A Review on Novel Approach for IoT Based Patient Health Monitoring System using Wearable Sensors

Shital Sunil Sambre[1], Dr. A. N. Thakare[2]

[1]M.Tech Scholar, Computer Science and Engineering, Department of Computer Engineering, Bapurao Deshmukh College of Engineering, Sevagram, Wardha, Maharashtra, India

[2]Assistant Professor, Department of Computer Engineering, Bapurao Deshmukh College of Engineering, Sevagram, Wardha, Maharashtra, India

ABSTRACT

Internet of Things (IoT) and Cloud Computing present great advantages by providing remote and efficient services. The purpose of the project entitled as "Novel Approach for IoT Based Patient Health Monitoring System using Wearable Sensors" is to computerize the Front Office Management of Hospital to develop software which is user friendly simple, fast, and cost-effective. It deals with the collection of patient's information, diagnosis details, etc. Traditionally, it was done manually. The main function of the system is register and store patient details and doctor details and retrieve these details as and when required, and also to manipulate these details meaningfully System input contains patient details, diagnosis details, while system output is to get these details on to the screen. The Hospital Management System can be entered using a username and password. It is accessible either by an administrator or receptionist. Only they can add data into the database. The data can be retrieved easily. The data are well protected for personal use and makes the data processing very fast. The main intention of introducing this system is to reduce the manual work at Health center counters. The system also facilitates the pharmacist to enquire about the drugs and about the stock to be ordered and about the expiry data. We expect this article will help unify and motivate future research to take advantage of the abundant literature that exists to promote the fruitful research in the multiagent community.

Keywords : IoT, Wearable Sensors, diagnosis, Multiagent Community

I. INTRODUCTION

The project Hospital Management system includes registration of patients, storing their details into the system, and also computerized billing in the pharmacy, and labs. The software has the facility to give a unique id for every patient and stores the details of every patient and the staff automatically. It includes a search facility to know the current status of each room. User can search availability of a doctor and the details of a patient using the id.

The Hospital Management System can be entered using a username and password. It is accessible either

by an administrator or receptionist. Only they can add data into the database. The data can be retrieved easily. The interface is very user-friendly. The data are well protected for personal use and makes the data processing very fast. Hospital Management System is powerful, flexible, and easy to use and is designed and developed to deliver real conceivable benefits to hospitals. Hospital Management System is designed for multispecialty hospitals, to cover a wide range of hospital administration and management processes. It is an integrated end-to-end Hospital Management System that provides relevant information across the hospital to support effective   decision making for patient care, hospital administration and critical financial accounting, in a seamless flow.

Hospital Management System is a software product suite designed to improve the quality and management of hospital management in the areas of clinical process analysis and activity-based costing. Hospital Management System enables you to develop your organization and improve its effectiveness and quality of work. Managing the key processes efficiently is critical to the success of the hospital helps you manage your processes.
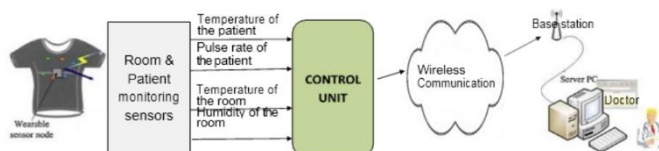

Fig.1 System block diagram (Journal of critical reviews 2020)

A. Patient Health Monitoring System: Need

To develop a   Patient Heath Center Monitoring system as   from manual system to computerized system, and to take care of Records of the various departments in the health center. The current manual system is slow laborious and error prone to computerize the same for quicker efficient results .

B. Patient Health Monitoring System: Goal

With every going day the need to be where the inflow of out patient request exceeds that which can be handled manually. Hence computerization of OP receipt request and maintenance of the drugs through the computerization brings better satisfaction and service oriented need.

