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User Interactive Hospital Management System by using Web application

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***Abstract*—Recently, the use of technology in Medicine and Healthcare has grown to a greater extent particularly during the pandemic period. The circulation of people in public is reduced considerably and people wish to do all possible work through online websites and mobile applications. Websites are the most popular and convenient means by which people can contact hospitals and other healthcare divisions. All the healthcare sectors require large database management systems to handle huge amounts of data regarding patients, doctors, consulting, and treatments. To solve this problem, a database management system is developed for the hospitals to maintain all the data efficiently that can be accessed by patients, doctors, and administrators via a common website. This system facilitates the patients to book appointments online and to view their medical profiles. It also enables the doctors to see their appointments and to provide online prescriptions taking into consideration of the medical history of the patients. This system allows administrators to manage all the medical data and lets the laboratory section upload reports online thereby providing contactless medical reports and sends reminders through Email regarding upcoming appointments. The website developed is a three-user dynamic system that manages data effectively and provides a sturdy database system.**

***Keywords*— Database Management System, Website, Three-User Dynamic System.**

I. INTRODUCTION

Our project is to create a web application for hospitals that includes registration of patients, details sorting the patients details into the system and user can search about the doctor whether they are available or not to book appointments and to provide online prescriptions including lab prescription and also sending remainder regarding appointment and enabling the lab technicians to upload medical reports online than providing paper free consulting. Our aim is to maintain a database that could store and provide information to patients, doctors and the hospital management all in one application.

The Hospital Management System is a multispeciality hospital management system that covers a broad variety of administrative processes. Hospital Management System is a useful to improve the management of hospital in the area of clinical process analysis and activity-based costing. Hospital Management System enables you to develop your organization and improve effectiveness and quality of work.

The hospital management system can be entered using ID, username and password. It is accessible by doctor, patient, administrator or receptionist. The data can be retrieved easily. from the database using this application. The interface is also very user friendly. For personal use and fast data processing, the data is well secured. The storage of all those details would be done by setting up using MySQL database. If a patient is about to visit the hospital, all the vital details would be updated for the doctors to check it online. Every person who visits the website can register themselves as a patient and get a unique Patient ID that is referred to in all the future consulting. A patient can take the appointments online by knowing the availability of the doctor. Notifications regarding the appointment date and session to the patients is done using this application.

The real motivation for the hospital management system project is to make easy process of all the management process like patient's registration, doctor's appointment, doctor's prescription, etc. The proposed system will help hospitals to do work fast and effective without applying major changes to the existing system and updating records instantly through the online website.

II. RELATED WORKS

Several literatures relevant to the proposed work have been reviewed. The EDXL-HAVE standard is heavily used by the Framework for Hospital Database in [1] to represent data internally and share it with other systems. Through a comprehensive overview of the standard, this section provides a description of the key data types effectively used by the HAMS. The Hospital Availability Management System (HAMS), which was created as part of the EU-funded SAFECARE project1, was created to assist hospitals in all of these areas. As a result, the HAMS' job is to monitor hospital asset availability and provide hospital condition and asset availability information in the event of an emergency. On the one hand, HAMS will provide operators with a graphic interface that shows the current availability of hospital services. HAMS recognises not only health emergencies, but also accidents (physical or cyber) that can disrupt the structure's daily operations, thanks to its integration of incident detection systems and impact propagation models. HAMS, on the other hand, will export data in an EDXL-HAVE standard-

compliant format. It was created to make it simple for various emergency systems to exchange and share information. OASIS created the EDXL-HAVE (HAVE) XML messaging standard in the context of emergency management. A HAVE schema contains a root feature that uniquely defines the reporting facility's responsible organisation. Each facility is defined using a set of attributes and sub-elements that allow for a thorough description of hospital departments, facilities, and resources.

The project methodology [2] is divided into four modules: administration, doctor, sister, and employee. If a patient is visiting the hospital for the first time, they must register their name at the front desk. They may schedule an appointment with a specific specialist based on their issue. All of the patients' names will be shown on a digital display screen located outside of each hospital. This method employs a queueing strategy to show the names of patients one by one. Employees first register and log in to the employee module, then register the names of patients and provide initial care, unless there is an emergency, in which case they send patients to the emergency room, otherwise they generate bill with prescription.

