



MNNITHealthCare: Digitizing MNNIT Health Centre

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by
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ALLAHABAD
May, 2017

UNDERTAKING

I declare that the work presented in this report titled “*MNNITHealthCare: Digitizing MNNIT Health Centre*”, submitted to the Computer Science and Engineering Department, Motilal Nehru National Institute of Technology, Allahabad, for the award of the **Bachelor of Technology** degree in **Computer Science & Engineering**, is my original work. I have not plagiarized or submitted the same work for the award of any other degree. In case this undertaking is found incorrect, I accept that my degree may be unconditionally withdrawn.

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CERTIFICATE

Certified that the work contained in the report titled “*MNNITHealthCare: Digitizing MNNIT Health Centre*”, by *Bazegha Tabassum, Ritesh Kumar, Alok Prakash Saxena, Pankaj Kumar, Sulav Kumar Saha*, has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

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Preface

Modern lifestyle has a number of advantages which includes easing people's life, saving hundreds of lives by the new development of medicine and vaccines. On the other hand different modern life style patterns have negative effects on health physically. The outburst of technology have made humans lazy. No one has enough time to take care of themselves unless there is an easy way to do the same. Our project aims at providing a platform to overcome this problem at some level.

We have developed an Android Application and a Website for Institute Health Centre. It wraps up the major functions (Doctor Appointment, Viewing Doctor availability, Medicine availability etc) of MNNIT Health Centre and makes them available for use at the click of a button.

These applications also help to reduce inefficiencies in health care delivery, improve access and increase transparency in the system by removing any discrepancies regarding any records.

Acknowledgement

We are highly grateful to our project mentor Dr. A.K.Singh,Associate Professor, Department of Computer Science and Engineering, Motilal Nehru National Institute Of Technology Allahabad for his indispensable guidance, suggestions and feedback that he gave us. He was always there to solve all our doubts. He also encouraged us in developing new ideas that made us think better to solve our problems in the most efficient way. He also provided a new vision for the practical application and utility of the project we are working.

Our thanks to all other faculty members of Department of Computer Science and Engineering, Motilal Nehru National Institute Of Technology Allahabad for every kind of help provided by them.

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Chapter 1

Introduction

Health issues have become quite common in recent times. People with busy lifestyles often tend to ignore their health. The amount of time it takes to visit a doctor starting from choosing the correct doctor, getting an appointment and finding required medicines , forces people to neglect their health.

The Institute Health Centre maintains its own web portal to manage the appointments and keep track of medicine records. But it does not provide any help to the patients visiting the Institute Health Centre to solve the above mentioned problems.

This project aims to solve the above problem for the people of our Institution. It provides both Android Application as well as a website with features to facilitate easy and time efficient health management.

1.1 Project Background

The project implementation has been done in three phases. The design and implementation of basic features of Android Application Care4U (Doctor Appointment, Medicine availability, viewing available doctors) were done during the 6th and 7th semester respectively. The 8th Semester work mainly includes major changes in the website (Appointment section, Medicine availability section) and some additional features in Care4U(Calendar notification, History of appointment).

The first version of the Application 'Care4u' included facilities for getting a doctor appointment on a selected date and convenient time and viewing the availability of the medicines. On the other hand we have another application for Institute Health Centre doctors 'Doctor Log-In' to enter any leave that they are about to take in near future with the facility of floating the same information through the App to the Chief Medical Officer. The initial version of the Application was tested through a locally build database which was a replica of the original database at the Institute Health Centre.

The second improved version of the Application 'Care4u' was build during the 7th Semester project work with extended features like appointment based on specialization. For convenience the user selects a required date and view only available specialisation on that day with doctors listed under chosen specialisation. To handle scenarios where the user cannot make a visit to the hospital a provision for cancelling the Appointment with the Android application has been provided.

The final version of Care4U has been developed during 8th semester with extended features like saving the appointments to user's Smart Phone default calendar and Appointment History section with all the details of the appointment(Doctor Name, Date of Appointment and Doctor Specialization) .

The Institute Health Centre website has been modified successfully to include features like getting a doctor's appointment on convenient date, viewing available-unavailable doctors on a particular date and medicine availability in the Institute Hospital.

Both the website and Android Application have been shifted on the same database which in-turn is synchronized to the actual dispensary database (using Master-Master Replication) to ensure consistency of available information on both sides.

The website for the Institute Health Centre has been hosted globally under the domain name "hc.mnnit.ac.in" and could be accessed from anywhere around the world. Care4U has also been made available on 'GOOGLE PLAYSTORE', 'Slideme.org' and 'getjar' and could be downloaded free of cost to enjoy its services.

1.2 Objective

1. Provide an easy to use 24X7 available platform helping people to manage their Medical Appointments and related functions.
2. Increase the transparency in the working of the system and avoid any discrepancies regarding Medicine stocks.
3. Reduce inefficiencies in health-care delivery and improve access.
4. Synchronize the Institute Health Centre Website with the Android Application to offer similar kind of functionality to serve maximum number of people.
5. Automate the process of Institute Health Centre to avoid any discrepancies and miscommunication due to human error.
6. Making the website and android application available globally to reach out to a larger audience.
7. Synchronizing the database used for the project and the actual database of Institute Health Centre to ensure consistency of information and smooth working of the system.

Chapter 2

Tools and Technologies

Development of Android Applications and Web based Applications has become quite easy with so many easy to use tools available to assist the development. Below is the description of some of the tools and technologies used in the development of our project.

2.1 Android Studio

Google provides an IDE called Android Studio as the preferred development environment for creating Android applications. This IDE is based on the IntelliJ IDE.[3]

It provide specialized editors for Android specific files. Most of configuration files are based on XML. It allows you to switch between the XML representation of the file and a structured user interface for entering the data. It provides features such as:

1. A flexible Gradle-based build system.
2. Build variants and multiple APK file generation.
3. Code templates to help you build common app features.
4. A rich layout editor with support for drag and drop theme editing.
5. Lint tools to catch performance, usability, version compatibility, and other problems.

The resulting .apk file contains all necessary data to run the Android application and can be deployed to an Android device via the adb tool.

2.2 Genymotion

Genymotion is a relatively fast Android emulator which comes with pre-configured Android (x86 with OpenGL hardware acceleration) images, suitable for application testing. The project has evolved from the old AndroidVM and comes with a new player design and installer. It provides features such as:

1. Easily download and run pre-configured virtual images: covering a range of Android versions from 2.x onwards, and various phone and tablet screen sizes.
2. Networking: Ethernet (emulates Wi-Fi connection).
3. GPS (with configurable coordinates) and battery (with configurable battery levels) emulation widgets.
4. Display: OpenGL hardware acceleration, multiscreen, full screen display.
5. Genymotion shell which allows you to interact with your VM using a command line.
6. This provides a way of testing your android code without much effort and easy debugging.

2.3 XAMPP

XAMPP provided the platform to develop our temporary database which is the clone of the actual hospital database. XAMPP is a free and open source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages. XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). It is a simple, lightweight

Apache distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes.

XAMPP is also cross-platform, which means it works equally well on Linux, Mac and Windows. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server extremely easy as well.[1]

2.4 Master Master Replication

Database replication is an important part of our project. Unless the data used/generated by our Android Application or the website is consistent with the data held in the Institute Health Centre (used for the current working portal), resulting discrepancies could hamper the smooth functioning of the Health Centre.

To solve the above problem, we have used Master Master Replication of MySQL database between the database used in our project and the current database used in Institute Health Centre.

MySQL replication is the process by which a single data set, stored in a MySQL database, is live-copied to a second server. This configuration, called "master-slave" replication, is a typical setup. Master-Master replication is better than that and allows data to be copied from either server to the other one. This subtle but important difference allows us to perform MySql read or writes from either server. This configuration adds redundancy and increases efficiency when dealing with accessing the data.

The Android Application 'Care4u' and 'Doctor Log In' use all the above tools for the quick and convenient development. It uses PHP at the back end.

The Web based Application similarly uses XAMPP to maintain its own little database with HTML and CSS being used for the front end and PHP, Javascript and Ajax used at the back end. We have used MySQL database and applied Master Master Replication to ensure consistency of information.

