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IoT in Health Monitoring System.

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ABSTRACT

Generally, it is very hard to find the abnormalities in the heart beat count of a patient. The average count of 25 years old ranges from 140 to 170 beats/minute, whereas in 60 years old people, it ranges from 115 to 140 beats /minute. Patients are not satisfied with the treatment which doctors normally use for finding the heartbeat count. So, there should be a device to track the internal changes in the human body. There are different types of instruments available in the market to track internal body changes, but there are some limitations due to their heavy cost, maintenance, instrument size and the patient's mobility. Here is a device namely wireless health monitoring system used to overcome this problem like easy to use, small in size, light weight and portable. This device uses a heartbeat sensor to track the patient's heart beat count and also abnormalities. The healthcare industry is in a state of great despair. Healthcare services are costlier than ever, global population is aging and the number of chronic diseases is on a rise.

Medical diagnostic consumes a large part of hospital bills. Technology can move the routines of medical checks from a hospital (hospital-centric) to the patient's home (home-centric). The right diagnosis will also lessen the need of hospitalization. A new paradigm, known as the Internet of Things (IoT), has an extensive applicability in numerous areas, including healthcare. The full application of this paradigm in healthcare area is a mutual hope because it allows medical centers to function more competently and patients to obtain better treatment. With the use of this technology-based healthcare method, there are unparalleled benefits which could improve the quality and efficiency of treatments and accordingly improve the health of the patients.

Keyword – IoT, Health Care, Arduino, Home centric, Blood Pressure Sensor.

1. Introduction

The advantage of today's rapidly growing technology and innovation should be adopted to improve access to quality health care services for patients in their local health centers. Health care service delivery is the management and delivery of health services for comprehensive preventive and curative services, according to the needs of individuals over time and across various levels of health system. Quality health care services are important for increasing everyone's quality of health, gaining quick access into a health care system, preventing disease and disability, detecting and treating health conditions, and thus preventing death due to negligence. Access to health care services comprises of coverage, services, timeliness and workforce. This paper focuses on patients' health care, which is to improve the health and wellbeing of patients through the use of IoT and e-Health solutions.

1.1 Objective

Developing a system for the users to achieve the following objectives:

- To develop gathering patient medical data that was never before available for analysis and delivering care to people for whom care wasn't previously accessible.

- To develop IoT-driven systems for making it possible to radically reduce costs and improve health by increasing the availability and quality of care.
- To develop and manufacture embedded technologies for use throughout IoT-driven healthcare systems, including:
  • Sensors that collect patient data.
  • Microcontrollers that process analyzed and wirelessly communicate the data.
  • Microprocessors that enable rich graphical user interfaces.
- To develop Healthcare-specific gateways through which sensor data is further analyzed and sent to the cloud.
- To execute queries that can arrange data of tables in the form ascending order and descending order. related your research work Introduction related your research work Introduction related your research work Introduction related your research work Introduction related your research work.

1.2 Proposed System

Integration of the IoT technology with e-Health solutions is the main focus here, that is, to show how IoT's main technology is useful in health care domain. Here we are going to use Blood pressure sensor, Temperature and Humidity sensor. Blood pressure sensor will be able to measure Systolic, Diastolic and Pulse Readings and send the reading to controller using UART Communication.

SIM900 GSM modem will create HTPP post request to web server to call php page and store reading in MySQL database. The data stored in database is now ready to publish to Doctor or family member to read the recent measured parameters. System will be always in operation and if found any measured blood pressure, pulse rate, temperature and humidity out of predefine range then system will send alert SMS to doctor and family member for help.

2. SYSTEM ARCHITECTURE

The Architecture framework for IoT enabled e-health, can be best understood by visualizing the lifecycle of the various entities and their interactions. Architecture for e-health must consider the needs of each step in this life cycle and must address the effective and efficient execution of each function. The key to e-health architecture is to support an interoperable system of different types of devices, applications, and backend systems to enable the free flow information for precise and timely decision-making.

