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SMART HEALTH ENVIRONMENT: NANO/BIO-MEDICAL SMART DEVICE AUTOMATED AND PORTABLE

SONIA CHHABRA^{1*}, DHRUVA SREENIVASA CHAKRAVARTHI², SUSHMITHA S P³,
RAJAVIGNESH.R⁴, BALAKRISHNAN.C⁵ AND DILLIP NARAYAN SAHU⁶

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- 1: Assistant Professor in Computer Science and Engineering at Sharda University Greater Noida, Uttar Pradesh, India
- 2: CEO in Prashanth Hospital & Research Scholar, MBA at Koneru Lakshmaiah Education Foundation, Vijayawada, Andhra Pradesh, India
- 3: UG Student, Final Year in Electrical and Electronics Engineering at KPR Institute of Engineering and Technology, Coimbatore, India
- 4: Professor in Computer Science and Engineering at K.S.K College of Engineering and Technology, Kumbakonam, Thanjavur-DT, Tamilnadu, India
- 5: Assistant Professor in Alagappa Institute of Skill Development at Alagappa University, Karaikudi-630003, Tamil Nadu, India
- 6: Lecturer, Department of MCA, School of Computer Science, Gangadhar Meher University (GMU), Sambalpur - 768001, Odisha, India

*Corresponding Author: Sonia Chhabra; E Mail: soniacse7@gmail.com

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ABSTRACT

A smart and prosperous society has a stronger and highly effective health service. Its Internet of Things (IoT) has improved a digitized medical systems by allowing continuous surveillance of individuals' medical status and providing physicians with accessibility to this knowledge. This research provides an IoT-based, streamlined, and economical approach for monitoring individuals' medical condition, storing and displaying knowledge over the internet,

and alerting clinicians to potentially life-threatening circumstances. The objective of this research is to making this method more affordable and accessible to the broader population. That technique will bring physicians up to date on the health state of their clients at all moments. On the case of an exigency, the proposed method will notify both the physician and a household members of a frightened client. As a consequence of distant surveillance, the proportion for life spared may increase, and a physician may be able to provide health treatments and advise to a wider range of individuals then previously.

Keywords: Online surveillance, Raspberry Pi, healthcare information, and healthcare assistance are all terms used to describe the Internet of Things (IoT)

INTRODUCTION

The Internet of Things (IoT) is revolutionized data and communication methods. The Internet of Things (IoT) provides access to massive amounts of information and allows objects with actuators and sensors to connect and share data. Physical technologies and systems with either a variety of sensors, applications and controllers are linked and transfer messages and data over the internet. Items are recognized and operated remotely over the internet. As the physical world is incorporated into computer-based processes, the Internet of Things presents enormous opportunities. As a result of this connection, human engagement is decreased, efficiency is increased, and precision is enhanced [1]. The major essential occurrence in healthcare monitoring systems is maintaining a patient under careful watch and monitoring vital indications such as pulse rate, BP, and

temperature. The preponderance of monitoring equipment is found in emergency medicine and ICU, as well as operating theatres. Only the adjacent screen displays measured data in these devices. It's likely that despite 24hrs of close surveillance, the doctor was not warned in an emergency case when the patient's health worsened to a severe level. The patient should also be maintained under strict monitoring after being discharged from the hospital and re-homed, as well as any health injuries should be reported to the doctor. The cause for not instantly expressing these data with specialized doctors & family members is that the system that incorporates all of these characteristics also isn't inexpensive and accessible to the general public in developing nations, even though the system has been accessible and established. All that is necessary is the implementation of

technology, and IoT is now the ideal route for doing so [2].

Related Works

This study intends to take a multiple-pronged approach to create a healthcare system that is beneficial to both patients & doctors. The fundamental goal of this project was to create a low-cost, small architecture that was also simple, transportable, and user-friendly. There are a variety of healthcare surveillance systems accessible, each with its own set of shortcomings such as low battery consumption, bulkiness, wired configuration, delayed reaction, and so on. To solve these disadvantages, a wireless wearable system is quite useful. This literature has concentrated on a few notable and relevant works.

