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Improved Distant Monitoring of Healthcare System

Research Article

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Abstract: Since the last decade, the healthcare applications have acquired significant attention of researchers. An ultimate goal is to innovate and develop not only a reliable but also economic patient health monitoring system (PMS) in order to that healthcare personnel can supervise their patients, either hospitalized or performing their usual daily routine activities. In India, so many lives are affected just because of lack of timely and properly treatment. Also for the inefficient and erroneous measurement of real time health parameter values in clinic and in hospitals too. Sometimes it becomes very crucial for hospitals to frequently check patients health condition. Also ceaseless observation of ICU patients is difficult or even not possible. To cope with these types of situations, this system is advantageous. It provides real time online data regarding physiological status of patient. It is designed to be used in hospitals for measuring and observing several parameters like movement or fall, temperature, pulse rate etc. The results are then collected by Raspberry Pi and stored in a database. Then this data is transferred on internet server using WiFi module. So that Doctors can login to a website and view those results and treat patient well within time without any constraint of distance or time.

Keywords: Raspberry pi, Wi-Fi module, Temperature sensor, Pulse rate counter, Accelerometer, Internet.

1. Introduction

Health is one amongst the global challenges of humanity [1]. As per the constitutions of World Health Organization (WHO) an eminent attainable standard about health is an elemental right for individuals [2]. Fit and healthy individuals induce to secured lifetime income which leads to hike in tax revenues as well as gross domestic products. Healthy and fit individuals also bring down pressure on the engulfed hospitals, ambulances, medical personnel which results in decrease workload over charities, public safety, governmental and non-governmental institutions. A competent and promptly accessible updated healthcare system is a pre-requisite to keep individuals fit and healthy.

An updated healthcare system must contribute to superior healthcare services for people from anywhere and all the time in a cost effective and user friendly manner. Presently, Healthcare systems are passing through a cultural transition from a traditional approach to upgraded approach. In traditional perspective the healthcare personnel performs a prime role. They must visit concerned patients frequently for mandatory detection, diagnosis and advising. This approach comprises of two major obstacles. Firstly, it is compulsory for the healthcare professionals or caretaker to be on site of the patient continually.

Moreover, the patient should have to be admitted in hospital equipped with several biomedical instruments for medical sessions. Thus, to resolve this issue modern approach which is patient oriented is being conceived. It includes educating

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patients with prior knowledge and information to portray a major contribution in the disease diagnosis, cure as well as prevention. An easily available and reliable PMS is a foundation of this technique. Effective PMS needed a real time data recording and indication of important signs of patient.

Thus, encapsulating the benefits of upgraded computers, bioinstrumentation as well as telecommunication technologies a upgraded PMS must acquire, store, display and later transmit the processed data that is from patients body to operators location without single constraint of time [3]. Nowadays, wireless communication is esteemed critical for solving global health challenges also became a powerful healthcare tool. Thus the physiological data of patients are quickly shared over the internet [4].

2. Proposed Methodology

The proposed system is shown in Figure 1 [5].

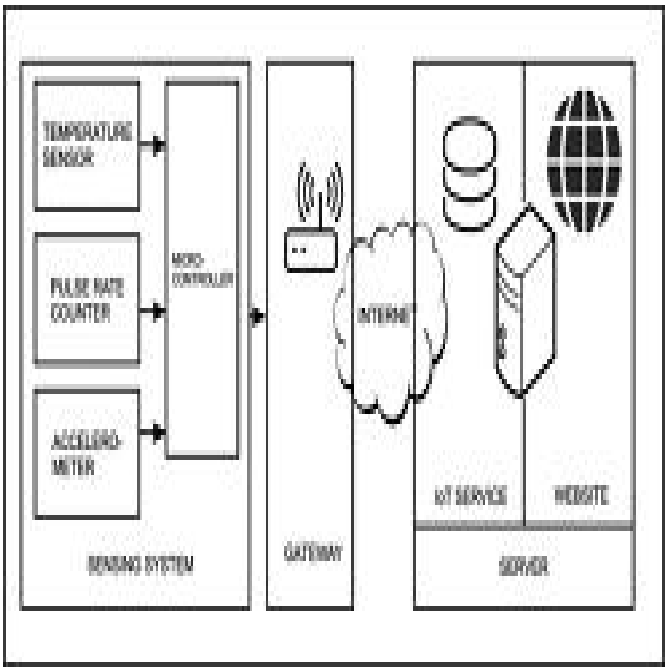

Figure 1. **The proposed system**

This system comprises of a temperature sensor to compute the body temperature, pulse-rate counter to count the pulses and accelerometers which recognize any fall that may occur. The micro controller used that is raspberry pi will gather the data from sensors to process and analyze. The processed data is later transmitted over internet through Wi-Fi protocol. Wi-Fi is used as a medium to connect with internet.

