
ABSTRACT

Alzheimer's is a leading neuro-degenerative disease affecting millions of people worldwide. The disease not only deteriorates the ability to undertake daily activities but also take a toll on the behavioural and emotional health of the patient and caregivers. The project is one such effort for the betterment of the quality of life for both patients and caregivers. Complete system provides assistance on various levels to both patients and caregivers. Some features include tracking patient's progress through an interactive adaptive quiz. The system is also equipped to monitor patient's heart rate and location, incorporating this feature helps caregivers and doctors to better organize treatment plans and understand patient needs. The developed system is composed of two Android application, Web module (to ease the progress tracking) and Arduino. The system can be used by every involving actor. The evaluation rate leads to an increase in the significance of our system.

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1 INTRODUCTION

1.1 Overview

Millions of people worldwide are affected by Alzheimer's disease, the most common cause of dementia. This progressive neurodegenerative disorder accounts for 50-60 percent of dementia cases. Early symptoms include difficulty in learning new things, however, as the disease progresses the symptoms worsen eventually. Advanced stages of the disease include disorientation, mood and behavioral changes, deepening confusion about events, time and place, unfounded suspicions about friends, family, and caregivers, more serious loss of memory accompanied by difficulty walking, swallowing and speaking. These symptoms interfere with critical thinking or reasoning, decision making, language impairment and behavioral changes make it almost difficult for patients to navigate daily life independently. Professional caregivers or family and friends taking care of the patient play a vital role in the lives of these patients. Alzheimer's not only constituted difficulties or challenges for only the person diagnosed with the disease but also to the people who undertake care-giving responsibilities of such individuals. Thus, Alzheimer's is rightly termed as a family disease. Since no complete cure for the disease yet exists, efforts made at improving the quality of life for such patients and caregivers could be crucial advances. Technology might not have answers to everything but it surely has contributed significantly to various health care areas. With the aid of technology, efforts could be made to assist patients to handle their daily activities with some ease. Since the disease progresses over time and patients may lose the ability to operate or understand technology, caregivers could definitely take advantage of such a service to better care-giving abilities and monitor patients over time. Recent publications have shown that there are many ways in which people with dementia can engage in pleasant activities and live well, including the use of novel technology devices such as a touchscreen tablet and personal computers. It is also important to remember that the role of the caregiver changes over time as the disease progresses and patient needs change, learning tools, instructions, and better patient monitoring applications and services could greatly contribute to taking care of such patients.

1.2 Motivation

The motivation for developing this system is to maintain the Alzheimer's patients quality of life by channelizing their brain and bridging the gap between patients, caregivers and doctors. The severity of the disease, and the absence of a solution or aid suitable to both Western as well as Indian society. Lack of awareness regarding the disease, absence of technology to aid the patients of Alzheimer's and general dementia. Day care homes and caretakers for these patients have difficulty monitoring patients and it becomes tiresome for them. All these factors have been the significant motivating factors for this project.

1.3 Problem Definition

A systematic system is developed for Alzheimer's patients suffering from chronic pain of memory disorders, personality changes and impaired reasoning. It involves an adaptive quiz that will help in reliving past memories, daily planner, automated report generation, music therapies and technologies focusing on cognitive development. Assessing and providing an aid to the patients will not only weigh down the responsibilities of their relatives but will also help in controlling the rate of plague invasion. The system is targeted to suit Indian markets and Indian standards too, and a collective aid application is to be developed.

1.4 Objective

1. Connect Patient, caretaker, Doctor through System
2. Track record of patient's progress
3. Provide stress relief techniques for caretaker

1.5 Project Scope

1. The system bring together all three: doctor, caretaker and patient through a common online portal for establishing quick and instant communication between

them. A common and connected interface helps all three to communicate easily.

2. The developed system also aims to control the rate of growth of the disease, enabling a comparatively better and easier lifestyle for the patient as well as the caretakers and the family members of the patient, thus increasing the quality of life.
3. The system is also able to provide for and consider the mental health of the caretaker as its depressing taking care of the patient with Alzheimer's.

1.6 Limitation

1. Requires Internet connectivity.
2. Usage of the application may lead to battery drain.

2 Literature Survey

1. Reference Paper : IJSCI International Journal of computer Science Issues Volume 12 ,Issue 5

Summary: This paper discusses a mobile application that works as a reminder for Alzheimer's patients. The system consists of two actors care provider and Alzheimer's's patients. When caretaker log into the system will display page which contains two buttons : Patient list and drug list. Patient list contains list of patients added by caretaker while drug list contains list of drugs that have added as well. The system also contains medication page. Patient can add new medication and also provide required information about medication. For Alzheimer's patient page, it contains three buttons: Family, meals and water and Event List.

