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IoT Based Infrastructure To Collect Patient's Data

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Abstract

This project is an IoT project that helps Doctors to know the initial details about a patient's health.

As per the needs of Hospitals, patients need to go to a nurse to check their weight, heartbeat, and body temperature before they meet the doctor, so it's a time-consuming process.

The aim of this project is to help the patient to go through an initial check-up. Patients sitting on the smart chair will be automatically checked for their weight, body temperature and heartbeat and the details will be sent to the doctor's device using Wi-Fi.

This easy way to check patients' initial details helps patients to be more comfortable while he is not in a good health condition as well as help the doctor to not waste their time while patients are going to a nurse for these check-ups.

The mobile application which is to be installed in the doctor`s device will help the doctor to store patients details by user name or patients `s ID for future needs.

Introduction

An IoT ecosystem consists of web-enabled smart devices that use general-purpose embedded systems connected to the internet to collect, send and process data. IoT is making the fabric of the world around us smarter and more responsive, merging the digital and physical universes.

As the COVID-19 pandemic continues to wreak havoc around the world. The pandemic has affected lifestyles and consumers now gravitate towards IoT-enabled products as they provide contactless service. IoT systems are now able to self-diagnose, request repairs, identify and predict usage-related service needs.

Smart chair will be a new IoT appliance which is used to check the patient's weight, body temperature and heartbeat once a patient sits on the chair.

We will use 3 types of sensors to receive patient's details:

- ❖ Temperature sensor
- ❖ Pulse sensor
- ❖ Load Cell

Temperature sensor: This sensor is used to measure the body temperature when a patient puts their hand on the arm of the chair.

Pulse sensor: It helps to detect the heartbeat per minute once a patient puts their figure on the sensor.

Load Cell: This device helps us to measure the patient's weight while the patient sits on the chair. This device will be attached to a part of a chair where all the weight concentrates at that part so it shows exact weight.

The outcome of all these three sensors will be collected and reformatted by the Arduino device. Arduino is an embedded system and will be connected to all the sensors and will receive the data in different formats and it will send the proper output to a mobile application through Wi-Fi.

Mobile Applications:

The App will be able to connect with the Smart Chair through Wi-Fi.

Once the application is connected to the Smart Chair, we will be able to control the flow of Data using different buttons.

Proposed Method with Algorithm:

We planned to build the project into three major parts:

A frontend, a backend infrastructure and, IoT module custom built for the purpose of this project.

A mobile application will be developed using Flutter and will be compatible with both Android and IOS devices.

Front end:

A field to enter the patient details (Name and patient ID) and below that the buttons to start and control the IoT module's functionality to fetch Data to mobile screen from database or sensor's outputs.

Frontend will be developed using Dart language and Flutter framework. Flutter was introduced by Google as an open-source technology for coding and creating native apps for Android and iOS. Flutter is relatively new as it was officially presented in December 2018 as the first stable version 1.0.

Backend:

The backend needs to support the data communication with the IoT module which uses the standard **ESP8266** Wi-Fi module for communication.

We will use firebase as a backend database which is a Google-backend application development software that enables developers to develop iOS, Android and Web apps. Firebase provides tools for tracking analytics, reporting and fixing app crashes, creating marketing and product experiments. The Firebase Realtime Database is a cloud-hosted NoSQL database that enables data to be stored and synced between users in real-time. The data is synced across all clients in real-time and is still available when an app goes offline.

IoT Module:

The IoT module will consist of a standard general-purpose microcontroller unit at its core.

A Wi-Fi module will facilitate connection with Internetwork to communicate with the backend server to fetch the instruction from the user input.

A body temperature sensor will be connected to the microcontroller to detect the patient's body temperature and send the output to the microcontroller.

A heartbeat sensor will help to detect the heartbeat per minute and send the output to the microcontroller.

A Load Cell will be used to detect a patient's weight and send the exact output to the microcontroller.

All the above sensors will be connected together in a proper manner and all will be set up in a chair to scan the patient's health accurately.

Connection Infrastructure:

We will develop a custom algorithm to receive data from all sensors and collect them as a single module and send it to the mobile app.

Programming environment and tools used

- ❖ **Frontend application:**
    - ▪ Flutter mobile application
- ❖ **Backend server:**
    - ▪ Firebase server
- ❖ **Iot Module:**
    - ▪ Arduino(Uno, Mega, Lilypad or similar)
    - ▪ NodeMCU with ESP8266
- ❖ **Wi-Fi module:**
    - ▪ ESP8266
- ❖ **Heartbeat sensor:**
- ❖ **Load cell:**
    - ▪ HX711 Load Cell Amplifier
- ❖ **Temperature sensor:**
    - ▪ Non-contact Human Body Infrared IR Temperature Sensor Module

Milestones

- ❖ Support backend server
- ❖ Module assembly
- ❖ Covert different inputs into a single module
- ❖ Wi-Fi configuration system
- ❖ Accurately measuring the weight, Body temperature and heartbeat.
- ❖ aesthetic and user friendly

REFERENCES

Term Appendix:

- ➢ Arduino (https://playground.arduino.cc/)
- ➢ Flutter (https://flutter.dev/docs/)
- ➢ NodeMCU (https://www.nodemcu.com/index_en.html)
- ➢ EEPROM (https://www.arduino.cc/en/Reference/EEPROM)
- ➢ IoT Microcontroller (https://www.nabto.com/iot-microcontroller-guide/)
- ➢ Arduino IoT Cloud API (https://www.arduino.cc/reference/en/iot/api/)
- ➢ ESP-8266 WiFi module (https://create.arduino.cc/projecthub/neveroofftheinternet/esp8266-setup-and-first-wifi-connection-76f
- ➢ c3c)
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- ➢ Body temperature sensor (https://maker.pro/arduino/projects/ir-thermometer-for-covid-19)
- ➢ Firebase (https://www.firebase.io)