The server is developed to store this data and update the data with respect to time. The website is developed to display the current data. Thus the doctor can access the data anytime and anywhere simply by accessing the corresponding website or typing the corresponding unique IP address in Internet browser.

2.1. Workflow of System

The workflow is shown in figure 2

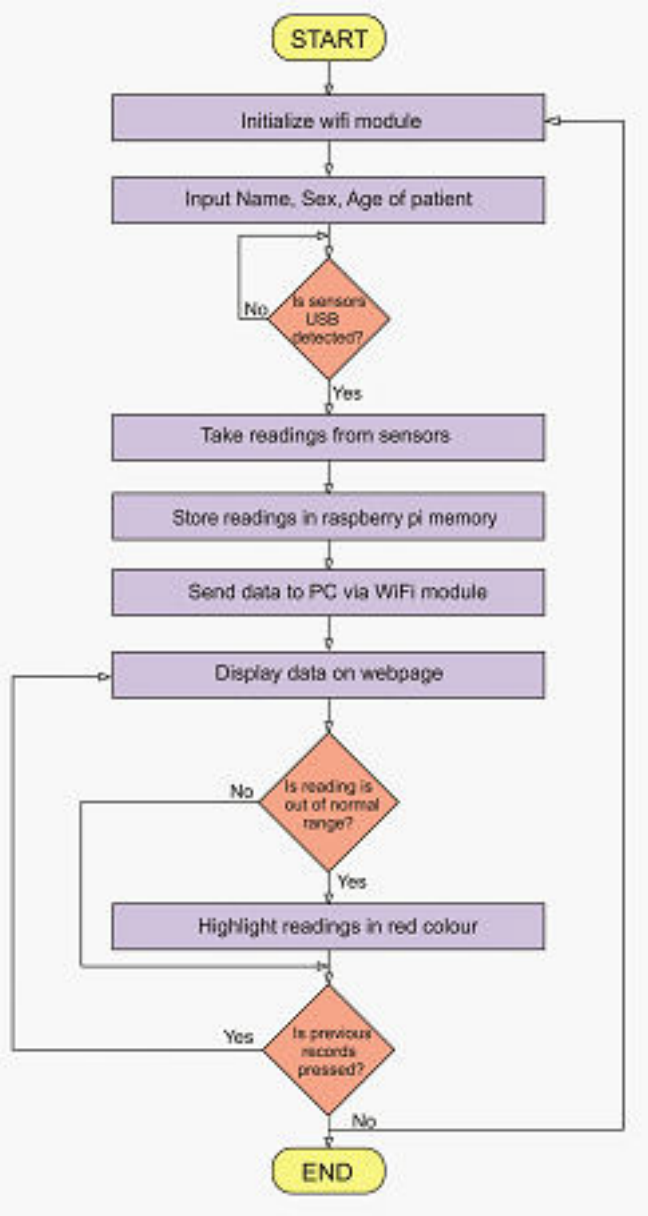

Figure 2. **Workflow of system**

The workflow of system initiates by receiving the data from varied sensors which are connected to patient's body. The collected data is later transmitted to the programming environment. In this step it undergoes through necessary processing on data, data analysis and then displays the relevant data like body temperature, pulse rate etc. Finally, the data are transferred over internet and shown on webpage.

3. Results

The system operating steps are as follows:

(1). Place all the three sensors on the patient's body.

(2). Connect power-supply to raspberry pi

(3). Open the webpage on laptop/PC to see the readings. The previous results can be displayed to compare and analysis the changes in parameters too.

(4). The data is finally published on the internet.

The experimental setup is shown in figure 3.