The proposed framework in [3] describes an idea for a web-based platform that would enable many medical/hospital procedures to be performed remotely using Web, networking, cloud, and android programming technology, which could be very useful in implementing online medical management features.

In [4,] an electronic framework for managing and administering patient information is proposed. Hypertext Mark-up Language (HTML), Cascading Style Sheets (CSS), Hypertext Preprocessor (PHP), and My Structured Query Language were used to construct the framework MySQL is a database management system. PHP, CSS, and HTML were used to create the user application programmes and gui, with PHP and MYSQL support. PHP was used to construct connections, manipulate pages, and handle storage functions in relational databases. To build and bind relational tables to the database, MySQL was used. The GUI was created using HTML.

[5-6] proposes a web-based real-time system for improving medical research and analysis. The framework is web-based, with a MySQL database and C# programming language. The spiral software development model was introduced and used in the development of this method. HTML (Hypertext mark-up language) allows for the development of a simple and intuitive user interface on the front end. C-sharp allows links from the text entered in the generated graphic user interface to be sent to the database in the centre. The MySQL database is used in the backend.

The suggested framework [7] is database-driven, uses an object-oriented programming language, and employs networking techniques. This paper [8]) outlines a hospital's information system and proposes an automated solution to assist Medical Doctors in completing their duties more effectively and efficiently.

The fundamental premise [9] is to deliver the medical report history of a specific person (patient) at any time and without charge. This application is basically to develop services using android studio.

This methodology [10] is the system that will be used in any Hospital, Clinic, Dispensary, or Pathology labs to obtain information from patients and then store that information for future use. Patients' information is gathered by simply writing the patient's name, age, and gender.

This system [11] is made up of various pieces. It entails tasks such as card printing, registration, medical treatment, drug information management, pharmacy dispensing, emergency, data dictionary maintenance, database backup, and report printing. The application architecture [12] is a three-tiered design. This application will be handled by packages such as the HTML, CSS, JavaScript. The PHP hypertext preprocessor will handle the application logic (PHP). The database, on the other hand, may be managed using MYSQL database software.

This work [13] begins by registering the patient's information, such as if he or she is a new patient. For an existing patient, the app goes straight to the app and logs them in with their unique id and password.

As a result, we believe that the proposed study would be extremely beneficial to hospitals in terms of efficiently maintaining information about doctors, patients, and hospital personnel. The system will be used to monitor the availability of resources such as departments, beds, clinics, medical equipment, and so on in the future. The framework can also be used for Online Consultation without the use of any other third-party software and stored in a database. By including such functionality, users would be able to add more feedback to the framework.

III. METHODOLOGY

EXISTING SYSTEM

When a patient goes to the hospital for treatment, the protocol is that the patient first purchases an identity card, which includes all of the necessary details as well as a card identification number. The patient waits for the card, which is kept in a file jacket, to be processed, along with a column for medical records. When the patient's file arrives, he or she joins the line to see a doctor. Specific patient cards are held in files in the new system, which uses file cabinets. This method is so time consuming when it comes to tracing a record file, scanning paperwork, space taken up by the file, and waiting for the receptionist to retrieve the patient file. The prescribed drug and laboratory test conditions are all included in the register, and the patient will need to review it in the future.

PROPOSED SYSTEM

A hospital management system is a computer system that aids in the successful completion of health care providers' jobs by allowing them to handle information relevant to health care. The proposed system is set up so that administrators, physicians, and patients can display and edit their personal information, schedule appointments, and verify the availability of doctors for remote visits. The allocation is dependent on availability once again. The HMS will handle the mismanagement of storing data by implementing the User Interactive Hospital Management System, which saves time and recovers errors incurred by existing data.

A. WORKING PRINCIPLE

Initially, when the patient tries to register, they are provided with a page where they could feed their personal details like, Username, DOB, Contact details and so on. Each patient is provided with unique ID. On logging into the page, the patient could enter his/her unique ID, user name and password. The Doctor on the other hand could feed their name, specialization, years of experience and could upload the profile picture in their login page. When it comes to administrators, they could view the patients' profile, list of doctors' appointments and could view medical records of the patient.

