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Smart Hospitals E-Medico Management System

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ABSTRACT--- As for medical plane, there are some exertions has to be prevailed over for making the quality of treatment to be elevated. So there are two different levels of changes has been concentrated to enhance the level of hospitalization. The patient's height, weight, temperature, pulse rate are being checked, manually by nurses. This is a time-consuming and tedious process for patients. Patient's Health Data Assortment (PHDA) is the device to be initialized in all the hospitals where the patients can fill up their details, and problems they face. Simultaneously it is indicated to doctor through the app. The next level of concentration will be on sensing the drips level sensing. We use saline to improve patient's health and avoid dehydration. The patient should be monitored and given special care during this stage or period of time. The saline level of the patient should be checked regularly. There are many deaths happening because of carelessness of caretakers and lack of nurses and doctors towards saline completion. If the saline level is monitored automatically the death rate can be reduced. The saline level monitoring system is developed to protect patient's life from this type of accident. This system is build using Internet of Things (IOT) platforms. A predefined critical level is fed into the system and compared with actual level of the saline in the patient. When the level reaches the threshold value a buzzer and a alter message will send to the corresponding nurse or doctors for replacement of bottle.

Keywords— IoT, PHDA, saline level monitoring, level sensor, threshold value, message.

I. INTRODUCTION

Smart hospitals is a very optimized and developed new medical processes for managing the hospital infrastructure. It is enabled by underlying digitized interconnected infrastructure of networking assets, for maintaining a valuable service or insight that was not existing or out there earlier, to realize higher patient care, expertise and operational potency. It makes the hospital to work smartly and not only digital. It is more important to change the hospital working smartly. The current implementation in digitized solution is a step towards our journey. The complete alignment of clinical process and management system is exploratory from intermediate stage to finally smart hospital. It is a network of physical objects comprising of all the devices, vehicles, buildings and other items embedded with electronics, software and sensors which enables these objects to collect and exchange data amongst each other. Using this technology, objects are sensed and controlled remotely across existing network infrastructure. This technology creates way for integrating the real world into technology-based systems. IoT is advantageous in many ways as it leads to automation of daily tasks leading to better quality of life and saves money as well as time. Applications of IoT include a vast number of systems such as Smart homes, Automated car, Automated doors, Automated Escalators, Automated Hand Dryer. Similarly IoT plays a major role in health monitoring system. SHEMS is a android-based management system for different types of users like patient, doctor, admin, nurse of a hospital which is used for the interaction between patients and doctors where all the information will be stored in a secured database.

II. EXISTING SYSTEM

In India there are nearly 35,416 government hospitals and 53,600 private hospitals.

(a) When a patient enters a hospital he/she must give their basic credentials such as name , age , DOB, contact details etc.. to the receptionist in person.

(b) The patient has to move to different places to check pulse rate , blood pressure, weight and height.

(c) When the drip bottles are not replaced at the right time it leads to blood reversal, this causes blood loss and incase of rare blood group it leads to complications.

III. PROPOSED SYSTEM

(a) As far as now, the in-patient details (ipd) and out-patient details(opd) is collected by the receptionist manually. To conserve patient's and doctor's time Patient's health data assortment (PHDA) is the device to be initialized in all the hospitals where the patients can fill up their details, problems they face and therefore the token are going to be issued by the device using printer.

(b) Due to miscommunication between nurse and patient, blood reversal takes place in drip bottle. Blood reversal leads to loss of blood in patients especially in case of rare blood groups it leads to complications. This can be overcome by Drip level sensor and controller which senses the drips level and intimates to assigned personality through the app.

(c) Under unfavorable conditions the controller closes the knob of the bottle thus saving the patient from blood loss and injury.

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Due to the carelessness of ward person oxygen cylinder explosion takes place. PHDA device alarms the assigned person through alarms when there is a leakage.

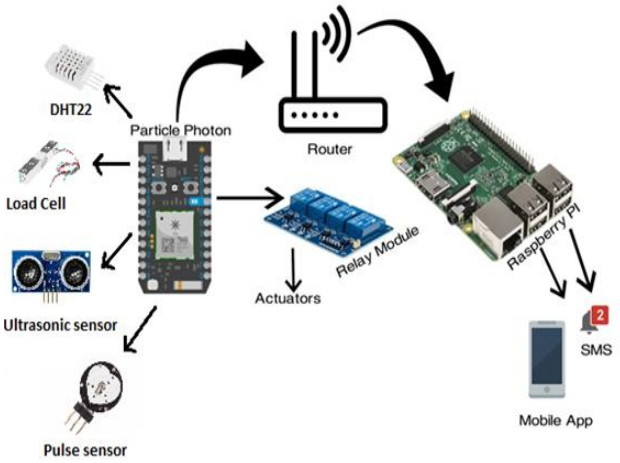

Fig 1.a Architecture of the proposed system

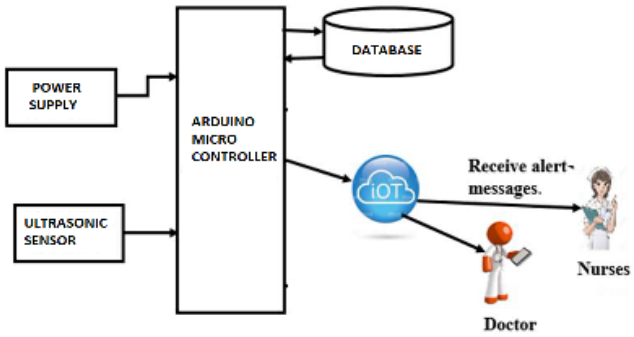

Fig 1.b Architecture of the proposed system

IV. COMPONENTS USED

1) Hardware Components:

