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Electronic Health Records System Android Application Development

Shubham Phegade[1], Manish Patil[2], Tejas Pankar[3], Vaishnavi Deshmukh[4]
[1, 2, 3, 4]*Computer Engineering, Terna Engineering College*

Abstract: ***These days, healthcare organizations are moving towards digital records from records on paper. In healthcare organizations, the Electronic Health Record system is being used to create, manage, maintain and retrieve patient's medical records. Electronic Health Record system consists of a comprehensive database used to store and access patient's health information like diagnosis, medication, medical history, laboratory data, radiology reports and much more. The Electronic Health Record has replaced the existing paper records as the primary source of information for health care purposes. We have proposed a system to store the patient's health record using an Android based mobile application. The application allows both the patient and the doctors to manage interaction. Our proposed application simply allows the doctor and patients to update records on the go.***

Keywords: Android Application, Electronic health records systems, healthcare, medical history, digital records

I. INTRODUCTION

The aim of the project is to create an android application which will help doctors and patients to update, retrieve, store and view the medical records on the go without wasting much time. We are proposing this system for a specific hospital or clinic. The android application will consist of separate login profiles for both doctors and patients. Doctors can simply register themselves first and then can log in to the system. They can search the patient by his name from the list of registered patients. The patients profile will contain his previous medical records if any, so that the doctor can examine him based on those records. After that, doctors can add diagnoses, view symptoms, add scheduled prescriptions. All this data is updated real-time and stored in a cloud based database called Firebase. Patient has been given a feature to add reminders of the medicines he/she is taking. He/she can create his basic health profile so that doctors can go through it at first if the patient is new. Patients are given an option to upload the lab reports.
This system is very effective and efficient keeping in mind the time factor and is helpful for the environment as it will eventually save lots of paper that would otherwise be used**.**

II. LITERATURE SURVEY

We have surveyed the existing systems on play-store and have observed that either they are a little complex to use or have some flaws in them. Some of the systems do not have separate logins for doctors and patients. Some do not have a good user interface. They also don't have features to update, store, retrieve the database. Resources available to doctors and healthcare professionals are abundant and vast with the advent of technologies that enable download of health related or medically oriented apps on cellular devices. Several objectives and functions such as investigation, diagnosis, remedies treatment electronically and tracking bills are fulfilled by existing applications made in the healthcare category. For help regarding the drugs prescribed and the various forms of caring and catering to patients along with guides for references regarding the help that can be provided to the ailing and sick in a medically prescribed way, there is a wide category of applications and portals. Several other applications that provided tests for simple symptoms, vision and hearing were available too. Other applications included ones that successfully simulated operations performed for experienced healthcare professionals. Most of the mobile applications we surveyed were designed and built as an extension of apps that were originally created for desktops and not mobile devices. Doctors and other healthcare professionals have now begun to use these apps much more frequently. When Apple iTunes Appstore was first introduced in 2008 in the month of July, the accessibility of mobile applications increased by many folds. Users owning and using devices such as iPads, iPhones, and iPod Touch, subsequently found it so much easier to download or buy applications on their devices from a forum that was real time and online. Catering to the constant increase in the number of users and the wide array of functions that can be carried out through mobile devices, Apple in the year 2014, in January, astonishingly recorded 1 million applications on its very own Appstore. 2011 saw Apple adding another subcategory within the medical category of the iTunes Appstore, namely, "Apps for Healthcare Professionals", becoming one of a kind in online applications marketplaces.

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Further subcategorization in the same category, in 2013 introduced medical education, imaging, patient education and monitoring, etcetera. Following in on the footsteps of apple Google introduces an online application marketing forum, called "Google Play". Efforts were taken to provide an array of applications for the healthcare community, for devices other than iPads, iPhones and such (devices running on the Android operating system). To further widen its accessibility and availability, certain mobile applications were designed to run with equal accuracy and efficiency on Android and Apple devices.

