# My Doctor: Dynamic Scheduling and Communication

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# Declaration

We, hereby declare that this thesis is based on results we have found ourselves. Materials of work from researches conducted by others are mentioned in the reference. This thesis, neither in whole nor in part, has been previously submitted for any other degree or any other publication. All the implementation has been and functionalities been used are done by ourselves.

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We would like to express our gratitude to Almighty Allah who gave us the opportunity, determination, courage, patience in hard times and strength to complete our work.

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# Abstract

Our proposition is to make an online system which will appoint a doctor to a patient dynamically and patients can speak with specialists over on the web. In today’s world on the off chance that somebody needs to take an arrangement to a specialist needs to go to hospital or clinic physically and then make the arrangement. This devours valuable time of the patient. Additionally, if the specialist crosses out his/her calendar, the patient does not come to know about it unless he/she goes to the center. Other than this, individuals living in significant urban areas have access to quality specialists yet have to struggle because of the absence of extra time and substantial congested road. However, individuals living in rural areas don't have legitimate medical support inside their range. To minimize the issue, we are attempting to build up an online system where patients can have quality medical administration from qualified specialists everywhere throughout the nation. Specialists will straightforwardly communicate with the patient through chat server. Furthermore, the system will be a stage for new specialists. The specialist will come to know a number of patients he needs to consult in the entire day. Our system "My Doctor" will eliminate the receptionist’s paperwork. We have utilized data compression to lessen the amount of data stored in the system. Past records are being saved into the patient's profile from where he/she can reappoint a previously consulted doctor.

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# Chapter 1

# Introduction

In the age of information, we have access to almost every necessity that’s needed to go on with our day-to- day lives. With the help of modern technology, we are now able to access almost everything within a very short period of time. We have access to almost all of the information of the world. Along with better performance, modern technology is also very much focused on saving time in the process. As it is evolving it is focusing more on getting the same or more amount of work done but in a smaller time frame. Technology has a huge contribution to medical sciences as well but still it hasn’t really brought the medical world “to us” as it has many other things. People still do not have a quicker medical access, so they have to rush to the hospital every time they are under the weather seeking consultation. This consumes a lot of time because of traffic and waiting in the line for an appointment etc. also especially in third world countries like Bangladesh itself, we do not have sufficient qualified doctors all over the country. So if someone comes down with a sickness their options are to either rely on the medical services they have near them which may or may not be useful or go to a place where they might find qualified medical assistant which can be time-consuming as well as very costly or in some cases unaffordable for many people. Our system “My Doctor” is designed based on these particular problems. It is a specially designed system that will eliminate the need to rush to the hospital for the smaller medical issues. Through the system, patients will have the ability to access professional medical consultation by just taking a few short moments to fill up an online information form to set an appointment with a doctor for both online consultation and physical if the consultant deems it necessary. Patients will also have the option to upload personal documents such as previous report cards, tests etc. Our system is based on the thought that people from all around the world may have access to better and faster medical assistants. Implementation of a special algorithm will allow the system to search and sort through the doctor’s schedule and manage the appointments accordingly. Doctors and patients will interact with each other online chatting which will be controlled by a central server. To get the best performance from the database advanced OLTP has been used. After the consultation period, the records will be stored for future requirement. Furthermore, there is also an online pharmacy available 24/7 will allow users to purchase their medication from. However purchasing drugs from the pharmacy will require prescriptions.

## 1.1 Objectives:

- The user can search for any specific specialty of doctor and a doctor will be dynamically appointed on the desired date.
- If any patient needs to take an appointment with a doctor with whom he/she consulted previously, all the records of the previous appointments will be saved in the system from where the patient can reappoint the desired doctor.
- Doctor can look every single past report of a patient in the event that he/she has taken an arrangement. Past information will be shown with respect esteem, which will be gathered from a legitimate and solid source.
- The doctor can prescribe medicine after communicating with the patient through chat server.
- The doctor can prescribe client to another specialist and make a plan from his board.
- Secure enrollment and login prepare for a client of the site. Single patient record data is utilized for both arrangement and drug store buy exchange. Account secret word will be kept scrambled. After all work in the database is done association will be kept close.
- Neither specialist nor patient can see each other's subtle elements. While they are associated they will have a perspective of id and no other individual data will be unveiled.
- Data ought to be kept covered up and very much encoded so regardless of the possibility that there is a rupture none of the information will be bargained.
- The system will be able to handle a huge number of users at the same time.

## 1.2 Motivation:

Individuals living in town don't have medicinal offices inside their range. To wipe this issue there exist some online social insurance framework. Those administrations are for the most part static and wellbeing web journals and just specialists contact databases. Utilizing those web journals individuals can find out about different wellbeing tips, yet there were not very many administrations who really offered online specialist counseling administrations.

In our thesis, we propose an online human services framework where the patient can specifically speak with a specialist through online talk framework. There will be an online enlistment process, planning and rescheduling process for the patient for their further arrangement. Last yet, not the minimum there will be a protected and secure installment strategy in our framework.

## 1.3 Emergence of online doctoring:

In the 2000s, many individuals came to regard the web as to begin with, or possibly a noteworthy, the wellspring of data and communication. Health counsel is presently the second-most famous subject, after obscenity that individuals look for on the internet. With the coming of broadband and video conferencing, numerous people have swung to online specialists to get online discussions and buy professionally prescribed medications. Utilization of this innovation has many favorable circumstances for both the specialist and the patient, including cost investment funds, convenience, accessibility, and enhanced protection and correspondence.

In the US, a recent report found that hunting down data on a solution or over-the-counter medications was the fifth most famous pursuit theme, and a recent report found that 4% of Americans had acquired professionally prescribed meds on the web. A 2009 overview led by Geneva-construct Health In light of the Net Foundation discovered one-in-ten Europeans purchases pharmaceuticals from sites and 33% claim to utilize online discussion. In Germany, roughly seven million individuals purchase from mail-arrange drug stores, and mail-arrange deals represent around 8–10% of aggregate pharmaceutical deals. In 2008, the Royal Pharmaceutical Society of Great Britain reported that roughly two million individuals in Great Britain were frequently acquiring pharmaceuticals on the web (both with a solution from enrolled online UK specialists and without medicines from different sites). A late overview dispatched by Pfizer, the Medicines and Healthcare items Regulatory Agency, RPSGB, the Patients Association and HEART UK found that 15% of the British grown-ups asked had purchased a remedy just solution on the web.

# CHAPTER 2

# Literature Review

There are some existing services that can be related to our thesis. Those services are mostly static and health blogs or doctors contact database. Only Grameenphone Health Care service provides direct communication with the doctor but is very time restricted and they don't keep records of patients so if a person needs help for the second time or more they have to start fresh. Since we have all the history and records in order to provide the best service, our system is more useful and easy for both long term and short term patients.

## 2.1 Grameenphone Health Care Service:

We explored on Grameenphone social insurance framework and came to realize that with the assistance of Telenor wellbeing, they have propelled a free wellbeing administration named "TONIC". To guarantee the prosperity of the general population of Bangladesh. It will bring an all-inclusive strategy of remaining great. Tonic individuals will get free wellbeing tips, a free markdown of healing centers and moderate access to the specialists through their cell phone. [24]. In our framework, we likewise have informing framework what's more with this we additionally keep free wellbeing tips to the patients who have selected once. Grameenphone social insurance framework gives medicinal services to the patients, however, the administration is accessible just for one session. On the off chance that any patient wishes to get back to for a criticism, they need to begin from the underlying point. Another detriment of Grameenphone medicinal services administration is that they never keep records of the patients for what's to come. As a result of that the patients who get treatment from a particular specialist first time never get him/her for the second time or more. Two specialists might not have recommended the same drug for similar illnesses. Along these lines, the patient frequently experiences legitimate treatment. Here, in our venture we need to build up a database framework where we will keep every one of the records, for example, specialist's name, patient's name, arrangement date, installment, next arrangement alongside standard test outcomes. This makes it simple to keep track for a patient in his/her next arrangement. In GP human services framework there is one framework that if any GP client is a star subscriber he/she will get privileged to get an appointment earlier. But in our system, we do not have any discrimination. Those who will log in to our system first will get the appointment first.

## 2.2 Doctorla:

We did our examination on Doctorla a notable site in our related field and accumulated learning that they just keep specialists list in their framework and in the booking page they have the specialist's name, regular checkup date, time and accessible territory they utilize Google outline this [25]. Be that as it may, in doctorola.com we don't locate any second arrangement framework in their framework. They likewise don't have any framework for the patients to contact the specialists straightforwardly. They do have a line number that is 16484 (Everyday 8.00am to 10.00pm). In any case, one can never get to the specialists specifically through that number. In our framework, one can get to the specialist specifically through online talk server. They additionally don't keep any record of the patient. Be that as it may, in our framework we will have a patient profile in our database with every one of the records and separate going by logs. To make our venture one of a kind and more supportive and also valuable here, we plan to set an online visit server through which patient can converse with the specialist from the remote corner of our nation utilizing the web. We likewise have wanted to execute a video talking framework in our venture by which patient can counsel with the specialists specifically, which we never find in of the current human services framework.

## 2.3 Webhealthcenter:

Websites like Webhealthcentre [26] and pinkwhalehealthcare [27] likewise offers social insurance administrations. Subsequent to concentrate those destinations we found that they likewise give quite a comparative kind of care like Grammenphone social insurance and doctorola.com to the patient. In any case, the fundamental disadvantage is that none of them give the second arrangement as this is the principal need of our venture. Among all the social insurance framework we never discover any framework that they give Ambulance. In any case, in our venture, we will have a framework that will let the patient know the briefest separation of accessible Ambulance in they require in crisis. This is one of one of the kind parts of our venture.

## 2.4 BDhealth:

We surfed on the BDhealth and discovered that they give medicinal services like the various wellbeing association however in more valuable and sorted out the way. They have every one of the specialists booking and arrangement framework like others, crisis administrations, sound living tips and hotline number [28]. Be that as it may, as other social insurance online journals they additionally don't have any second arrangement framework and direct correspondence with the specialists for the patients. An immediate correspondence over the telephone can spare a patient's part in time and comfort which is the primary worry of our venture.

# Chapter 3

## System Specification

System specification describes all the system structure and process. In this section, we will discuss how will build the system and develop with which algorithm and software or process.

### 3.1 CSP:

A CSP issue incorporates a few factors, and legitimate values for those factors (we call it space of the factors) and struggles tables. We should discover an answer to allot qualities to every one of the factors and those qualities must fulfill the contention tables. CSP issue is known as NP-finish issue. We can't locate a polynomial time calculation until we can demonstrate P=NP, however, we've built up some calculation to quicken the procedure to discover the arrangement of CSP [3].

