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## IoT based android application for remote health monitoring

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### ABSTRACT

Health care is extremely important to each country. Negligence in health monitoring may result in negative outcomes. The advent of Internet of Things (IoT) facilitates the growth in digital health care field. The main idea behind the project is to constantly monitor the health condition of a person with the help of sensors and internet. The core purpose of the project is to develop an android based application that collects the data from a wearable sensor like smart watch via Bluetooth and transfer the data to the cloud for data storage and graphical analysis. The stored data can be accessed across various devices connected through Wi-Fi-module. The entire application is developed on Android Studio platform and Firebase real-time database is used for the back-end-services of the application. As the outcome of the project, an application is developed that connects different devices through internet that helps in monitoring the patient's health even from a far distance without necessarily approaching the patient and can also be alerted in case of any abnormalities.

**Keywords**— Internet of things (IoT), Firebase and Android studio

### 1. INTRODUCTION

Health care is extremely important and it is no longer those days where one can sit in front of the patient and monitor them constantly. The growing busy schedules and the raising fear of direct contact, has paved the path for many new technologies. This project is also an initiative to build an android based application for remote health monitoring.

The core purpose of the project is to develop an android based application that collects the data from a wearable sensor like Fitbit sensor via Bluetooth and transfer the data to the cloud for data storage and graphical analysis. The stored data can be accessed through various devices connected through WIFI-module. The entire application is developed on android studio platform and firebase real-time database is used for the back-end services of the application.

### 2. LITERATURE SURVEY

Table 1: Literature survey

S. No	Author	Title	Observation
1	Devashri Deshmukh <sup>1</sup> , Ulhas B. Shinde <sup>2</sup> , Shrinivas R. Zanwar <sup>3</sup>	Android Based Health Care Monitoring System	Sensor data is sent to the web portal wirelessly without much cost
2	Sarfraz Fayaz Khan	Health Care Monitoring System In Internet Of Things (Iot) By Using RFID	Inorder to transmit the information directly to the mobile phones, RFIB based WBAN is used.
3	Ranjeet Kumar, Rajat Maheshwari, Amit Aggarwal, M. Shanmugasundaram And Sundar S.	Iot Based Health Monitoring System Using Android App	Body sensor network is used for sensing the data and transferred to the internet using raspberry Pi.
4	R.Harini, B. Rama Murthy , K. Tanveer Alam	Development of ECG Monitoring System Using Android App	Microcontroller, ECG sensor & android technology are used for processing, storing and retrieving Xampp is used

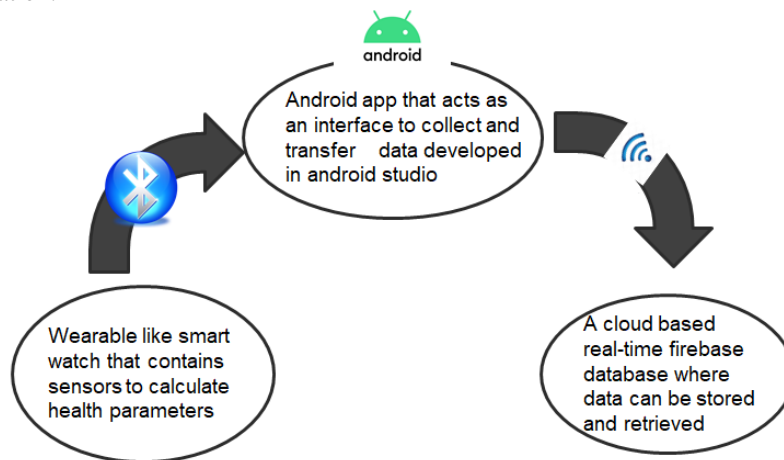
5	Bhaskar Niraghatam, M V Ramanamurthy	Heart Beat Monitoring System and Security Using Android	Different ECG pulses samples are taken by connecting the mobile phone and emulator while the received data is stored for reference by the doctor. Does not work in remote areas
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**3. OBJECTIVE**

The primary motive is to bring together a doctor and a patient so that the doctor can monitor the patient based on the user’s health data collected through the same medical app. To build an android app that allows doctors to monitor patients remotely and keep track of their vitals. The app allows not necessarily the doctor but also normal people who wants to monitor the health condition of their elderly people residing in home. Another important objective to be avoid the contact between the patient and caretaker.