B. GENERAL BLOCK DIAGRAM

Fig 1 represents the block diagram on the User Interactive Hospital Management System which has three main modules, Admin module, Patient module and Doctor module. The Admin, Patient and Doctor has the accessibility and are connected to the database where interaction and exchange of data takes place. The database holds all necessary details of the registered patients. The login control is accessible by admin, patient and doctor where, admin could manage patient's records, check for doctor's availability and so on. The patient could book appointments online based on the specialization and availability of doctors, could update their personal details and view their medical profile. The doctors could manage and view their everyday appointments, view patient's medical records and could prescribe medications online.

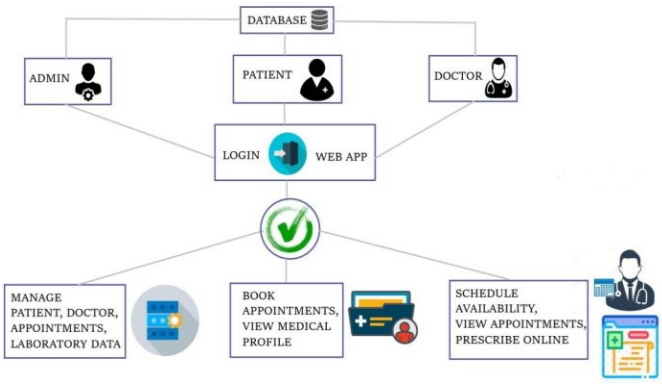


Fig. 1. Block Diagram of the Proposed Work

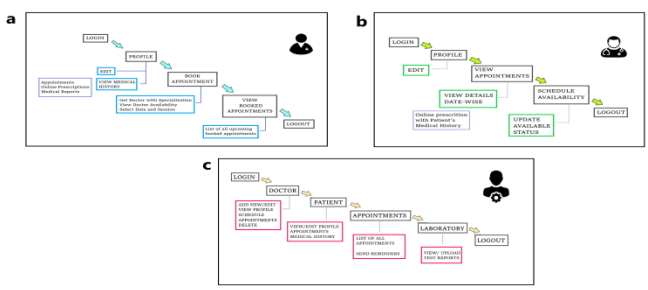


Fig. 2. (a) Patient Flow Diagram; (b) Doctor Flow Diagram; (c) Admin Flow Diagram.

The login page controls the Login details entered and redirect to Patient, Doctor and Admin Home pages. The home page includes all functionalities mentioned above in Fig 2(a), Fig 2(b), Fig 2(c) for Patient, Doctor and Admin respectively.

C. CONCEPT AND OPERATION

The User Interactive Hospital Management System consists of the following modules.

- Login Module
- Admin
- Patients
- Doctors
- Appointment Bookings
- Online Prescriptions
- Medical History

Login Module:

This module controls all the other modules and users. It inputs Patient ID / Doctor ID, Username, and Password from the users and verifies the data from the database, and authenticates the users to their respective Home pages. The admin login requires a password to be directed to the Admin Home page.

Admin Module:

This Module includes all the Patient, Doctor personal, and medical profiles that can be accessed from the database. In here, adding new doctor profiles and deleting resigned doctors are processed. Also, the list of appointments with their status such as 'Booked', 'Consulted', 'Not Consulted', 'Cancelled' can be viewed by an admin. The patient is intimated with a remainder regarding the appointment on the booked date via Email from this Module. This module also includes a Laboratory section to view and upload Lab Reports prescribed by the doctor based on Appointment ID.

Patient Module:

This module allows patients to feed their details like Date of Birth, Age, Blood group, Address, Email, contact number and also lets them in uploading their profile picture. If the patient's appointment is confirmed, they can view their appointment sheet. In case if the patient wants to cancel the appointments, they can go through the cancellation process through the website.

Doctor Module:

Doctors can update their details (i.e., Name, specialization, doctor id, etc.) after login and can access his patient's details, give medications regarding the appointment considering the medical history of the patient (previous appointments with all other doctors and their prescriptions with Laboratory Test Reports).

Appointment Bookings:

For fixing the appointment, the patient has to choosethe doctor through the specialization required and availabledate and time of that particular doctor which will be displayed while booking. Before the appointment date, our application reminds the patient regarding the appointment through Email.

Online Prescriptions:

This module enables the doctors to provide medications through Online Prescription which will be added to the database in the patient's medical history and can be viewed by

the patients and Laboratory (in case if Lab Test Prescriptions are available).

