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Concare – A Teleconsultation System Using IoT in Healthcare

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ABSTRACT

With the rapid growth of the aging world population, proper health care has become a prior issue in all countries; especially during the life altering COVID – 19 pandemics. While everything is getting digitized, the ease in providing medicinal services in an online basis is still a factor in today's era. Current medical system is expanding by leaps and bounds in the last couple of decades for their considerable aim towards wireless and e-health monitoring systems providing remote monitoring of patients. But the tools used to deal with health conditions are tedious to maintain and limited to specific number of parameters. Incorporating patient's data into a database and accessing the system in the form of a mobile application with proper medical assurance and diagnosis will demonstrate that this proposed system will be efficient to provide the patient a proper consultation from anywhere. It reduces the number of hospitals visits, saves time, and is convenient for both physician and patient.

Keywords: COVID – 19, digitized, proper medical assurance, proper medical assurance, reduces hospital visits, saves time

I. INTRODUCTION

The goal of the project is to use the mobile application as the intermediating device between the doctor and the patient. The idea helps in getting the patient in contact with a doctor without going to the hospital directly and get the right diagnosis for the disease or illness caused. The objective is to provide a prescribed set of medicines via different modes of consultation by without reaching the hospital physically by using a chatbot, a live consultation or an offline navigation whichever is preferred by the patient. This device happens to reduce manual work and saves time for both the doctor and the patient mutually. By using the system, the caregivers can monitor the health of a patient without waiting in a hospital or a clinic physically in order to avoid manual contact and save time. It also provides the patient the nearest hospitals located from their current location in case of any emergency. To display the clinical situations of affected person continuously, the usage of present wi-fi technology is pretty convoluted. To conquer this, we're providing an alternate in wi-fi sensor generation via way of means of designing a biomedical tracking tool comprised of various sensors to collect the records concerning human frame temperature, coronary heart rate, blood pressure, and similarly transmit these records on an IOT server that's person available over the internet.

II. EXISTING SYSTEMS

There are various medical applications available theoretically as well as in action. Most of the solutions fail to implement a service that can handle medical consultation via a Chat Bot or Offline assistance for especially elderly people who needs constant care and follow ups. While providing a consultation for a condition, there must be a simple and easy to use User Interfaces a package that can be implemented for an ease at communication. Without considering the complexity of the condition the system works in a way that every time a human medical assistance is in need; which might not be the case for every condition. Using a domestic telemedicine device to supply care to sufferers with kind II diabetes led to a 16% discount in HbA1C levels. The technological elements open possibilities for brand spanking new techniques to aged care, as tested with the aid of using initial studies results, this method must be complemented with the aid of using a cautious evaluation of the socio-financial affects and moral issues.

III. PROPOSED SYSTEM

The proposed system will be providing the patients a user-friendly interface via their mobile phones. It creates an environment by giving 3 types of consultation modes – Chatbot, Live Consultation, Maps Assistance; possible for them to connect with medical specialists easily. The Android application on the doctor's smartphone allows the doctor to check the patient's health. A warning message is displayed if any of the parameters exceed the threshold. The Android application on the patient's or caregiver's smartphone allows the patient to check their health. The proposed system will introduce a health monitoring system that uses sensors to collect patient data, intelligently predict patient health, and provide feedback to physicians via mobile devices with Android applications. Patients can participate in the medical process via mobile devices and have access to medical information anytime, anywhere. As it features Chatbots, the system can interact with the patient easily in a speech – to – speech level. This makes the patients to easily find out their desired solutions or alternatives.

