



E-Health based Patient Surveilling Device

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ABSTRACT

In day to day life health care problems are increasing at very high level. But the hospitals are not having sufficient nursing staffs. To overcome this problem the patient health monitoring system are gaining importance. This paper is based on monitoring the patient in Intensive Care Unit. In previous year the health center is used for measuring the patient blood pressure level, glucose level and heart beat. Now a days the latest technologies are brought changes to this measurements these are carried out by the various sensors like pulse rate sensor, Blood pressure sensor, three axis accelerometer sensor and heart sound sensor. The sensed information are transformed from the sensor which is connected with the ESP8266 WIFI module along with NodeMCU board to the doctors. The sensed information compared with the fixed threshold value when the value is less or above it send the notification to the doctors. With the help of the system the patient health is monitored continuously.

Key words: Health Monitoring System, NodeMCU, Internet of things, Sensors.

1. INTRODUCTION

This system is used for surveilling the patient in Intensive Care Unit. The unexpected circumstances are common in intensive care unit the diagnosis of patient takes place through their carnal display that shows essential signs. The monitors used in intensive care unit are used to maintain the data's in numerical and wave format which makes only the anesthesiologist to understand the patient condition. The problem related to these device is the nursing staff are not aware to use the system .So, they cannot analyze the patients. This proposed system provides the details about the patient physiological status to the doctors as well as nurse which makes them to describe the patient condition in easy and fast way. The main aim of the system is to overcome the ancient method. In ancient days the essential role of a doctor is to diagnosis the patient it takes lot of time

which makes the working people to skip the health checkup. In current trend the smart system brought a new change not only for personal health care but also in hospitals. Thus, enhancement of smart health monitoring system which is suitable for analyzing the elderly people remotely, with the help of the microcontroller the collected information is stored in a database and if any emergency case the collected information is forwarded to the doctor through cloud for further treatment. constant monitoring is also required for the patient who admitted in the hospital. This device works based on Internet Of Things. IOT Collects the real time information regarding patient health that send to the cloud with the help of internet Connectivity. The proposed system is user friendly, economical and easy to use.

2. INTERNET OF THINGS

The term IOT was founded by KEVIN ASHTON in 1999. Internet of things is a system of connecting the physical objects with each other called smart devices. A wide variety of intercommunication technologies proceeding by steps to come into being through evolution, reflecting to huge of application domains. A coarse division is emerging between End user iot and Industrial iot. The consumer iot is mainly focused at increasing the standard of people's life by recovering time and money. It involves the communication of end users electronic devices as well as the surrounding environment such as offices, cities, homes. The main aim of the industrial iot is to link the operational technology and informational technology It generally suggest machine to machine interaction for application surveilling or distributed control which does not need human mediation. Iot System is called 'Smart' which represents automation in which the human work is reduced or involvement is decreased and increasing the intelligence of machine to perform the task. In future Iot will become broader and complex to change the world in

terms of anytime, anyplace, anything to connect the objects[13] [20]. The IoT in modern world are smart grids, smart cities, smart homes,smart industries, healthcare ,education and transportation. The key force behind the internet of things is the MOSFET(MOS transistor) it is a building block of modern electronics which includes Internet services.

The Characteristics of Internet Of Things are:

- It is Scalable and Efficient.
- Consumes less power.
- Interoperability.
- Cost Effective.
- Security and privacy.

3. MONITORING SYSTEM

The monitoring system is classified into two modules fatigue detection module and mental stress detection module. The detection system helps to collect the health reports of the patient. The fatigue detection module receives fatigue detection report computing and resolving the heart rate variability ,pulse rate variability and ECG curve. Fatigue is classified as low, medium and high fatigue.In the case of high level fatigue it makes the alarm system to produce caution message to the surgeon. The mental stress detection module is generally related to the factors such as environmental condition ,patient mood, emotion and health level[7]. When a person is mentally disturbed the changes occurred in the body by increased blood pressure level, heart rate, pulse rate and other health related problems[8].The detection system computes and analysis the report if the condition is severe it automatically generates the alarm signal.