The prospects and challenges of IoT in attaining this vision of a future for health care were emphasized in [3]. He argued that wearable sensors may easily include several physiological parameters, allowing for the storing of information with a much higher sampling frequency over very long timeframes. In [4] the researcher described the process in which several sensors were attached to the board of the Arduino Fio transmitter, which also includes an XBee component. The patient's PC is attached to an Arduino, which wirelessly receives a sensed evaluation. All of these data are read by

LabVIEW. When LabVIEW connects to the internet, it creates a URL that may be accessed from any computer device.

The researcher of [5] presented a system in which all of the sensors are linked directly to the Raspberry Pi, that will show the estimated outputs, ring an alarm inside the event of any threats, send out alerts via SMS and e-mail, and save the information in the cloud display and database for later use. Both names & dosage units of the medications prescription will be shown in this system, which is a unique feature. In [6] the author examined many available IoT systems and chose the GSM-GPRS platform for data transmission & RFID for the human monitoring system. The researcher of [7] presented a system that utilizes an Atmega328P micro-controller for data sensing and an ESP8266 Wi-Fi module for data transmission via the internet. A Wi-Fi module does have a lot of storage & processing power, so it's quite easy to connect to it. The researcher proposes a system in [8] that leverages IoT characteristics to measure a patient's body temp and pulse rate. The information collected by this technology can be seen via a smartphone app. Data is transmitted to the internet utilizing a Wi-Fi module, and

information is displayed on a smartphone app utilizing Bluetooth connectivity.

The creator of [9] suggested a device that uses the LPC 2129 ARM Processor Development Kit to assess the cardiovascular system and body fat. Area network technology was utilized to convey information to the web host, which was then presented via a new website. The creator of [10] discussed many of the IoT network designs that are presently accessible. In addition, the author examined several methods for perceiving distinctly human physiological characteristics side by side, as well as information uplink and downlink

methods based on data volume and needs. It is, without a doubt, a comprehensive survey that will aid in the knowledge of IoT networks and their functioning.

1. System Model (Figure 1)

The device is split into 2 parts: one would be the custom application part, which includes website content and a repository, while the other is the client part, which includes sensing devices. **Figures 01 and 02** illustrate the overall device circuit architecture and sequence diagram, while figure 03 shows the schematic circuit for its sensor system.