IV. WORKFLOW

The working flow of the proposed system is in Fig. 1.1 mentioned below,

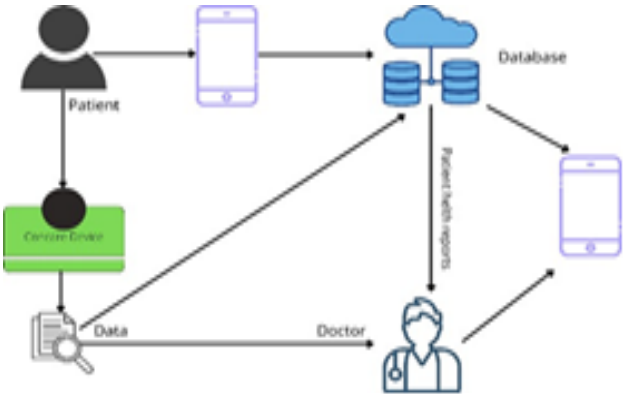

Figure 1. Working process

V. MODULES

There are 5 modules and a hardware connection involved in the proposed system.

A. Front End

REGISTRATION MODULE:

This front-end module is used by the end user to register their personal details like Name, Age, Gender, Contact No., Emergency Contact, Address, etc. through their mobile application.

VERIFICATION MODULE:

This is used by the patient in order to securely and safely use the system. Once the patient enters the details, he/she will have to enter their Social Security Number or their Aadhar number which when entered will generate an OTP for that particular number of that particular Aadhar in case of security.

B. Consultation Selection

There are three modes of consultation. They are

Chatbot – There is an interactive Chatbot that assists the users with their needs. It is built using IBM Watson tool and as it uses NLP, it automatically responds to the user regarding their requirements and produce suggestions & remedies.

Virtual Consultation – The sensors involved in the system will detect the patient's vitals and if the user needs a consultation, he/she can search for an appointment and book a slot if available. Doctors consulting them will charge according to their hospital norms and the patient must pay once after the consulting is done.

Maps Assistance – There is a Map assistance that connects Google Maps through which the patient can search for their nearest hospital from their current location, according to their need.

The system uses sensors like Temperature, Pulse, Oxygen monitor is connected to the database and displays the output in the mobile application respectively.

TEMPERATURE SENSOR:

The readings in BPM (Beats Per Minute) will be shown on the LCD linked to the sensor. The body temperature, as well as BPM values, will be presented on the serial monitor. The DTHT11 is a temperature sensor which could hit upon temperatures among 0°C and 80°C. It's a three-terminal sensor that outputs analogue voltage proportional to temperature.

The output voltage will increase because the temperature rises. The output analogue voltage may be transformed to virtual shape the usage of an ADC after which processed with the aid of using a microcontroller. We are using this sensor for the detection of temperature and it will display the temperature to the patient and the same values will be uploaded in the IoT database that can be accessed by the doctor.

PULSE SENSOR:

The Blood Pressure Sensor is used to take non-invasive blood pressure readings. It works in the same way as a sphygmomanometer, but instead of a mercury column, it uses a pressure sensor to monitor blood pressure.

The oscillometer approach is used to evaluate systolic, diastolic, and suggest arterial pressure. The coronary heart price is likewise recorded.

OXYGEN SENSOR:

Dissolved oxygen diffuses from the pattern thru an oxygen permeable membrane and into the sensor in an electrochemical DO sensor.

The oxygen plays a chemical discount occasion withinside the sensor, which leads to an electrical signal. This enables in analysing the Oxygen remember withinside the body.

C. Slot Booking

Patients can register their profile and book slots when required. The application takes you to the next section when Live Consultation is selected.

To maintain user safety, the app mainly sends OTP to verify the user after registration. Slot booking can be done based on their availability. If they are full, that slot cannot be in selectable mode. They can also be cancelled anytime but with a cancellation fee based on the number of hours pending before cancellation.

D. Payment and Notification

A payment method is required so that the patient can pay for the service at the time of booking. Payment methods have been developed by integrating third-party payment.

Payment process takes place while booking a slot, so that the service is paid off. APIs that allow the use of a variety of debit and credit options for payment for services, including Internet Banking, UPI, and other banking facilities.

Concare uses Razor pay in order to access payment facilities for its users.

