Telemedicine Data Management System

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IJASR 2022
VOLUME 5
ISSUE 2 MARCH – APRIL **ISSN: 2581-7876**

Abstract: Telemedicine is the use of modern communication and information technologies to deliver therapeutic treatment and data transmission to people who live far away. Telemedicine can be utilized for judgment, remote sensing, and collaborative arrangements in the simultaneous treatment of remote patients. Telemedicine is a term that encompasses telecommunications, medicine, and informatics. The equipment and techniques for obtaining, presenting, storing, and retrieving clinical data are all detailed in the medical systems architecture. The difficulties that different countries face as they develop telemedicine are discussed. Telemedicine applications define technological, political, and professional boundaries. This data management system demonstrates the aforementioned idea.

Keywords: Telemedicine, Tele-consultation, Medical, Medical database, Tele-conferencing, Tele-diagnosis, web-based medical applications

1. Introduction

Telemedicine is the diagnosis and treatment of patients over a long distance using telecommunications technology, providing high-quality healthcare to low-income communities. For more than 40 years, researchers have looked into how contemporary telecommunications and information technology may be used to improve health care.

Telemedicine, also called telehealth in some areas, has gotten a lot of press recently. The practice of medicine at a distance is referred to as telemedicine. Any use of technology to offer medical resources and knowledge is a bigger concept. Diagnose, treat, manage, and teach patients using telemedicine technology, which enables real-time access to specialist advice and patient data irrespective of the patient's or relevant file's location. Fundamentals of telecommunications and internet-working computer systems, communications software, and telecommunications types.

2. Objective

Many physicians may be afraid to serve in rural and physically isolated places due to the scarcity of medical resources. As a result, rural populations will receive less healthcare than city residents. In order to increase the quality of healthcare care and provide extra training opportunities for experts, these locations urgently require the establishment of a telemedicine infrastructure. The objective is to remove all these inconveniences.

This project aims to assist those who lack the financial means to pay for services such as health or dental insurance that the provider accepts. Because 80 percent of the country's main healthcare centers are in metropolitan areas, which account for 30 percent of the population, a large portion of the rural population is suffering.

3. Challenges in the Telemedicine System

A number of important issues face the current generation of telemedicine programs as they mature. It is suggested that the successful resolution of these challenges is critical to the future development of telemedicine as an integral component of the healthcare system. Physicians, institutions, patients, and the general public are all on the table for

discussion. Informed speculations are offered based on the concepts of telemedicine and its ability to transcend traditional boundaries of medical treatment via telecommunications in order to generate discussion and provide direction for tackling many potential challenges.

The main objective is to find the big issue with the deployment and development of the system. Telemedicine may necessitate the creation of new laws, legal interpretations, or medical paradigms. However, if these issues are not addressed, they could constitute significant obstacles to the development of optimal telemedicine systems.

Because this generation of telemedicine is still in its infancy, none of these issues have yet reached a critical mass that would compromise the operation of existing telemedicine systems, the bulk of which are extensively subsidized as demonstration projects. Despite the fact that the number and scope of demonstration projects funded in the first generation of telemedicine were limited, the number and scale of second-generation telemedicine systems, as well as the associated monetary and psychological investments, demand immediate and serious consideration. The solutions to the problems highlighted here are critical if these technologies are to mature and become really fundamental parts of our healthcare delivery system.

4. Results

Below Figure 1 is the login screen through which the patient and the doctor can log in to the website. Figure 2 is the sign-up page through which a patient or the doctor can sign up. However, to prevent abuse we decided to keep the patient and doctor sign-up page the same. Later on, the administrator via Google Firebase (Figure 6) can change whether the person signing up is a doctor. If he/she is a doctor then the flag 'isDoctor' can be changed to true. The default value of this flag is false. In case the user forgets the password; it can be reset via the reset page (Figure 3). A mail will come to their respective email addresses requesting to reset the password. After logging in successfully, the user will first see the home page (Figure 4), where they can set up appointments. The user can also upload files. These files are visible only to the patient and to the respective doctor. Hence privacy has been achieved. They can also interact with each other via chat messages and video calls. Lastly, all the patient and doctor's personal details are also saved in the database.