The cost or price that needs to be paid for the use of a certain app largely influences the user preferences for the same. To start with, users prefer downloading apps that are available for free and will later on decide to buy an application with higher functionalities which will often be a paid application. This is entirely dependent on the user's need for the same. In the same light, some applications require no payment and are fully accessible and functional. Others compulsorily require payment or are partially functional and become fully functional when certain subscriptions are purchased. Reading material in the Healthcare category, including famous journals and textbooks can be downloaded post payment of a subscription fee. Certain medical applications may seem costly in the initial phase of usage but when updated may become cost-effective. For instance, educational apps regarding medical textbooks, are updated each year, enabling the user to access new content without ever needing to purchase newer editions of the book.

Professionals working with Healthcare use applications for various purposes such as maintaining health records, providing access to the same to the patients, online consultations and communication, patient history and information gathering, administration and medical education. The proposed system aims to satisfy the majority of these purposes.

III. PROPOSED SYSTEM

The proposed system should meet the following requirements:

1) Should be less in size
2) Should be compatible with most of the android OS
3) Should be having easy to understand user interface
4) Should be real-time
5) Should keep all the patients data separately according to the id's
6) Should perform the operations like update and retrieve efficiently
7) Should store the records

We have proposed a system which will reduce the use of paper documents or reports. The system consists of three users, namely doctor, patient and an administrator who verifies a doctor and add or change his credentials. The doctor uses application for viewing his patients information, updating the required information such as prescriptions, diagnosis.

Patient uses an application for adding the symptoms, for letting doctor know that he is facing some symptoms. For database purpose, firebase real-time database is used. It also provides cloud storage for uploading reports. Firebase authentication is used for authenticating users. Firebase allows users to update, retrieve data real-time.

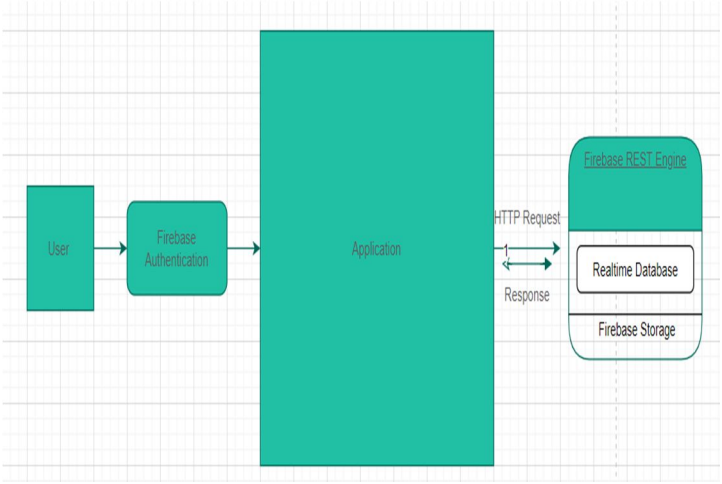

Fig 1. Architecture diagram of the system

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The following will further describe the functionalities of the prototype system developed:

A. Doctor's Profile

Doctors can login through the system by entering credentials given to them directly for authentication. After logging in, a doctor can view the list of patients and can search for any patient within it. After searching for particular patient, he can see patient's profile as well as can view symptoms added. For specific symptom, doctor can add related prescription and diagnosis. Doctor can also view the list of patients who have added symptoms recently and who wants the doctors to get notified about this.

B. Patient's Profile

The patient has to create account first through signup, and then they can login to the patient's profile. Patient can add the symptoms under symptoms tab. Then if he wants he can create notification for doctor by filling some details about symptom, and this will reflect in doctor's profile immediately. Patient can view the prescriptions and diagnosis provided by the doctor. Also they can upload reports for particular symptom. Patients can add remainders for their medications.