Chapter 3

Software Requirement Specifications

3.1 Introduction

3.1.1 Purpose

The project 'Care4u' and the parallel website for 'Institute Health Centre' aims to help people maintain their health with their busy lives by providing a platform which is available round the clock. The project provides easily accessible interfaces to its users to manage their doctor appointments (currently at Institute level) and view the medicine stock information available at the Institute Hospital. The users could choose a convenient date with required doctor of necessary specialisation and book/cancel an appointment for the same. He could also view his appointment history through the android application. To remind him of the appointment the calendar notification section sets a default alarm 10 minutes prior to the appointment. The website apart from the above mentioned features also provides the facility of viewing the entire duty chart of doctors at the Institute Health Centre.

The android application and the website by proving the above mentioned facilities saves the user's time by automating the initial procedures involved in health care. This would encourage people to take better care of their health and lead a peaceful and healthy lifestyle.

3.1.2 Project Scope

- Vision: One of the major problems faced by people in life today with humdrum affairs is that they cannot find any time for themselves. Everyone is so busy doing work that they tend to ignore most of the health complications that would cost them a lot of time (making an appointment, remembering the appointment is difficult sometimes, finding out the place with availability of required medicines etc). These little complications result in becoming major health problems in future due to mere ignoring them during its initial stages.
These problems could be solved to some extent by making some of the initial time taking steps in health management available to user at the click of a button. Our project serves this process and help people manage their healths.
- Objective: Our project currently works at the Institute Hospital level but we aim at making it generalised including doctors from more than one hospital in nearby areas. Also the medicine availability section could be extended to include the data of any nearby pharmacist shop as well so that people could easily find the required medicines if not available at one place.

3.1.3 Product Functions

This product facilitates the patient in different ways. It serves the patient in the following aspects:

- A history page for viewing past appointments with a doctor
- Facility to make doctor appointment with selected date and under given specialisation.
- Cancel appointments already made with a doctor for a given date.
- Calendar notification could also be added for each of his appointments at his will.
- A default alarm 10 minutes prior to his appointment could remind the user of important doctor visits he need to make.

- Viewing the medicine stocks available for any given medicine at the Institute Hospital.
- Website for the Institute Health centre provides an additional facility of viewing the entire duty chart of doctors at the Hospital.
- One could also use the website to view available unavailable doctors with their specializations on a given date.
- Both the Website and Android Application is available globally and could be easily used.

3.1.4 Operating Environment

- Platform :
 - for website : Any Browser
 - for Android Application : Android 4.0 Kitkat and above.

3.2 Design and Implementation Constraints

- IDE:
 - for Android Application : Android Studio.
 - for website development : Adobe Dreamweaver.
- Technologies Used:
 1. Front End : HTML, CSS, JavaScript, AJAX, XML
 2. Back End : PHP, JAVA
 3. Database : MYSQL
 4. OS : Windows/Linux/Other

3.2.1 Limitations

- There is no user logIn facility with a password corresponding to each Card number, hence anyone can access the system.
- Complete duty chart can be viewed through the website. The android application 'Care4u' gives filtered results of only available doctors on a particular day.

3.3 Functional Requirements

- Select a valid date of choice.
- Make a doctor appointment for a given date if not already done.
- Cancel appointments.
- Viewing the appointment history.
- Adding Calendar notification and reminder for the appointments.
- Viewing the medicine stocks available at the Institute Hospital.
- Viewing the entire duty chart of doctors at Institute Health Centre.
- Website could be used to view the available-unavailable doctors in the Institute Health Centre on a selected date with their specializations.

3.4 Software Quality Attributes

- adaptability
- availability
- correctness
- flexibility
- interoperability

- maintainability

- portability

- reliability

- reusability

- robustness

- testability

- usability.

3.5 Abbreviations used

- HTML - Hyper Text Markup Language

- CSS - Cascading Style Sheets

- PHP - Hypertext Preprocessor (server side scripting language)

- SQL -Structured Query Language

Chapter 4

Design

4.1 Introduction

'Care4u' and 'Institute Health Centre' website provide services to the user, helping them manage their medical appointments. With the advent of technology and most of the people having smart phones the Android Application could provide services to most of the people. The 'Institute Health Centre' website improves access to these services. By eliminating the need to install and run the Web Application on the customer's own computer, it alleviates the customer's burden of software maintenance, ongoing operation, and support. It reduces upfront expense of software purchases through on-demand pricing for the required services.

Advantages of using such systems:

1. Centralized updates for software.
2. Global users who have basic knowledge of using smart phones and internet .
3. Easy to access and highly available.

4.2 Modules

4.2.1 Database

The central database of the Institute Hospital maintains a record of necessary the information regarding patients, hospital doctors, Doctor appointments, Medicines and their stocks.

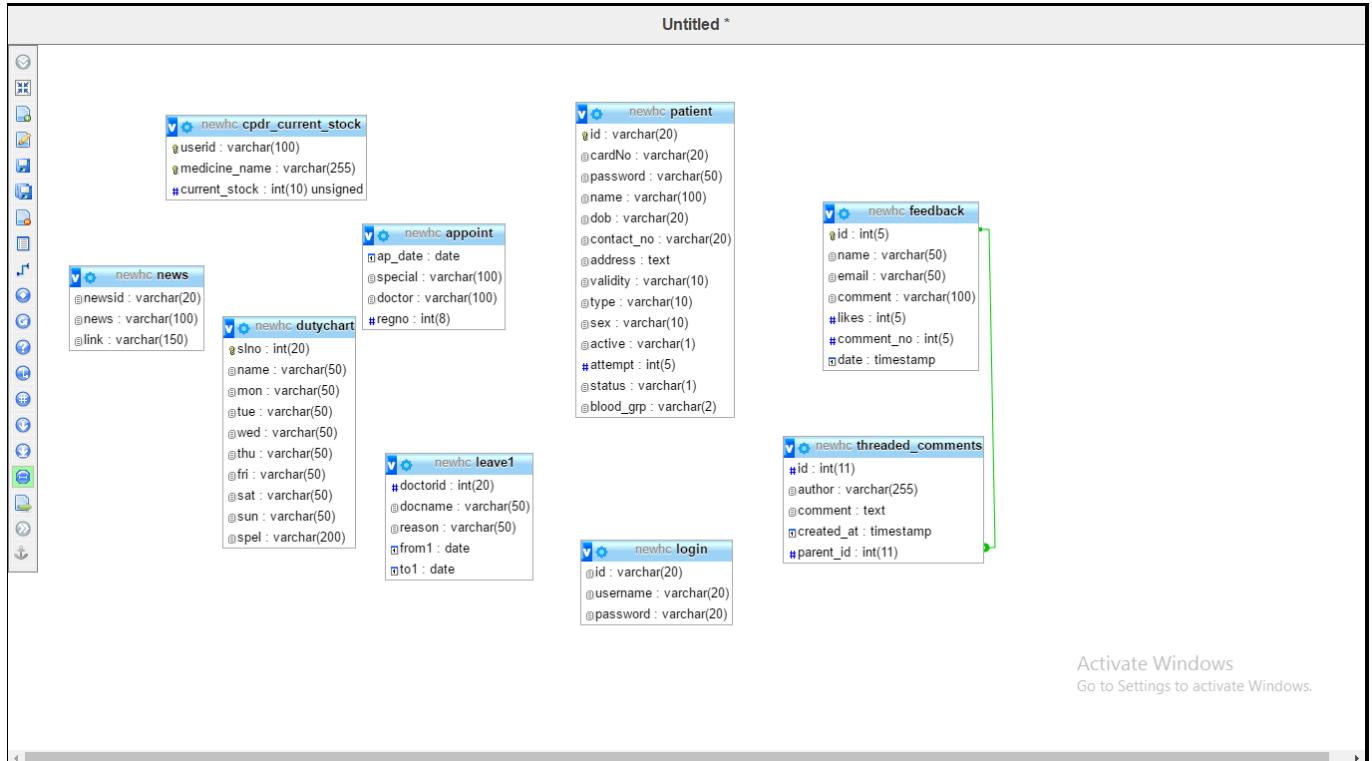


Figure 1: Basic Layout

It consists of 9 tables which are as follows:

1. Patient table : stores the information of the patient as a user of the system such as user Card no., name etc.
2. Cpdr_current_stock table : stores the available stock of all medicines categorized under various pharmacist.