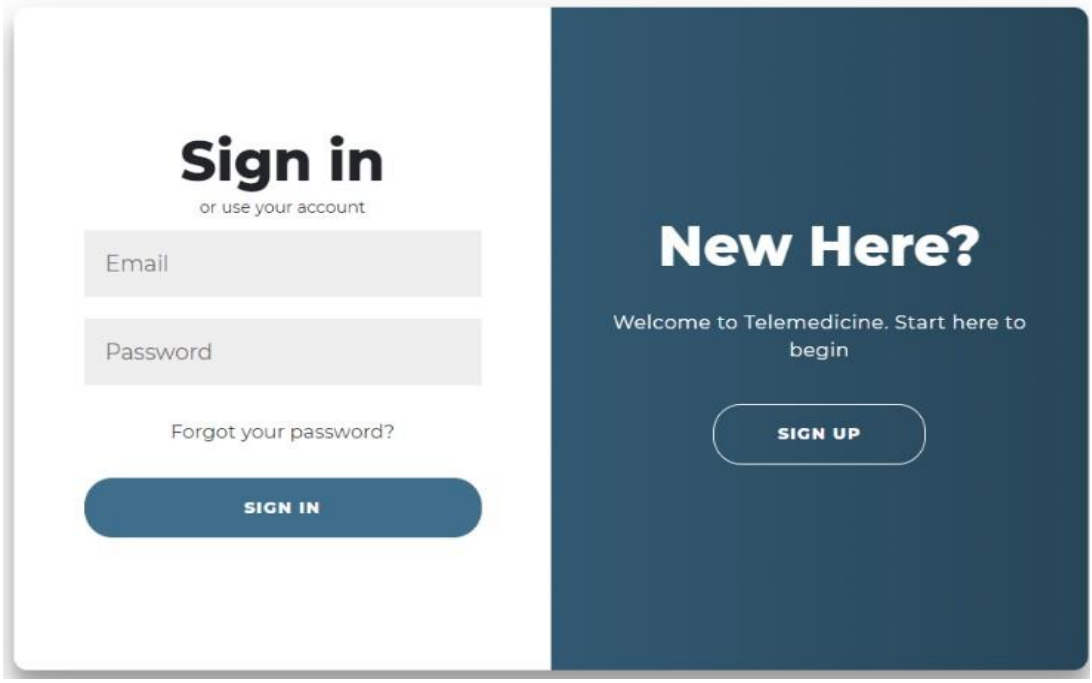

Figure 1. The login page

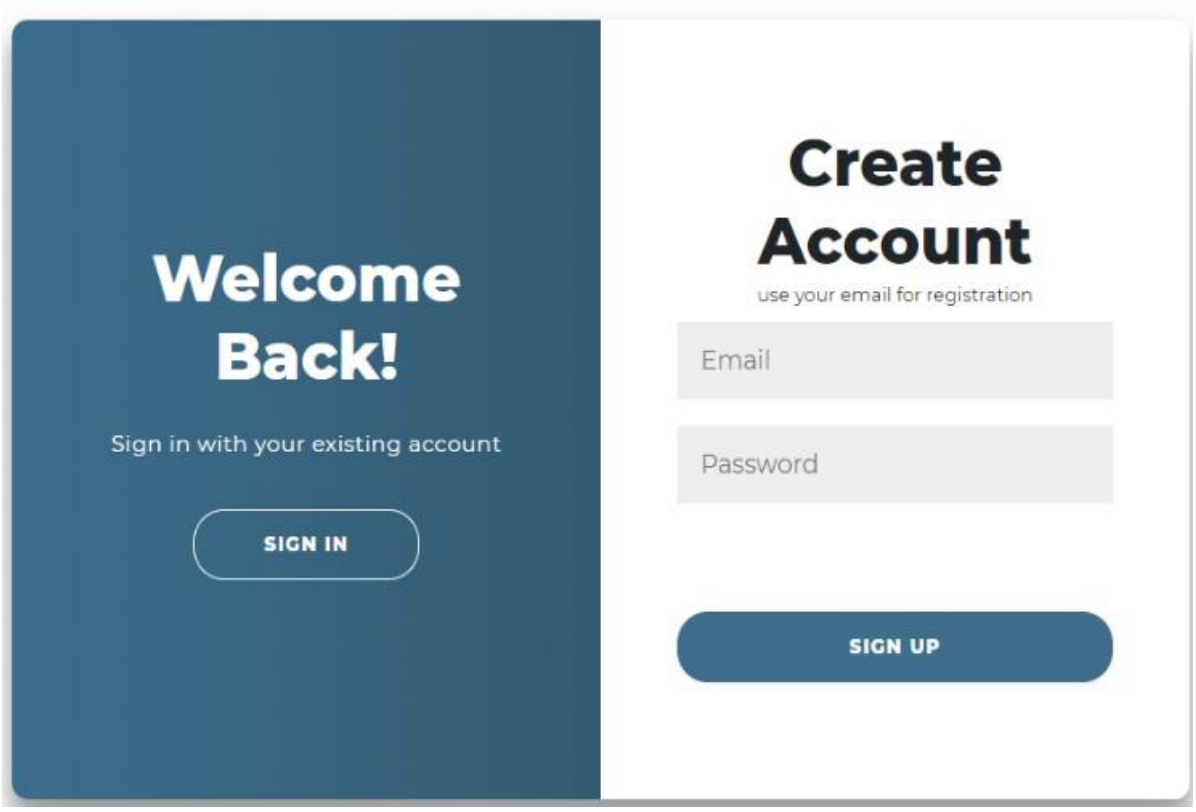

Figure 2. The sign-up page

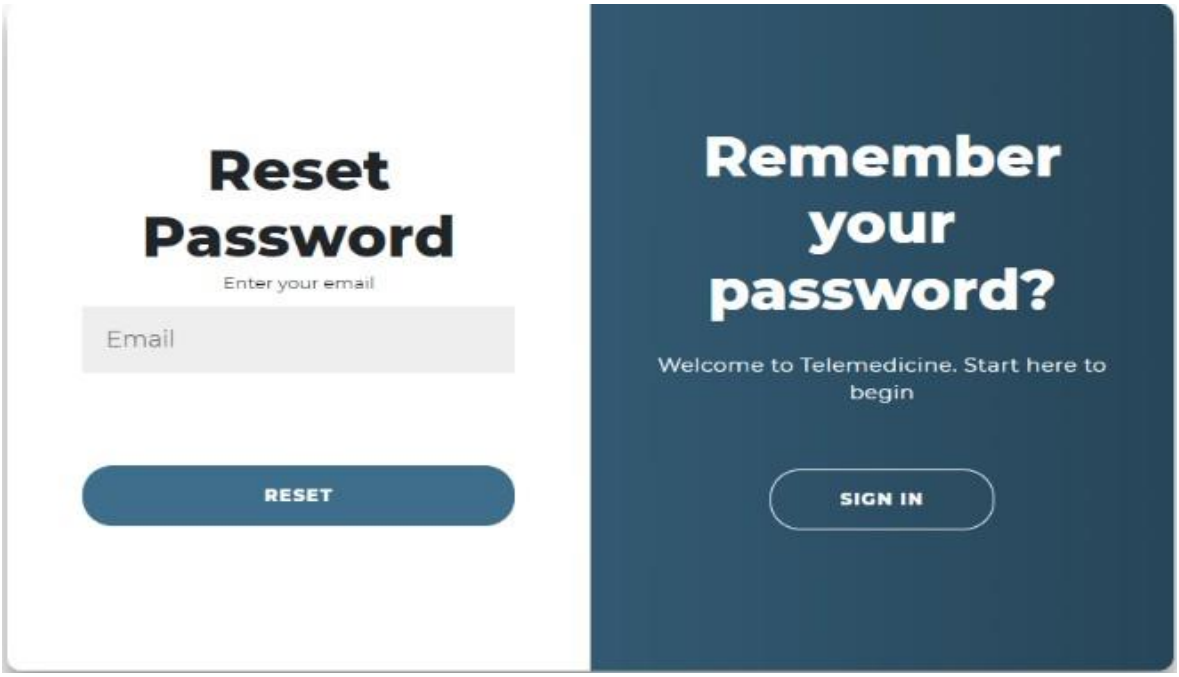

Fig 3: The password reset page

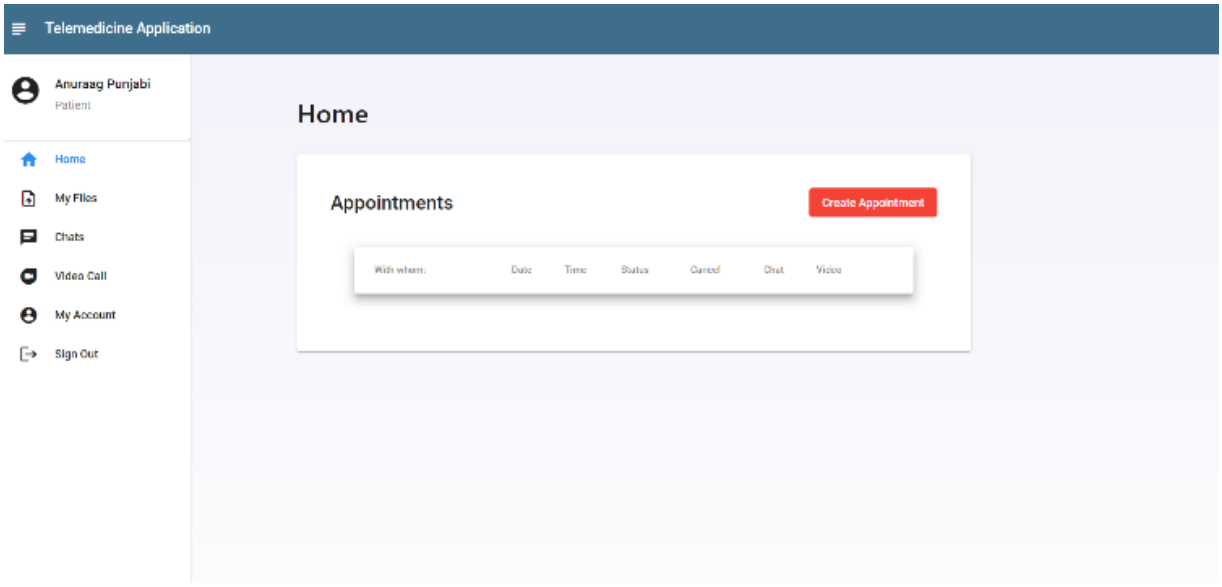

Fig 4: Homepage for the patient

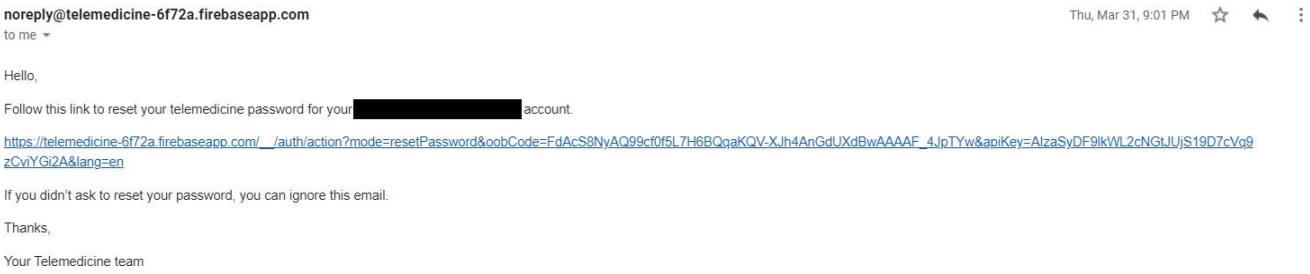

Fig 5: Reset password email notification

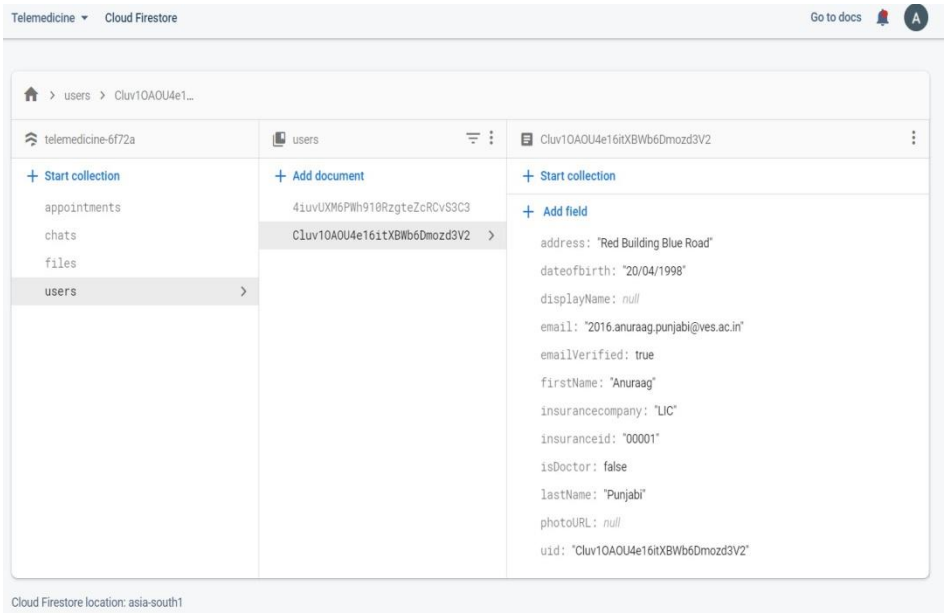

Fig 6: Google Firebase - The backend where all the data, files shared, and other confidential data is stored

5. Implementation Details

The objective of this work is to bring the doctors and patients closer. Since that is not possible in many cases, we have developed an application that will do this.

For developing our project, we have used Google Firebase, Google Auth, Angular CLI, and Agora.io SDK. We have made it in Typescript, HTML, JavaScript, and Jasmine.

Our project's block diagram (Figure 7) can be considered as two blocks namely:

1. Doctor

2. Patient

On both sides, a network connection is required for informational transfer between the patient and the doctor. On the patient's side, the main processing unit involves a medium to send medical data to the doctor. Similarly, on the doctor's side as well a medium is required to receive the data for diagnosis and send back the reports that will be received by the patient. Both sides have a set of user commands to perform certain operations. A camera is also required on both sides to aid a video call. By having fulfilled the requirements, telecommunication can be established between the doctor and patient.