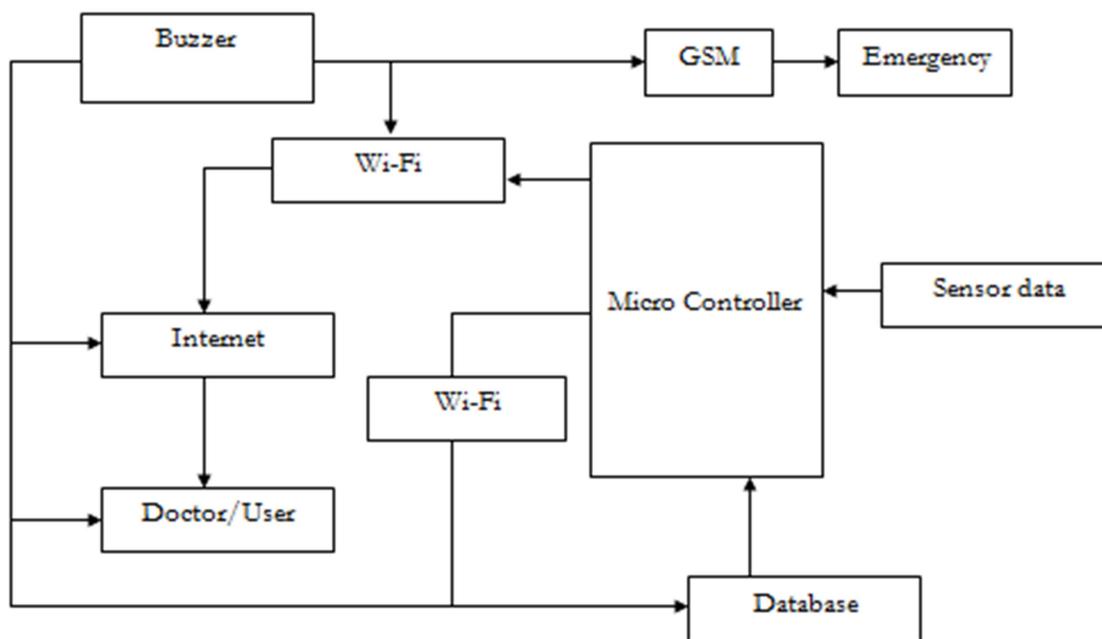


Figure 1: The system's block diagram

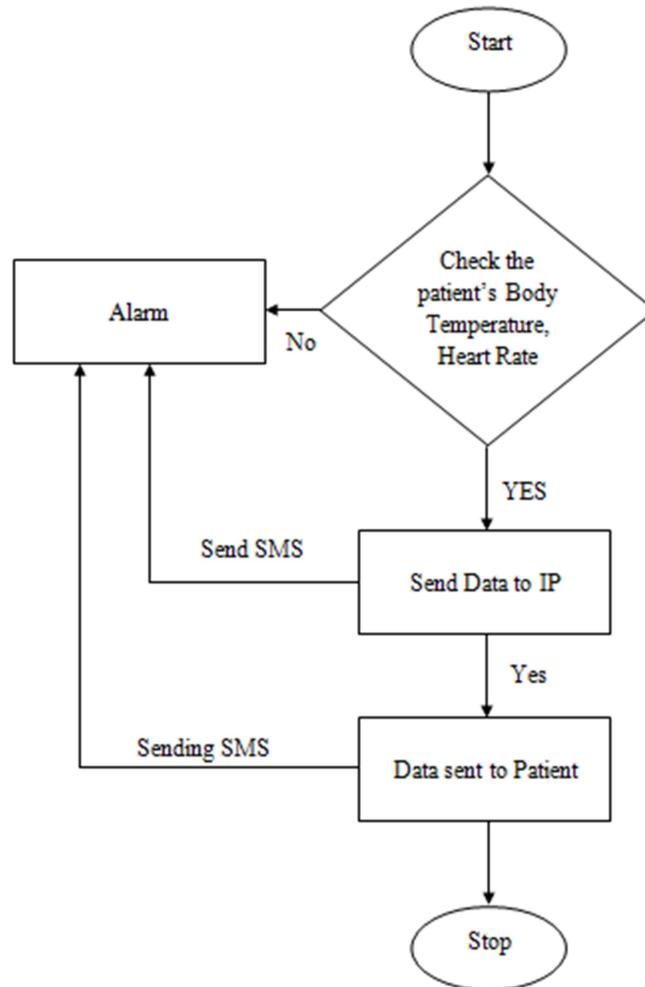


Figure 2: System's Flowchart

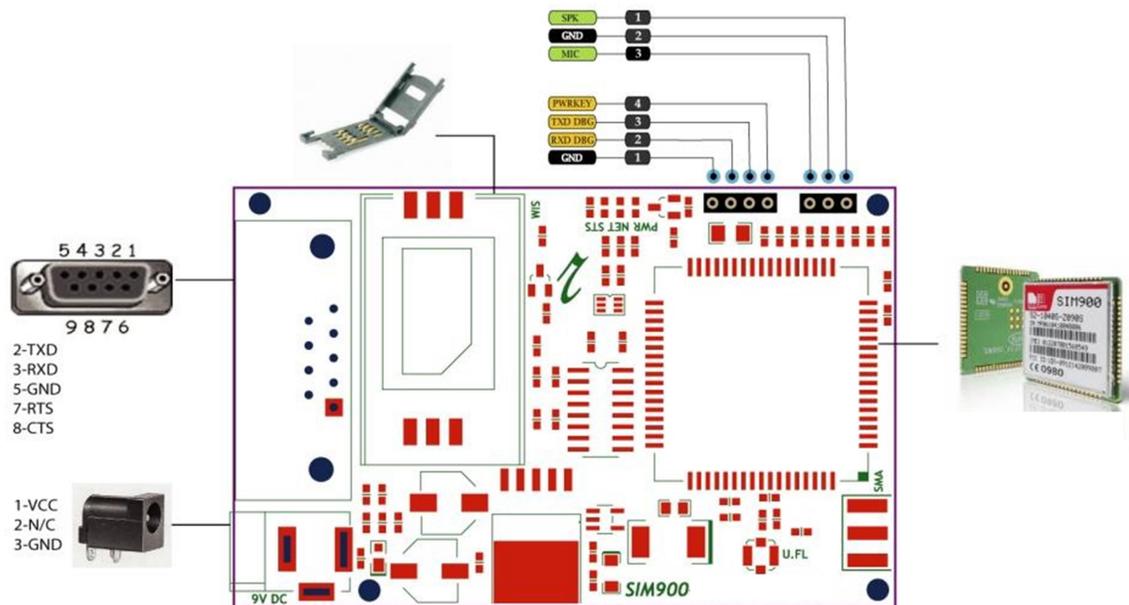


Figure 3: The system's circuit simulation

Flex, a Programming language small source of online and site, is used to build the computer. Although the term "micro," Flask supports modifications that can add a variety of capabilities, and they're all accessible. By building an empty web browser, Flex enables functionality and capabilities [11]. The Database server is available via a public Network and runs on a Raspberry Pi 3 Model b. The System is a low, credit-card-sized device that can be carried around and do a variety of functions [12]. HTML, CSS, and JavaScript were used to generate the websites, while SQLite was utilized to develop the program. Flex has been connected with such a Database file to save client medical conditions for later consumption. For medical professionals and clients, a browser enables registration. Specialists can view several clients' data at once and examine a single patient's overall status from everywhere to use the computer. Clients could also sign up with and deal with the real and historical data. Clients can submit actual health data for future reference, as well as for specialists to review and recommend based on their ailments. A specific API collects data from the client device for privacy reasons. The collected information is provided in a form of a table, and a visual format is also available online,

complete with individual datetimes, thanks to the Chrome Chart API. Webpages have also mentioned the crucial level.

Wearable technology components are controlled using the Microcontroller. We employed two cameras in this experiment, one measure body heat and the other measuring the cardiovascular system. Two sensors contain many different types of information to provide the most exact estimation available. The piezo sensor is used to detect pulse rate and has the added benefit of being able to be worn as a major update. The information from the piezo device is in analog form, which is magnified and transformed to an input value.