Findings : Alzheimer's patient forget a lot of things, one of it is forget the people whether family or friend. Therefore, caretaker can add a person and its relationship to the patient with picture and then help patient to remember them easily. They also forget to eat and drink water and this increase deterioration of his/her health. Therefore, list of meals and its required information can be added. The system will send an alert and a push notification at the specified time of main meals and reminding the patient to drink water. Similarly reminders can be set for medicines.

2. Reference Paper : IEEE paper 2018

Summary : This paper discusses a system that measures heart rate. Arduino Uno board has been used for calculating the heart rate. The obtained heart rate values are initially displayed on Liquid crystal display (LCD) and Raspberry Pi is used as an IOT gateway. The values are then sent to the cloud through protocol. The designed system updates user with their heart rate through Email or SMS.

Findings : Health status of Alzheimer's patients can be determined with help of observing heart rate levels. Heart rate above 100 bpm is indication of fever. The patients may not be able to visit a doctor for regular heart rate check-up because of their inability to make their way to hospital. Therefore a smart heart rate monitoring system will measure heart rate of patient and will send calculated value to cloud platform. The heart rate will be detected using heart beat sensor.

3. Reference Paper : Proceedings of 4th International Conference on computing and

Informatics, ICOCI

Summary : This paper discusses an application that alerts patient when to consume the medicine based on schedule provided by doctor. The application has two actors doctor and patient. The doctor interface consists of functions as follows : view patient profile , patient feedback , add new patient, add medicine and perform quick patient search. The patient can view his/her medications schedule

Findings : Proper medication may reduce the effect of Alzheimer's disease on the patient. Hence it is necessary that patient consume the medicine based on the schedule provided by doctor. Hence through application patients, caretakers and doctors can be connected. Application can be used to assist doctors to monitor Alzheimer patients medication.

2.1 Current Market Survey

There are android apps that already exist for Alzheimer's but these apps are different from our application and system in terms of functionalities. Existing system are as follows :-

1. Alzheimer's Daily Companion

Pros :

- Free and immediate advice and tips.
- 24-hour nursing assistance via phone number or email.

Cons :

- No GPS tracker involved
- Does not provide reminder, daily planner, etc.

2. Alzheimer's Caregiver Buddy :

Pros:

- Get instant caregiver help and advice.
- Access free help from Alzheimer's association helpline.

Cons:

- It is caretaker oriented.
- No location tracking functionality.

3. Alzheimer's Disease Pocketcard

Pros:

- Latest information on management of Alzheimer's disease.
- Education/support PDFs available.

Cons:

- No progress reports to view the progress of patient.
- complicated user interface to use

The above apps helps in increasing the caregiver's confidence to provide nursing assistance by arming them with immediate tips and practical advice for all behaviours and situations they face on a daily basis. These apps feature clinically relevant information on Alzheimer's disease and interactive tools to help clinicians in effectively assessing the patients. They also include education/support PDFs. They provide resources and training materials to the caregivers. These apps also include helpful information for how Alzheimer's disease affects the mind.

The idea behind implementation of it on "Android" is, nowadays android is widely accepted and open source operating system. Majority of handy gadgets are being supported by it like Tablets, Cell Phones.

3 Software Requirements Specification

3.1 Assumptions and Dependencies

The Assumptions for the system are as follows:-

1. The user is experiencing problems related to cognitive impairment.
2. The patient using the system is in the primitive stages of the disease.
3. A caretaker is assigned to take care of the patient.
4. The caretaker and the patient should be well acquainted with the android devices and the heart rate monitoring system.

The dependencies for the system are as follows:-

1. Android devices should have at least 5.0 operating system.
2. The database should be a real time database.
3. Arduino android connectivity should work relentlessly.

3.2 Functional Requirements

3.2.1 Adaptive Quiz

Interactive adaptive quiz is a unique feature that generates an adaptive quiz questions with both text and visual questions. The difficulty level of this quiz is adjusted dynamically, based on the patient's response. If a patient is able to answer the questions, difficulty level will be increased else will change accordingly. The score of the quiz will be stored to generate the report.

3.2.2 Reminders

Patients suffering from Alzheimer's needs daily medicine dose. But it is difficult for them to remember the timing and quantity of drugs. The prescribed medicines from doctors web module can be scheduled in Reminder activity so that the patient will get timely notification of the drugs. Also, it will be helpful for them to schedule their other daily activities like evening walk, wake up alarm, etc.