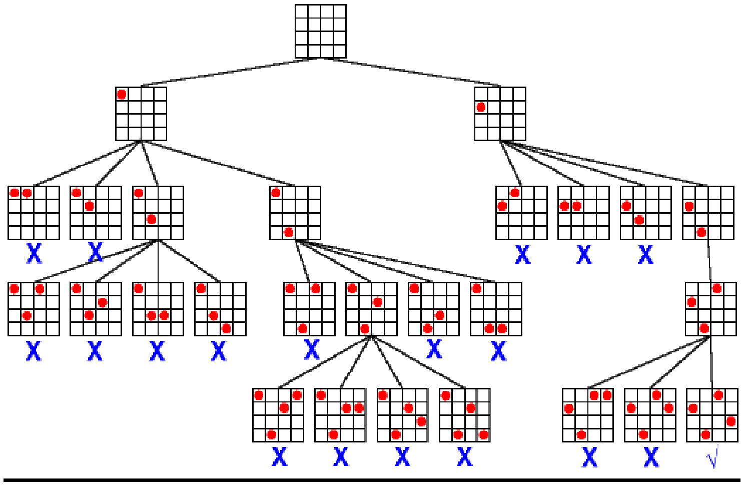

**Figure 3.1: CSP Algorithm**

## 3.2 OLTP:

Online Transaction Processing is a data framework sort that organizes exchange preparing, managing operational information. This sort of PC frameworks is recognized by the huge number of exchanges they bolster, making them the best to address online application. The primary utilizations of this technique are all sort of value-based frameworks like databases, business, healing facility applications etc. Just, these frameworks accumulate input data and store them in a database, on a vast scale. The vast majority of today's applications depend on this communication technique, with executions of the concentrated or decentralized system. [13]

## 3.3 XAMPP:

XAMPP is a free open source cross-platform web server which is developed by “Apache Friends”. It consisting of “Apache HTTP Server, MariaDB database” and interpreters for scripts written in PHP and Perl. XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). Because of the advantage of lightweight, it is easy to create a local web server for testing and deployment purpose. It has everything to set up a web server. XAMPP is also cross-platform for this it equally works on Linux, Mac, and Windows. It makes easy to the transitioning local test server to live server. [2]

**Figure 3.2: Logo of XAMPP**

## 3.4 PHP:

PHP is a server-side scripting dialect essentially intended for web advancement reason. It is basic, practical, question situated and intelligent. PHP remains for Personal Home Page. It was composed by Rasmus Lerdorf in 1994 and later on created by The PHP Development Team. PHP is to a great extent utilized dialect to create sites. It can be inserted into HTML code and can be utilized a blend of various types of web layouts and system [14]. Thus, we have utilized the most recent rendition of PHP 7.1.0 to construct our theory extend.

**Figure 3.3: Logo of PHP**.

## 3.5 HTML 5:

HTML remains for Hypertext Markup Language. It is the most standard markup dialect for making pages and sites. Utilizing CSS (falling Style System) and JavaScript, HTML shapes the premise of World Wide Web. Consideration of CSS characterizes the standpoint and design of the substance and the incorporation of JavaScript control the conduct of the substance. HTML components resemble building squares of HTML pages. HTML directions are depicted by HTML labels, for example, <img/> and <input/>. The most recent form of HTML (HTML5) was distributed on 28 October 2014 by the World Wide Web Consortium (W3C) [5]. We have utilized the most recent rendition HTML5 as a part of our venture.

**Figure 3.4: Logo of HTML5**

## 3.6 MySQL:

MySQL is fundamentally an open-source social database administration framework. It is the world's most natural open-source database. It was established by Widenius and Axmark in 1994 and created by a Swedish organization MySQL AB. For its superb execution, demonstrated unwavering quality and convenience, it has turned into the world's driving database decision to web designers. Numerous prominent Web Companies including Facebook, Gmail, Twitter, YouTube, Yahoo thus on like this utilization the MySQL database framework [1]. We likewise utilized MySQL database to build up our system.

**Figure 3.5: Logo of MySQL**

## 3.7 000WebHost:

00Webhost is a free web facilitating space that is being utilized all through the world. A free site facilitating is a non-paid facilitating administration that gives constrained advertisements on to the supporter's site. For the most part gives a sub-space or a catalog. It is protected, free and simple to dispatch site. Along these lines, we have utilized 000WebHost for starting testing of our venture.

**Figure 3.6: Logo of 000WebHost.**

## 3.8 Mozilla Firefox:

Firefox is a Web program that is littler, speedier, and in some ways more secure than the Mozilla program from which a lot of its code was initially inferred. Contrasted with Internet Explorer, the most well-known Web program, Firefox gives clients a cleaner interface and quicker download speeds. Firefox incorporates the vast majority of the elements with which clients of different programs are recognizable. The primary emphasis of the program additionally incorporated a few new elements different programs did not have at the time, for example, a bookmarks toolbar and selected perusing that permit a client to rapidly switch forward and backward between a few Web destinations. Different programs have since received a considerable lot of these components, however, Firefox's significant engineer base keeps on making new modules that offer expanded convenience and usefulness. Since scripting controls, for example, Java and ActiveX can without much of a stretch be unselected amid establishment, there is the likelihood of better security [15].

**Figure 3.7: Logo of Mozilla Firefox**

## 3.9 Google Chrome:

Google Chrome program is an open source program for getting to the World Wide Web and running Web-based applications. The Google Chrome Web program depends on the open source Chromium extend. Google discharged Chrome in 2008 and issues a few overhauls a year. It is accessible for Windows, Mac OS X, Linux, Android and iOS working frameworks. The Google Chrome program adopts a sandboxing-based strategy to Web security. Every open site keeps running as its own particular procedure, which averts pernicious code on one page from influencing others (or the PC working framework on the loose). The program additionally bolsters Web models, for example, HTML5 and falling templates (CSS) [12] .

**Figure 3.8: Logo of Chrome**

## 3.10 Ajax:

Ajax (Asynchronous JavaScript and XML) is a technique for building intuitive applications for the Web that procedure client asks for promptly. Ajax consolidates a few programming devices including JavaScript, dynamic HTML (DHTML), Extensible Markup Language (XML), falling templates (CSS), the Document Object Model (DOM), and the Microsoft protest, XMLHttpRequest. Ajax permits content on Web pages to upgrade instantly when a client plays out an activity, not at all like HTTP ask for, amid which clients must sit tight for a radical new page to stack. For instance, a climate estimating site could show nearby conditions on one side of the page immediately after a client sorts in a postal division [16].

**Figure 3.9: Logo of AJAX**

# Chapter 4

# System Architecture

In this section, we discuss system architecture which will describe our system flow, actors, entities, coordination. ER diagram and Activity diagram will describe the full design of the system and flow of the system.

## 4.1 Use case diagram:

A use case diagram is a graphic depiction of the interactions among the elements of a system. A use case is a methodology used in system analysis to identify, clarify, and organize system requirements [17].

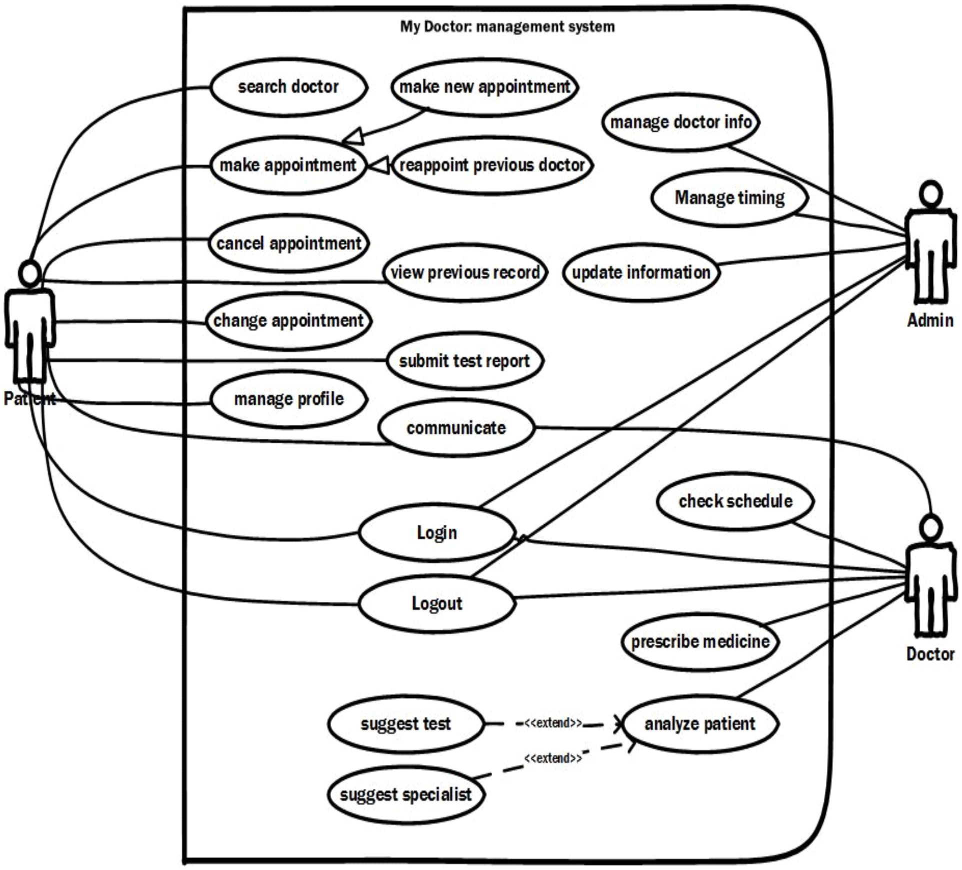

**Figure 4.1: Use Case Diagram**

Here in our system, there are three actors who will be able to access the system. They are an admin, doctor, and patient. All of them will have to log in with appropriate information. Admin will be able to see all the information and activity of the system. He can also update any information including adding or discarding a doctor and timing slot modification. The doctor will be able to check the timing and the information about the patient he is being assigned to. Doctor and patient will communicate through an internal chat server [18]. If any test or specialist in other sector is needed the doctor can also suggest that to the patient otherwise he will prescribe medicine accordingly. Doctor and patient will be able to update their personal information. After logging in the patients will be able to select any specific medical sector and request for an appointment. He can either a new specialist or choose the previous one with whom they already consulted.

## 4.2 ER model:

ER-modelling is a data modeling technique used in software engineering to produce a conceptual data model of an information system. Diagrams created using this ER-modelling technique are called Entity-Relationship Diagrams, or ER diagrams or ERDs. So we can say that Entity Relationship Diagrams illustrate the logical structure of databases [20].