Medical History:

All of the required patient information is stored in the hospital database. The disease history, test results, prescribed treatment can be accessed by doctors and patients without much delay to make an accurate diagnosis and monitor the patient's health. It enables a lower risk of mistakes and helps patients to maintain their medical records with much ease.

D. DEVELOPMENT PROCEDURE

Step 1: Creating a database for hospital management by forming tables with required attributes – Back End.

Step 2: Create model POJO classes, DAO classes and Controller API classes in the programming language used (JAVA as in this system).

Step 3: Develop User- Interactive System using Front End Languages like HTML and CSS.

Step 4: Establish servlet request mapping to controller classes via Spring Framework in JAVA and process request by fetching data from hospital database.

E. ALGORITHM

Front End:

- Create a rough sketch of the features needed and functions performed for the web page.
- Implement the script files for each feature such as login page, Appointment booking tab, Online Prescriptions tab etc., in the editors.
- Include styles, colors and designs with CSS and HTML.
- Test the created files by running in local server.

Back End:

- Create a database in the MySQL Test Bench for the Hospital Database.
- Create tables required to implement the features involved in the project. The tables created in Hospital Database in MySQL Workbench and the dependencies of table with each other are represented in Fig 3.
- Create a Maven Project in Java Eclipse IDE with web app Artifact.
- Install the Apache Tomcat local server to process server requests from the client and add its files to the Build path of the project created in IDE.
- Configure Dispatcher Servlet and Controller in Spring MVC framework.
- Establish Connection with the database using JDBC API of Spring framework.
- Create packages, POJO (Plain Old Java Object) model classes, (Data Access Object) classes and Service classes for processing business logics.
- Define main controller class to process Server requests from client-side.

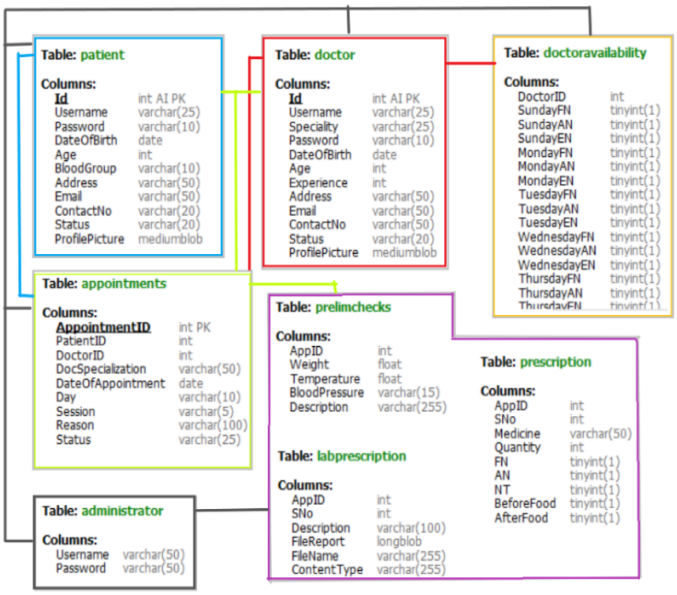


Fig. 3. Tables in MySQL Database.

Spring MVC Framework:

The Dispatcher Servlet, which handles all HTTP requests and answers, is at the heart of the Spring Web model-view-controller (MVC) architecture. The Spring Web MVC Dispatcher Servlet's request processing pipeline is depicted in Figure 4.

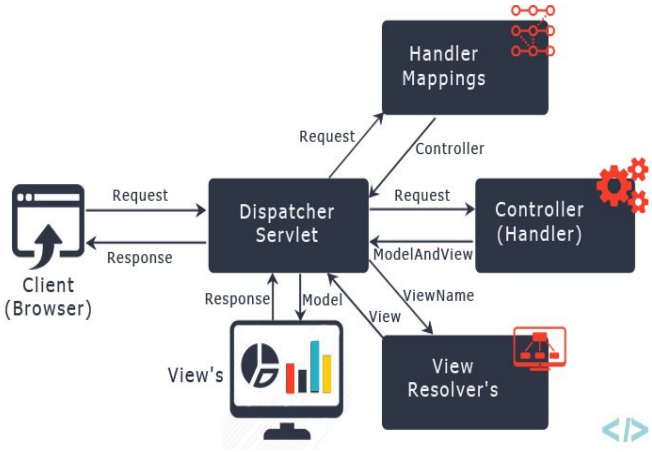


Fig. 4. Workflow of the Spring Web MVC Dispatcher Servlet

Following is the sequence of events corresponding to an incoming HTTP request to Dispatcher Servlet –

- After receiving an HTTP request, Dispatcher Servlet consults the Handler Mapping to call the appropriate Controller.
- The Controller takes the request and calls the appropriate service methods based on used GET or POST method. The service method will set model data based on defined business logic and returns view name to the Dispatcher Servlet.
- The Dispatcher Servlet will take help from View Resolver to pick up the defined view for the request.
- Once view is finalized, The Dispatcher Servlet passes the model data to the view which is finally rendered on the browser.