3.2.3 Detection test

A detection test is a series of tests that will be conducted on patient. It might be helpful to determine the severity of the disease to some possible extent. It will also help doctors to decide the medication

3.2.4 Registration login

The patient can register in the app by creating a new account or by using an existing account. Caretaker can register using patients link and doctor can view profiles of both patients and caretakers on their web module. The information includes name, contact number, a doctor associated, etc.

3.2.5 GPS Tracker

Caretaker always needs to keep an eye on the patient since it is possible that they may get lost. It may happen that due to any reason if patient is lost, the GPS tracker will show the position of the patient and hence patient can be found using maps.

3.2.6 Stress relief for caretaker

Alzheimer's caregivers frequently report experiencing high levels of stress. This stress needs to be relaxed. The symptoms of stress can be anxiety, depression, etc. Visualisation, meditation, exercise, and communication are some of the ways to reduce stress.

3.2.7 Heart rate monitor

Smart heart rate monitoring device that will measure the heart rate of patient and will send the calculated value on a cloud platform and display it on the web portal. It will be recorded as used as patients history.

3.2.8 Report generation

Based on the patient's medical history, the score of the quiz and detection test doctor will be able to generate a report. This report will be helpful for future treatment in case the patient decides to change the doctor.

3.2.9 Appointment scheduling

Scheduling can be a tedious task. It can be done by performing online booking based on time slot which will be feasible for both doctor and patient using scheduling algorithm.

3.2.10 Doctor forum

It connect doctors with each other so that they can share their experiences, take advice. They can discuss course of medicine, new researches and advance technologies for the treatment.

3.3 External Interface Requirements

3.3.1 User Interfaces

We have developed project which consists of different access methods and different access portals for all three(caretakers,doctors and patients)

1. Patient will use the android application that monitors the patient statistics,allowing

patients to access all the modules like quizzing, reminders and heart-rate monitoring, musical sessions, cognitive games all through the android application.

2. Caretaker will be connected to the patient and the doctor through bar-code or QR code. Caretaker will involve status updates and real-time monitoring updates on the caretaker's mobile application
3. Doctor will be given access through a web portal for assessing the progress and providing medication to the patients.
4. Family members, caretakers, doctors are connected through a forum on web portal for which a separate access would be given to them.

3.3.2 Hardware Interfaces

1. Heart rate monitoring system developed using arduino will detect the heart beat using the heart beat sensor and will show readings in BPM. Heart beat sensor is interfaced with Arduino board.
2. In order to view it in web portal over the Internet Amazon Web services is configured.

3.3.3 Software Interfaces

1. Android Studio IDE: Android Studio is the official integrated development environment for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development.
2. Aurdino IDE: The Arduino integrated development environment is a cross-platform application that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.
3. PyCharm: PyCharm is an integrated development environment used in computer programming, specifically for the Python language which comprises of many libraries.

3.3.4 Communication Interfaces

1. HTTPS protocol is used for secured communication
2. Internet: We have used cellular network/Wifi for connecting different users and database
3. LTE: For sending emergency alerts.

3.4 Nonfunctional Requirements

3.4.1 Performance Requirements

1. Processing should be fast.
2. Calculations should be accurate.
3. Database should be able to work on real-time data
4. Responses should be quick.
5. Patients should be able to comprehend with all modules easily.
6. The data set created should be well structured and uniform.

3.4.2 Safety Requirements

1. Information transmission should be securely transmitted to server without any changes in the information.
2. Data transmission should be secure as the collected data is personal and confidential.
3. Caretaker should be familiar with the usage of heart rate sensor and the wear device.
4. The application should process exceptional cases and inputs from the health monitoring devices effectively.

3.4.3 Security Requirements

1. Patient's data is highly sensitive and is to be protected at all cost. Securing the server with proper certification and data by proper encryption.
2. Data should be transmitted over secure servers.

3.4.4 Software Quality Attributes

1. Adaptability:- On the basis of the patient's progress the quiz adapts itself.
2. Availability:- Good amount of information of the patients should be available which can be used to train the system.
3. Correctness:- An accurate report of the patient is generated which helps the doctor in deciding the medication.
4. Flexibility:- The module is flexible enough and can be used for various patients.
5. Portability:- The entire system requires an android device, Arduino and a computer.
6. Testability:- The system can be tested on android devices.

3.5 System Requirements

3.5.1 Database Requirements

1. Firebase noSQL Realtime Database
 - (a) The web and the mobile application are both connected to a noSQL database on Firebase and hosted online.
2. Dataset is created and maintained by surveying forms and interviews and then stored in CSV.

3.5.2 Software Requirements

1. Web application

Web application is useful for doctor since it is easily accessible from anywhere, does not require any special storage, provides easy and simple User Interface. Can be used with help of laptop/desktop.