3. Appoint table : stores the details about appointments done by patient consisting attributes doctor name, appointment date, appointment time, patient card no.
4. Leave table: stores details of doctor taking leave along with start date, end date and reason.
5. DutyChart table: stores complete information of doctors along with their duty timings day wise and specifications.
6. feedback table: stores the feedback given by the user along with his name and email id.
7. Threaded Comments: stores reviews and comments to a particular feedback identified with *LogInusername.newstable* : gives the information of various latest health center activities.
8. login table: stores the username and password of user for log-In facility.

4.2.2 Interface

The project provides two interfaces- Android Application (Care4u) and a Web Interface (Institute Health Centre Website) providing similar functionality.

Main categories of coding, scripting and programming for creating Android application are as follows[4]:

1. Front End of Android Application : It consists of various activities which are interface through which user interact with the application logic. The coding for the Front End is done using XML.
2. Back End of Android Application : This part of the application implements the logic and is done using JAVA at the Back End. On initiating the application the XML declared for the initial activity is displayed and the underlying Java file is launched.
3. Back End coding for connecting Android application to Database : This is done using PHP. PHP is used to make connection to the database and fetch

any data required from the database and passed to the java code of the Android application.

4. Front end for web application : The home page of website gives many short links for various functionalities like Dutychart, Feedback, Appointment section, Medicine availability section. Apart from this it gives a direct interface of a 'Doctors availability calender' which shows the list of all the doctors available and on leave on a particular selected date.
5. Back End for web application : Back end logic for web application is coded using JAVASCRIPT,AJAX and PHP languages. It implements all logic queries for fetching data from database.

Main categories of coding, scripting and programming for creating Website and Android app are as follows:

1. Client Side Scripting / Coding:- Client Side Scripting is the type of code that is executed or interpreted by browsers for website and for android there are java files along with their XML files which gives the interface and executed during working of app.

Client Side Scripting is generally viewable by any visitor to a site (from the view menu click on "View Source" to view the source code).

Below are some common Client Side Scripting technologies used:

- HTML (HyperText Markup Language)
- CSS (Cascading Style Sheets)
- JavaScript
- jQuery (JavaScript Framework Library)
- XML (Extensible Markup Language)

2. Server Side Scripting / Coding :- Server Side Scripting is the type of code that is executed or interpreted by the web server.

Server Side Scripting is not viewable or accessible by any visitor or general public. Below are the common Server Side Scripting technologies used:

- PHP (very common Server Side Scripting language - Linux / Unix based Open Source - free redistribution, usually combines with MySQL database)

4.3 Conceptual Design

4.3.1 Basic Concepts

1. User interaction: Both application and website provide various interfaces on user to display input forms. Care4u uses Android API for front end interface and website uses basic HTML web page interface. Another interface through a separate application for doctor is provided. This gives a portal for doctors. Some essential facilities like taking leave, display of leave history are shown in this application.
2. Input forms: Interface provides basic input forms to take input of user for further flow of application activities. Appoint section has a input form for inputs like date, specialization and card no.
3. Inputs: User gives basic inputs like date, card no, medicine name etc through corresponding provided interface. These given input by user decides the further flow of application.
4. Queries: With the help of given input, background queries run to fetch the respective relevant data. This data is further showed to user using consecutive next activity.

4.3.2 ER Diagram

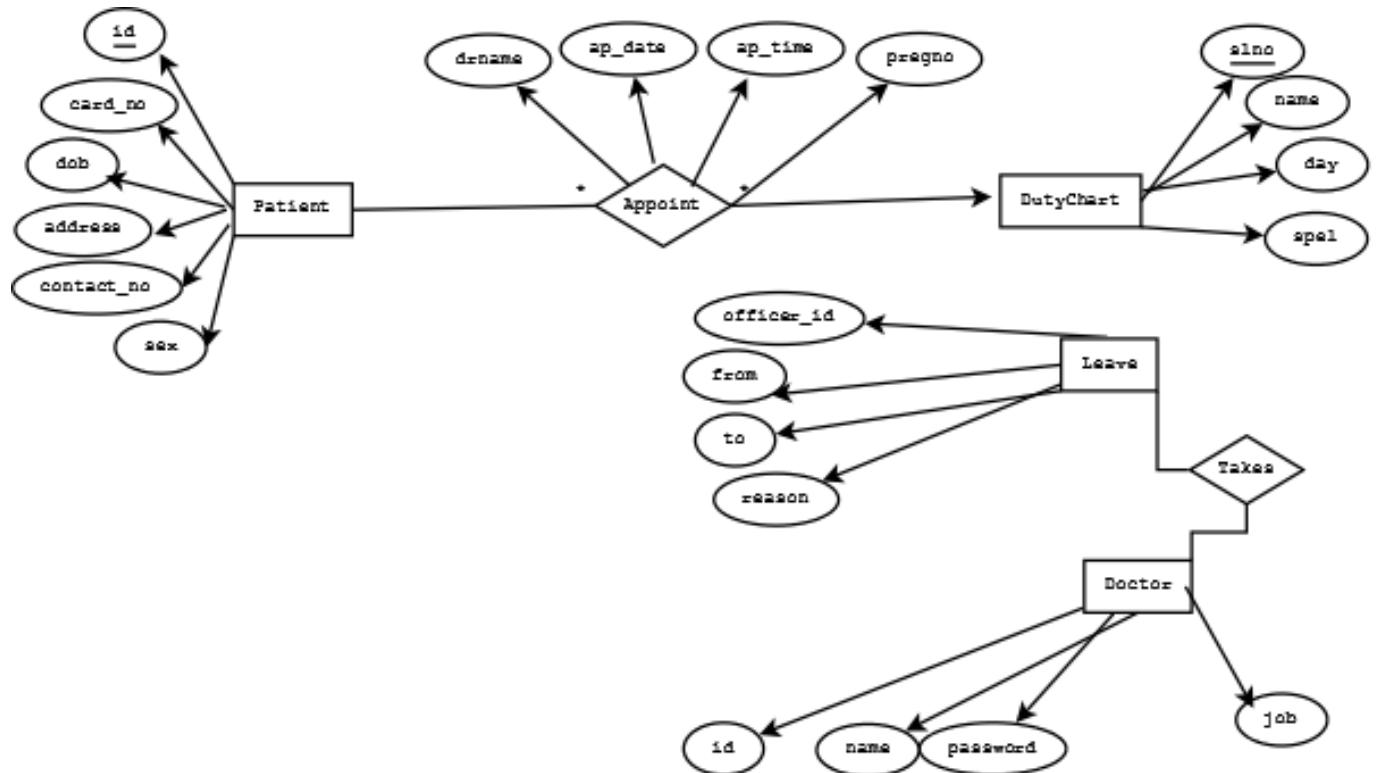


Figure 2: Basic Layout

4.3.3 ER diagram Description

1. Patient and DutyChart are two entities related with the relation Appoint. Patient with the attributes `card_no`, `address`, etc can view the dutychart and accordingly takes an appointment on selected date. DutyChart entity has attributes `slno`, name of doctor, specialisation, and time of duty on a particular day. Patient takes an appointment which is then stored in the Appoint

relational entity. Appoint has attributes docname, ap_date , ap_time , $Regno$.

2. Doctor and Leave are two entities related with the relation Takes. Doctor can take leave which is stored in Leave entity having attributes officer_id, from, to, and reason for leave.
3. User needs to check the medicine availability so another database is provided to check the updated medicine stock status. It contains Medicine name, stock, pharmacist-Id.