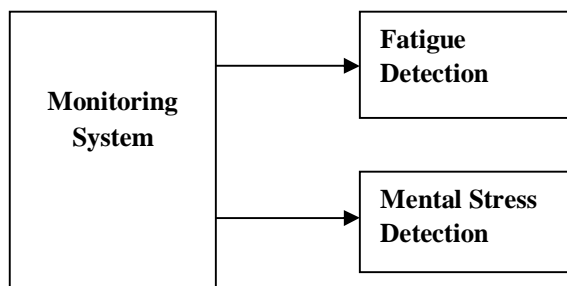


Figure 1: Monitoring system

4. WIRELESS SENSOR NETWORK

A Wireless network[14] consists of spatially distributed devices using sensors to progress the environment the sensor network represents the node. Each represented node is connected with sensor. Wireless sensor network has several applications[15].One of the usage is in medical system. The medical system integrated with

wireless sensor network[21] to provide the efficient treatment. The various sensor nodes are used in the system to predict the patient health. Surgeon make use of some sensor at the time of surgery. these sensors are used to collect the timely information from the patient. It is ready to produce the caution message at the time of abnormal condition in high speed in order to secure the patient. The sensors used in the surveilling system are:

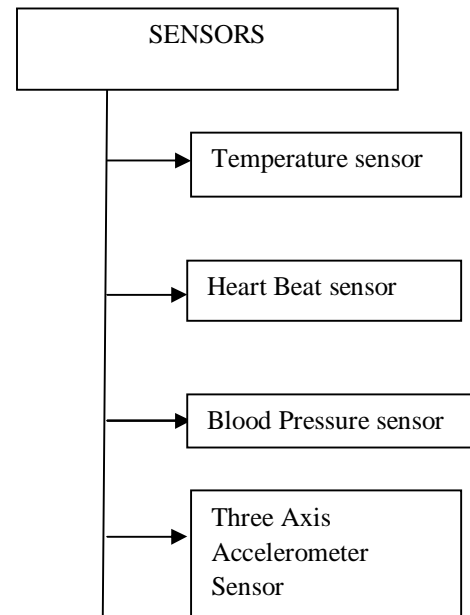


Figure 2: Types of Sensor

4.1 Temperature Sensor

The temperature sensor used to detect the amount of heat by the object in which the sensor is connected the temperature sensor are classified into contact temperature sensor and non contact temperature sensor.

4.2 Heart Beat Sensor

Heart Beat Sensor[16] are used to detect the heart rate. The heart rate can be analyzed by two ways: The traditional way is to check the pulse by the use of stethoscope. In modern way they used the heart beat sensor. The source of light is used as IR LED and the detector would be photogenic like photo diode.

4.3 Blood Pressure Sensor

Blood pressure is the force of blood from the heart particularly in the arteries as it pumped around the body. This sensor used to detect the hypertension[10]. The readings are of two ways: Systolic and Diastolic. The blood Pressure method can be invasive and non invasive. Invasive is the traditional method and the non invasive is a modern technology which is the example of our blood pressure sensor.

4.4 Three Axis Accelerometer Sensor

Three axis accelerometer is used to monitor the coma patients. This capacitive accelerometer measures the acceleration on one, two or three axis and it uses a silicon micro machine element. To measure the acceleration of gravity the output range is about 1.5g

5. MICROCONTROLLER

Node MCU with ESP8266 is an open source IOT platform it is used to run the user programs. The ESP8266 WIFI module is a 32 bit microcontroller with simple programming language or arduinoIDE. The NodeMCU consists of 30 pins while 15 pins are at the left and remaining pins are at the right. The Node MCU with ESP8266 has 16 General Purpose Input and Output pin and 1 pin is analog pin. Out of this 16 General Purpose Pin 10 pins are used for digital Input and Output Pins[11]. The remaining pins are serial peripheral interface, Inter –Integrate circuit and Universal Asynchronous Receiver Transmitter. The Node MCU connected with arduino using Serial Peripheral Interface Pin.

6. CONTROL SYSTEM

The control system helps to monitor the patient in health care units and provide precautions. The control system classified into two they are display system and alarm system.

6.1. Alarm System:

Over past 25 years the technologic advances in hospitals have increased. These techniques has become more challenging and complicated in monitoring the patients in hospitals. Most of the healthcare units built in audible alarm and display system. Twenty five years ago few healthcare unit uses only the alarm capability. In Today's scenario most of the hospitals uses this alarm system. Alarm is a spontaneous warning device which helps the care takers in hospitals to alert and convey the message quickly and effectively with others at the time of emergency[9]. In Intensive care unit the use of monitors and other bedside instruments are available at anytime for surveilling the patient. When the sound alarm reaches its threshold value its starts triggered. This alarm System reduces the need of nursing staff to physically monitor the patient throughout the day. Especially this system is very helpful during night time because the nursing staff shortage occur during night time rather at day time, to monitor the patient continuously is not suitable in night to overcome this alarm system is very helpful. By transmitting the alerts from patient surveilling device to the mobile reduces the noise pollution inside the hospitals and also which does not disturb other patient inside the hospitals. Alarms are

sensitive care units that are enacted from any number of devices such as infusion pumps, respiratory monitoring equipment, feeding pumps and cardiac vascular monitoring. This alarm system saves many patient life by alerting the doctors or nursing staffs on right time. Researches has described that 72percent to 99percent of health care alarms are said to be false The alarm fatigue has occurred due to the huge number of false alarms. The patient death have been laid to alarm fatigue.

