

Design and Implementation of Health Monitoring System for Patient using Wireless Sensor Network

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ABSTRACT

Adequate health care services and doctors are often unavailable in rural and remote areas and this problem is expected to grow worse in near future. "Patient health monitoring system using wireless sensors" objective is to provide essential medical services online to users irrespective of their location. The system offers mobile support to facilitate faster using sophisticated medical equipments in emergency cases. The daily records are also maintained so that drugs are dispatched in a proper way. The proposed health monitoring system consists of four modules: 1) Doctor module, 2) Patient module, 3) Nurse module and 4) Admin module. For the successful execution of modules sensors are being used. The sensors used are namely temperature sensor, heartbeat sensor and blood pressure sensor. This system will work on basically three algorithms namely KNN algorithm, semantic matching algorithm and data distribution algorithm. This system helps to overcome time and memory required to a great extent. The sensors used in the system are developed using low-power dedicated sensor arrays for temperature and movement. It also resolves the issue of inaccurate results.

Keywords : Health Monitoring System, Wireless Sensor Network, KNN, TMP

I. INTRODUCTION

Wireless sensor network achieves environment monitoring and controlling through use of small devices of low cost power. Such network is comprised of several sensor nodes, each having a microprocessor, sensor and wired/wireless transceiver inside a small device. The sensor nodes provide intelligence information and useful services for common human life through negotiation with their adjacent nodes. Wireless sensor networks can be adjusted widely in application fields such as medical care, military tactics, home networking , environment monitoring and so on. This system is providing reliable and fast medical services for

patients by transmitting reports to doctors, nurses and other caregivers.

II. LITERATURE SURVEY

The information about the previous system discovered were collected and studied. Various approaches in the past include a proposal to implement patient health monitoring system which comprises of different sensors. It proposed to sense the temperature, blood pressure and pulse rate automatically using a bio medical kit that is connected with the patient. Another approach was using IoT based Healthcare monitoring for ECG Telemetry system. The proposed system has four modules: administrator module, patient module,

nurse module and doctor module. The inputs from these sensors are read by the microcontroller and are send to the web server through internet. From the web server the doctor can view the current values and according to inputs doctor can prescribe suitable medicines. The above approaches lack to work in the absence of doctor. Hence, we propose a system which can not only monitored patient's health but also can immediately diagnose with appropriate medication.

III. PROPOSED APPROACH

The approach of patient health monitoring system is that to have sensors such as temperature sensor, blood pressure sensor and pulse rate sensor. The inputs from these three sensors are read by the microcontroller or the arduino uno board. Then via Internet these inputs are send to the web server. Using the respective web server the inputs are viewed on the PC/laptop and mobile after the connection with the web server.

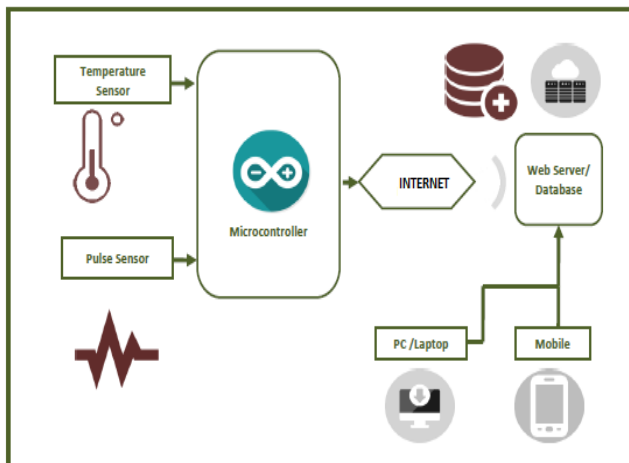


Fig 1 : System Architecture of Patient Health Monitoring System

The patient health monitoring system is briefly divided into three sections -

1. Hardware Requirements

As the system uses sensors so firstly we require blood pressure and temperature sensor and then we require the converters and cables. The hardware requirement is specified below –

- Blood Pressure Sensor – Serial Output
- Temperature Sensor – TMP36
- Arduino Uno
- USB to TTL UART RS232 Serial Converter Module PL2303HX+AU
- Male-to-Male Jumper Ribbon Cable
- 9DC100 9 Volt Power Adaptor
- USB data cable

2. Hardware implementation

The patient health monitoring system requires some kind of hardware as wireless sensors are used. The sensors used are namely temperature sensor , pulse rate sensor and blood pressure sensor. The brief details about these sensors are given below-

1] Temperature Sensor- TMP 36

The temperature sensor being used is named as TMP 36. TMP 36 is a low voltage, precision centigrade temperature sensor. It provides a voltage output that is linearly proportional to the Celsius temperature. It just needs a ground and a 2.7 to 5.5VDC and reads the voltage on the V_{out} pin. This sensor is easily available as it is a non-industrial sensor.