4.3.4 Flow Chart

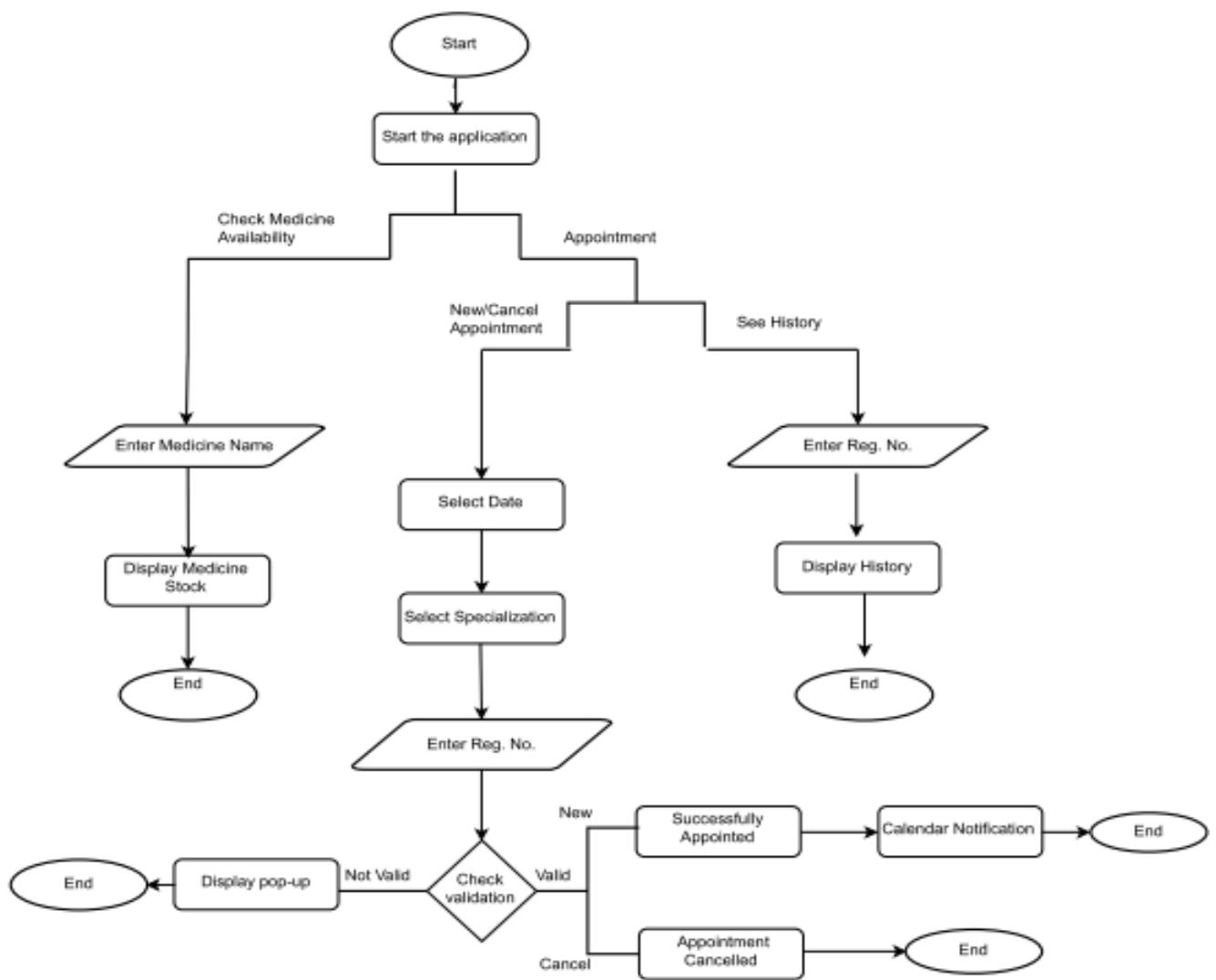


Figure 3: Basic Layout

4.3.5 Flow Chart Description

A flowchart is a type of diagram that represents an algorithm, workflow or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows. This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields.[4]

Description of the flow of the current project is as follows:

The Application starts with an initial activity from which the user chooses between making/cancelling appointment or viewing medicine availability.

1. Check Medicine Availability: If the user chooses to check medicine availability he is directed to another activity. He is required to enter the medicine name in an auto-suggestion textbox. Entering the required medicine displays the total stock available in the dispensary of the required medicine. From here he could go back to the main page or choose to end the application.
2. Appointment: If the user selects the appointment option on the first page he is directed to a whole new activity asking him to choose further between making/cancelling appointment or viewing his appointment history.

If the user selects the appointment option below described flow takes place:

- (a) Select Date : The user initially is required to select a date of his choice to make an appointment or cancel an already booked appointment of that date.
- (b) Select specialisation : The select date section transfers control to another activity that lists the specialisation of doctors available on that date. User could choose a specialisation according to his needs.
- (c) Enter Registration Number/Card Number : This activity requires the user to enter his card number/registration number to make an appointment in his name.

Before confirming the appointment some validation checks have been added. On passing all the checks the a new appointment is made or an existing appointment is cancelled as per user's input.

If the user chooses to see appointment history the below process flow takes place:

- (a) The user is asked to enter his Card/Registration Number and all details regarding his previous or any booked appointments are fetched from the database.
- (b) Finally the history is displayed to the user in a new activity.

Chapter 5

User Interface and Implementations

5.1 Android application:Care4u

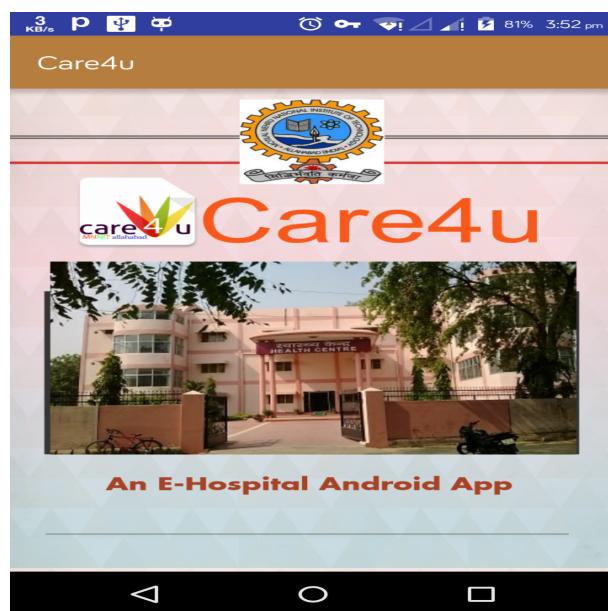


Figure 4: Initial Activity

This is the initial activity which is shown when the app is launched. It is basically a splash-screen, which is a graphical control element consisting of window containing

an image, a logo and the current version of the software. After this, main activity is shown as in figure 4:



Figure 5: Main activity

This activity provides an interface through which user can opt to take doctor appointment or can check medicine availability. The two icons show the buttons through which user can avail the features. These features is described as shown below:

5.1.1 Appointment

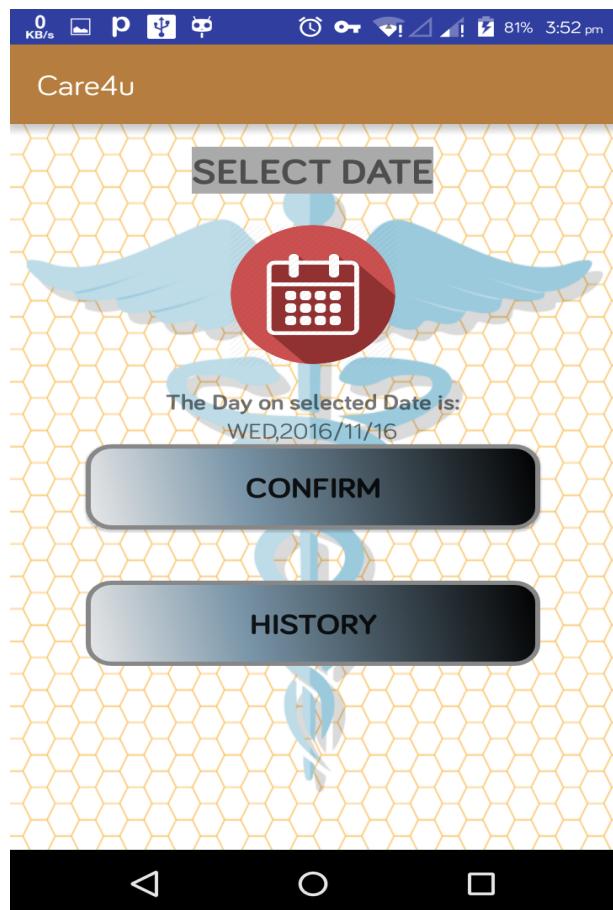


Figure 6: Select_date activity

This activity shows the interface through which an user can select a date on which he/she want to take appointment. This selected date can also be used for cancellation of an existing appointment. This activity also has a feature of history through which user can see its previously appointed doctors and cancel them. These features can be seen in the following figures:

■ New appointment



Figure 7: Select_specialization activity

This activity shows the list of specialization available on the day selected by the user. This list is being fetched by the query running at the back end in MySQL on the basis of doctors specialization available on the selected day. The query uses "dutychart" table created in the database which has the entries of doctor's duty timing details along with the specialization.