Sensors are electrical devices (electro-mechanical) that is used to measure a physical parameters like temperature, pressure, force, acceleration etc. by measuring these parameters from the signals that either perceptiable measures (level) that physical measures or it gives an easy binary digital signal that shows a yes/no signal that tells us if one thing occurred or not (such as barely sensor). Most sensors need power to be provided to a sensor and electrical signal is then generated once the measuring.

A. Load Cells:

It is a electrical device for sensing element. It is used to convert a load or force performing on it into AN signal. This signal may be a voltage modification, current modification or frequency modification betting on the sort of load cell and electronic equipment used. There are many different kinds of load cells.

Similarly, Resistive load cells work on the principal of piezo-electric. When a pressure is given to the sensing parts it converts its resistances. This modification in confrontation results the change in the output voltage once input power is given.

There is another load cell known as capacitive load cells. It changes the capacitance of a system an explicit quantity of power once the charge is applied. In common parallel plate capacitors, the capacitance is directly proportional to the amount of overlap on the plates and di-electric between the plates. It is inversely proportional to the gap between the plates.

B. Ultrasonic Sensor:

Ultrasonic sensors measure distance by using ultrasonic waves[9]. The sensing element head emits AN inaudible wave and receives the wave mirrored back from the target. Ultrasonic Sensors live the space to the target by mensuration the time between the emission and reception. An optical sensing element includes a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model inaudible sensing element, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head.

C. DHT22 Sensor:

It is a low-cost, digital temperature and humidity sensor , which uses capacitive humidity sensing and a thermistor to measure the surrounding air and provides a digital signal on the data pin. It is straightforward to use however needs careful temporal order to grab knowledge. The only real downside of this sensor is that we can only get new data from it every 2 seconds . Just connect the first pin on the left to 3-5V power, the second pin to the data input pin and the rightmost pin to the ground. If it has to be multiple sensors, then each one should have its own data pin.

D. Pulse Sensor:

Pulse sensor is designed to give digital and analogue output of the heart beat when a finger is placed on it. The Sensor clips onto a fingertip and plugs right into Arduino with some jumper cables. Thus the waveform can be checked using data visualization software in analogue whereas the numeric values are available on the digital screen.

E. Raspberry Pi:

The SHEMS uses Raspberry Pi3 Model B as local server which is powered by a Broadcom BCM2837, 4*ARM Cortex-A53, 1.2GHz and 1 GB Ram with Raspberry Stretch OS[9].

F. Wi-Fi Router:

A wireless router is a networking device that performs the routing operation. Deepening upon the manufacturer it can be configured to provide internet access. For this project we have configured the router in Wireless Internet Service Provider (WISP) mode which is making the device to connect with the near available Wi-Fi Network.

G. Four Channel Relay Module:

The Relay module permits a good vary of microcontroller with digital outputs to manage larger hundreds and devices like AC or DC Motors, electromagnets, solenoids, and incandescent light bulbs. The 4CH module is designed to be integrated with 4 relays that it is capable of control 4 relays. The relay output state is separately indicated by a LED.

H. Arduino Micro-controller:

Arduino is an open source microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino Micro-controller used as processing and programming unit for sending instructions to the dc motor, buzzer, database.

2) Software:

A. *Particle DEV :*

It is an IDE that is used to program the Particle Photon board.The local copied firmware files can be assessed using desktop applications. However, Internet is needed because the files are pushed to the particle cloud for compilation and returns of binary. The particle IDE can be accessed only by logging in to the particle cloud. A user can add any number of particle devices in his particle cloud account and can write the code to the particular device. Whenever a code is written the code will get compiled in the particle cloud and when the particular device is found online the code will be flashed via the cloud to the device.

B. *Android Studio :*

It is an IDE developed by Google that is used to develop the android applications.

3) Framework:

A .Node.js :

Node.js is associate open-source, cross-platform JavaScript run-time surroundings for execute JavaScript code server-side. Node.js permits JavaScript to be used for server-side scripting, and runs scripts server-side to supply dynamic online page content before the page is distributed to the user's application. Consequently, Node.js has become one of the foundational elements of web application development to unify around a single programming language, rather than rely on a different language for writing server side scripts.