IV. RESULTS AND DISCUSSION

The Patient's profile and Medical History can be accessed from the Home page of the Patient which is viewed to the client (patient) as shown in Fig 5 and Fig 6.

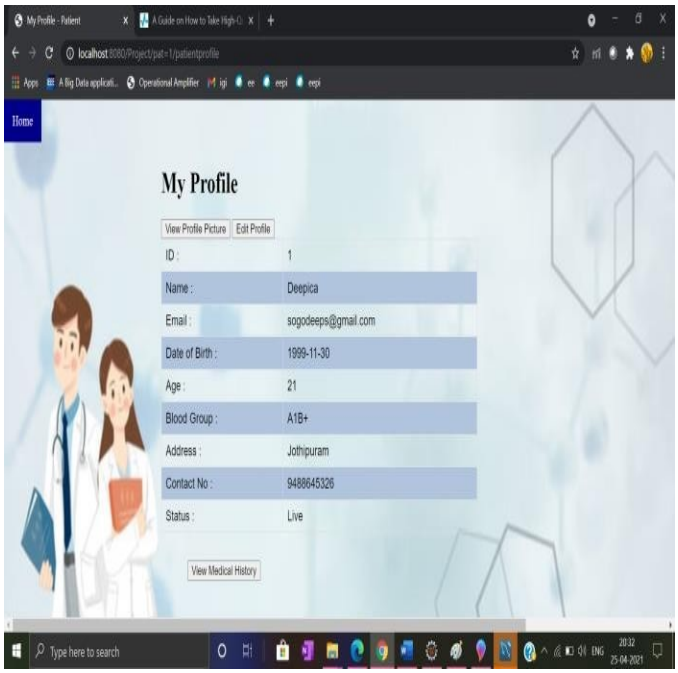


Fig. 5. Patient Profile

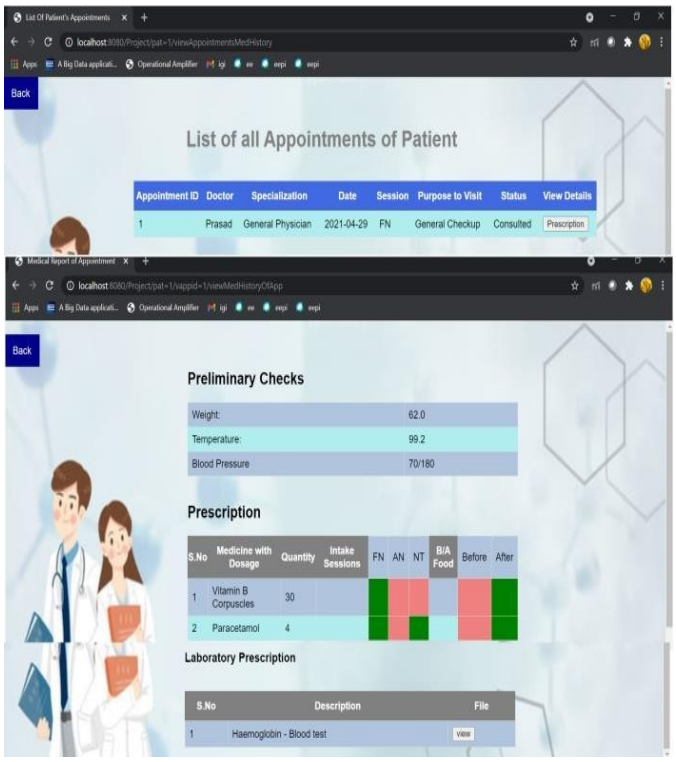
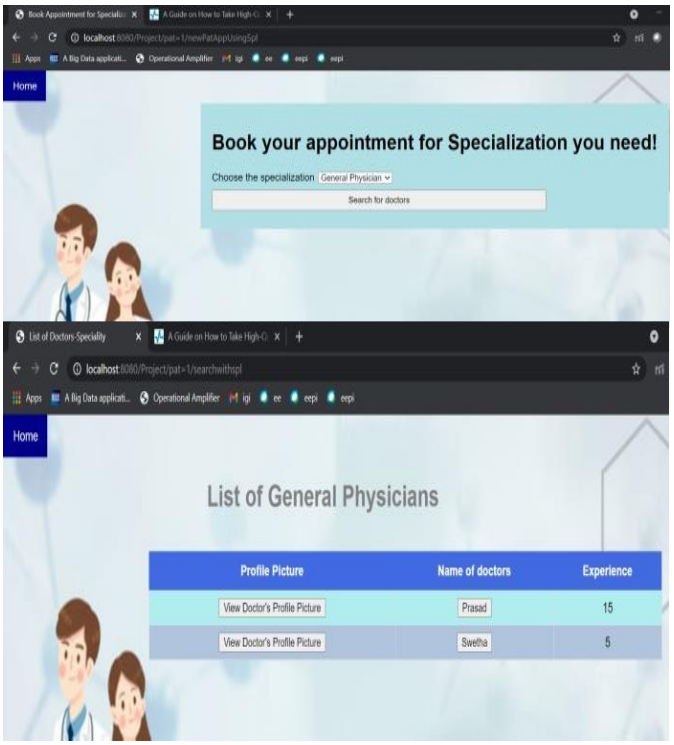