IV. IMPLEMENTATION

Android Studio is used as development environment. Android Studio has an inbuilt support for firebase. We just need to import firebase SDK in the project. Firebase provides user Authentication, real-time database and firebase cloud storage. Both are used to achieve the purpose of data storage. The Firebase Realtime Database is a cloud-based No-sql database. Data is stored as JSON and synchronized in real-time to every connected client. All the clients share one Realtime Database instance and automatically receive updates with the newest data.

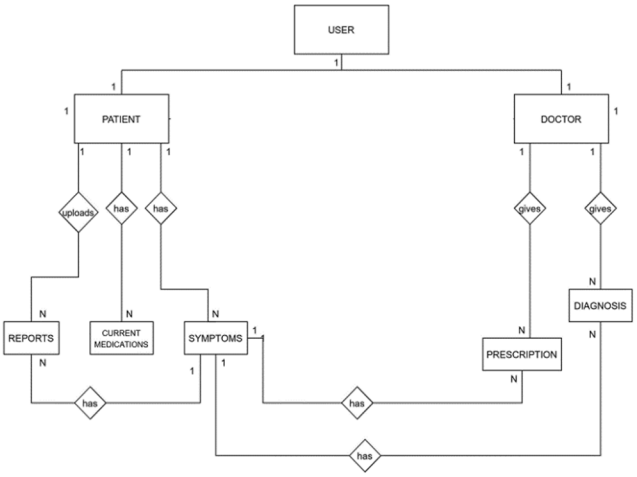

Fig 2. Data Model

Database schema is designed according to this data model. Firebase stores the information in form of key-value pairs.

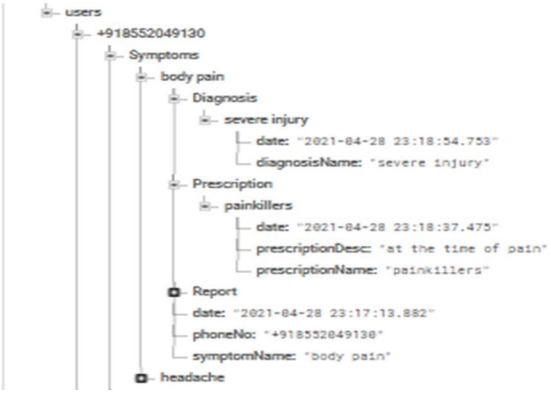

Fig 3. Patient Database Schema

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To read or write data to firebase, database instance is required.

```
private DatabaseReference mDatabase;
mDatabase = FirebaseDatabase.getInstance().getReference();
```

To write data at certain child,

```
mDatabase.child("users").child(userId).child("username").setValue(name);
```

To read data, we have to create a value event listener.

```
ValueEventListener SymptomListener = new ValueEventListener() {
    @Override
    public void onDataChange(DataSnapshot dataSnapshot) {
        Symptom symptom = dataSnapshot.getValue(Symptom.class);
        // ..
 }
```