Now, the user can select specialization according to his requirement and according to which the list of doctors is viewed on next activity which is discussed in figure 7:

NAME	SPECIALIZATION	TIME
Dr. Sadhana Dwivedi	General Duty Doctor	8 : 00 AM to 10 : 00 AM
Dr. S.Paulson	General Duty Doctor	2 : 00 PM to 4 : 00 PM
Dr. K.K. Singh	General Duty Doctor	4 : 00 PM to 6 : 00 PM
Dr. Puneet Upadhyay	General Duty Doctor	6 : 00 PM to 8 : 00 PM
Dr. Shailendra Mishra	General Duty Doctor	9 : 00 AM to 6 : 00 PM

Figure 8: Duty_chart activity

This activity shows the list of doctors with their name, specialization and time at which they will be available. These entries in this list are displayed after filtering out the doctors who have leave on that particular day. This leave has been checked in PHP file through mySQL query which uses "leave" table and entries of available doctors have come from "dutychart" table according to the selected day and specialization in the previous activities.

Now, the user can select any doctor from the list according to his convenience and take an appointment which is shown in next activity, figure 8:

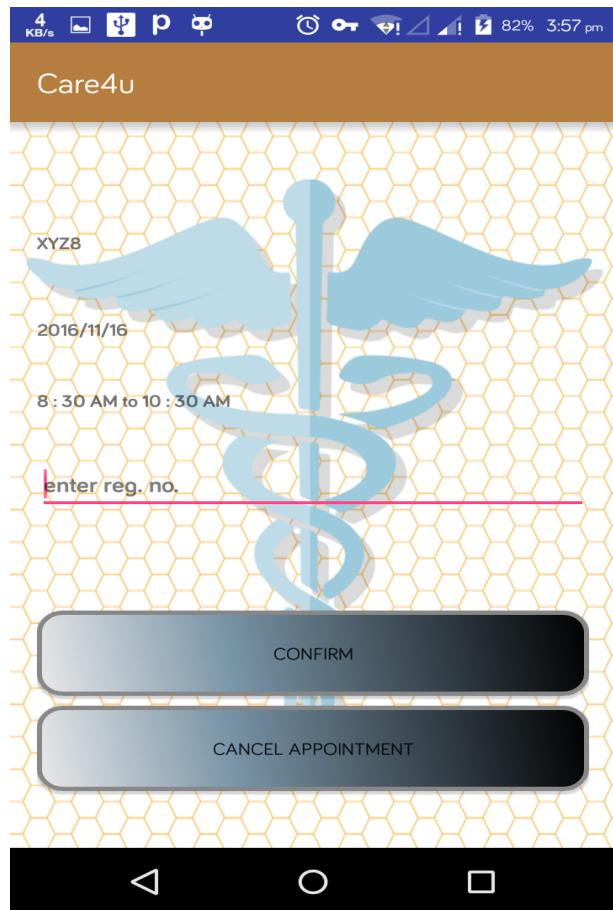
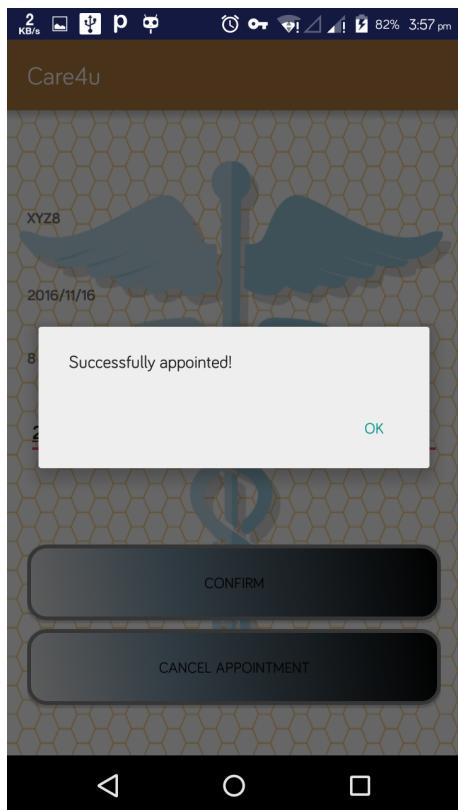


Figure 9: Appoint activity

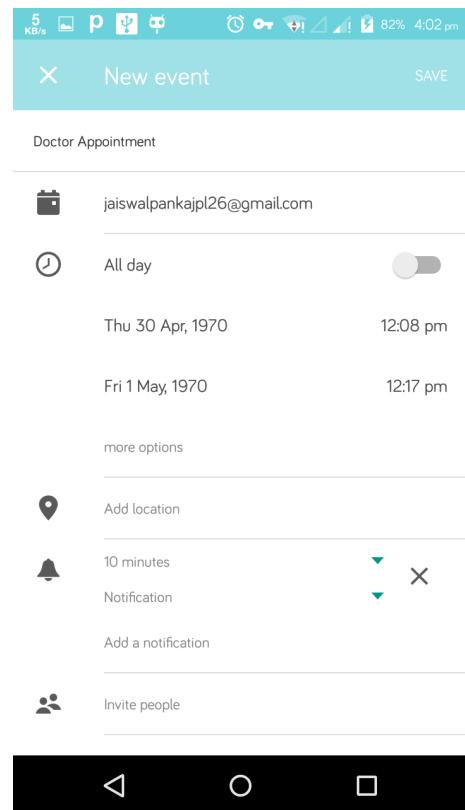
This activity shows the name of doctor, date and time of appointment selected in the previous activities. It has a field of enter card number in which user has to enter his medical card number to take appointment, for students registration number is their card number and specific card number is already given to all the staff and members of institute.

When user has entered his card number and click 'confirm' button, there is validation check at the back end for valid card number and limited appointment entries for the particular doctor at the specified slot of time. If card number is valid and no same appointment has already been done then appointment is successfully done and an appointment entry is inserted in the "appoint" table. There is also a 'cancel appointment' from which user can cancel his previously appointment because

there may be some cases where user takes an appointment but due to some reason, he can't visit the health center so he can use this feature to avail the cancel appointment facility. The user has to enter card number, if it is valid then the appoint entry from "appoint" table will be removed else it will toast "No such appointment". The confirmation for the appointment is shown in next activity:



(a) Successfully Appointed



(b) Calendar

This is the confirmation that user get after successful appointment. It is basically a pop-up that user see that confirms his appointment after which there is a calendar notification stored in the user's smart phone which is basically acts as a reminder for him to visit Health center according to his appointment.

5.1.2 History

DOCTOR NAME	DATE	TIME
XYZ8	2016/11/9	4 : 00 PM to PM
XYZ3	2016/11/15	2 : 00 PM to PM
Dr. Nishant Nigam	2016/11/14	8 : 30 AM to AM
XYZ5	2016/11/18	8 : 00 AM to AM
XYZ9	2016/11/16	6 : 00 PM to PM
XYZ8	2016/11/16	8 : 30 AM to AM
XYZ10	2016/11/16	3 : 30 PM to PM
Dr. Sadhana Dwivedi	2016/11/17	8 : 00 AM to AM
Dr. S.Paulson	2016/11/18	2 : 00 PM to PM
Dr. K.K. Singh	2016/11/23	4 : 00 AM to PM

Figure 11: Show history activity

This activity shows the history of appointments taken by a particular user. He has to only enter his card number and according to that the complete appointment entries done by that particular user is shown here each specified with doctor name, date and time of appointment.