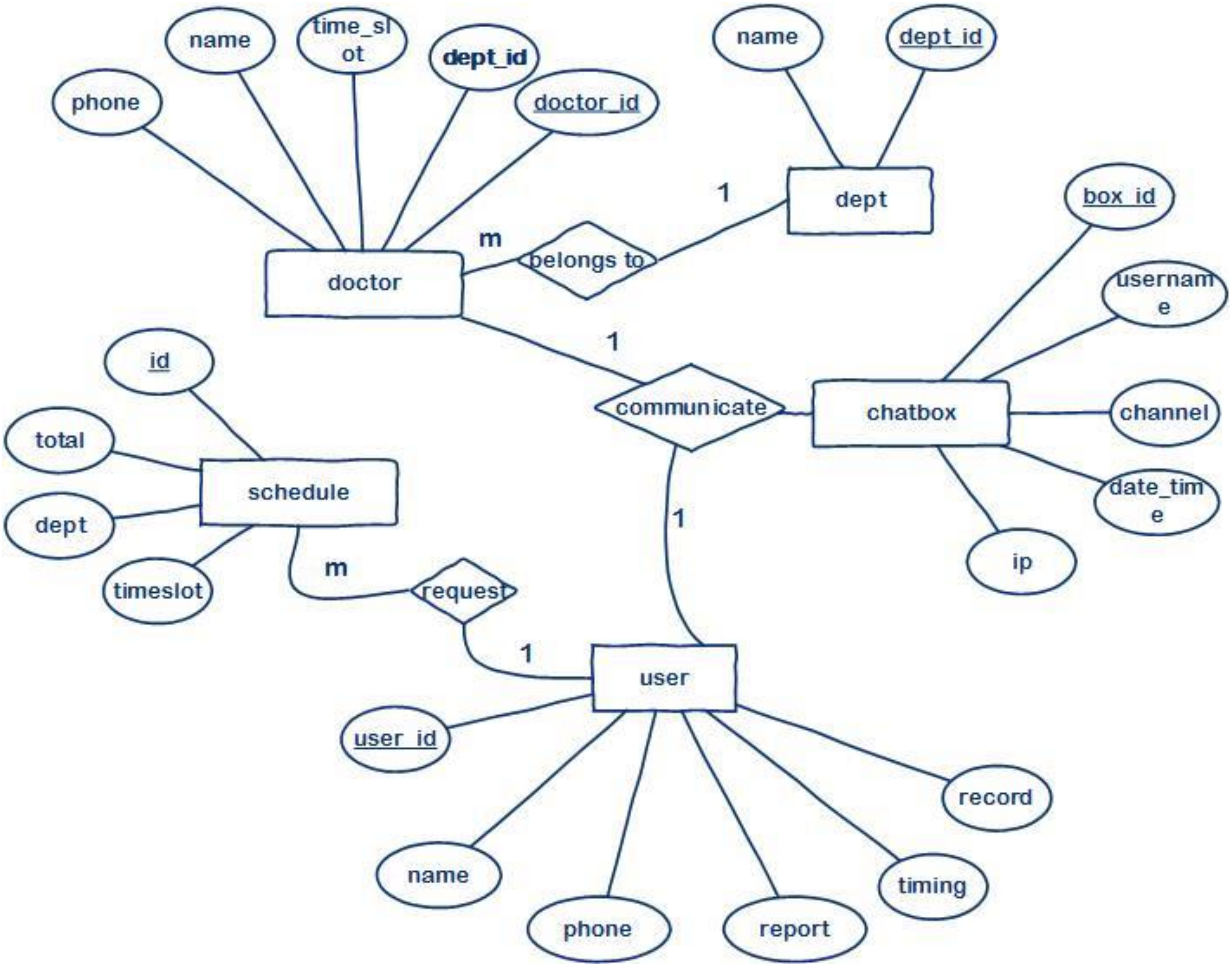

**Figure 4.2: ER Model**

In the system we developed, we used this database model shown above. Here, there are five main tables in our database. Those are a doctor, user, schedule, dept (department) and chatbox. User and doctor table contains all the information about the user and doctor accordingly. Both of the tables have a specific id for doctor and user which is automatically generated when inserted a new record into the database. Dept table will contain the information about which doctor is of what specialty. Every doctor belongs to some department and one department can have more than one doctor. Chatbox table is used for maintaining the communication among the doctor and the patient. Schedule table keeps all the data about timing. This table has an array of time slots allocated for any appointment which keeps track of all the available and booked slot. It can also provide the information about which doctor have more appointment and which doctor have less in order to make balance the load more efficiently.

## 4.3 Activity Diagram:

An activity diagram is used to model a large activity's sequential workflow by focusing on action sequences and respective action initiating conditions. The state of an activity relates to the performance of each workflow step [21].

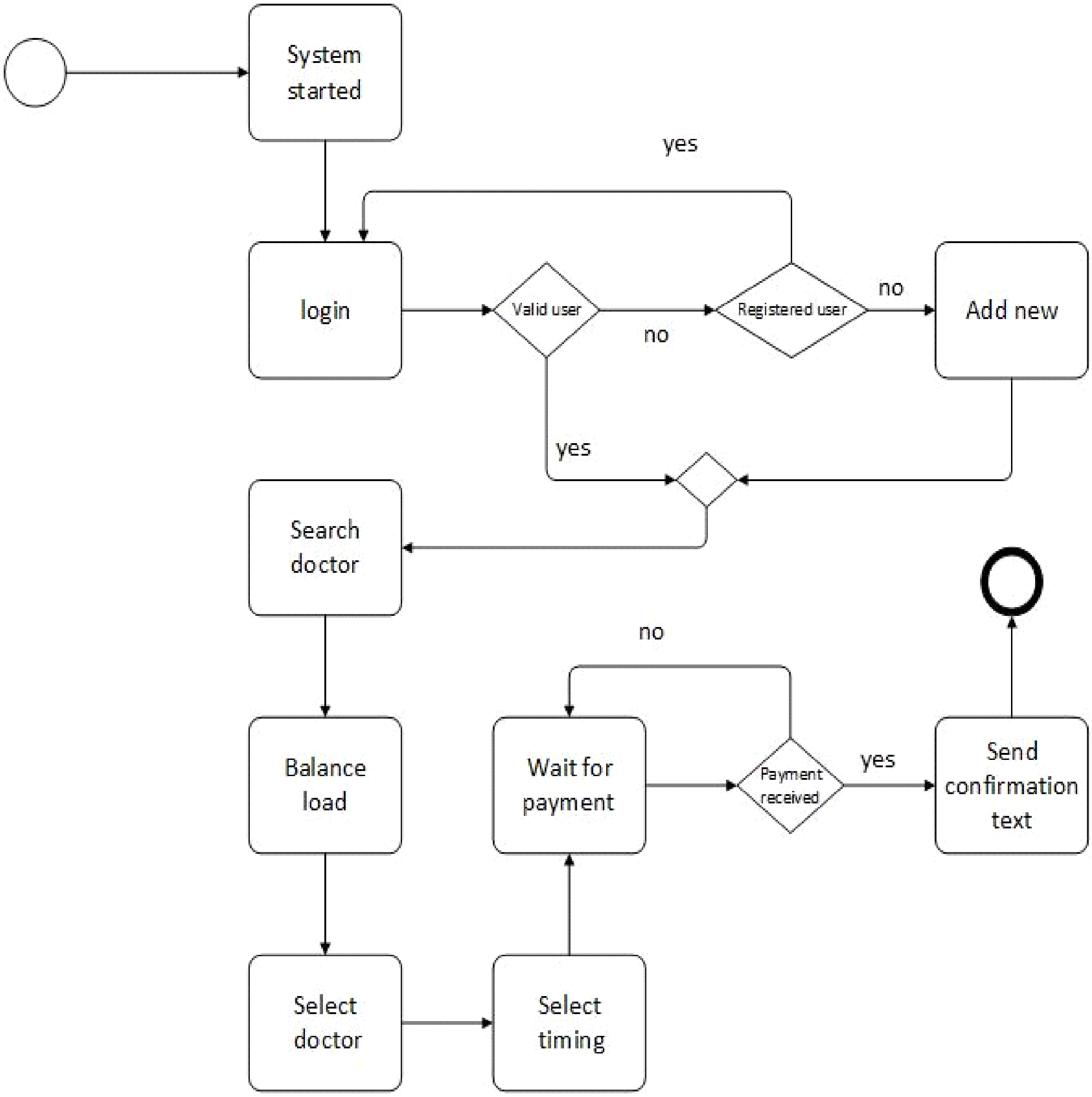

**Figure 4.3: Activity Diagram**

After the system is started which is triggered by the user by entering into the system, the system will ask the user to log in. If the user is not registered previously the system will navigate the user to the registration option. After verification, the user will be able to search for the specialist as their interest from the availability options given by the system. When the user selects his specifications the system runs an algorithm to balance the load among the doctors and select one from the available pool and a time slot for the meeting. After this process is done it will till the payment is done. When the system gets the confirmation of payment it sends a confirmation notification to the user through text. At the scheduled time the user will be able to communicate with the assigned doctor [22].

# Chapter 5

# Implementation

The system we are trying to build here is actually based on dynamic scheduling and searching. We have researched several algorithms for the efficiency of scheduling. Finally, we got our desired solution from Constraint Satisfaction Problem (CSP) algorithm. Here each of the constraint checks individually for the best case. We implemented the algorithm using PHP for merging with web language. Algorithm took data from the database and start the searching for scheduling. Searched results showing on the user interface to confirm user appointment. For communication between doctor and patient, there is a chat server where the doctor can create rooms and prescribe patient.

## 5.1 Database:

The database design is based on ER diagram. It contains all the patient and doctor records and all appointment history of each individual patient. For scheduling doctor time it contains a table for each day. All kind of files which that are to be uploaded by patients or doctors will be stored in this database. For keeping the database lighter all large file like images or patient reports are to be kept on the server or cloud storage [19].

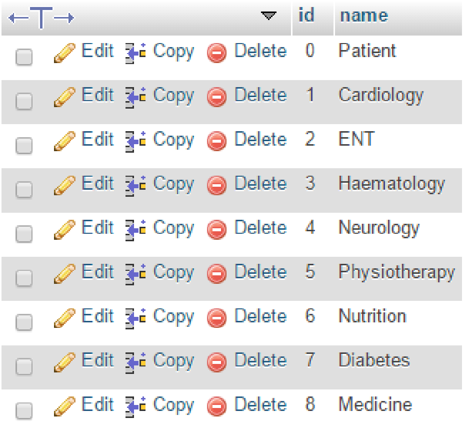

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**Figure 5.1: Department Table**

This is the department table of the database which can handle the specialty of a doctor. Each department has a unique id which helps it to separate from other.