6.2. Display System

Display system is considered to be a output device for presenting of visual information in hospitals. In this technological world they are using different kinds of display devices they are liquid crystal display, light emitting diode and cathode ray tube. In most of the computers display they uses Liquid crystal display because they consuming less power which is used in many movable devices such as laptop ,mobile and calculator. The resolution refers to pixels. It is considered to be the number of dots such as 800*600. The computer display receives input as a analog signals. In computer the Liquid Crystal Display works when the electric current is applied to the Liquid Crystal Display molecule, this tends to untwist. The few amount of light is allowed to pass through the polarized glass through a particular area of the Liquid Crystal Display. e mentioned area will become dark compared to other. The display which is known to show only digits or alphanumeric characters are considered to be a segment display. The display devices are used in many fields but particularly it is very useful in medicine field. Monitoring is an observation of disease. In these field the data transmission is from monitor to farthest monitoring station is termed as biotelemetry. When comparing to standard displays the medical system display offers expressive advantage for distinctive imaging. The standard display have only the fixed resolution that is not optimized for distinctive imaging so that in medical display the resolution is about 2048*2560 in portrait. In medical display the view of angle is different that is the doctors usually view the display image in perpendicular angle. Generally the Liquid crystal display System does not have uniformity in luminance that is the image appears slightly different at the corner than in the center. The medical System fitted with Barco's Uniformity Luminance Technology (ULT). In this technology the perception will be equal eventhough the image is not displayed properly on the screen. The luminance level get increased to achieve contrast and image quality.

7. LITERATURE SURVEY

In this paper they addresses Body Wireless Sensor Network using Internet of Things with cloud computing. Generally cloud computing is the massive storage of data

which can be updated and accessed anywhere in this world. In rural areas there is no sufficient health care facilities at the time the cloud computing is very suitable[6]. The BSWN sensor used to transmit the patient health parameter. In case of emergency situation it quickly detect the patient health and send message to the nearby health centers [1].

Biosensor which is used to collect the data from various body parameters and send to the server which shares the collected data to the hospitals for further treatment. The sensor collects information such as heart beat, pulse rate, blood pressure level and body temperature. The sensed information get transmitted and during emergency situation the server rings the alarm to the ambulance[2].

In this paper they facilitate end to end surveilling screen through following steps. At first the patient surveilling device generally sends the daily status through the smart phone with the help of sensor the data transmitted via server. Second Stage the system sends the particular information to their family member and caretaker for further treatment. Finally in case of emergency the alarm triggers which alerts the doctor and the nursing staffs[3].

In this paper they mentioned about the concept of Internet of things and hardware layer. Then how the sensor are connected with the arduino and to find the processing speed, storage and power consumption[4]. Another challenges found in it are communication layer where the device connected to the network and about the bandwidth and the electromagnetic spectrum. This also describes about the role of Internet of things in health care such as RFID based smart watches, smart cameras and smart phones. The smart devices along with Internet of things used in health care system reduces the complexity and complications.

M-health is also known as mobile health which is a subset of e-health that refers to the use of portable wireless devices which is capable of storing, processing, transmitting and retrieve the real time data. The mobile communication device supports services such as smart phones, tablet PCs, personal digital assistants. The wearable device is providing good support to the user and its friendly supporting software play vital role in continuing in regular. The major challenges are low power consumption, accuracy and small in size. In Wearable IoT they used machine learning and deep learning and mainly used support vector machine algorithm through which is used to predict the pattern of certain diseases and diagnosis of potential diseases[5].

8. CONCLUSION

The proposed System[12] is used to collect the physiological data of ill people using various sensors. The system provides good support to the nursing staff

and doctors in order to monitor a patient health. The rigid sensors along with Internet of Things make a high reach on every patient life. The Surveilling system monitors the essential signs and feels the abnormalities. Once the sensor senses that the patient in abnormal condition it automatically pass the message[17][18][19] to the server the caution message transmitted to the doctors or care takers in order to save the patient life. The main advantage of our proposed system is effective measurement and accurate, consumption of low power, low cost, easily analyzed and easy to use. The wireless sensor node is to collect the information and send it to the cloud without any issues. In Future we have planned to fix a single sensor instead of using separate sensors to monitor and also it provide information to give first aid for the patient with notification which helps nursing staffs to take care of the patient until the doctor arrives.

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