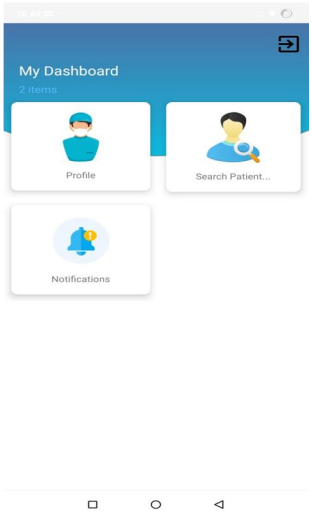

Fig 4. Doctor's Dashboard

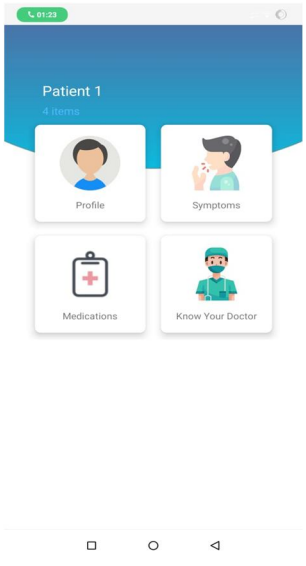

Fig 5. Patient's Dashboard

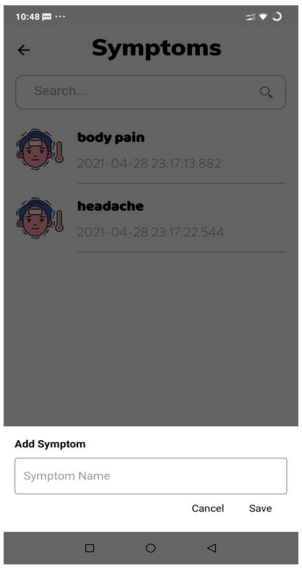

Fig 6. Patient Adding Symptoms

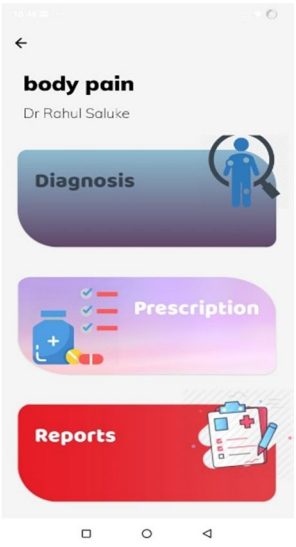

Fig 7. Symptoms Details

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The above snapshots show, the dashboards of patient and doctor. Doctor can search the patient as well as can check the notifications if the patient has created it. In fig 6, patient is adding a symptom and fig 7 shows details of particular symptom. Doctor can see the same and when he adds prescriptions and diagnosis, they are reflected in patient's profile also.

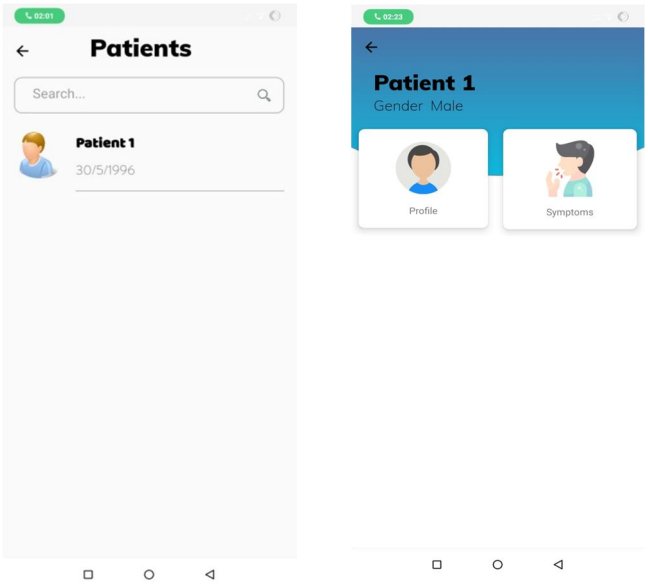

Fig 8&9 Patient View in Doctor's Profile

V. FUTURE SCOPE

The platform could be made universal. The appointment system can be added. There is a scope for online payment system as well as telemedicine. ML could be used to analyse the behaviours of symptoms and suggest medicines for patients. All in all, the idea holds great future scope.

VI. CONCLUSION

Due to the covid situation, it has become necessary to maintain least contact with others. So, this system proves helpful in this scenario. The doctor can make use of the system to grow his reach. He can keep track of the registered patients through application. On the other hand, patients can add symptoms and can collect all the data at one place.
The system can achieve the purpose of bringing small clinics on a digital platform and reduce the use of paper documents.

VII. ACKNOWLEDGEMENT

This research work is the cumulative result of efforts put in by the team members. Also we would like to thank our guide, Dr Sandeep Raskar (Associate Professor, Computer Engineering at Terna Engineering College) for guiding us throughout the project and helping us sail through the research work.