2. Android application

With the help of technology, interactive smartphones are providing help for patients. Nowadays android is widely accepted and open source operating system. Hence we are providing an android application which will be personalised for each patient. Since we are connecting caretakers with the patients, we are providing separate login for them as well.

3.5.3 Hardware Requirements

Hardware : Arduino Uno board , USB cable , Heart beat sensor , Jumper wires.

A single Arduino Uno board is used for controlling entire mechanism. The board has various controls in entire process to serve purpose of system which includes the process of collecting data from heart beat sensor and further working on data to give the desired results.

3.6 Analysis Models: SDLC Model to be applied

The spiral model combines the idea of iterative development with the systematic, controlled aspects of the waterfall model. This Spiral model is a combination of iterative development process model and sequential linear development model i.e. the waterfall model with a very high emphasis on risk analysis. It allows incremental releases of the product or incremental refinement through each iteration around the spiral.

Spiral Model - Design The spiral model has four phases. A software project repeatedly passes through these phases in iterations called Spirals.

1. Determine Objectives
2. Evaluation and Risk Analysis
3. Development and Test
4. Plan the next Phase

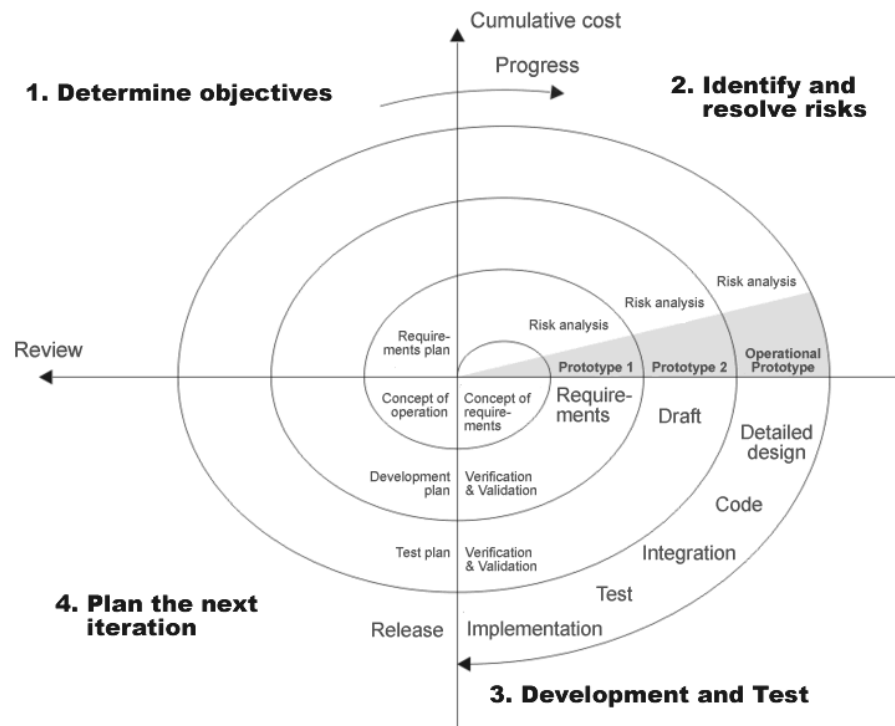


Figure 3.1: Spiral Model

4 System Design

4.1 System Architecture

A system architecture diagram would be used to show the relationship between different components. Usually they are created for systems which include hardware and software and these are represented in the diagram to show the interaction between them.