E. Database Integration

The details of the patient are collected and stored in databases. This helps in readily sharing information, transmitting data, which allows humans and machines to interact freely with each other. The Mobile application connects to the smart devices through Bluetooth or Wi-Fi thereby making the connection simple and easy to use.

The sensorial data will be uploaded to the database which can be accessed by the doctor to view the patient's health report. The system uses IEEE Standard IEEE/ISO/IEC 11073-10201-2004 - ISO/IEEE International Standard for Health Informatics.

F. Hardware Set Up

The hardware of the system is built with its sensors like Temperature Sensor, Pulse Sensor and an Oxygen Sensor. This is connected with a microprocessor, Arduino Uno and a Wi-fi Module, ESP8266 unlike other systems. These components are interconnected with a proper Ground connection and a Voltage connection with the help of Jumper Wires.

In addition to that, the apparatus is placed over a Bread Board which is linked to a power supply. The sensors will sense the values and display in the form of a serial plotter and a serial monitor. The output is detected by following IFTTT Protocol which makes it viable to calculate properly.

VI. WORKING

- The CONCARE Monitoring System has 3 types of sensors here. The system has a Temperature sensor, an Oxygen sensor a Pulse sensor.
- The system is useful for its users because doctors can easily monitor patient health parameters using a mobile application. The doctor can now track the user's health via the mobile application. The system runs on the internet.
- The microcontroller i.e., an Arduino Uno Board that connects to the Wi-Fi network using a Wi-Fi module component, ESP8266. The Arduino UNO board continuously reads input from these 3 sensors.
- Then, this shares the data to the database thereby linking it with the Arduino Software which reads the corresponding code and displays the output.
- The Mobile application consists of a Registration/Login Page which directs to the Modes of Consultation Page. Now here, there are 3 modes: Chatbot, Virtual Consultation, Maps Assistance. By selecting Chatbot, there is 'NORA' an artificial assistance aiding with the patient's needs.
- Once Virtual Consultation is selected, there is Slot Booking that will be synced with the patient's calendar on their smartphone. The patients can book their appointment and check with a doctor.
- The Maps Assistance will direct to the searched destination with the shortest route by using Google Maps Search.
- The sensors read data by placing the index finger over the corresponding sensors which displays the output in both the application and the Arduino Software.
- The sensorial values will be displayed to the patient in the Check Vitals under Virtual Consultation Mode. Here they can view their vitals and can share them to their family doctor, if needed. The data is saved in the cloud once it detects the sensor values.

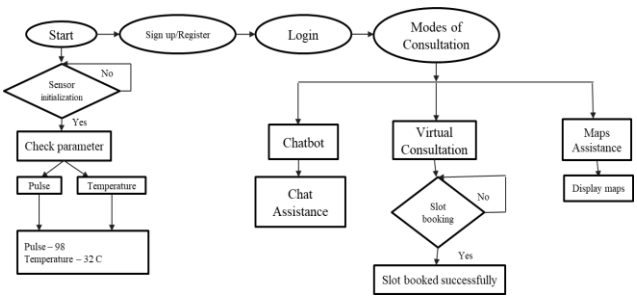

Figure 2. Working based on IFTTT protocol

Body Temperature(°C)	Pulse rate (BPM)	State
31.0 –36.5 °C	60 BPM - 110 BPM	Normal
>36.5 °C	>110 BPM	High
<31.0 °C	<60 BPM	Low

Table 1. The table represents the outcomes that can be possibly detecting the vitals like Temperature K and Pulse via sensors linked to the database