Fig. 6. Medical History of Patients Based on previous appointments

The several view pages that involve in booking an appointment for a doctor from the Patient's Home page is shown in Fig 7. When an appointment is successfully booked, this page is generated along with the Appointment ID as shown in Fig 8. If the doctor is not available or if patient count for a particular session (six) is booked, a page to redirect to look for other doctors is generated.



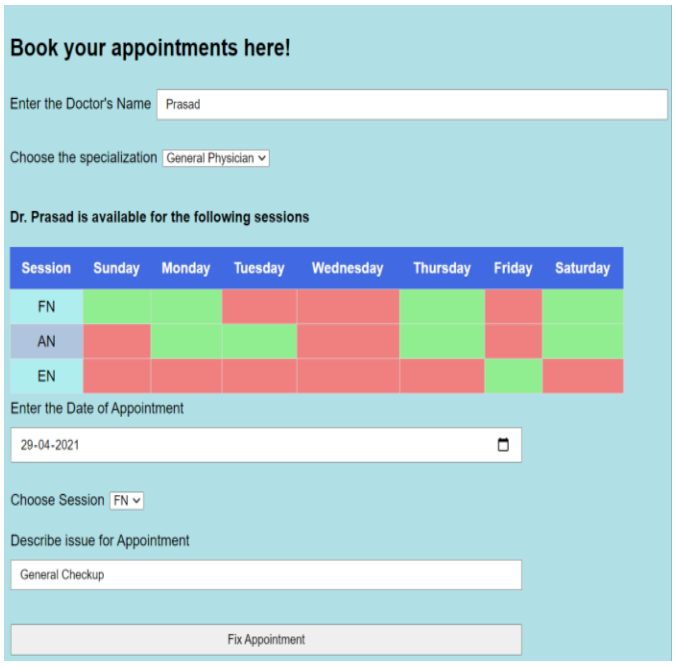


Fig. 7. Book Appointments

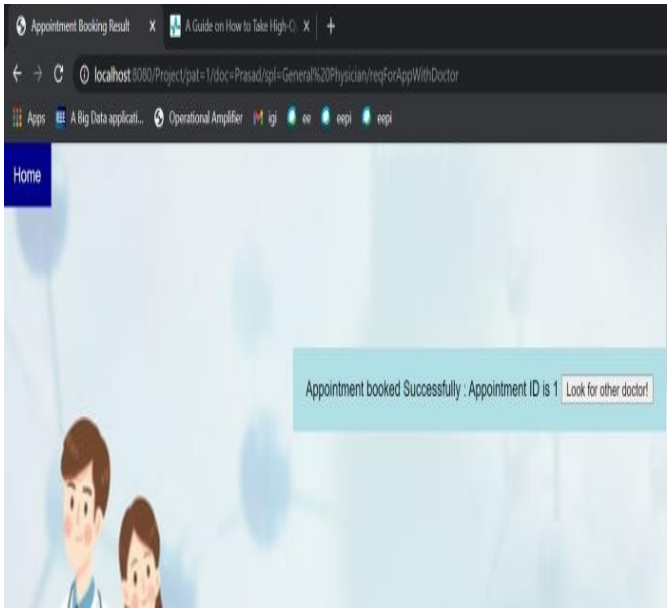


Fig. 8. Appointment Booking Result

The doctor can view the appointments on a particular date by selecting date and clicking view appointments and by clicking the Appointment ID in the list with all details of the appointment, a new prescription form with patient's personal