C. *Message Queuing Telemetry Transport (MQTT) :*

MQTT stands for Message Queuing Telemetry Transport. It is designed with simple and light weight messaging protocol for constrained device with low band width, high latency or unreliable network. The sender and receiver is the most important in this protocol

B. *Node Red :*

Node-Red could be a programming tool for wiring along hardware devices, APIs and online services in new and interesting ways. It provides a browser primarily based editor that produces it simple to wire along flows exploitation the big selection of nodes within the palette which will be deployed to its runtime in a single-click.

C. *Twillo SMS Gateway :*

Twillio provides a straightforward hosted API and mark-up language for businesses to quickly build ascendible, reliable and advanced voice and SMS communications applications. Twillio provides a telecom infrastructure internet service “in the cloud”, enabling web programmers to integrate real-time phone calls into their applications.

V. RESULT

The results were based on two phases. Entire project was tested under two phases namely

- Monitoring Session
- Automation Session

In both the Sessions there were no flaws and the expected result came.

1. Monitoring Session

In this Session the temperature , height , weight , pulse rate of patients coming to the hospitals were collected with the help of the hardware that was designed. On the analysis we were able to find that the vital parameters were not maintained at the correct level but still the patients were able to get yield out of it.

2. Automation Session

In this Session of testing the sensors were made to monitor the conditions and the modules were interfaced with the device and when the vital parametric condition changes the corresponding action was performed as per the algorithm we have put in the microcontroller. We were able to notice that whenever the threshold values varies the corresponding action was taking place and notification was sent to the user through SMS.

S.NO	NAME	TIME SPENT AT RECEPTION	TIME SPENT BEFORE PHDA	TOTAL TIME SPENT
1	Arun	3	5	10
2	Bala	4	7	14
3	Varun	6	8	18
4	Deepa	2	5	10
5	Rani	7	8	15
6	Prem	6	9	15
7	Yogesh	4	10	14
8	Naren	7	6	13
9	Gaythri	9	8	17
10	Harish	7	5	12
11	Elango	5	7	12
12	Keerthi	8	8	16
13	Jagan	10	5	15
14	Indhu	6	7	13
15	Sathya	5	8	13

Fig 2.a Result before PHDA device

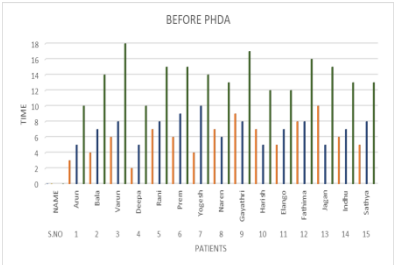

Fig 2.b Result before PHDA device

S.NO	NAME	TIME SPENT
1	Arun	3
2	Bala	4
3	Varun	5
4	Deepa	5
5	Rani	4
6	Prem	5
7	Yogesh	3
8	Naren	5
9	Keerthi	4
10	Harish	7
11	Elango	3
12	Fathima	5
13	Jagan	4
14	Indhu	5
15	Sathya	7

Fig 3.a Result after PHDA device

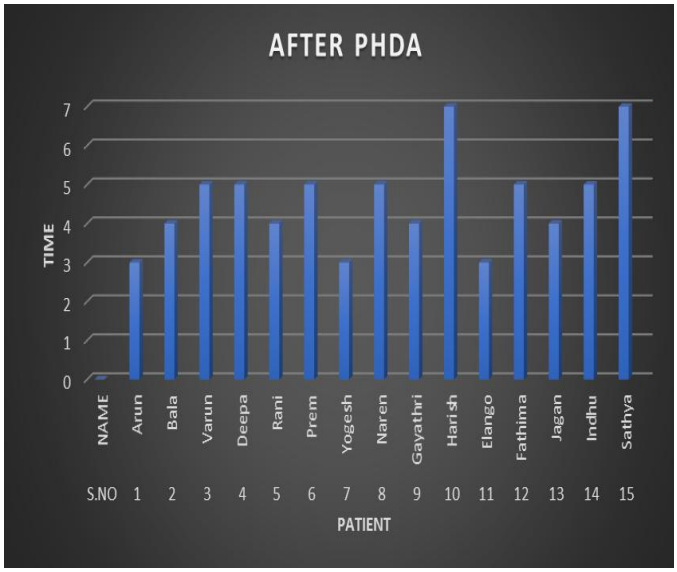

Fig 3.b Result after PHDA device

Fig 4. View on mobile app

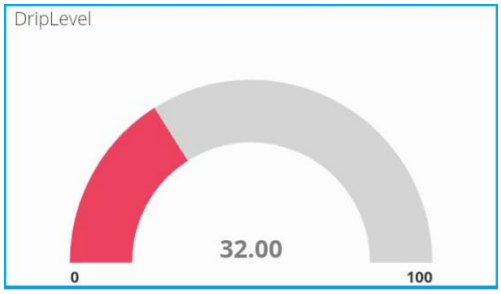

Fig 4.b Drip level indication

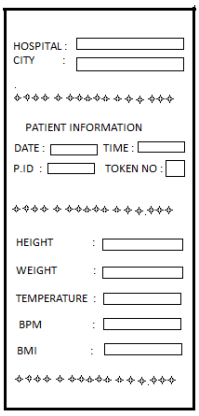

Fig 4.c Output from Printer

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