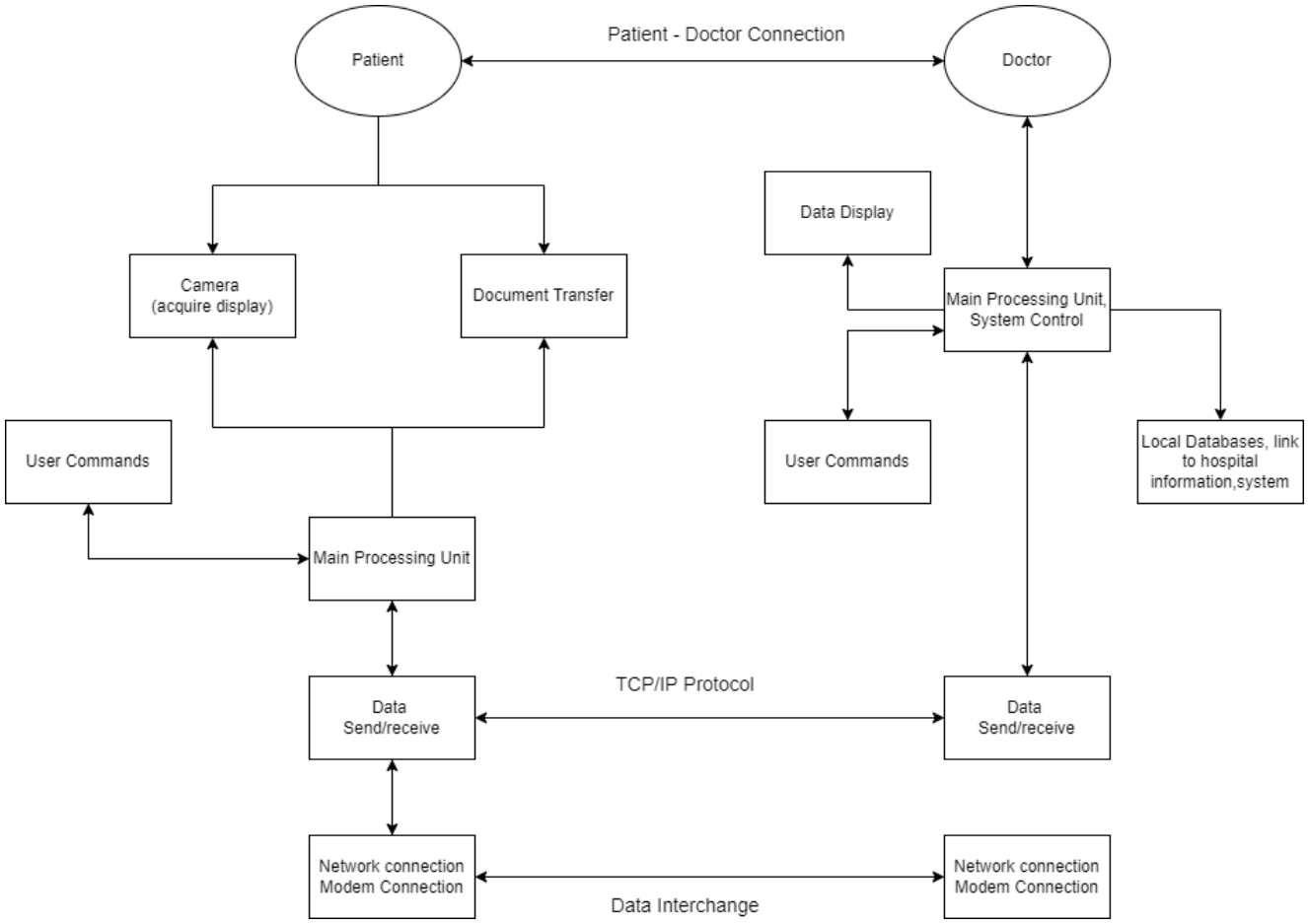

Fig 7: Block Diagram

Below are the modular diagrams of the project. First, the new patient needs to enter the site URL. Then to register as a new patient, he/she needs to click on the register as a patient and fill in all the required details. After that validation of entries will take place. If the entries are valid, the data will be saved and an email will be sent to the patient to activate his/her account. If not, the patient will be required to recheck the details.

After that, if the account gets activated, a message will be sent to the administrator saying that the new patient has been registered. Or else the administrator will be emailed to handle the incomplete account. A welcome mail will be sent to the patient and he/she will be invited to log in to the website.