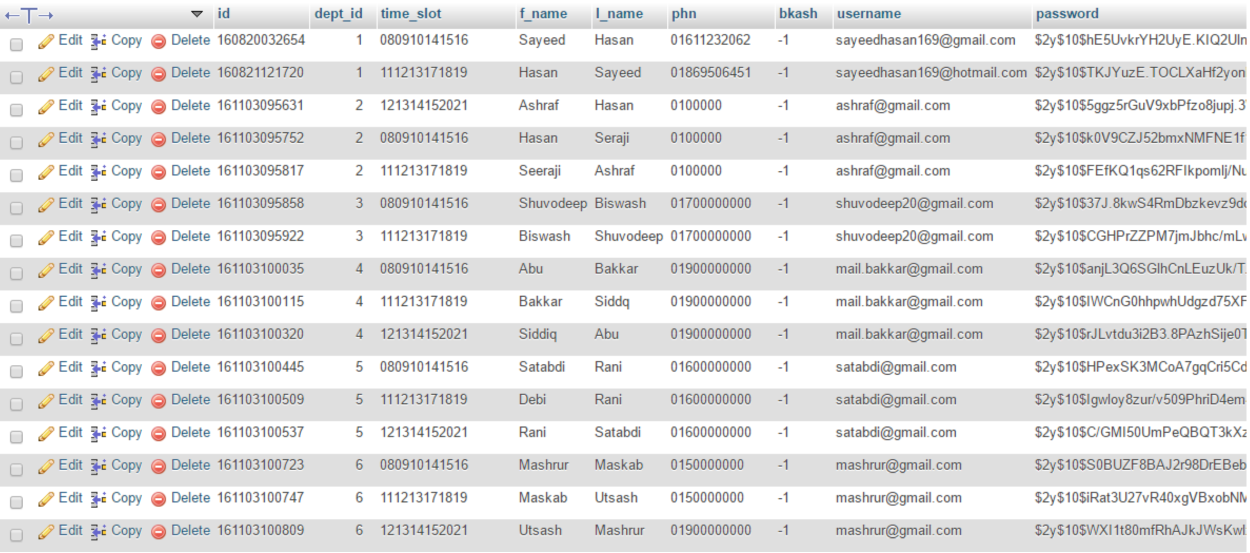

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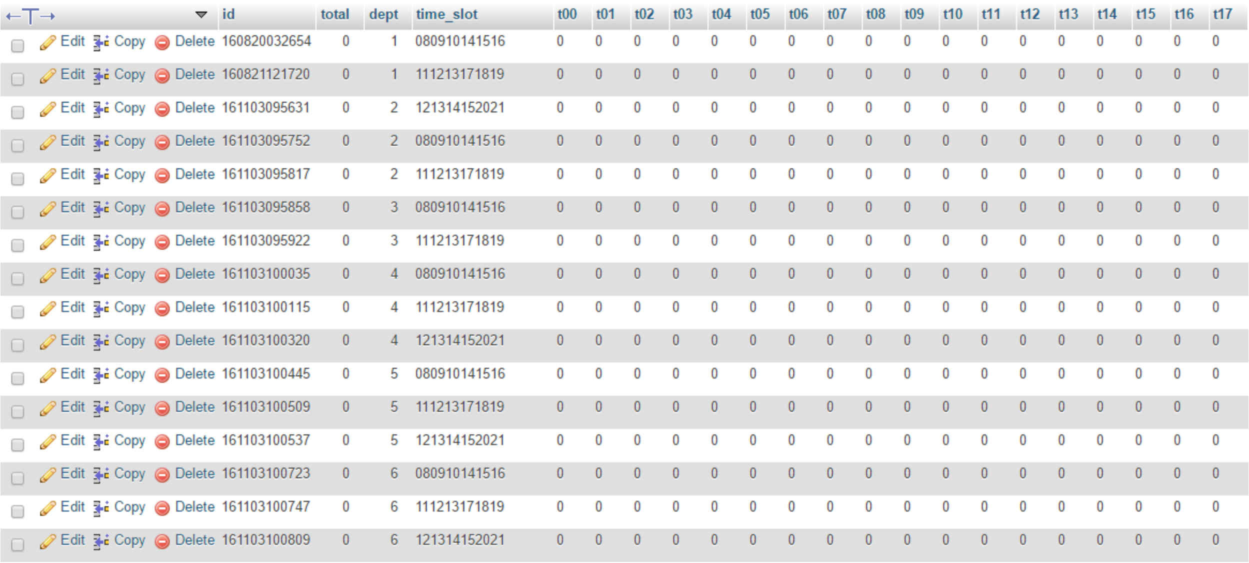
**Figure 5.2: Doctor Table**

This table contains all the information about the doctor. A registered patient will be saved here and for the doctor, it is manual because of the doctor verification. Doctor register system can make a possibility of a fake doctor, so only certified doctor will give service here. In this table patient have a different id from others, so the doctor can easily find the patient provided information by searching. For security issue, all the password are get encrypted so that no one can change the password except the user. Email should be on email format otherwise, the system will show the error that email is wrong. Doctor is separated by their department id, each id defines different specialty.



| ←T→ ▼ | id | total | dept | time_slot | t00 | t01 | t02 | t03 | t04 | t05 | t06 | t07 | t08 | t09 | t10 | t11 | t12 | t13 | t14 | t15 | t16 | t17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| □ Edit Copy Delete | 160820032654 | 0 | 1 | 080910141516 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 160821121720 | 0 | 1 | 111213171819 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103095631 | 0 | 2 | 121314152021 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103095752 | 0 | 2 | 080910141516 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103095817 | 0 | 2 | 111213171819 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103095858 | 0 | 3 | 080910141516 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103095922 | 0 | 3 | 111213171819 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103100035 | 0 | 4 | 080910141516 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103100115 | 0 | 4 | 111213171819 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103100320 | 0 | 4 | 121314152021 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103100445 | 0 | 5 | 080910141516 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103100509 | 0 | 5 | 111213171819 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103100537 | 0 | 5 | 121314152021 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103100723 | 0 | 6 | 080910141516 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103100747 | 0 | 6 | 111213171819 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| □ Edit Copy Delete | 161103100809 | 0 | 6 | 121314152021 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

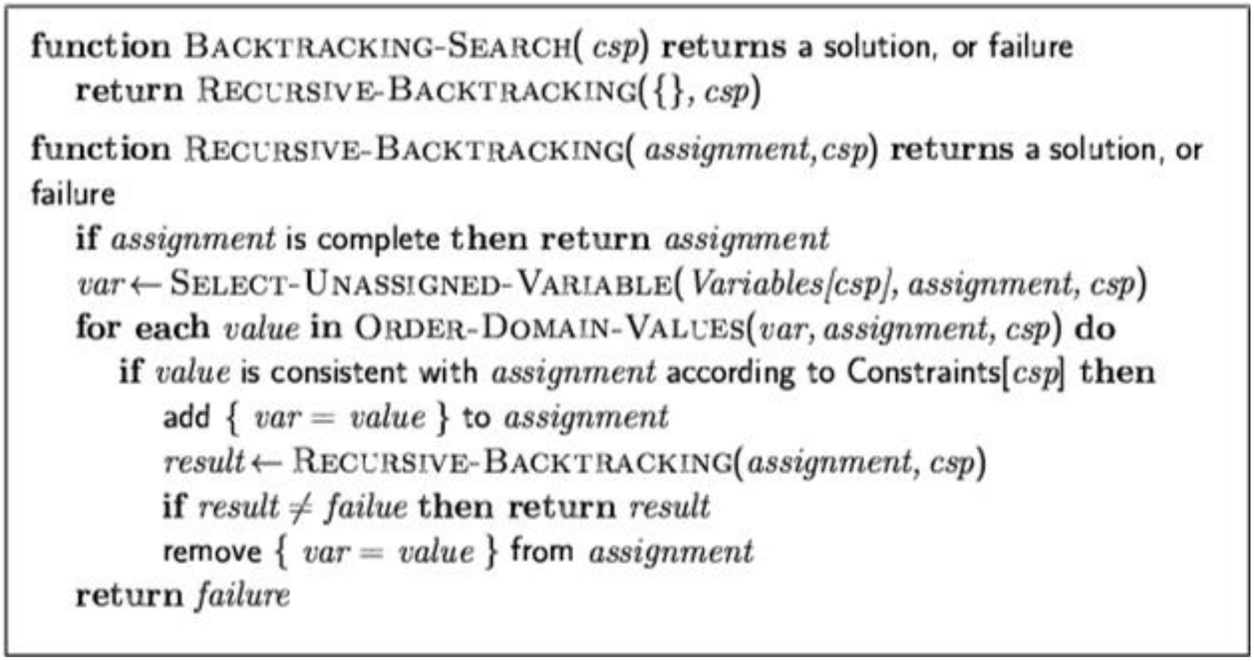
**Figure 5.3: Schedule Table**

On this table, for each doctor, there is a 24-time slot. Initially, this time slot is 0 if a doctor gets an appointment then the patient id will be set on their automatically. It is the table for a whole day. Time difference between the slots is 1 hour. This table contains all the information about scheduling, which doctor have the appointment, when the appointment scheduled and who appointed the doctor.

## 5.2 CSP (Constraint Satisfaction Problem):

Generally, CSP Algorithm has more power than a standard search algorithm. Constraints specifying allowable combinations of values for subsets of variables. Backtracking search is the basic uninformed algorithm for CSP, Depth-first search for CSPs with single-variable assignments is called backtracking search.

The Backtracking algorithm can be easily extended to backtrack to the conflicting variable and, thus, to incorporate some form of look-back scheme or intelligent backtracking. Nevertheless, this adds some additional expenses to the algorithm and it seems that preventing possible future conflicts is more reasonable than recovering from those [4].



```
function BACKTRACKING-SEARCH( csp) returns a solution, or failure
   return RECURSIVE-BACKTRACKING({}, csp)
function RECURSIVE-BACKTRACKING( assignment,csp) returns a solution, or
failure
   if assignment is complete then return assignment
   var ← SELECT-UNASSIGNED-VARIABLE( Variables[csp], assignment, csp)
   for each value in ORDER-DOMAIN-VALUES(var, assignment, csp) do
      if value is consistent with assignment according to Constraints[csp] then
         add { var = value } to assignment
         result ← RECURSIVE-BACKTRACKING(assignment, csp)
         if result ≠ failue then return result
         remove { var = value } from assignment
   return failure
```

**Figure 5.4: Algorithm for Backtracking**

Forward checking is the easiest way to prevent future conflicts. Instead of performing arc consistency to the instantiated variables, it performs restricted form of arc consistency to the not yet instantiated variables. We speak about restricted arc consistency because forward checking checks only the constraints between the current variable and the future variables. When a value is assigned to the current variable, any value in the domain of a "future" variable which conflicts with this assignment is temporarily removed from the domain. The advantage of this is that if the domain of a future variable becomes empty, it is known immediately that the current partial solution is inconsistent. Forward checking allows branches of the search tree that will lead to failure to be pruned earlier than with simple backtracking. Note that whenever a new variable is considered, all its remaining values are guaranteed to be consistent with the past variables, so the checking an assignment against the past assignments is no longer necessary.

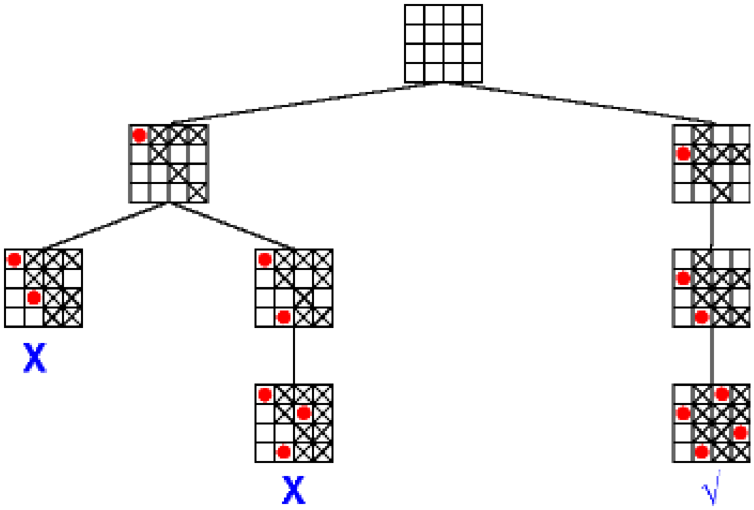


**Figure 5.5: Forward Checking Diagram**

Forward checking detects the inconsistency earlier than simple backtracking and thus it allows branches of the search tree that will lead to failure to be pruned earlier than with simple backtracking. This reduces the search tree and the overall amount of work done. But it should be noted that forward checking does more work when each assignment is added to the current partial solution.