5.1.3 Medicine availability

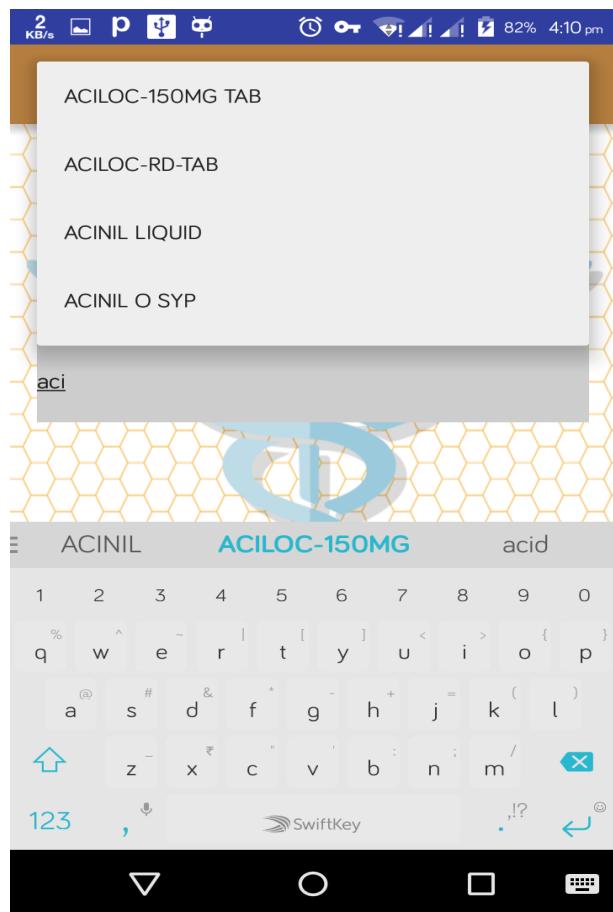


Figure 12: Search_medicine activity

This activity gives facility to user of searching current available stock of any medicine. It also gives appropriate suggestions of medicines names according to search letters of user. The complete back-end for this activity is done with the help of 'cpdr_current_stock' in database and a PHP query which fetches the data of medicine stock.

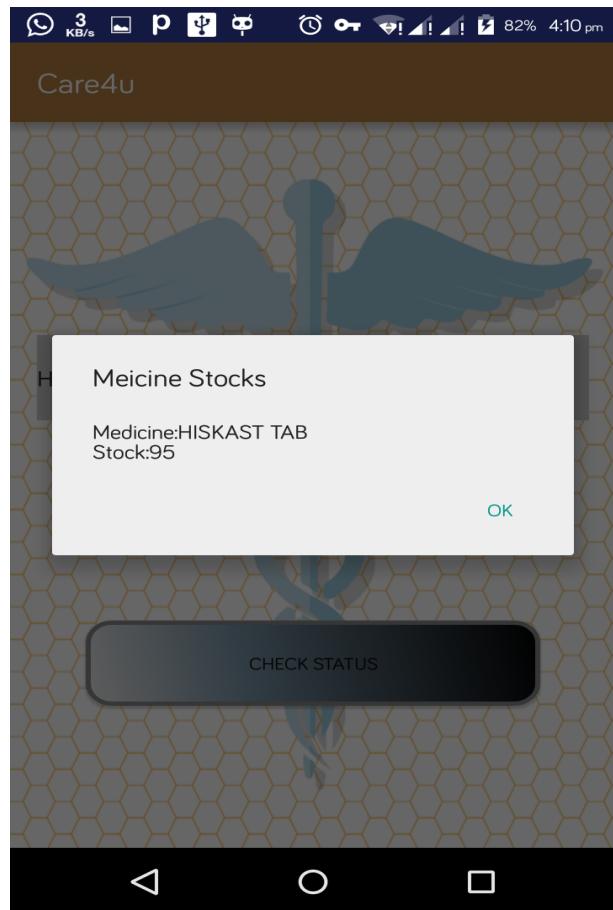


Figure 13: Medicine_stock activity

This activity shows the available current stock of medicine search by user in previous activity. A PHP query gives stock of input medicine as a result and this is shows as a pop-up in activity.

5.2 Website for Institute Health Centre



Nov 2016						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Figure 14: Homepage

This is the homepage of website of Institute Health Center. It has various features such as "Quick view" of availability of doctors on a particular day, complete dutychart of all doctors, taking new appointment, check medicine availability, etc. This website is mainly focussed for those people who don't have a direct access to android mobile phones. The appointment interface is described in figure 14:

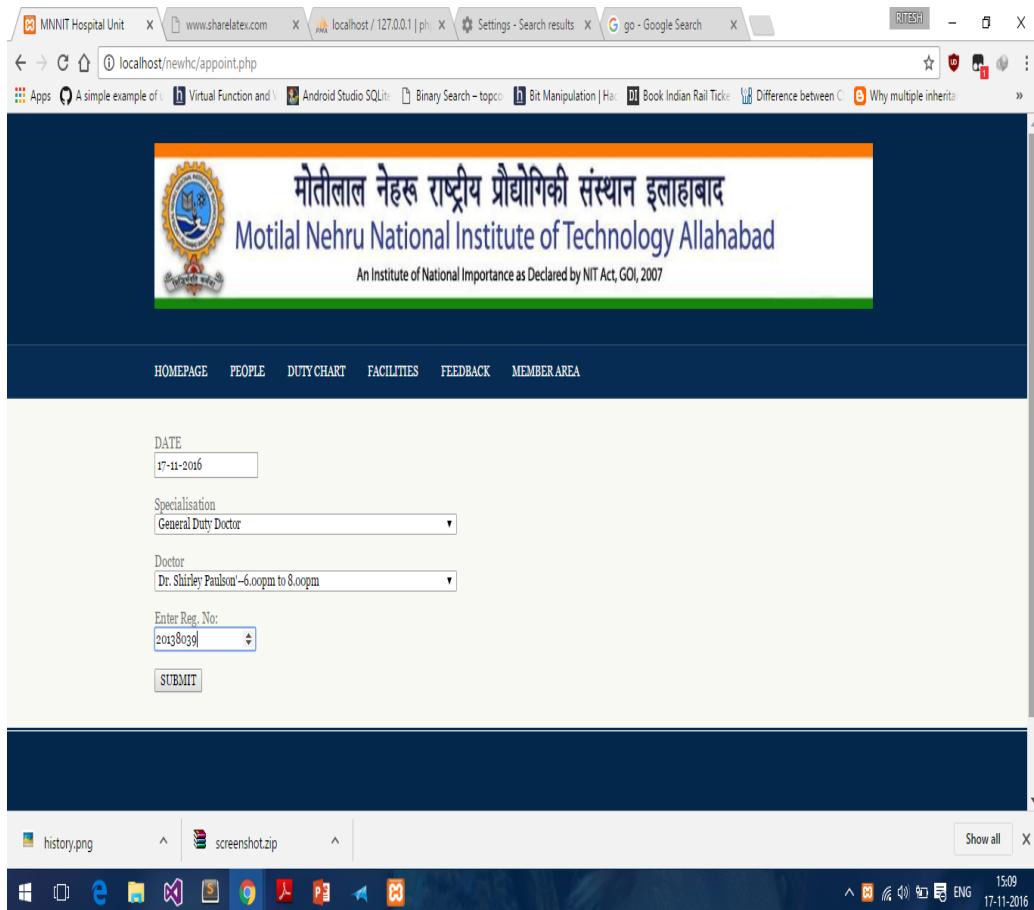


Figure 15: Appointment page

This page is mainly designed for user taking new appointment. First, user has to select a date from the calendar on which he wants to take an appointment. After selecting a date, there will be list of specialization of doctors available on that day. After selecting a specialization, there will be list of doctors of the selected specialization available after filtering out all the doctors who is leave on the day. Then, user has to enter his card number, if card number is valid the doctor is successfully appointed.