C. Patient Health Monitoring System: Objectives

1. To implement embedded system and software can calculated and access the patient body records.

2. To design and implement the portable software for monitor or display patient health condition to the doctors and specialist.
3. To implement the recommendation system for find the medicals of that hospital premises of particular medicine that are prescribed to the patient.
4. To design a system for display the available doctors list and their live location automatic with the help of Kiosk screen and QR code which is present at entry point of that hospital at the time of emergency case.
5. To design a system which detect and inform Covid-19 patient to their relatives and doctors.

II. BACKGROUND AND RELATED WORK

Today, the use of technology to improve the quality of life is becoming a common attribute of modern society. When the technology is oriented to improve the Quality of Life (QoL), it is referred to the Internet of Things (IoT) [1]. IoT is a network of interconnected 'smart' devices, allowing collecting information and managing physical objects [1].

In the healthcare environment, the use of IoT technologies brings convenience to physicians and patients as they can be applied to various medical areas (such as constant real-time monitoring, patient information   management,   medical   emergency

management, blood information management, and health management) [2]. The present paper describes the steps taken to design and build a low-cost modular monitoring system prototype. This system aims to offer mobile support in order to facilitate faster and better medical interventions in emergency cases and has been developed using low-power dedicated sensor arrays for EKG, SpO2, temperature and movement [3].

The core objective of this project is the design and implementation of a smart patient health tracking system that uses Sensors to track patient health and uses internet to inform their loved ones in case of any issues. The Internet of Things is considered now as one of the feasible solutions for any remote value tracking especially in the field of health monitoring. It facilitates that the individual prosperity parameter data is secured inside the cloud, stays in the hospital are reduced for conventional routine examinations and most important that the health can be monitored and disease diagnosed by any doctor at any distance[4]. Now days, heart diseases are exceeds up to dangerous level which leads to death of human being. Monitoring the patient constantly is difficult or doctors are also unable to monitor particular patient for total working hours. In many critical conditions such as patient is located far away from hospitals or also in case of old patient who suffering with heart diseases and physical disorders. This module consists of heart rate sensor and temperature sensor which measures the heart rate and body temperature and sends SMS through GSM module to the medical advisory for the preliminary precautions so that patient can be prevented from serious situations before reaching to the hospital. The data are stored in the cloud for the physician reference [5].

Remote wireless health monitoring systems are generally based on using wearable sensor devices for collecting medical data from patients residing outside health institutions and transferring the measured biomedical parameters to a central storage with the help of emerging communication and information technologies. The remote wireless health monitoring system was able to successfully monitor the change in the patient's health status and transmit vital signs via RS232 communication to a local PC for display and evaluation [6]. This device that is a heartbeat sensor would help them to keep track on heartbeat counts of a patient and check for any abnormalities. If any varied change takes place it is notified through the GSM, this notification would help to take an appropriate action at instant time. This would help for patients from the future health problems.

Here we have analyzed the health of the patient wireless by using heart beat and temperature sensor. If patient will not good it will sends a message through GSM Any abnormalities in health conditions are informed via SMS to the indicated mobile number through GSM. The hardware is implemented and the output is studied [7]. The development of wireless patient monitoring system has been quite intensive in the past decade. Hence, in the present study, a new approach of wireless patient monitoring system was proposed as a prototype to minimize the power consumption and the costing issue [8].

The proposed system can be used to extract information about human location, motion and health-critical posture features. According to the specific application of fall detection, the system is devised to enrich the range of sensors, which currently are the key-point of workers safety and protection in industrial applications. Monitoring the health status of patients is a very challenging issue. Remote healthcare monitoring can play an important role here. An effective remote healthcare monitoring system can reduce the workload on healthcare service providers. It can also reduce the workload on the public safety networks, charity, and governmental and non-governmental organizations.

The current designed system eliminates the need for utilization of expensive facilities, decreases the unnecessary back-and-forth patient visit to the healthcare centers, reduces the tasks for healthcare professionals, and provides the doctors with the information about their patients at anytime and anywhere. A healthcare system in the last decade was made possible due to the recent advances in wireless and network technologies, linked with recent advances in nanotechnologies and ubiquitous computing systems. The term telemedicine refers to the utilization of telecommunication technology for medical diagnosis, treatment, and patient care.