**To apply CSP:**

- States with unsatisfied constraints
- Randomly select any conflicted variable
- Pick value that violates the fewest constraints
- Total number of violated constraints

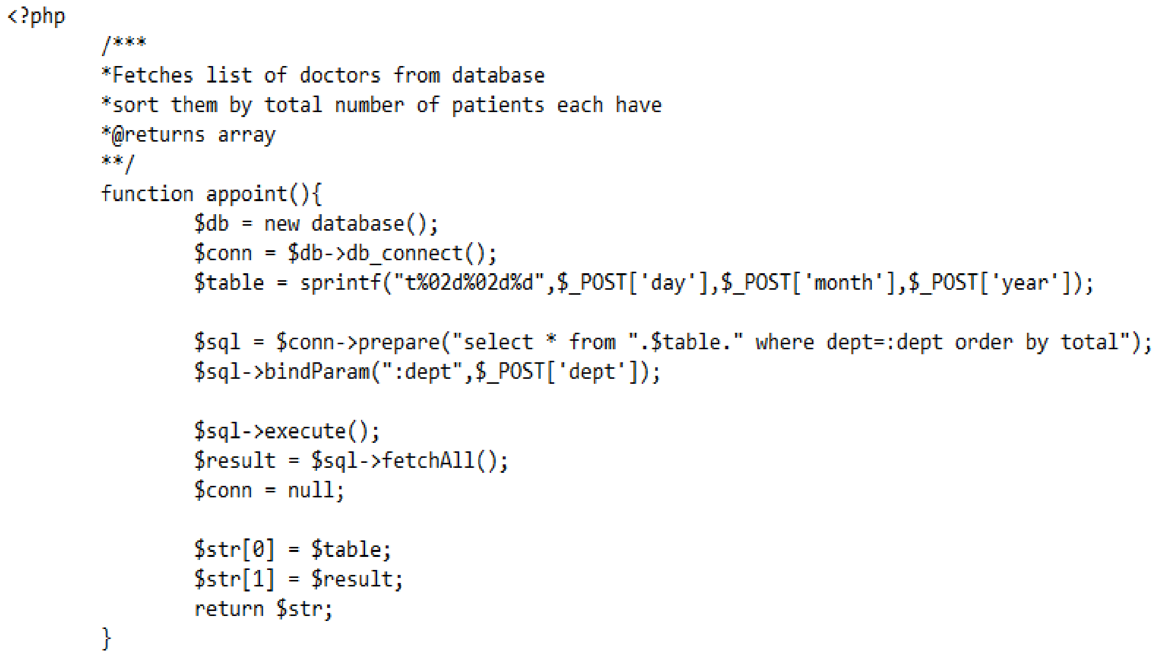
In CSP states defined by values of a fixed set of variables and goal test defined by constraints on variable values. Variable ordering and value selection heuristics help significantly. Forward checking prevents assignments that guarantee probable future failure. Constraint propagation does additional work to constrain values and detect inconsistencies.

## 5.3 Reason for using CSP:

In our project, we tried to implement a system which will appoint a doctor for a patient based on the doctor's specialty, selected date of the patient, the doctor's free schedule and best possible time for the patient. It contains multiple constraints to search simultaneously and need backtracking for the best possible way.

## 5.4 Code Implementation:

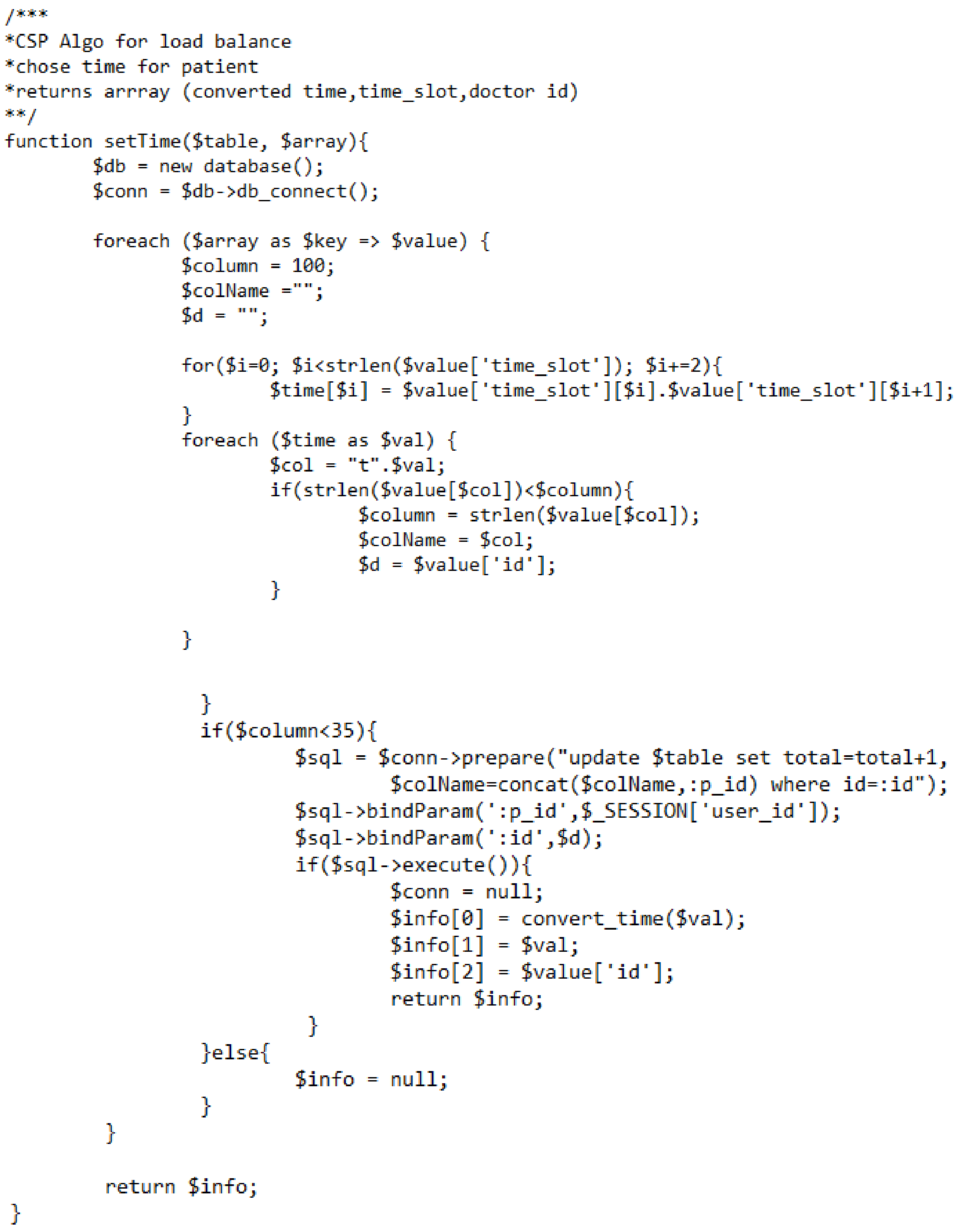
Firstly it fetches the list of doctors from the database then sorts them by the total number of patients.



```
<?php
        /***
        *Fetches list of doctors from database
        *sort them by total number of patients each have
        *@returns array
        **/
        function appoint(){
                $db = new database();
                $conn = $db->db_connect();
                $table = sprintf("t%02d%02d%d",$_POST['day'],$_POST['month'],$_POST['year']);

                $sql = $conn->prepare("select * from ".$table." where dept=:dept order by total");
                $sql->bindParam(":dept",$_POST['dept']);

                $sql->execute();
                $result = $sql->fetchAll();
                $conn = null;

                $str[0] = $table;
                $str[1] = $result;
                return $str;
        }
```

**Figure 5.6: Code for Fetch**

Then it balances the doctor's busy schedule from individual specialty, the number of patients each doctor has and free slots. It chooses the best possible slot for the patient and appoints it.



```
/***
*CSP Algo for load balance
*chose time for patient
*returns arrray (converted time,time_slot,doctor id)
**/
function setTime($table, $array){
        $db = new database();
        $conn = $db->db_connect();

        foreach ($array as $key => $value) {
                $column = 100;
                $colName ="";
                $d = "";

                for($i=0; $i<strlen($value['time_slot']); $i+=2){
                        $time[$i] = $value['time_slot'][$i].$value['time_slot'][$i+1];
                }
                foreach ($time as $val) {
                        $col = "t".$val;
                        if(strlen($value[$col])<$column){
                                $column = strlen($value[$col]);
                                $colName = $col;
                                $d = $value['id'];
                        }

                }

                  }
                  if($column<35){
                          $sql = $conn->prepare("update $table set total=total+1,
                                  $colName=concat($colName,:p_id) where id=:id");
                          $sql->bindParam(':p_id',$_SESSION['user_id']);
                          $sql->bindParam(':id',$d);
                          if($sql->execute()){
                                  $conn = null;
                                  $info[0] = convert_time($val);
                                  $info[1] = $val;
                                  $info[2] = $value['id'];
                                  return $info;
                           }
                  }else{
                          $info = null;
                  }
         }

         return $info;
 }
```

**Figure 5.7: Code for Load Balance and Scheduling**

# Implementation of User Interface:

To develop a standard user interface we compute HTML, CSS and JavaScript code and merged them.

## 5.5 HTML:

Hypertext Markup Language (HTML) is a simple markup language used to create hypertext documents that are platform independent. HTML documents are SGML documents with generic semantics that are appropriate for representing information from a wide range of domains [7]. HTML markup can represent hypertext news, mail, documentation, and hypermedia, menus of options, database query results and simple structured documents with in-line graphics and hypertext views of existing bodies of information [6].

## 5.6 CSS:

Cascading Style Sheets (CSS) is the language for describing the presentation of Web pages, including colors, layout, and fonts. It allows one to adapt the presentation to different types of devices, such as large screens, small screens, or printers. CSS is independent of HTML and can be used with any XML-based markup language. The separation of HTML from CSS makes it easier to maintain sites, share style sheets across pages, and tailor pages to different environments [8].

## 5.7 JavaScript:

JavaScript is Netscape's cross-platform, object-oriented scripting language. Core JavaScript contains a core set of objects, such as Array, Date, and Math, and a core set of language elements such as operators, control structures, and statements. Core JavaScript can be extended for a variety of purposes by supplementing it with additional objects [11]. Client-side JavaScript extends the core language by supplying objects to control a browser and its Document

Object Model and Server-side JavaScript extends the core language by supplying objects relevant to running JavaScript on a server.

## 5.8 Implemented Pages:

Register page is for a new user who wants to use the service. All data from registration will be saved in the database and for each patient, there will be specific account. User login is for registered users who can log in their account and use its features.