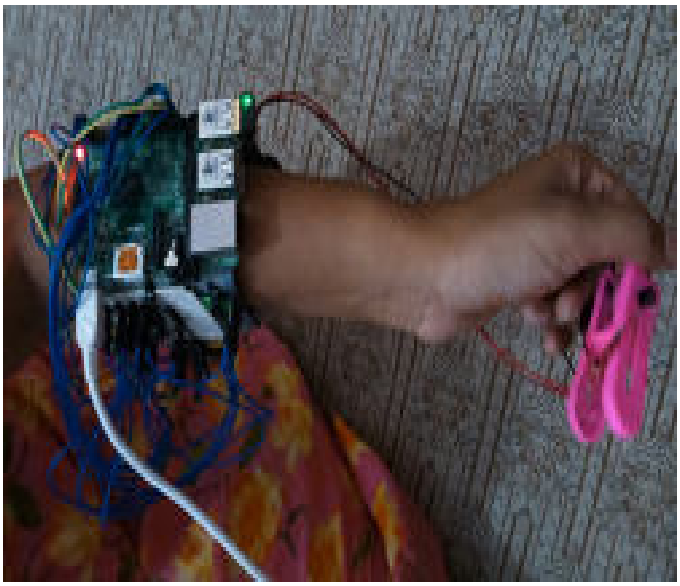

Figure 3. **Experimental setup**

After following all the steps stated above the acquired data can be utilized to observe and analyze the patient condition and collect sensitive information which is to be continually observed and analyzed for medical diagnosis. This biometric data gathered may also be sent using varied communication protocols like WiFi, WiMax, Bluetooth or Zigbee. To make this system more modern we can also connect a camera to Raspberry Pi to capture a real time image for exact diagnosis. Data is sent permanent storage so that we can maintain the previous records also and visualize the real time result by logging to a webpage on laptop or PC or smartphone. We can design the webpage in such a fashion that it displays data regarding current date, day and time along with the measured medical parameters. A button named as “previous results” located on webpage can assist in retrieving previous results which enables healthcare personnel and caregivers to analyze patient’s health status earlier.

Webpage showing online data is shown in figure 4.

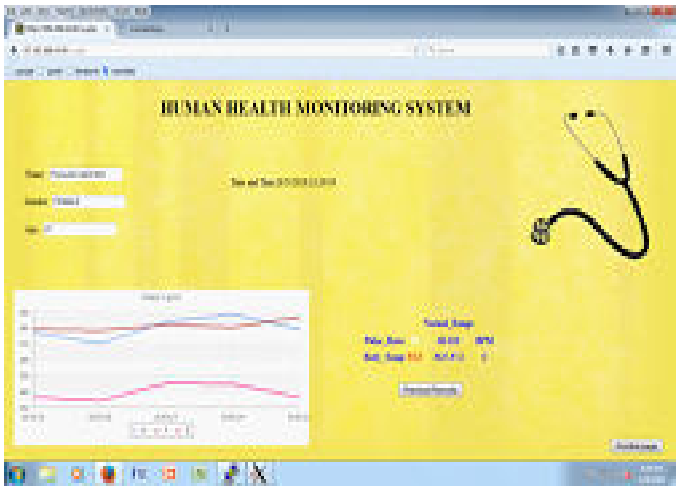

Figure 4. **Webpage showing online data**

Webpage showing previous records is shown in fig.5.

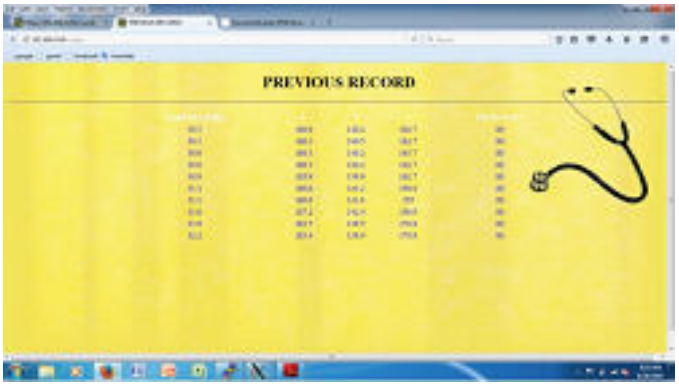

Figure 5. **Webpage showing previous records**

Screenshot of developed website (www.doctoratmysite.com) is shown in figure 6

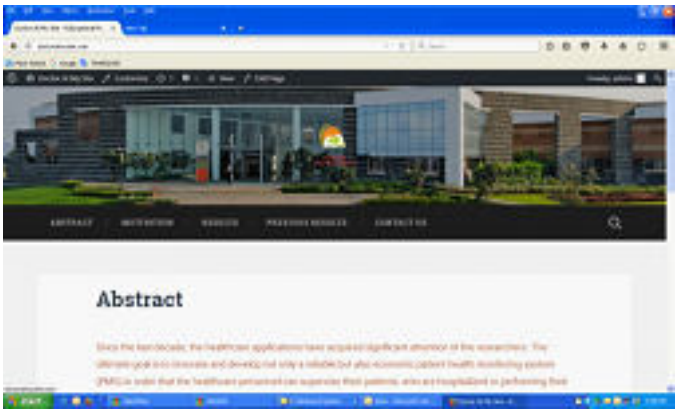

Figure 6. **Screenshot of developed website**

4. Conclusion

As health services are essential part of our society, automating these services reduces the burden on operator and eases the process. Also transparency of this system leads patients to trust on it. The primary objective of developing such a healthcare systems is to lessen health care costs by reducing frequent hospital visits, hospitalizations and diagnostic testing formalities. The WiFi technology helps the server to send and update the patient data on website. As a result, the healthcare personnel can monitor and diagnose their patients from remote location all the time.

Further, apart from medical application this system can be used in industrial as well as agricultural field by using various sensors like fertility identity sensors, humidity sensors etc.

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