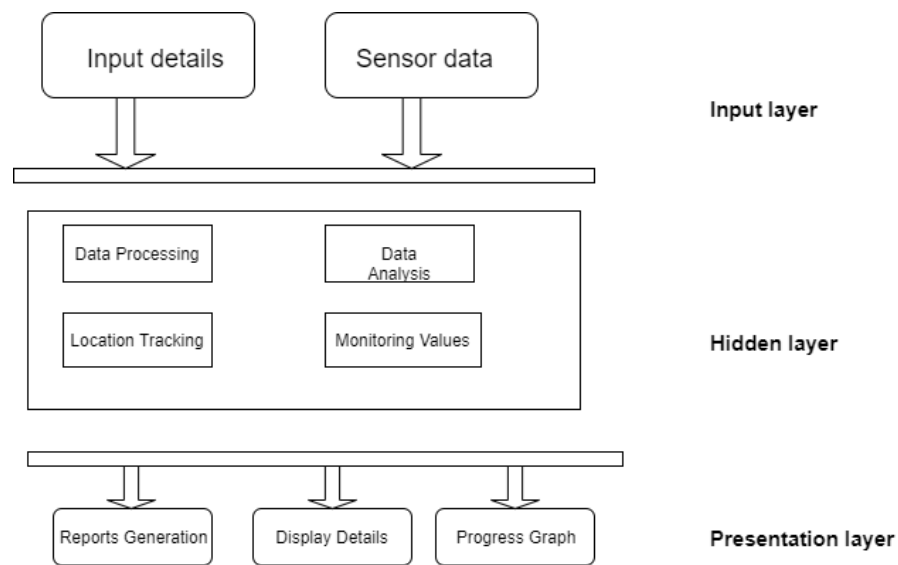


Figure 4.1: System Architecture

4.2 Data Flow Diagrams

4.2.1 DFD level 0

A level 0 data flow diagram (DFD), also known as a context diagram, shows a data system as a whole and emphasizes the way it interacts with external entities.

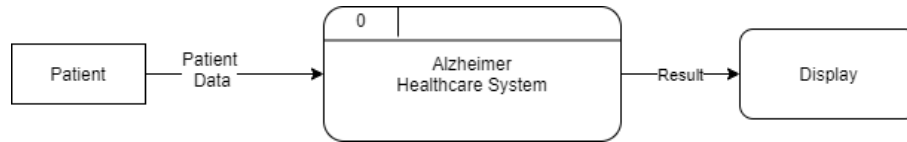


Figure 4.2: Data Flow Level 0

4.2.2 DFD level 1

A level 1 data flow diagram (DFD) is more detailed than a level 0 . It breaks down the main processes into sub-processes that can then be analyzed and improved on a more intimate level.