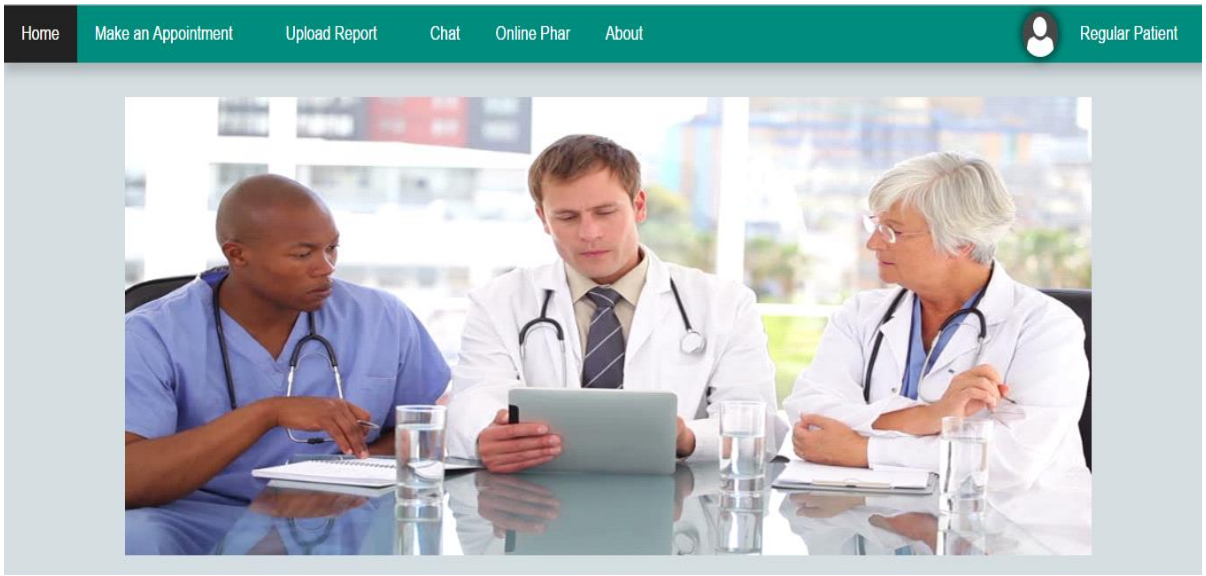
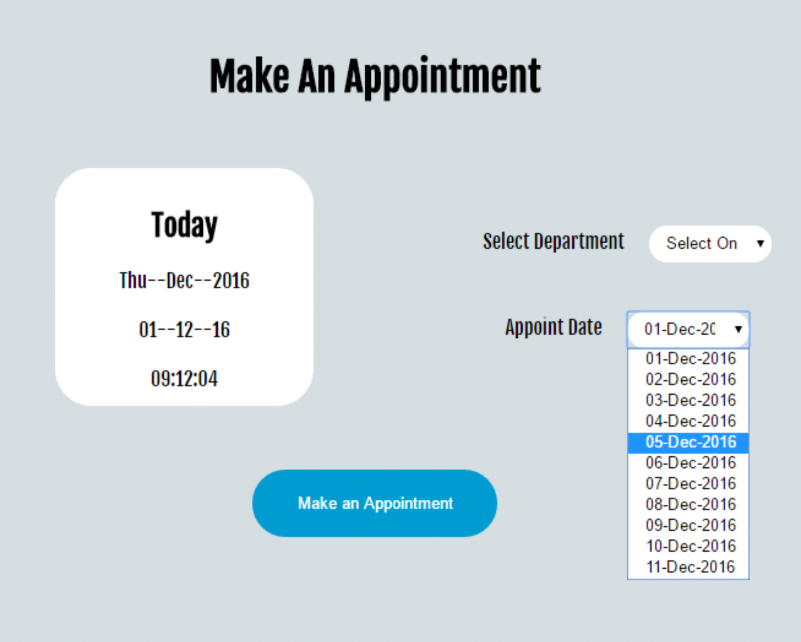


**Figure 5.8: Home Page**

This is the home page of the website. It contains a navigation bar which will help the user to use the system perfectly. The "Home" bar will redirect the user homepage wherever he is, "Make an Appointment" bar will help him to appoint a doctor. By "Upload report" user can upload his treatment report for the doctor. By "chat" he can communicate with the doctor on scheduled time. "Online Phar" will redirect him to the pharmacy store where he can buy doctor prescribed medicine and search for it. "About" is the information about the website and details.



Make An Appointment

Today

Thu--Dec--2016

01--12--16

09:12:04

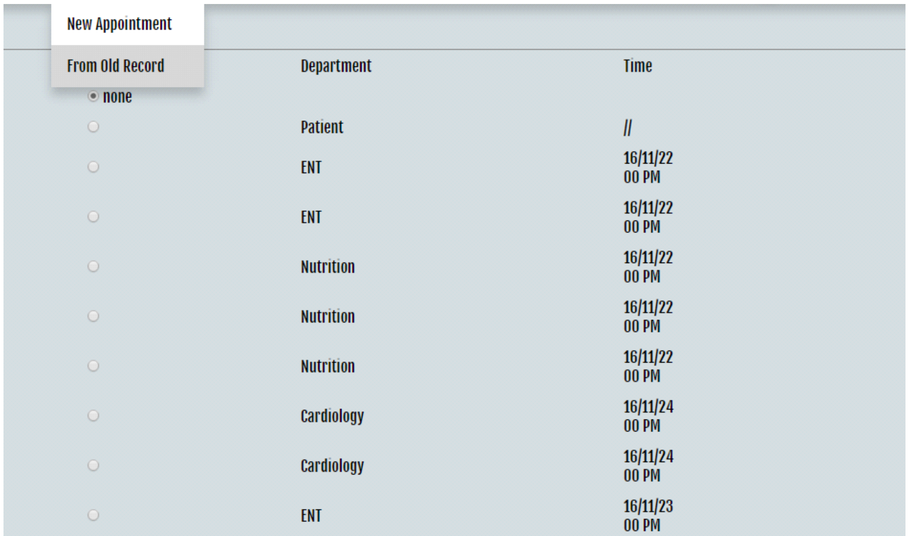
Select Department: Select On

Appoint Date: 01-Dec-20

01-Dec-2016
02-Dec-2016
03-Dec-2016
04-Dec-2016
05-Dec-2016
06-Dec-2016
07-Dec-2016
08-Dec-2016
09-Dec-2016
10-Dec-2016
11-Dec-2016

**Figure 5.9: Appoint Doctor**

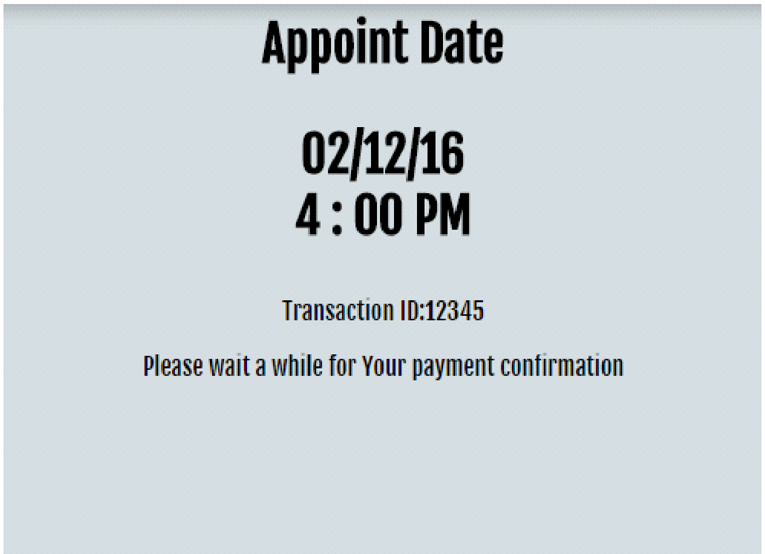
This page is for making a new appointment. By this page, the user can select specialty of doctor and expected appointment date. After selecting the option the user can press "Make an Appointment" button which will create an appointment for the user.



| | Department | Time |
|---|---|---|
| ● none | | |
| ○ | Patient | // |
| ○ | ENT | 16/11/22<br>00 PM |
| ○ | ENT | 16/11/22<br>00 PM |
| ○ | Nutrition | 16/11/22<br>00 PM |
| ○ | Nutrition | 16/11/22<br>00 PM |
| ○ | Nutrition | 16/11/22<br>00 PM |
| ○ | Cardiology | 16/11/24<br>00 PM |
| ○ | Cardiology | 16/11/24<br>00 PM |
| ○ | ENT | 16/11/23<br>00 PM |

**Figure 5.10: Appointed Record**

The user can also make an appointment from his/her previous appointment history. It will give privileges to appoint the previously appointed doctor. By this page, the user can see his/her total appointment history, appointment date, and doctor specialty. To appoint a previous doctor the user has to check the checkbox and click the "Make Appointment" button.



Appoint Date

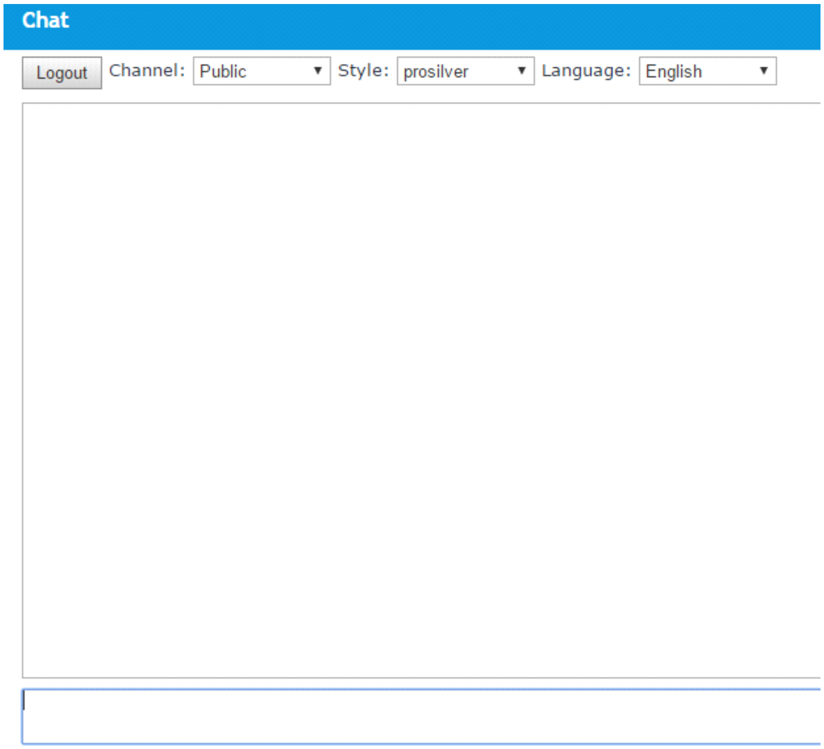
02/12/16
4 : 00 PM

Transaction ID:12345

Please wait a while for Your payment confirmation

**Figure 5.11: Scheduled Appointment**

By clicking "Make Appointment" button user will successfully make an appointment. This page will show the user his/her appointment confirmation, date and scheduled time. This page will directly show to the user when the user confirms his payment. Otherwise, an appointment will not be fixed.



Channel: Public

Style: prosilver

Language: English

**Figure 5.12: Chat Server**

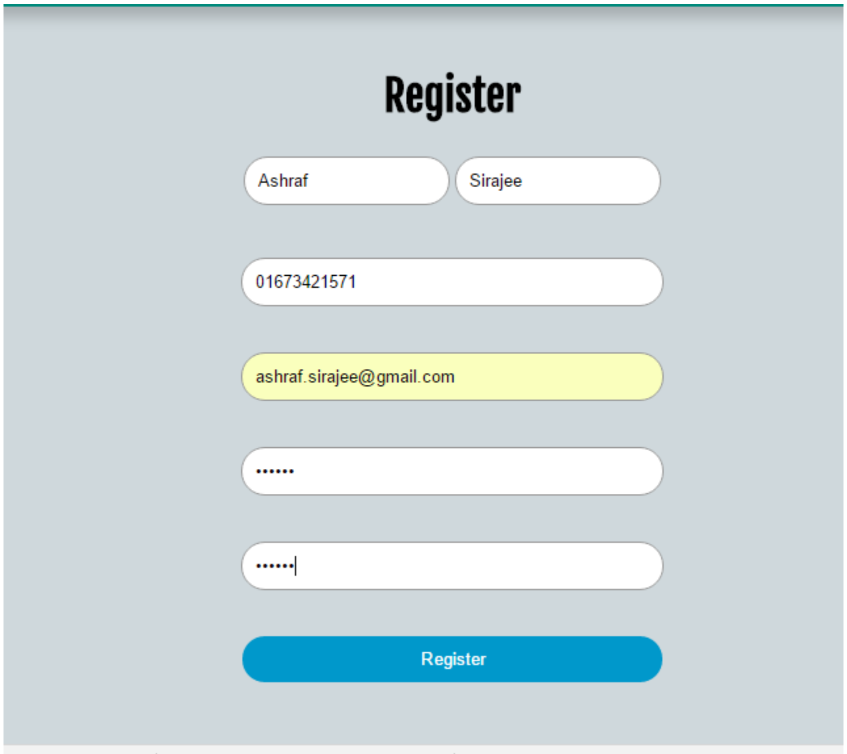
On the appointed date and time the user can contact the doctor a through chat server. The doctor can create room for an individual patient and can consult them one on one. The doctor can also prescribe the patient through this chat server. This chat server is only for doctor-patient consultation.