and medical information opens for Consulting and Medications as in Fig 9. Also, the doctor can cancel the appointment if he/she is not available for that specific session and the intimation to patient regarding the cancellation will be sent through mail. The status of the appointment, then changes to "cancelled by doctor". Once consulted, the status changes to "Consulted".

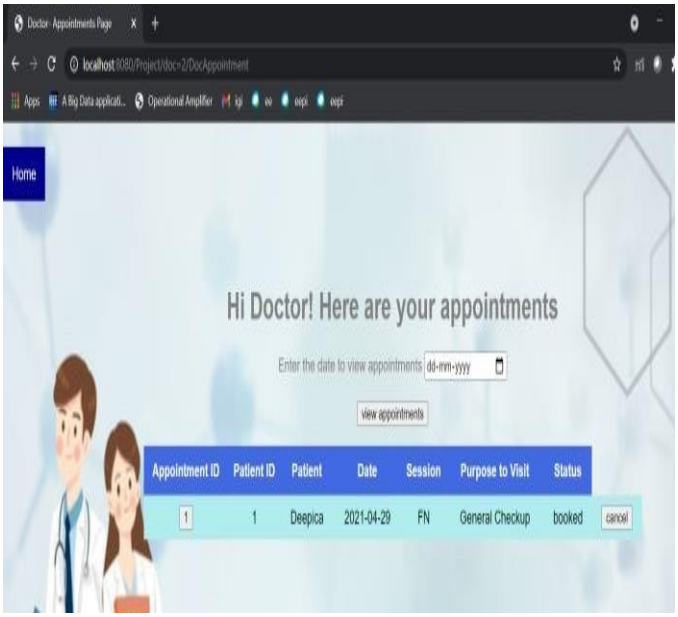


Fig. 9. Doctor's Appointments

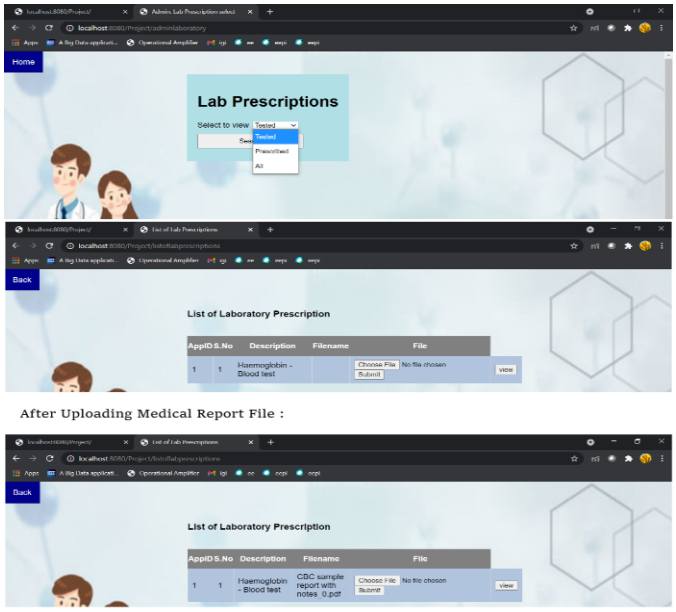


Fig. 10. Admin- Uploading Laboratory Reports

Once the medical report is uploaded by clicking 'submit' in the page shown in Fig 10, the file is inserted in the databasein BLOB format. When 'view' button is clicked, the file in the database is retrieved and viewed in this page. The document can be accessed and view by patients and doctors as well.