As well as the LM35 monitors the client's body heat in real-time. Because that is in contact with customers, the heat sensor is installed underneath the gadget for the greatest outcomes. Every 10 minutes, Arduino collects information from various sensors and transmits the data SIM 900D GSM module. In a catastrophic circumstance, the Microcontroller sends an SMS to an emergency case via GSM SIM900D and also sounds an alert. Figure 03 depicts the full procedure.

Performance of the System

To begin, the portable gadget, which includes a simultaneous pulse rate and

pressure sensor, is affixed to the retina. The circuit will begin analyzing the information after the gadget has been installed in the retina, and it will give the final information to the server. **Figure 04** depicts the client holding the fitted smart gadget. The SignUp screen for patients and clinicians can be seen in **Figure 05**. For Signup, both the specialist and the client have their user account. Just specialists have access to all of the clients allocated to them.

Figure 06 depicts the presentation of actual data from several clients to an approved and skilled specialist. Specialists can examine the entire information represented in **Figure 06** by clicking on the

client id. **Figure 07** depicts an individual client's whole medical history in a form of tables. Now at the end of the page, clinicians and clients upload the ECG/Blood Type or another type of research lab result for a more thorough study of the client's situation.

Warmth and cardiac beat, as well as the duration and information, are depicted diagram in **Figure 8**. **Figure 9** depicts the warning message delivered to the client's immediate contact information to decrease the risk to the patient's health condition. Simultaneously moment, the beep transmits an audio wave to someone around who can assist the client.