# Chapter 6

# Result & Analysis

Here our goal was to implement a system which will help a patient to appoint a doctor in terms of criteria, free time and date based on dynamic scheduling. Our implemented software fulfill all this section perfectly for the patient and save his/her valuable time. On this process user can visit our website and register to get our service and then login into the website. The patient can make an appointment on his selected date. The patient also can appoint the previous doctor for the treatment process.

## 6.1 Register & Login:



Ashraf
Sirajee

01673421571

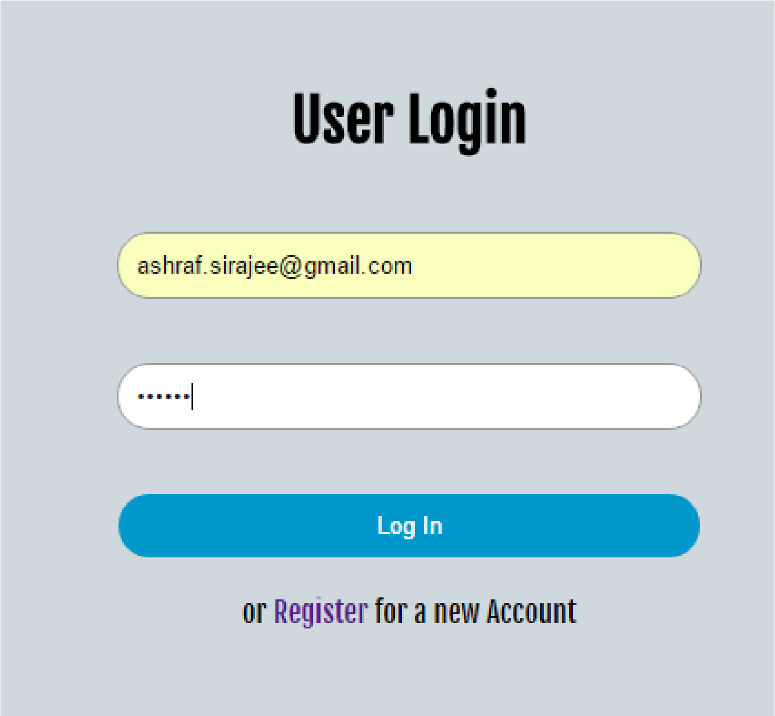
ashraf.sirajee@gmail.com

••••••

••••••

**Figure 6.1: Register**

Here the user can give the important required information and register for an account. The system will take the information and create an account for the patient and make a space in the database.



User Login

ashraf.sirajee@gmail.com

••••••

or Register for a new Account

**Figure 6.2: User Login**

After registration, the user has to log in to access his account and use the facilities of the system. The user has to log in with the given email address and password which he provided during the registration.

## 6.2 Edit Profile:

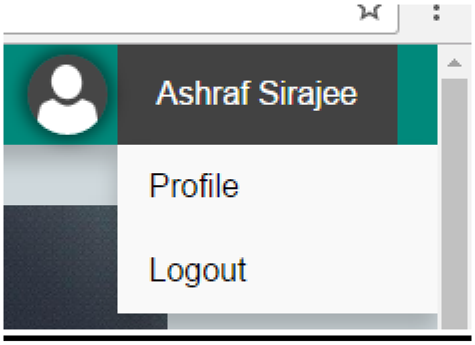
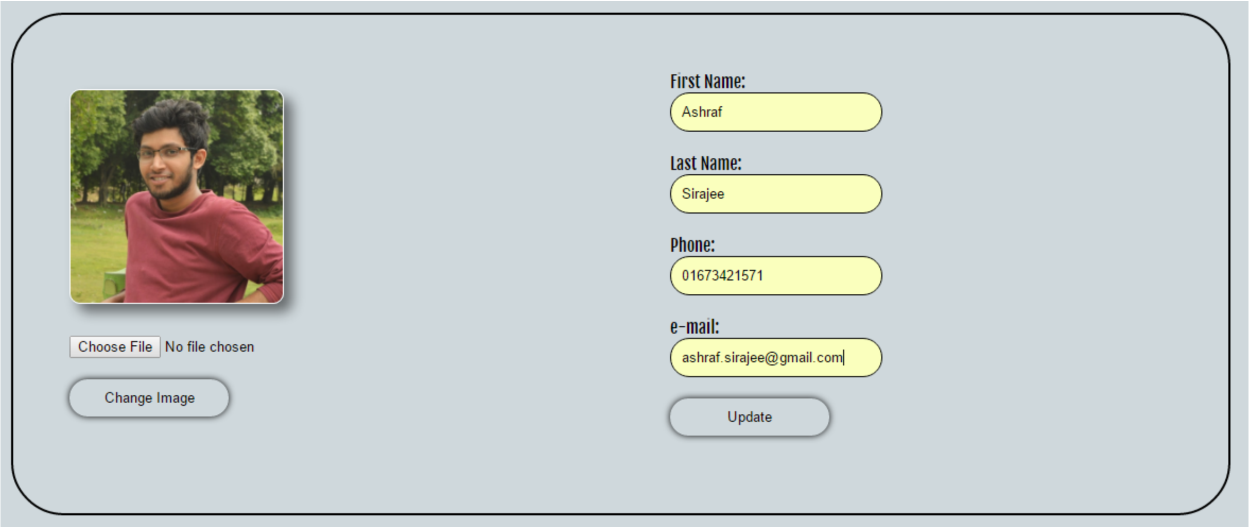


**Figure 6.3: User Profile**

After log in system will show his name in the corner and there is a dropdown option which will show him profile edit option and log out option.



First Name: Ashraf

Last Name: Sirajee

Phone: 01673421571

e-mail: ashraf.sirajee@gmail.com

**Figure 6.4: Edit Profile**

Here the user can edit his profile by giving information and there is an option of upload picture of the user. The user can upload his picture through this option and update the profile.

## 6.3 Updated Profile:

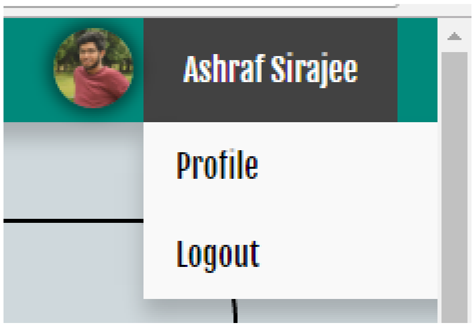


**Figure 6.5: Updated Profile**

After the update, the profile system will show the user the updated profile.

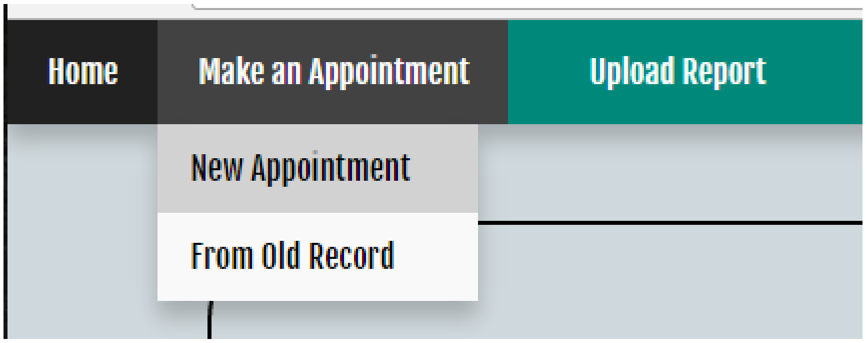
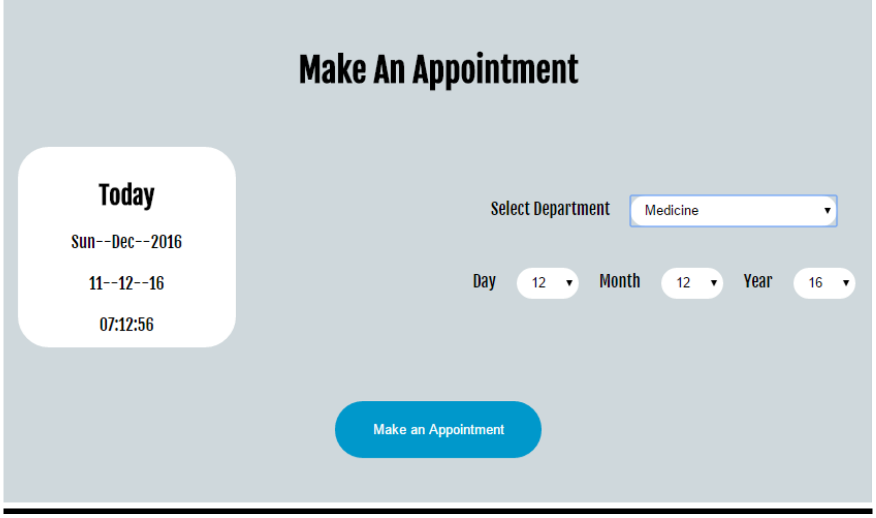


**Figure 6.6: Appointment Criteria**

After login user can see his homepage and navigation bar of the website. There is an option called "Make an Appointment" which will show user two option "New Appointment" and "From Old Record".

## 6.4 Appointment System:



Make An Appointment

Today

Sun--Dec--2016

11--12--16

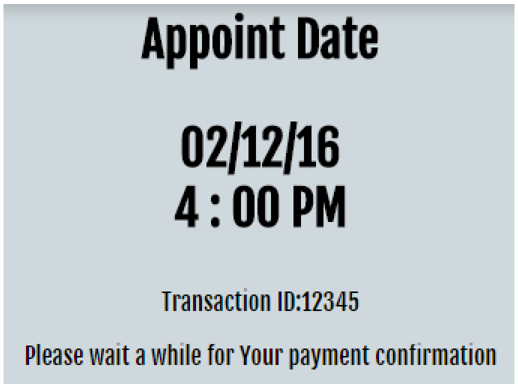
07:12:56

Select Department Medicine

Day 12 Month 12 Year 16

**Figure 6.7: Appointment System**

By choosing "Make An Appointment" option user will redirect to appointment page by the system. Here the user can select the specialty of a doctor and date for an appointment. After choosing the option user to press the "Make an Appointment" button. This button will tell the system that schedules a doctor based on selected department and date. The system will search the database and find a doctor on that date then system schedule the time for the patient. A total process running in the background after a user press makes an appointment button.