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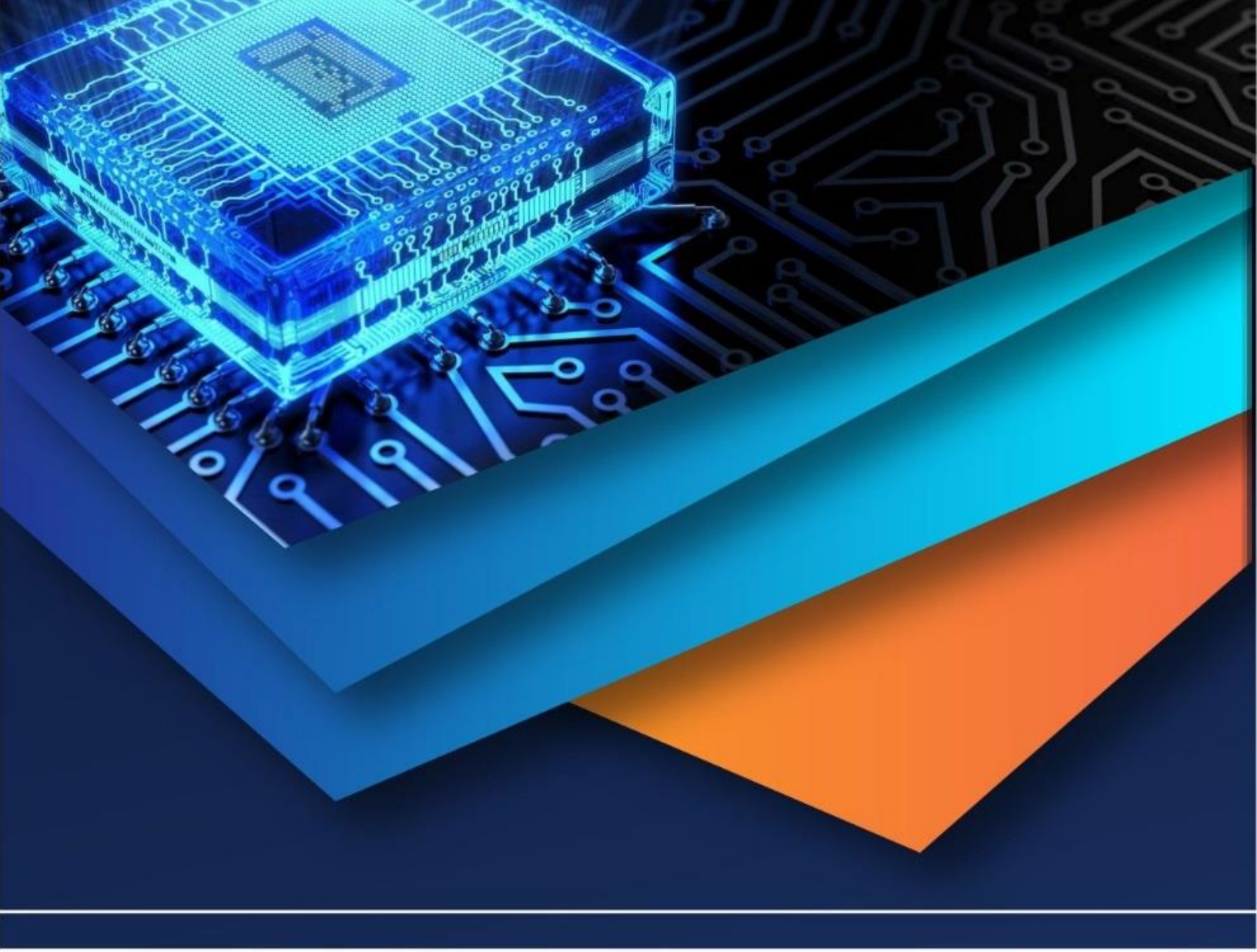

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