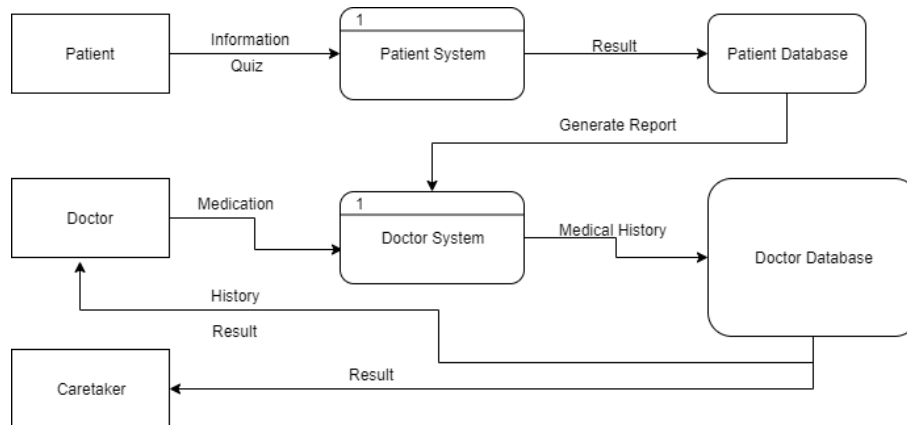


Figure 4.3: Data Flow Level 1

4.3 Entity Relationship Diagrams

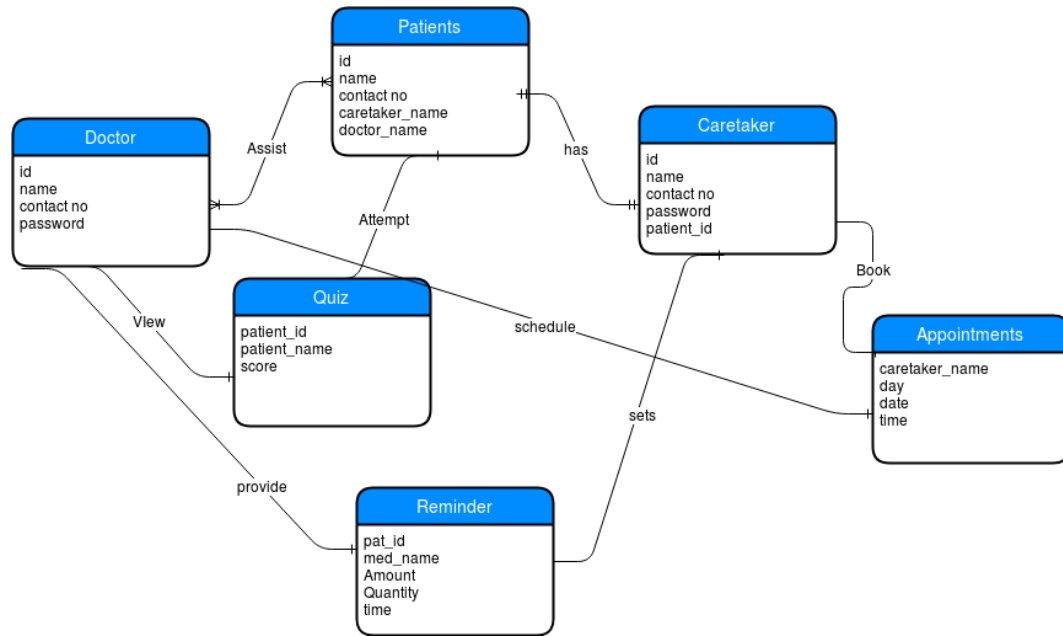


Figure 4.4: Entity Relationship

The ER or (Entity Relational Model) is a high-level conceptual data model diagram. Entity-Relation model is based on the notion of real-world entities and the relationship between them. ER modeling helps you to analyze data requirements systematically to produce a well-designed database.

4.4 UML Diagrams

4.4.1 Use Case Diagram

Use case diagram capture the systems functionality and requirements in UML. A use case consists of use cases, persons, or various things that are invoking the features called as actors and the elements that are responsible for implementing the use cases. Use case diagrams capture the dynamic behaviour of a live system. It models how an external entity interacts with the system to make it work. Use case diagrams are responsible for visualizing the external things that interact with the part of the system.