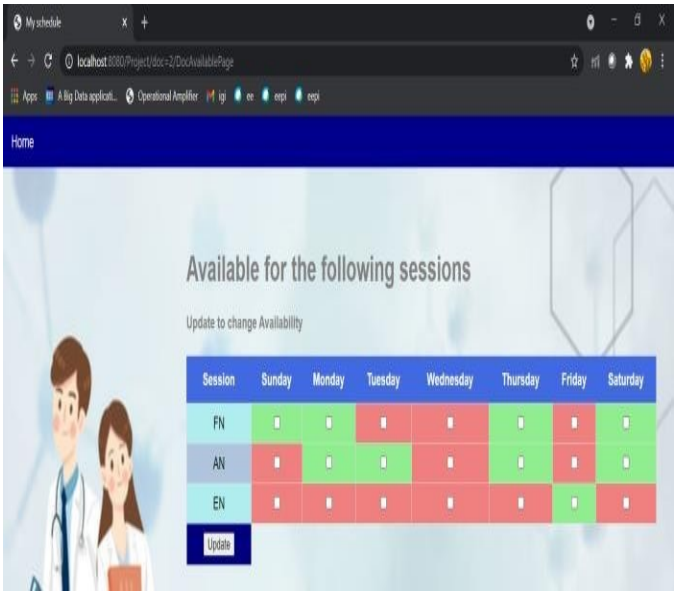


Fig. 11. Update Doctor's Schedule

The page above enables the doctor to update his/her schedule of the week of all sessions by clicking the check-boxes and Update button. The page will generate the new Schedule of the doctor as in Fig 11.

Fig. 12. Online Prescription Form

The doctor can preview patient's personal details and previous medical records and can prescribe medications through this prescription as shown in Fig 12. Also, the rows of prescription table can be added and deleted dynamically. The doctor can also prescribe for Lab tests and the preview of the prescription is generated when the prescription is saved in database.

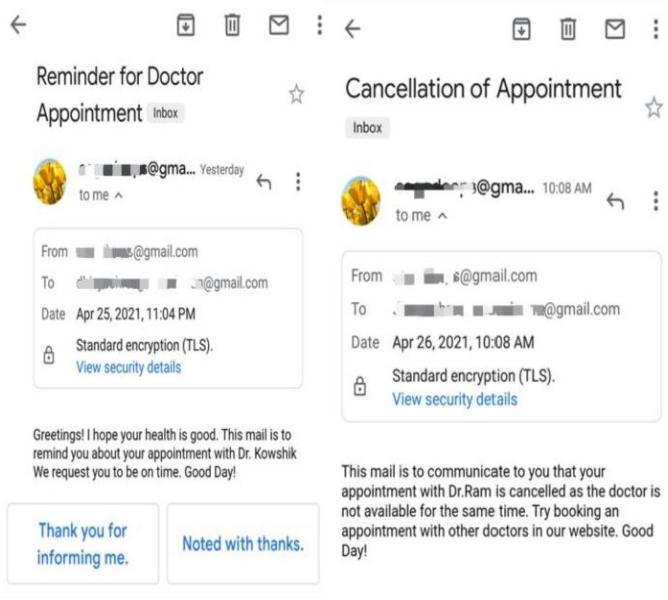


Fig. 13. Reminders via Email

The mail is sent via java mail API after authentication of Email ID with password which is shown in Fig 13 in the patient's mail. The patient's Email ID are retrieved from the database and is added to the recipient of the message.

V. CONCLUSION

Since the Hospital Management System is essential for maintaining detail about the Doctor, Patient, Hospital staff etc., it is understood that on the introduction of the Hospital Management Project into play, the work at the hospitals would be seamless and efficient. Transferring the patient data would take only seconds compared to the traditional way of sending the file manually. By implementing this web-based application, managing the patient records will be very much easier, efficient and less time consuming. Since the history and reports are already in the system, it would be simple for physicians and patients to access the records and reports, and the patient will not have to bring all of the reports, large x-rays, and MRI videos, etc. Since the patient's information is already stored in the database during registration, there is no need to fill out a form in an emergency. The doctors will review the patient's information on their system and issue a prescription with a single click, which will be sent to the pharmacist. This can save a lot of time because the pharmacist will know which medications to have on hand ahead of time, and contact between the doctor and the patient will be improved because the patient will get as much help online as they need. It will assist in reducing many manual efforts, cost as well as the amount of time spent on them.

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