VII. RESULTS AND DISCUSSIONS

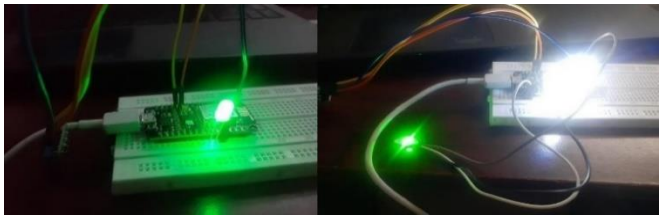

Figure 3. Temperature and Pulse Sensor

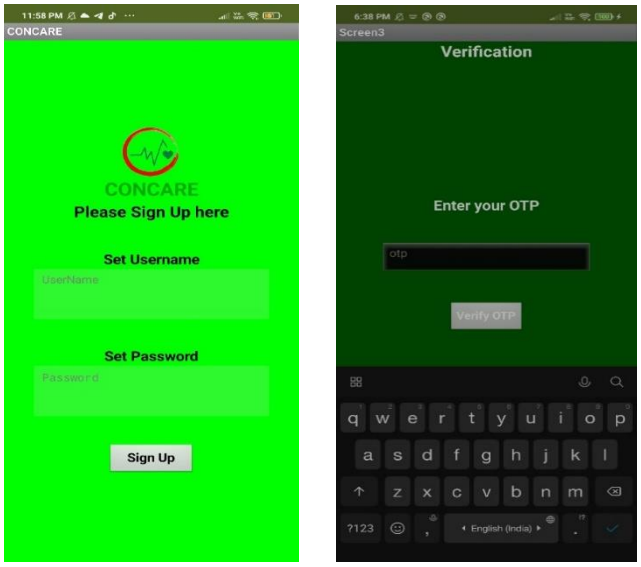

Figure 4. Registration and OTP verification

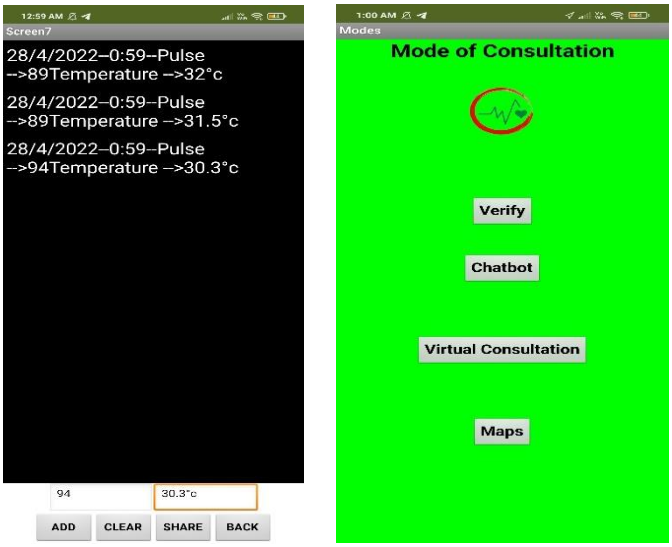

Figure 5. Modes of Consultation

VIII. CONCLUSION

Nowadays, the IoT is one of the possible and compelling solutions for remote asset monitoring, especially in the areas of health management.

It facilitates and makes it less difficult in securing the data on individuals' health vitals inside the cloud, reduces hospital stays for routine examinations, and most importantly, is traceable.

The proposed system works on the mere health monitoring using sensors connected with a mobile app that helps in booking slots and assisting directions to the nearest hospitals.

The system monitors body temperature, Rate of pulse and count of Oxygen using sensors, which is integrated with a mobile application. These sensor values are then updated to a server over internet.

This sensorial data is then collected on smartphones certified using the CONCARE application. Using the values obtained, the doctor diagnoses the illness and the patient's health.

IX. FUTURE WORKS

The system can be extended with online pharmacy where medicines prescribed can be bought.

It may also be developed as a product in the form of a wearable or a furnished fabricated product. It can be extended as a web UI to execute various activities like hardware control, real-time graphs, history and analytical graphs to monitor anomalies and deviations. As IoT is managed and operated by multiple technologies and involves multiple vendors, further research is being conducted on issues related to online data availability and its privacy. Algorithms for improving security and specific user warnings help avoid security-related threats and bugs in IoT networking.

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