2] Blood Pressure and pulse rate Sensor – Serial Output

The blood pressure and pulse rate both are measured in the same device namely the serial output. Blood pressure and pulse rate readings are shown on the display with serial out for the external projects of embedded circuit processing and display. This device shows the systolic, diastolic and the pulse readings. The device is a compact design which fits over your wrist like a watch. As the device is in a wrist style therefore it eliminates the need of pumping. As this

device is an industrial device so it is given more preference as it is easy to operate and has a switching button to start, fully automatic and it has clinical accuracy as well.

In order to transfer and receive the values of the sensors there is a need of a microcontroller. The brief details are given below-

3] Arduino Uno

The arduino uno is a microcontroller board based on the ATmega328 (datasheet). The board has 14 digital input/output pins, 6 analog inputs, a 16MHz ceramic resonator, USB connection , a power jack, an ICSP header and a reset button. The Arduino Uno differs from all the preceding boards as in that it does not use FTDI USB-to-serial driver chip.

IV. RESULTS AND DISCUSSION

Working of Web portal

The working of web portal is divided in four phases -

Phase 1: Patient Registration

As soon as we enter the web portal we get an authentication access page in which there are two options patient admission (specifically handled by administrator only) and nurse section. In the authentication access page if we select the patient admission section so it pops a page where the administrator (receptionist) needs to enter the user id and password. After the patient admission login, an dashboard is displayed in which the count of wards, doctors, patients is given. The left side of the dashboard shows various options such as masters, add patient, add doctors and so on. The masters option will show the blood group, city ,state and other general information of the patients. In the add patient option the patients who are being admitted are registered. The patient admission form consists of

patient id , first name, last name, age , address , city, mobile number (two mobile numbers) , some general medical information such as weight(in kg), height(in feet), blood group, email id ,aadhaar card number and they have to choose the ward type from the drop down menu whether they want general ward or ac ward. After the form is filled they have to save it and the administrator can view the full information of the patient in the patient record menu.

Fig 2: The Patient Registration Page

Phase 2: Nurse Registration

The nurse admission process is carried out when you click the option add nurse of the dashboard. Similar to the patient registration nurse also has to register. The nurse will be allocated with a nurse id and then she has to enter her details such as name , designation ,gender, address , mobile number, city ,state, pin code , date of admission or joining and date of birth. After the information is filled it is saved. As in general every nurse is allocated a ward similarly here also the nurse is allocated a ward whose process starts by viewing the ward allocation option. In ward allocation as soon as the nurse id is selected from the drop down menu the information of the nurse can be viewed. The administrator has to select the ward for the nurse from the various options. As soon as the

ward is allocated to the nurse a unique username and password is generated for the nurse so that the nurse can login directly into the nurse section. The username and password is sent to the nurse via the messaging service on the mobile number given by the nurse. And this user id and password can be viewed by the nurse on her mobile phone and the administrator. As the nurse is allocated a ward she must have all the details of the patients in her ward so for that view data option is created. In the view data option, the nurse has to select the ward first and then the information of only those patients in that particular ward is displayed.

Fig 3 : Nurse Registration Page

Phase 3: Sensor Connection

As soon as sensors are connected by the nurse to the patient's body the nurse will click on the sensor connection option available on the patient admission page. After that a hardware communication page is displayed in which there is selection of the communication port according to the computer hardware system. This selection of the communication port is for the body temperature sensor particularly. Then click on the connect button. The output of the body temperature is displayed on the same page within a time span of 10 seconds. For the output of the blood pressure sensor, click on the connect BP sensor option available on the same page. After doing this, another hardware communication

page is displayed in which also the selection of communication port is required and then click the connect button. The output of the blood pressure cum the pulse rate is displayed in the systolic, diastolic and pulse rate boxes respectively. For the nurse to view all the outputs together she has to click on the get data option in the hardware communication page of the BP sensor. The outputs are shown in the patient diagnosis page in which the general information as well the current or runtime outputs taken are viewed both in text and label form.

Fig 4: Connection of body temperature sensor


Fig 5: Connection of blood pressure sensor

Phase 4: Prescription Generation

For the prescription from the doctor firstly we name and specialization of the doctor in the diagnosis page itself. After that the nurse will get the particular patient's prescription from the patient prescription option. Here also the nurse has to first select the respective ward and then the outputs of the particular patient and the particular doctors name is seen. To view the prescription just click on the

patients name and the prescription is viewed defining the medicines, dosage of the medicine and the timings.

Close



See A Doctor INSTAntly : Anytime, Anywhere

Dr. pawade
MD Surgen

Leena Akare
Disease: fever
Prescription Date: 28-04-2017

Recommended Action

1. drink Salt water twice a day
2. Avoid cold exposure for few days
3. apply a hot pack to your throat and chest

RX. Medication

SR.	Medicine	Dose	Instruction, If Any
1.	Crocin	1 Tab	After Meal
2.	brufen	2 tab	2 time
3.	lonazep	1 tab	3 time

Fig 6: Generated Prescription

V. CONCLUSION

This system helps to overcome time and memory required to a great extent. The system also helps to resolve the issue of inaccurate results. The system uses sophisticated medical equipments to facilitate faster in emergency cases. Each and every patient's record is maintained in systematic manner in order to make the searching process easier. Also, it establishes a real-time communication between the patient and the doctor.

VI. REFERENCES

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