For this functionality, Ajax, Javascript, PHP has been used at front end while for database query, MySQL is used.

Sno	Name	Speciality	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Availability
1	Dr. Shailendra Mishra	Medical Officer Incharge	9.00am to 12 noon	XXX	9.00am to 11.00am	details				
2	Dr. Shirley Paulson	General Duty Doctor	6.00pm to 8.00pm	11.00am to 1.00pm	XXX	details				
3	Dr. Sadhna Dwivedi	General Duty Doctor	4.00pm to 6.00pm	XXX	11.00am to 1.00pm	details				
4	Dr. Karunesh Kumar Singh	Homeopathic Medicine	9.00am to 11.00am	XXX	details					
5	Dr. Sanjay Baranwal	Ayurvedic Medicine	4.00pm to 6.00 pm	XXX	9.00am to 11.00am	details				
6	Dr. Puneet Upadhyay	Dentist	2.00pm to 4.00 pm	XXX	9.00am to 11.00am	details				
7	Dr. Nadeem Javed	Dentist	4.00pm to 6.00pm	9.00am to 11.00am	XXX	details				
8	Dr. Nishant Nigam	Skin	8.30am to 10.30am	XXX	8.30am to 10.30am	XXX	8.30am to 10.30am	XXX	XXX	details
9	Dr. Avinash Jaiswal	Orthopedic Surgeon	XXX	XXX	4.00pm to 6.00pm	XXX	XXX	XXX	9.00am to 11.00am	details
10	Dr. S. K. Agarwal	ENT Surgeon	4.00pm to 6.00pm	XXX	XXX	4.00pm to 6.00pm	XXX	XXX	XXX	details
11	Dr. R. N. Mehrotra	Pediatrician	2.30pm to 4.30pm	XXX	XXX	2.30pm to 4.30pm	XXX	XXX	XXX	details
12	Dr. Pushkar Nair	Psychiatrist	XXX	4.00pm to 6.00pm	XXX	XXX	4.00pm to 6.00pm	XXX	XXX	details

Figure 16: Dutychart

The above Duty Chart page gives weekly schedule of all the doctors in the Institute Health Centre. It displays the doctor's specialization along with his Institute Hospital visiting timings on respective days. Doctor's unavailability on a given day is marked using 'xxx' under that day. The availability column on clicking for a particular doctor gives the necessary details of that doctor.

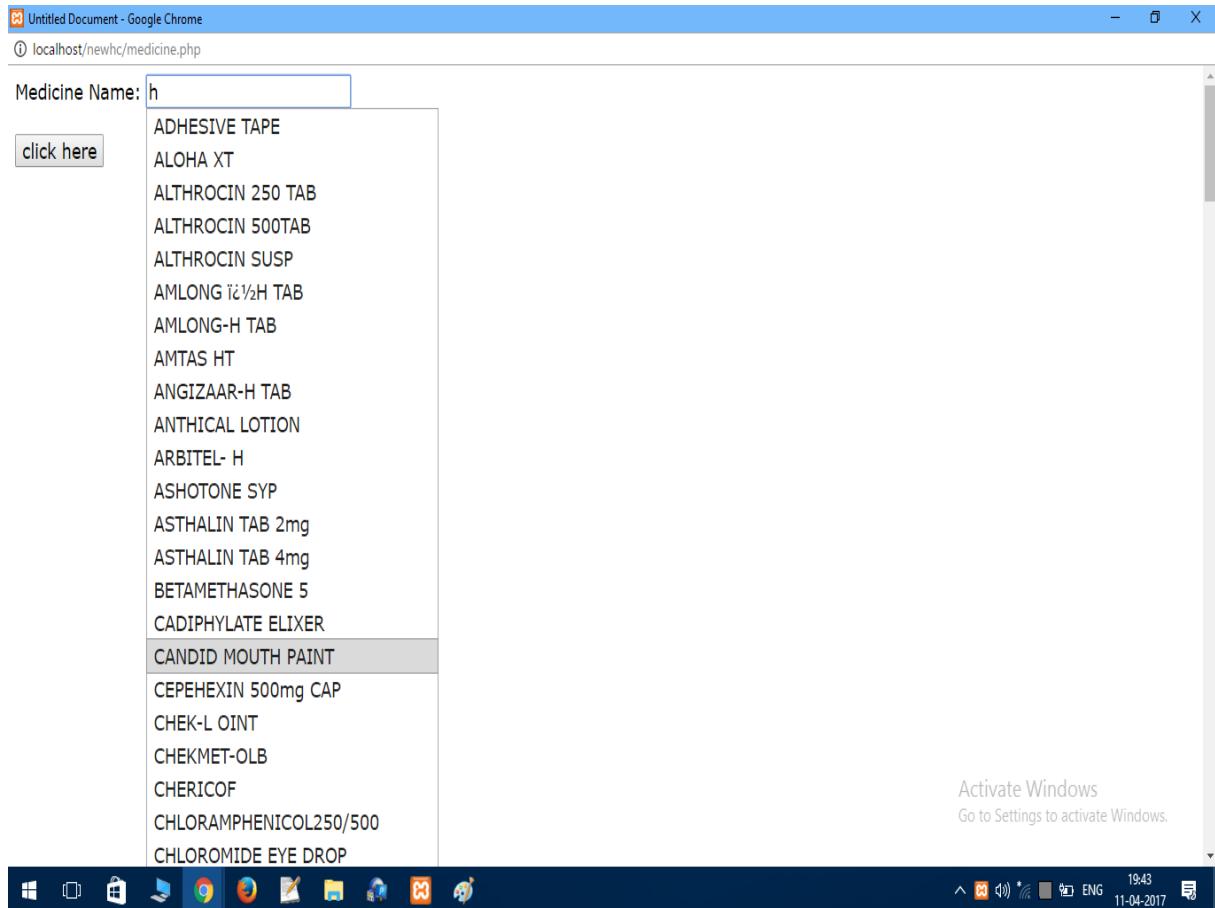


Figure 17: Medicine search

The website provides the user a facility to view the medicine records. A new window pop up opens after clicking on the Medicine Availability on the top of the page. This window consists of an Autosuggestion text-box . User could enter the medicine name or even parts of the complete name, the serach box gives a drop down with all the medicine names with matching substring entered by the user. The required medicine name could be selected and the Search button provided below the box is clicked to know the complete medicine stocks available with the pharmacists in the Institute Health Centre.