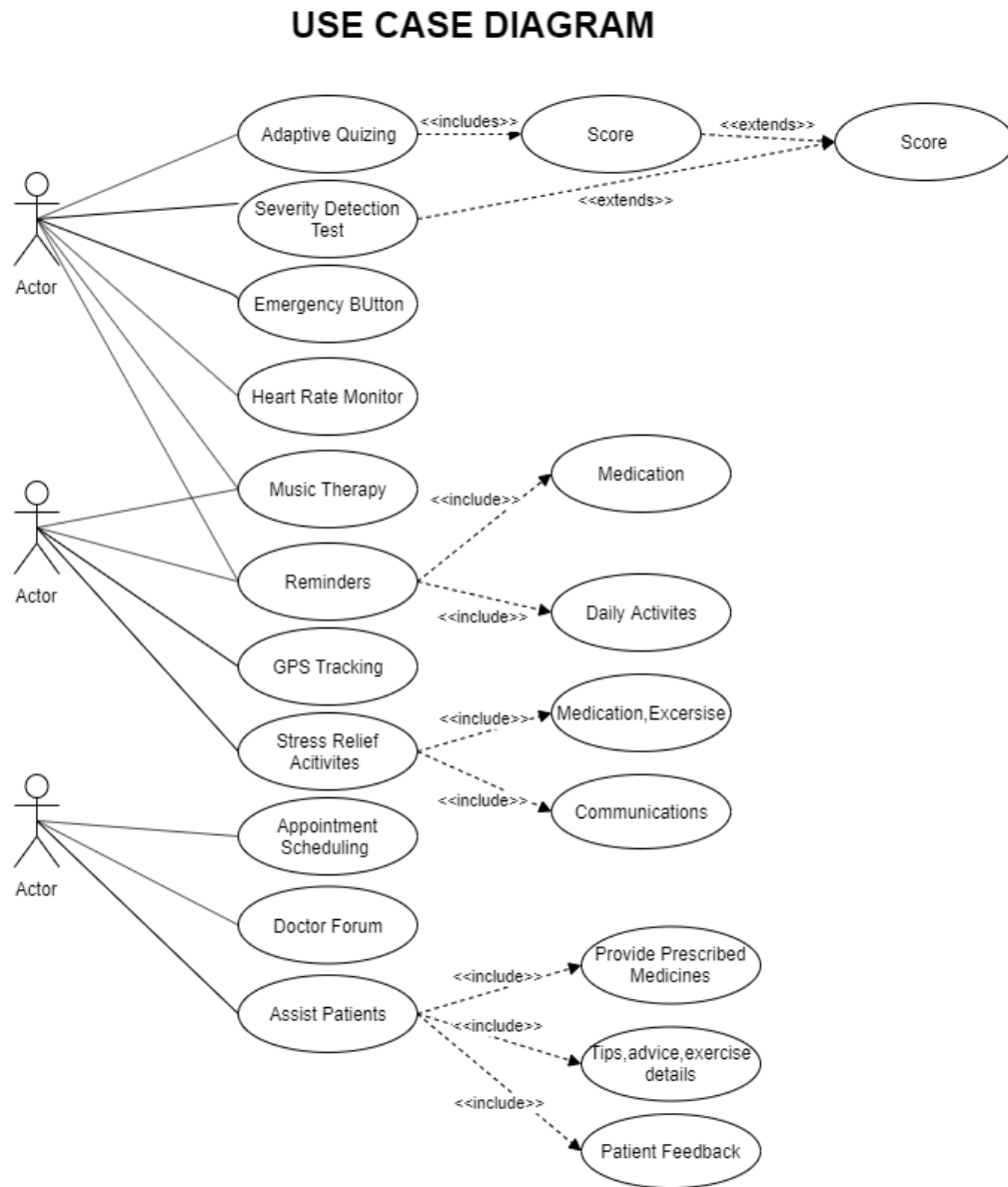


Figure 4.5: Use Case Diagram

4.4.2 Activity Diagram

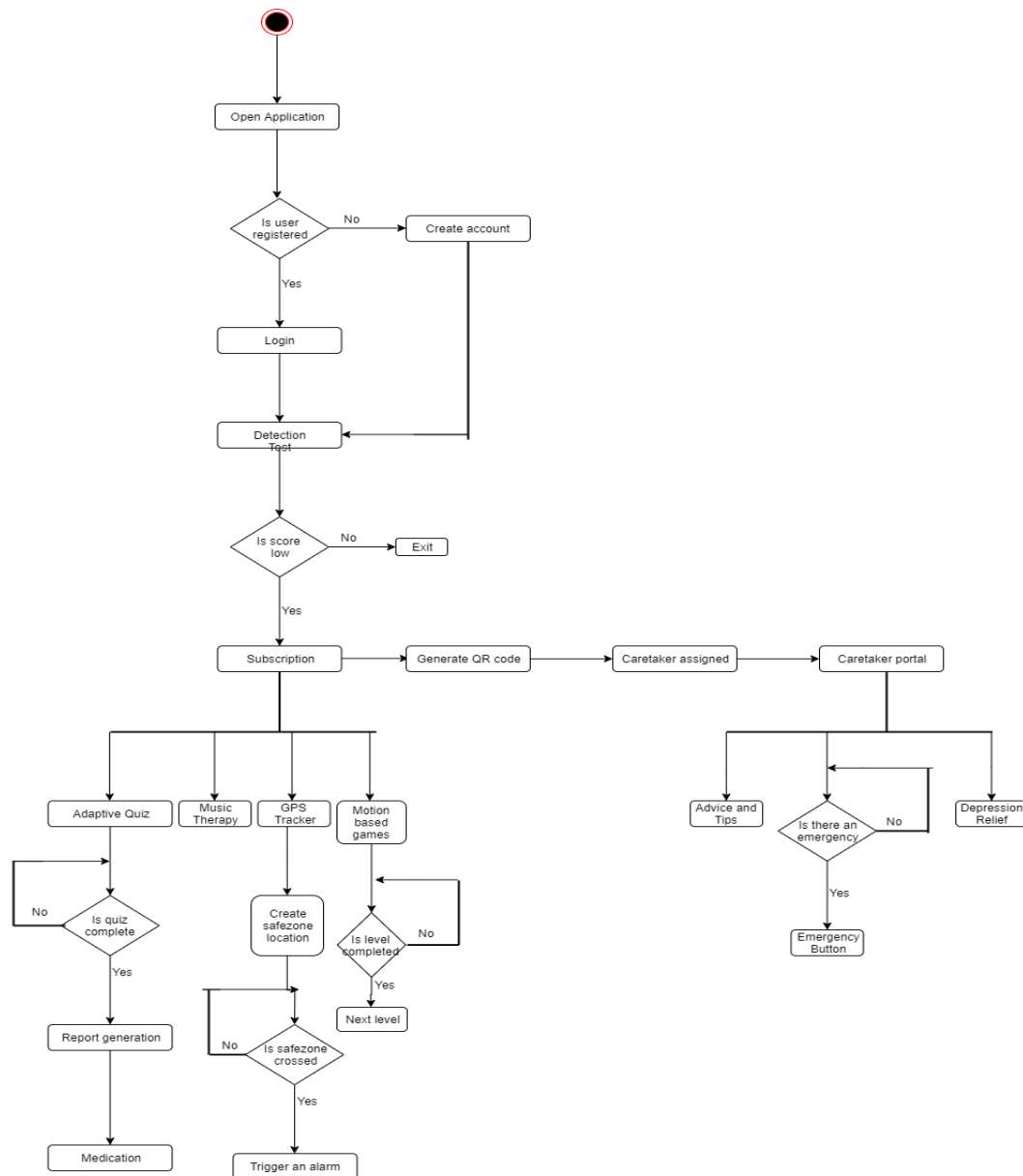


Figure 4.6: Activity Diagram

Activity diagram is defined as a UML diagram that focuses on the execution and flow of the behavior of a system instead of implementation. It is also called object-oriented flowchart. Activity diagrams consist of activities that are made up of actions which apply to behavioral modeling technology. Activity diagram is similar to a flowchart that visualizes flow from one activity to another activity. Activity diagram is identical to the flowchart, but it is not a flowchart. The flow of activity can

be controlled using various control elements in the UML diagram. In simple words, an activity diagram is used to activity diagrams that describe the flow of execution between multiple activities.