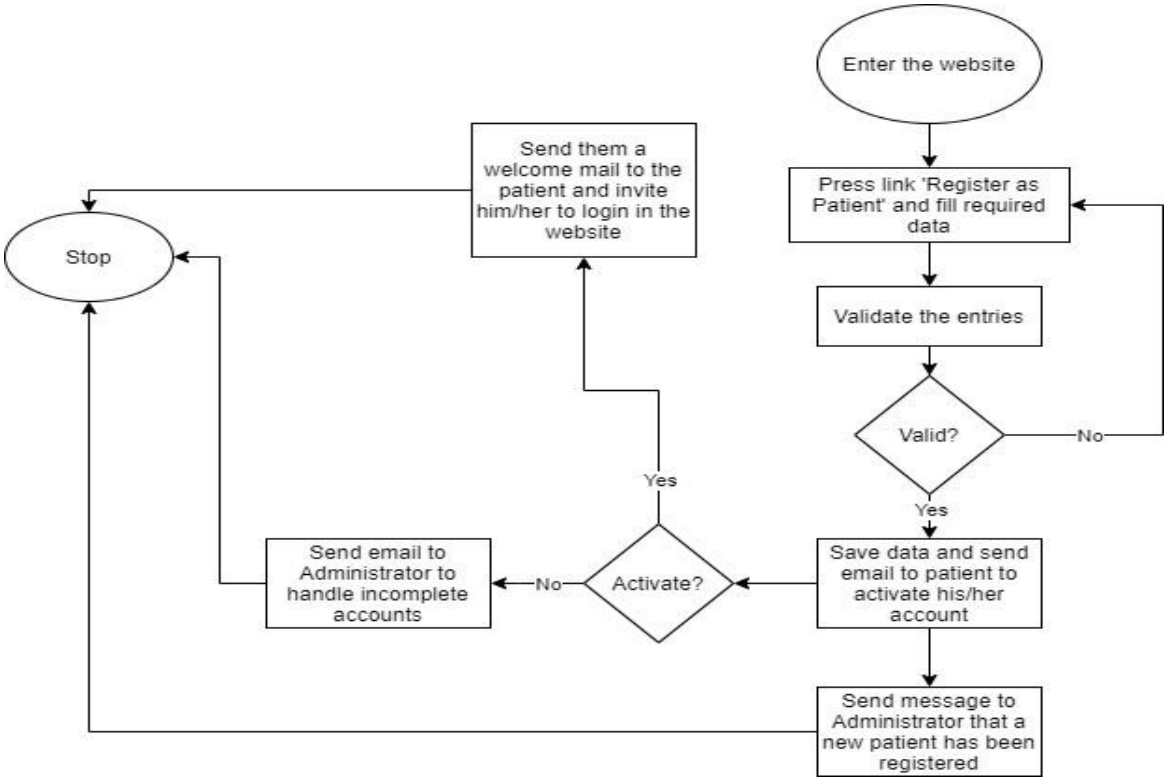

Fig 8: Modular Diagram of the Patient

First, the new doctor needs to enter the site URL. Then to register as a new doctor, he/she needs to click on the register as a doctor and fill in all the required details. After that validation of entries will take place. If the entries are valid, the data will be saved and an email will be sent to the doctor to activate his/her account. If not, the doctor will be required to recheck the details.

After that, if the account gets activated, a message will be sent to the administrator saying that the new doctor has been registered. Else administrators will be emailed to handle the incomplete account.

If the doctor gets approval, he/she will receive a welcome mail and will be invited to the login page of the hospital website. Else if not approved, a rejection message will show up and the data will get deleted.

