patients, clinicians, managers and even researchers to make better-informed decisions, leading to better patient outcomes and fewer mistakes.

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