Figure 4: At the patient's hands is a wearable gadget

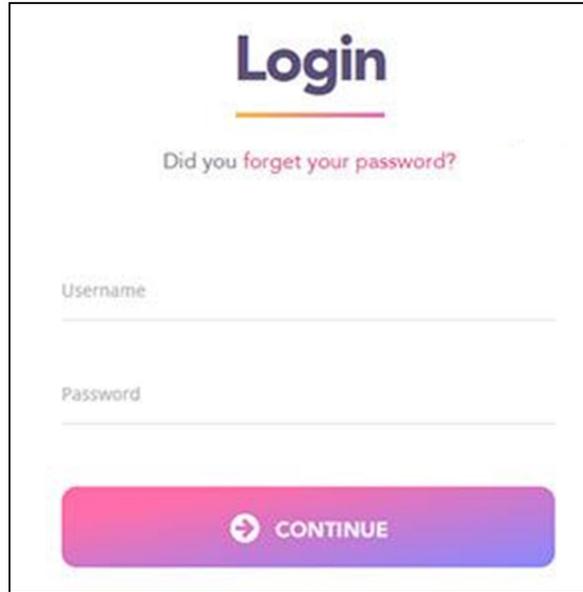


Figure 5: Login Page

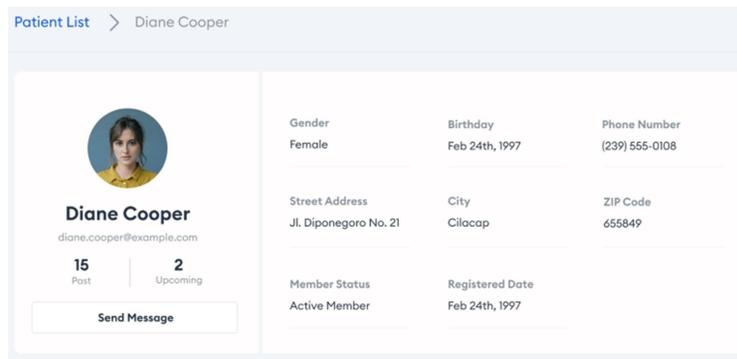


Figure 6: Patient's Database

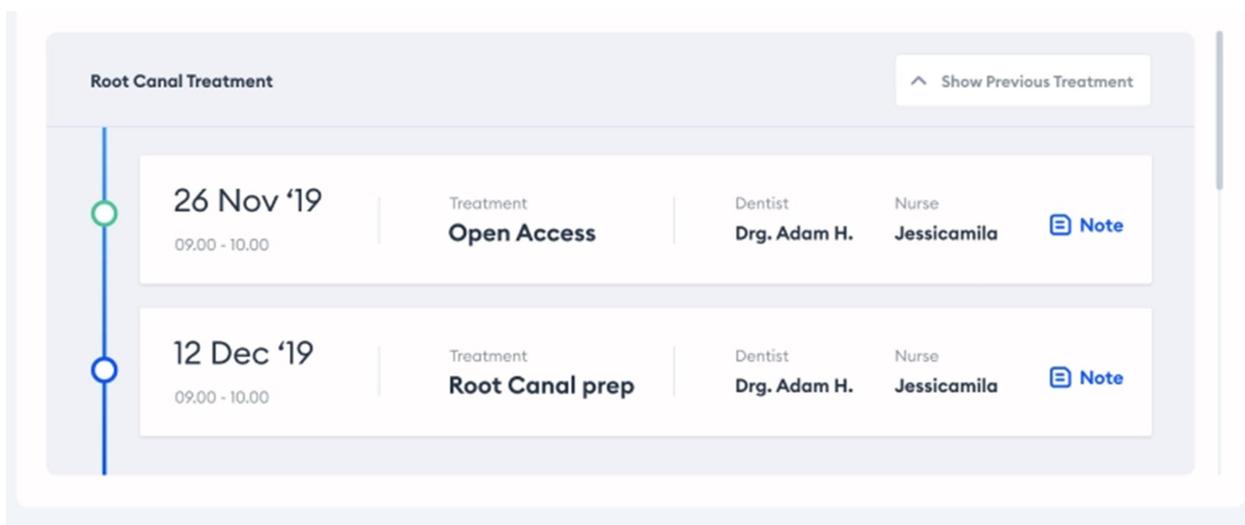


Figure 7: Health records and reports for each patient

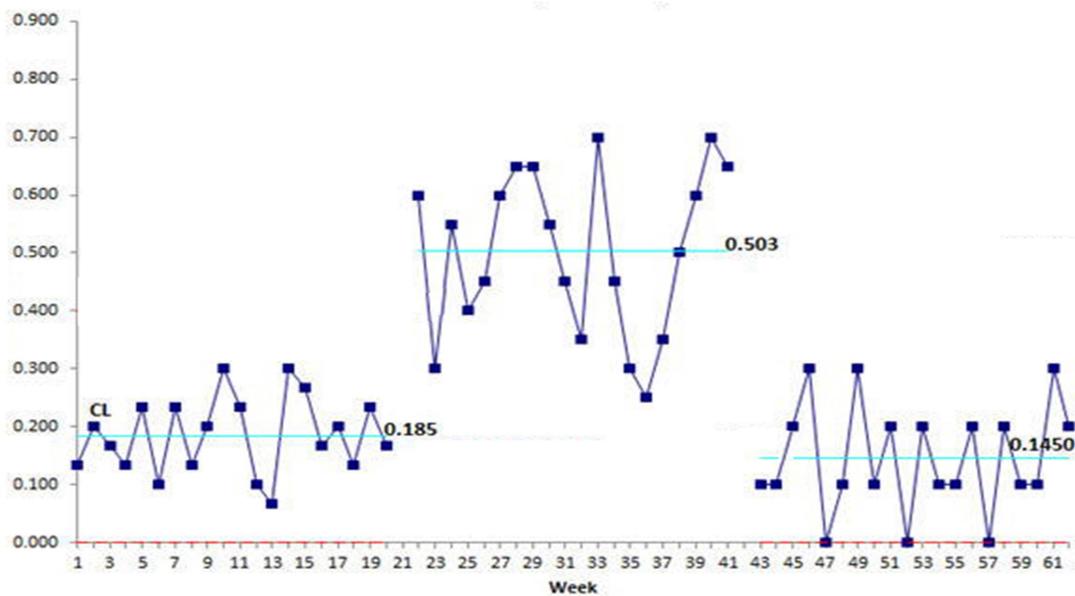


Figure 8: Health records and reports for each patient

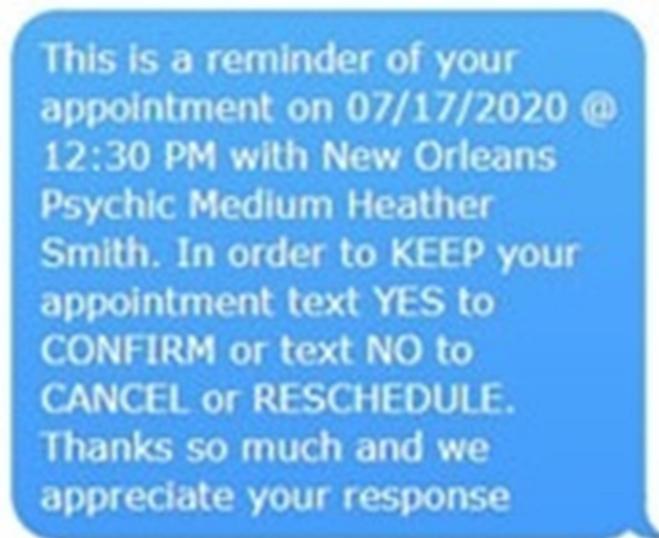


Figure 9: SMS-based emergency notification

CONCLUSION

The technology is energy efficient, has a basic architecture, and is an expense. The issue of inadequate specialists can be completely remedied with this technique. The alert system, the method eliminates the hazards to the person's health. Specialists can

use the information to decide based on past health information. In an important health scenario, this approach will serve to minimize waste of time. The technology is accessible on the web from anywhere in the world. However, our technology will be improved in the future to allow us to employ

the concept extra smoothly. Because the cardiac monitor remains unreliable whenever patients are discharged, it has to be updated. Heart rate, EEG, and ECG, for example, can all be used in the device. Greater devices mean extra information for specialists to analyze to diagnose ailments. Modern database protection could be utilized for data protection. In a remote community, a virtual meeting technology could be connected to the network, providing an additional benefit of administering the treatment without needing to move from place to place.

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