Appoint Date

02/12/16

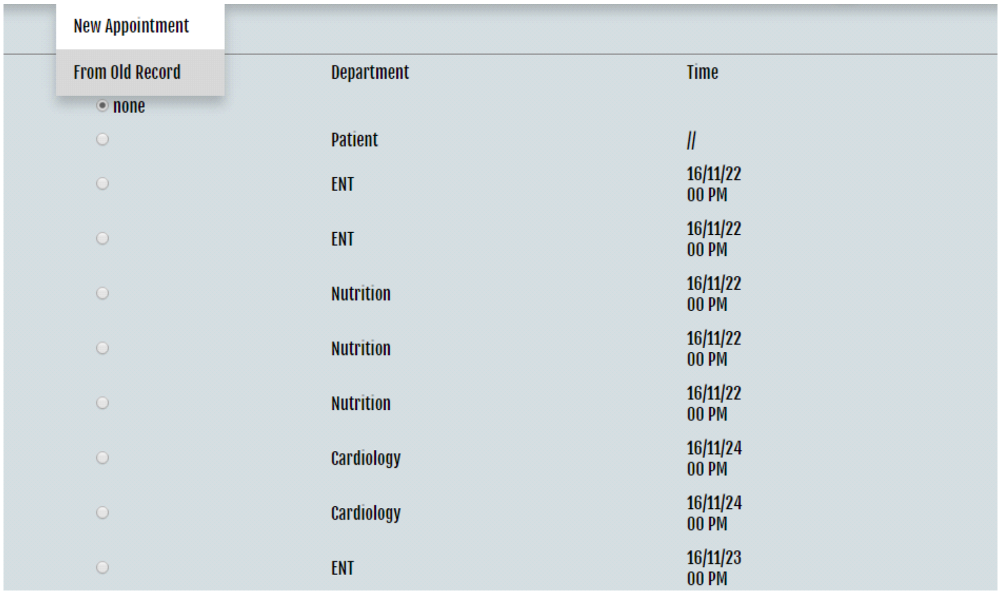
4 : 00 PM

Transaction ID:12345

Please wait a while for Your payment confirmation

**Figure 6.8: Appointed Schedule**

After clicking the button system will show the user the scheduled time and date. This process is running by following the algorithm process.

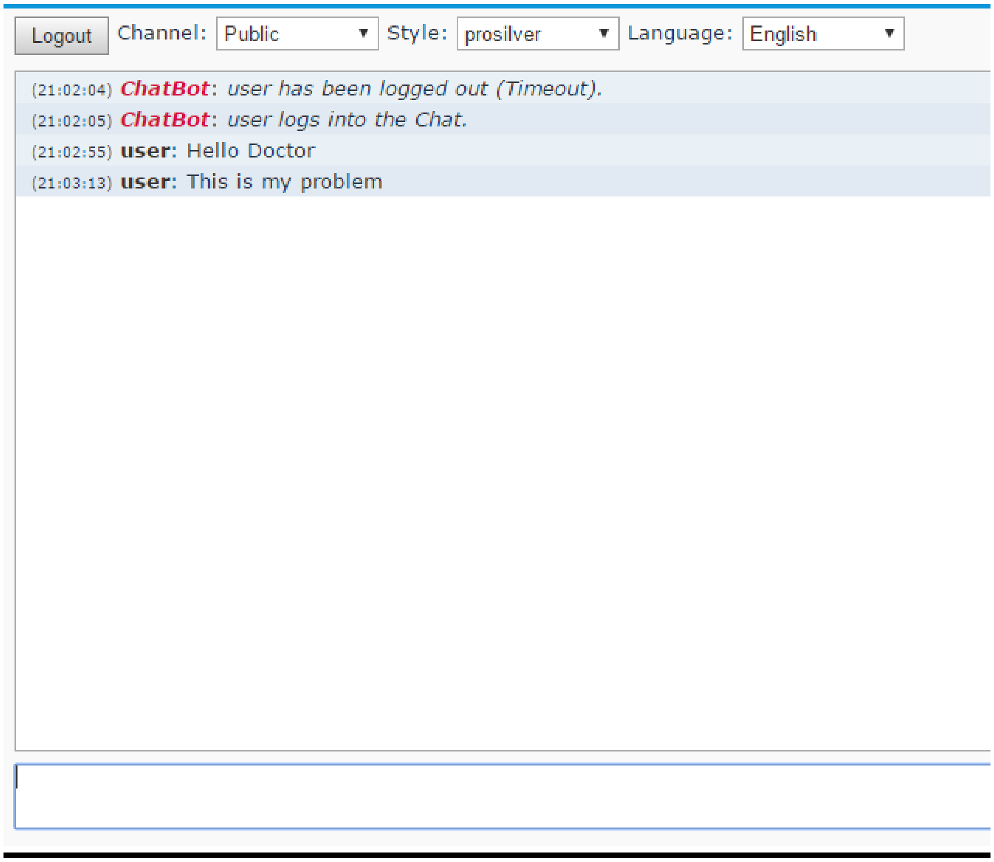


| | Department | Time |
|---|---|---|
| ● none | | |
| ○ | Patient | // |
| ○ | ENT | 16/11/22<br>00 PM |
| ○ | ENT | 16/11/22<br>00 PM |
| ○ | Nutrition | 16/11/22<br>00 PM |
| ○ | Nutrition | 16/11/22<br>00 PM |
| ○ | Nutrition | 16/11/22<br>00 PM |
| ○ | Cardiology | 16/11/24<br>00 PM |
| ○ | Cardiology | 16/11/24<br>00 PM |
| ○ | ENT | 16/11/23<br>00 PM |

**Figure 6.9: Old Record**

By selecting “From Old Record” patient can appoint the previous doctor and get an appointment with his previous consultant to continue his treatment.

## 6.5 Chat System:

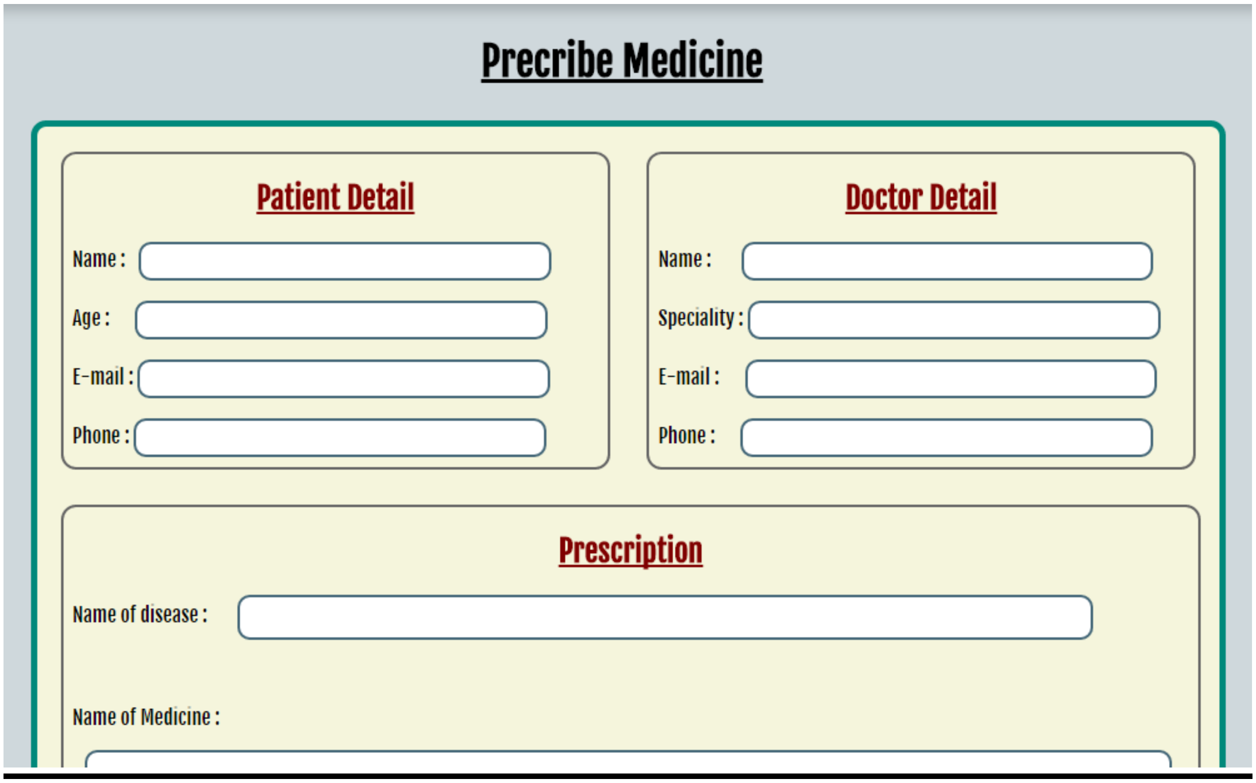


```
(21:02:04) ChatBot: user has been logged out (Timeout).
(21:02:05) ChatBot: user logs into the Chat.
(21:02:55) user: Hello Doctor
(21:03:13) user: This is my problem
```

**Figure 6.10: Chat System**

On the scheduled time user can consult with a doctor using this chat server. Doctor can create a room patient and chat one on one. By this system, the doctor can prescribe medicine and suggest another specialist.

## 6.6 Prescription:



Precribe Medicine

Patient Detail

Name :

Age :

E-mail :

Phone :

Doctor Detail

Name :

Speciality :

E-mail :

Phone :

Prescription

Name of disease :

Name of Medicine :

**Figure 6.11: Prescription**

This is the prescription page, and here doctor will give the advice and medicine and how to take them. After giving the details of the medicine doctor can upload this prescription for patient and patient can download it.

# Chapter 7

# Conclusion and Future Work

## 7.1 Conclusion:

We started the project keeping in mind to solve one of the very old issues of the whole world which are the availability of medical support. It is not possible to change the medical support system overnight. Our goal was to provide a solution so that this problem could be minimized and provide medical support to every corner even the remotest area where people are unable to reach a doctor when needed. In order to eliminate the difficulties of scheduling, we came up with dynamic scheduling system which will also eradicate the waiting for a doctor physically in front of the chamber. We achieved our goal which is this system can balance the load among doctors and schedule a patient to a specified specialist and at the scheduled time the patient can communicate with the assigned doctor. We believed our motive to develop this project can reduce the unnecessary hassles of traveling all the way to the doctor and save their valuable time which can eventually prevent the patient from suffering further.

## 7.2 Future Work:

We have future improvement plan regarding this project. As it is an online based system, we intend to make this system a global platform where users from all over the world will be able to consult a specialist of their interest. We also have the plan of developing a mobile application to access this system in order make it easier to use. We also have the plan for free checkup campaign by the available doctors once a month.

# References:

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[2.] Hillesley, Richard (June 30, 2010), "GNU HURD: Altered visions and lost promise", *The H* (online ed.), p. 3, Nearly twenty years later the HURD has still to reach maturity, and has never achieved production quality. […] Some of us are still wishing and hoping for the real deal, a GNU operating system with a GNU kernel.

[3.] Cai, Jin-Yi; Chen, Xi (2012). *Complexity of counting CSP with complex weights*. pp. 909–920. arXiv:1111.2384. doi:10.1145/2213977.2214059. ISBN 978-1-4503-1245-5.

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[5.] Berners-Lee, Tim; Connelly, Daniel (November 1995). "RFC 1866 – Hypertext Markup Language – 2.0

[6.] Manu Sporny (2013-01-26). "DRM in HTML5". *The Beautiful, Tormented Machine*. Manu Sporny. Archived from the original on 2014-04-25. Retrieved 2014-05-16.

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