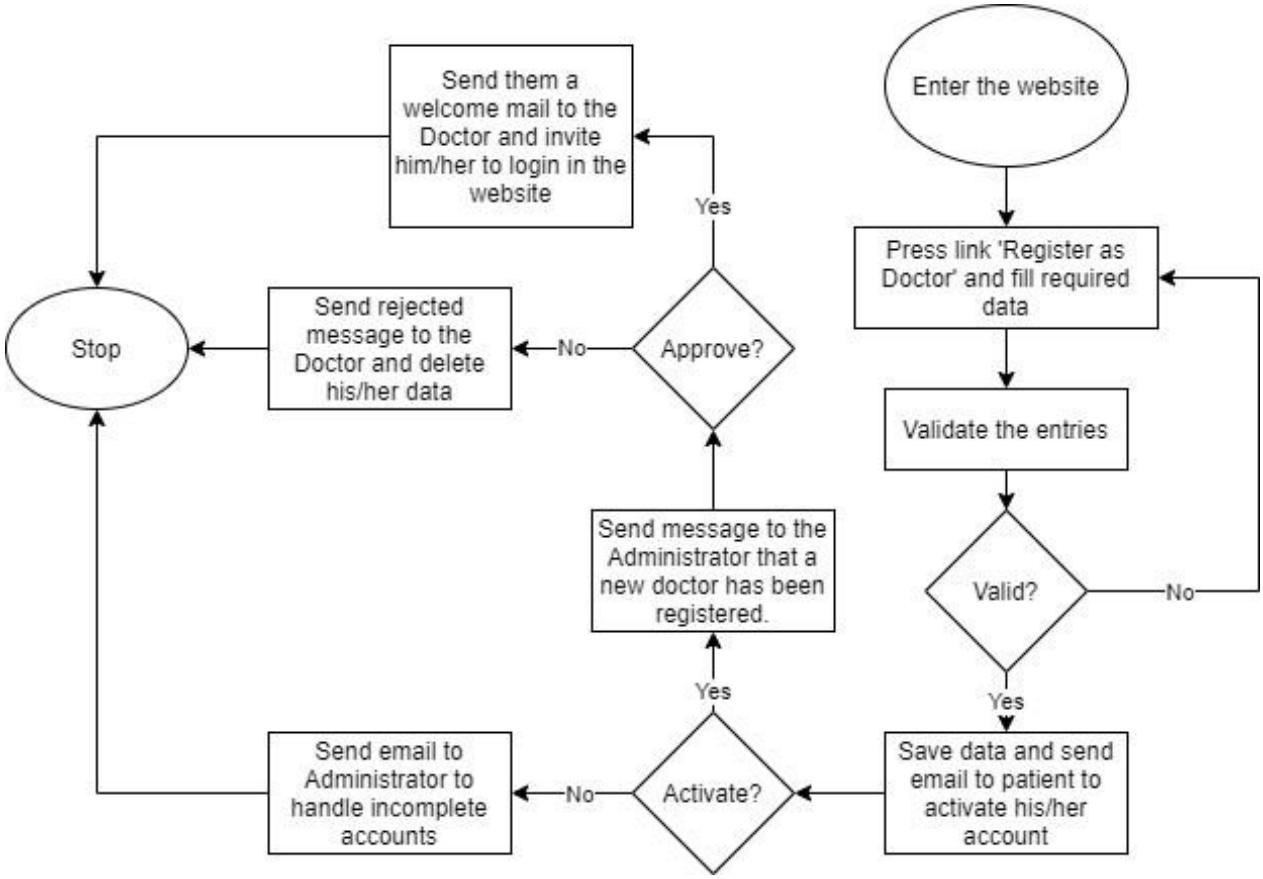

Fig 9: Modular Diagram of the Doctor

6. Methodology Implied

We propose a simultaneous two-way webcam system as well as a file system to enable rural physicians to convey their clients' health information to specialists and participate in face-to-face discourse via teleconsultation. Telediagnosis is comparable to videoconferencing in that the professional makes a diagnosis depending on the info gathered. The expert sends the evaluated results to the rural physician after making the diagnosis. The primary contrast is that telediagnosis requires high-quality data and images for accurate diagnosis, whereas teleconsultation requires a synchronous interactive conference environment.

On both sides, a network connection is required for data interchange between the patient and the doctor. On the patient's side, the main processing unit involves a medium to send medical data to the doctor. Similarly, on the doctor's side as well a medium is required to receive the data for diagnosis and send back the reports that will be received by the patient. Both sides have a set of user commands to perform certain operations. A camera is also required on both sides to aid a video call. By having fulfilled the requirements, telecommunication can be established between the doctor and patient.

Future Scope

During critical times, artificial intelligence-powered technology can be used to deliver automated interactions with patients. When combined with medical data such as symptoms, prescriptions, treatments, doctors, and illnesses, these

AI-based healthcare chatbots can save time. Not only that, but AI applications can improve the diagnosing process' speed and accuracy. 5G is the most important technology. It will enable better network speeds, which might totally revolutionize the telemedicine market. Medical pictures, remote patient monitoring, and virtual meetings will all benefit from this strong network.

7. Conclusion

India, as a developing country, is attempting to provide better healthcare and specialized health services to all of its citizens. A major portion of the population is unable to receive primary healthcare and specialty treatments due to poor organizational and transportation facilities, poverty, and ignorance, and there is a significant imbalance in healthcare distribution between rural and urban areas. Telemedicine can act as a bridge between urban and rural populations, allowing patients in outlying locations to obtain prompt diagnosis and treatment.

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