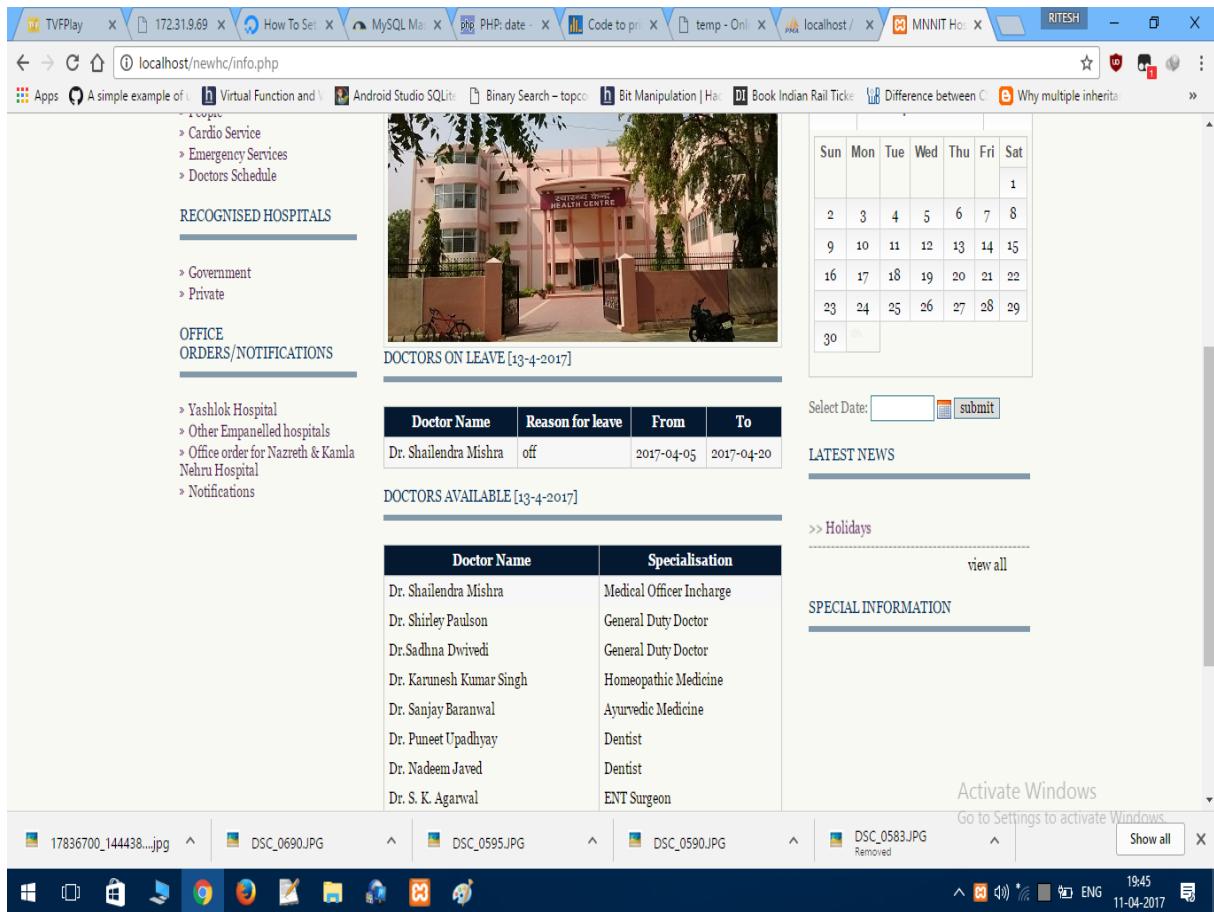


Figure 18: Doctor availability

The Website provides a useful feature of viewing the complete list of doctors available in the Institute Health Centre and the ones on leave. The required date could be selected by the user from the calendar interface provided on the home-page. On clicking the submit button the required list of doctors along with their specializations is displayed.

Chapter 6

Accessibility

6.1 Android App Accessibility

1. Android application is successfully launched and runs with the help of a institute global server.
2. For large scale accessibility, it has also been offered by 'MNNIT WORKSPACE' on largest global application platform 'GOOGLE PLAYSTORE'.
3. Other then these platforms the Android application has also been made available on 'Slideme.org' , 'getjar' .
4. Keywords like MNNIT, MNNITHealthCentre and Care4U can be used to search for the App on above mentioned platforms.

6.2 Institute Hospital Website Accessibility

1. The website has been successfully hosted globally and could be accessed from anywhere.
2. DNS entry for the website is present in the global server that makes it accessible under the domain name "hc.mnnit.ac.in".
3. It provides a user friendly interface and one could use it without any guidance.

4. The website is compatible with most of the popular browsers including Google Chrome and Firefox.
5. It is both browser and mobile friendly and could be easily accessed from both.

The Institute Health Centre currently uses a Web Portal to maintain data of appointments, check ups, medicines available/dispensed. There was no provision for the patients to manage their appointments or view medicine related information. Our project is more patient oriented and aims at providing some useful features to its user (i.e. patients of the Institute Health Centre). The Android Application 'Care4U' and the Institute Health Centre website developed under our project MN-NITHealthCare is easily available to all and anyone (authorised to use the facilities) could enjoy the facilities made available through it.

Chapter 7

Results

7.1 Discussion

We have successfully developed the Android Application 'Care4U' to serve the purpose of easily managing doctor appointments based on ones choice of date, specialization and doctor and viewing medicine stocks. Other useful features like cancelling booked appointment and adding calendar notifications for appointments depending on user's will have also been successfully implemented. A history section is available to view the required information on booked appointments. All necessary checks like validating the user Card number, Selection of valid dates, avoiding duplicate appointments, limit the number of appointments in a given time slot for a given doctor have been taken care of. Care4U is available on 'GOOGLE PLAYSTORE', 'Slideme.org' and 'getjar' and could be downloaded free of cost to enjoy the provided services.

Institute Health Centre website has been successfully modified to include additional features as that of 'Care4u' i.e. doctor appointment on given date under desired specialisation, viewing available and unavailable doctors on a particular date, viewing medicine stocks . Another useful feature of viewing the entire duty chart of the Institute Hospital has also been provided through which all required details of a particular doctor could also be obtained. The website is hosted globally under the domain name "hc.mnnit.ac.in".

Both 'Care4U' and the website uses a common database. To ensure consistency of information, Database replication has been applied to between the project's database and the database of Institute Health Centre.

7.2 Limitations And Challenges

1. There is no user Log_In facility with a password corresponding to each Card number, hence anyone can make an appointment for any person.
2. No facility of a printed confirmation of appointment is available to the user to prove booking in case of discrepancy.
3. Complete duty chart can be viewed through the website. The android application 'Care4u' gives filtered results of only available doctors on a particular day.
4. The database being consisting of too many tables with complicated references, writing the correct SQL query with desired output was time taking and required keen observation.
5. The date saved in calendar for appointment was wrong initially due to date parsing problems.
6. We faced problems in cancel appointment feature because of some remaining error checks and nature of the return value of DELETE SQL command.
7. Transferring the Android Application onto the same database as that of the website was time consuming as most of the SQL queries initially written had to be modified according to the new database.
8. Global hosting of the website posed a lot of problems .Missing IP table rules have to be added and new global IP had to assigned many times. Changing permission of the /etc folder caused problems in starting linux on the server which was later fixed.

9. Hosting Care4U on 'GOOGLE PALYSTORE' took a lot of effort because the default package name used during project development was not acceptable and changed back to the default name each time we uploaded the APK.
10. Master Master Replication between the project's database and Institute Health Centre database required going through the PHP files of another web portal used at the Health Centre to find out the actual tables to replicate, hence required a lot of time and hard work.

7.3 Future Scope

The product that we have developed has great intellectual as well as commercial value. We could develop a user profile with proper Log.In facility and maintain his complete medical history. In the medical history section patient could have a look at the doctors he had visited , their time and date along with the entire prescription and tests that were prescribed to him. Along with this a facility to link the application with the hospitals that carry out these tests could be provided to refer the patient to that hospital and book an appointment directly through the application on doctor's referral and the results could be send to the patient through this application only.

In the Doctor Log.In application developed during the 6th semester we could have a thumb impression detector so that his actual time of arrival and leave could be recorded and displayed as active inactive in the dutychart of Website and Care4U.

The android application could also be extended to work for any general Hospital requiring these kinds of facilities. This could be used as a blueprint and features could be customised according to the needs.

Chapter 8

Conclusions

Over all experience of taking up this project was truly amazing. In a short span of time we could learn the technical aspects of developing a stable, secure and device adaptive Android Application and integrating it with a database in MySQL. We also learnt the working of the Institute Hospital and how information flows through the system. This project gave us an experience to handle the nitty gritties of implementation, interaction with eternal experts of different fields. Understanding the domain aspect, the scope of this service, user(students) perspective and interface, and working as a team to always supporting each other have been the most rewarding experiences. The technical knowledge gained was also immense.

References

- [1] APACHE_FRIENDS. <https://www.apachefriends.org/index.html>, 2016. [Online; accessed 22-Sept-2010].
- [2] AVI SILBERSCHATZ, HENRY F KORTH, S. S. *The Database System Concepts*. McGraw-Hill.
- [3] GOOGLE. <https://developer.android.com/reference>, 2016.
- [4] WEBSITE. <http://www.w3schools.com/>, 2016. [Online; accessed 22-Aug-2008].
- [5] WEBSITE. <http://stackoverflow.com/questions/tagged/android-studio>, 2016. [Online; accessed 22-Sept-2016].
- [6] WIKIPEDIA. https://en.wikipedia.org/wiki/Digital_healthcare, 2016. [Online; accessed 19-Aug-2016].

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