The data flow architecture focuses on the source of the data, the destination the data and path the data. The source of the data is typically the sensor. The data can be either locally cached or is sent to the upstream systems without storing in the sensor. The path taken by the data includes a gateway, which can also cache some of the data and do distributed processing.

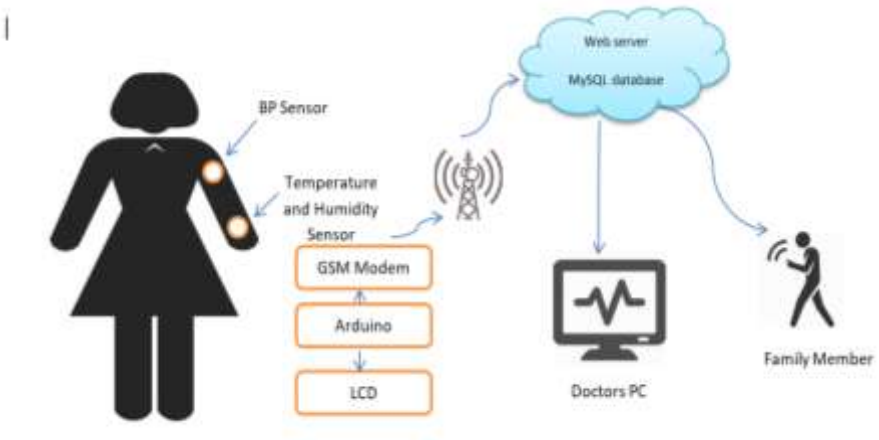

Fig -1: System Architecture.

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2.1 Arduino Board

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Fig-2: Arduino Mini Pro Board

2.2 SIM900 GSM Modem

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption

Fig-3: SIM900 GSM Modem

2.3 Blood Pressure Sensor

Blood Pressure & Pulse reading are shown on display with serial out for external projects of embedded circuit processing and display. Shows Systolic, Diastolic and Pulse Readings. Compact design fits over your wrist like a watch. Easy to use wrist style eliminates pumping.

Blood pressure is the pressure of the blood in the arteries as it is pumped around the body by the heart. When your heart beats, it contracts and pushes blood through the arteries to the rest of your body. This force creates pressure on the arteries. Blood pressure is recorded as two numbers— the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats). The unit which measures this is called Sphygmomanometer.

Monitoring blood pressure at home is important for many people, especially if you have high blood pressure. Blood pressure does not stay the same all the time. It changes to meet your body's needs. It is affected by various factors including body position, breathing or emotional state, exercise and sleep. It is best to measure blood pressure when you are relaxed and sitting or lying down.

Table-1: Classification of blood pressure for adults (18 years and older)

	Systolic (mm Hg)	Diastolic (mm Hg)
Hypotension	< 90	< 60
Desired	90–119	60–79
Prehypertension	120–139	80–89
Stage 1 Hypertension	140–159	90–99
Stage 2 Hypertension	160–179	100–109
Hypertensive Crisis	≥ 180	≥ 110

3. BENEFITS OF IOT IN HEALTHCARE

IoT has many advantages to individuals, society, the environment, consumers and business, as with every technology there are some benefits with some drawbacks. Following table provide the list of major benefits we have from IoT. Though, IoT is very beneficial in the domain of the medical health care. Iot based applications and systems have transformed the world into an imaginary world which human of 90's thought about. Due to Iot there is revolutionary change in the field of internet communication; this has a lot of contribution in the growth of many challenging domains but especially in the field of medical things. This is the one of major reasons to close the gap between doctors, patient and healthcare

4. CONCLUSIONS

The rapid advancement of cloud computing, mobile applications and wearable devices facilitates the IoT's role in transforming the traditional approach to healthcare into smart and personalized healthcare. The IoT-enabled healthcare systems can be categorized under three primary areas, as follows: monitoring and controlling, information sharing and collaboration, and big data and data analytics.
The IoT enabled health care devices offers wide sensor connectivity like Blood Pressure Sensor, Temperature sensor, Humidity sensor, Glucose and SPO_2 Sensor.

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