III. PROPOSED METHODOLOGY

1. PROPOSED SYSTEM:

The Hospital Management System is designed for any hospital to replace their existing manual paper based system. The new system is to control the information of patients. Room availability, staff and operating room schedules and patient invoices. These services are to be provided in an efficient, cost effective manner, with the goal of reducing the time and resources currently required for such tasks . The core objective of this project is the design and implementation of a smart patient health tracking system. Fig.1 shows the overview of the proposed system. The sensors are embedded on the patient body to sense the temperature and heartbeat of the patient. Two more sensors are place at home to sense the humidity and the temperature of the room where the patient is staying. These sensors are connected to a control unit, which calculates the values of all the four sensors. These calculated values are then transmitted through a IoT cloud to the base station. From the base station the values are then accessed by the doctor at any other location. Thus based on the temperature and heart beat values and the room sensor values, the doctor can decide the state of the patient and appropriate measures can be taken.
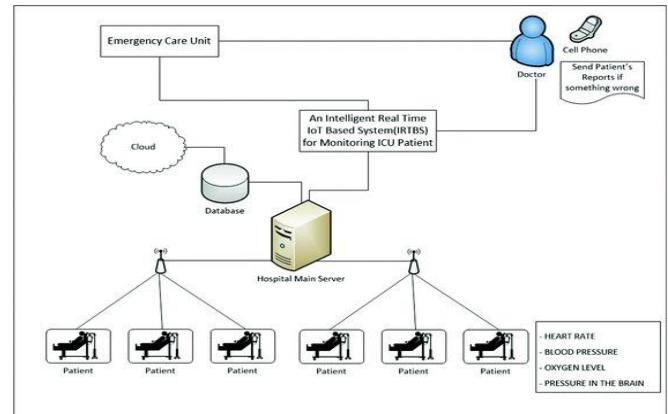
Sensors

The temperature sensor connected to the analog pin of the Arduino controller is converted into digital value with the help of ADC [10]. Using this digital data, the controller converts it into the actual temperature value in degree Celsius using the equation:

$$\text{temperature (°C)} = [\text{raw ADC value}*5/4095-(400/1000)]*(19.5/1000)$$

The heartbeat sensor is based on the principle of photo phlethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). The digital pulses are given to a microcontroller for calculating the heat beat rate, given by the formula:

$$\text{BPM (Beats per minute)} = 60*f, \text{ where } f \text{ is the pulse frequency}$$

A humidity sensor (or hygrometer) senses, measures and reports both moisture and air temperature. Humidity sensors work by detecting changes that alter electrical currents or temperature in the air. The relative humidity is calculated as given below:

Voltage = (ADC Value/1023.0)*5.0;

Percent relative humidity = (Voltage-0.958)/0.0307;

IV. FORMULATION:

To design this system I used the following materials:

➤ IoT (Internet of Things) : The Internet of Things (IoT) defines a network of materials – " embedded objects", software, and other technologies for the purpose of connecting and exchanging data with other devices & systems over the internet.

➤ WSN (Wireless Sensors Network) : Wireless sensors network (WSN) refers to a group of scattered and dedicated sensors for monitoring & recording the natural physical condition & organizing the data collected in a central location.

➤ Naive Bayes Algorithm: NB classifier are the collection of classification algorithm based on bayes theorem. $P(A|B) = P(B|A)P(A) / P(B)$

➤ Pseudo Random Number Generator: Uses mathematical formulas to generate sequences of random numbers. $X_{n+1} = (aX_n + c) \bmod m$

V. CONCLUSION

As we have already seen that the need cannot be emphasized for the further development of this system is only timely and helpful to Health Center, the system defined in the above script is up to date and caters to all kinds of request faced by the Health Center employees requirements to provide the better service to the patients, being developed in java it is also flexible modularized highly parameterized and hence can be easily deployed by any other application because of its componentized approach.

VI. REFERENCES

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