**4. PROPOSED STRUCTURE**

The health attributes like heart rate, blood pressure and oxygen levels are obtained from the wearable smart watch via Bluetooth to the android application. The respected sensor values will be stored in cloud firebase. The same android application will have login for both patient as well as caretaker. Unique ID will be generated to each and every patient. The care taker will access the patient’s health condition using the Unique ID shared. The caretaker can also send messages as notification to patient using messaging services available in android studio. Hence different devices are connected through internet (Internet of things) and are able to transfer and retrieve information.



**Fig. 1: Proposed structure**

**5. METHODOLOGY**

The application will contain the registration for every user and Unique ID will be generated for each and every one of them. Smart watch that contains sensors to calculate the health parameters is connected to our android app via Bluetooth. The app requires to obtain the sensor permission in order to access the values. All the values obtained in app will be transferred and stored in firebase real-time database. The values can be retrieved by the caretaker from the same app using the Unique ID.



**Fig. 2: Methodology**

**5.1 Wearable Smart Watch**

Various smart watches now-a-days come with different features including heart rate, Blood pressure, Oxygen levels, ECG, calories count etc. Few smart watches have their respective app available in play store in order to display the information. Whereas few do not have one. The project targets all the smart watches that has Bluetooth feature available. The project may not work for few of the watches as it denies to allow for its sensor permissions. But most of the cases it works.

**5.2 Bluetooth Connectivity**

In order to perform Bluetooth communication in android studio like requesting connection, accepting connection and transferring data. Permission for the location of the user is obtained for scanning the Bluetooth devices around. In order to initiate Bluetooth settings, BLUETOOTH\_ADMIN and BLUETOOTH permissions are needed. Android 4.0 (API level 14) introduces support for the Bluetooth Health Device Profile (HDP). That lets us create applications that use Bluetooth to communicate with health devices that support Bluetooth, such as heart-rate monitors, blood meters, thermometers, and scales.

To find remote Bluetooth devices either through device discovery or by querying the list of paired devices, BLUETOOTH ADAPTER is used. A nearby Bluetooth device responds to a discovery request only if it is currently accepting information requests by being discoverable. Server-side and Client-side mechanisms both are used to establish connection between two devices. The server device and the client device each obtain the required BLUETOOTH SOCKETS in different ways. The server receives socket information when an incoming connection is accepted. The client provides socket information when it opens an RFCOMM channel to the server. Input Stream and Output Stream are used to handle the transmissions.

### **5.3. Android Studio Platform**

Android studio platform is used to develop the user interface of the application. The user interface is made as simple as possible to navigate and approach easily. Registration is made separate for patient and caretaker. Patient needs to connect the app with the smart watch via Bluetooth and the readings are updated on real-time basis. Location is also tracked from the user. The same app is also used for the caretaker login.

The caretaker can view the patient's information anywhere through app. Various parameters like heart rate, blood pressure, Oxygen levels, BMI, location of the user can be retrieved by the caretaker from time-to-time. Messaging services will also be enabled in the application in order to establish communication between patient and caretaker.

### **5.4. Firebase Real-Time Database**

Firebase real-time database is used for the back-end services of the application. The advantage of the firebase over other standard servers is that Firebase is a cloud-hosted database. Data will be stored as JSON and synchronized in real-time to every connected client. Initially when a user registers in the app, their location and health parameter values are set to null. When they logged in to the app, then the respective values will be updated from time-to-time. Every user will have unique child ID. That ID will be used as key to differentiate each and every user. It helps to retrieve the data to the caretaker from firebase cloud.

## **6. CONCLUSIONS**

The android application helps in acting as a bridge to connect patient and caretaker hence avoiding the immediate contact. Firebase shows greater results when compared to other standard SQL server because of its exceptional properties. Usage of smart watch can give the results of most of the basic health parameters when compared to usage of body sensors. With the growing usage of smart phones and with the increasing need for proper healthcare, development of this kind of android application is the utmost necessity.

## **7. FUTURE WORK**

The android app can be updated to provide efficient user experience. Video calling and consulting the doctor through it can also be included. Sensors measuring most of the health parameters can be connected to the app in order to get the readings in real-time manner. The development of the application can be never ending process as the technology changes from time-to-time. Changes can be made according to the demand of the need in order to approach with most of the customers.

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