4.4.3 State Diagram

State diagrams are used to capture the behavior of a software system. UML State diagrams can be used to model the behavior of a class, a subsystem, a package, or even an entire system. State diagrams provide us an efficient way to model the interactions or communication that occur within the external entities and a system. These diagrams are used to model the event-based system. A state of an object is controlled with the help of an event.

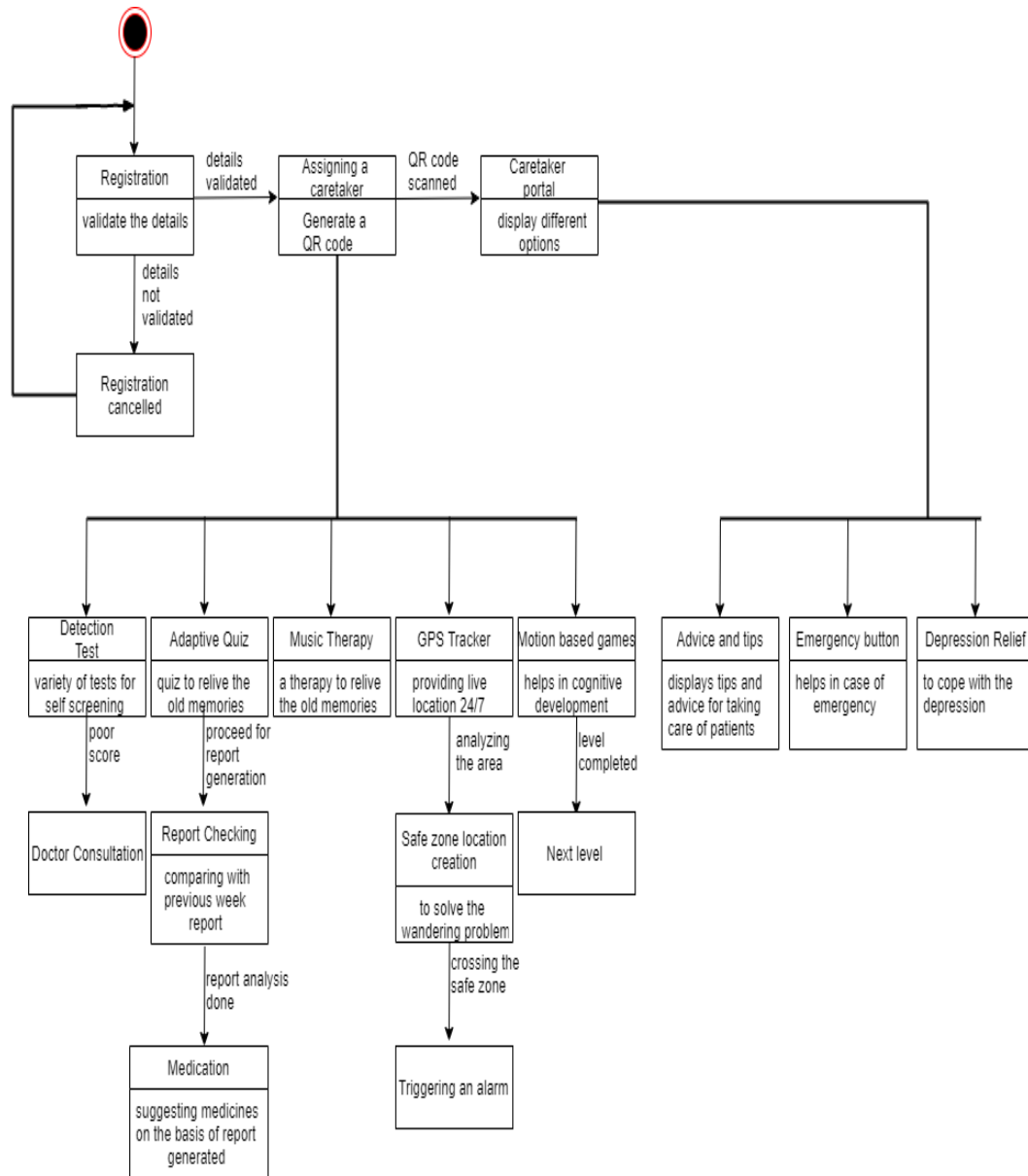


Figure 4.7: State Diagram

4.4.4 Class Diagram

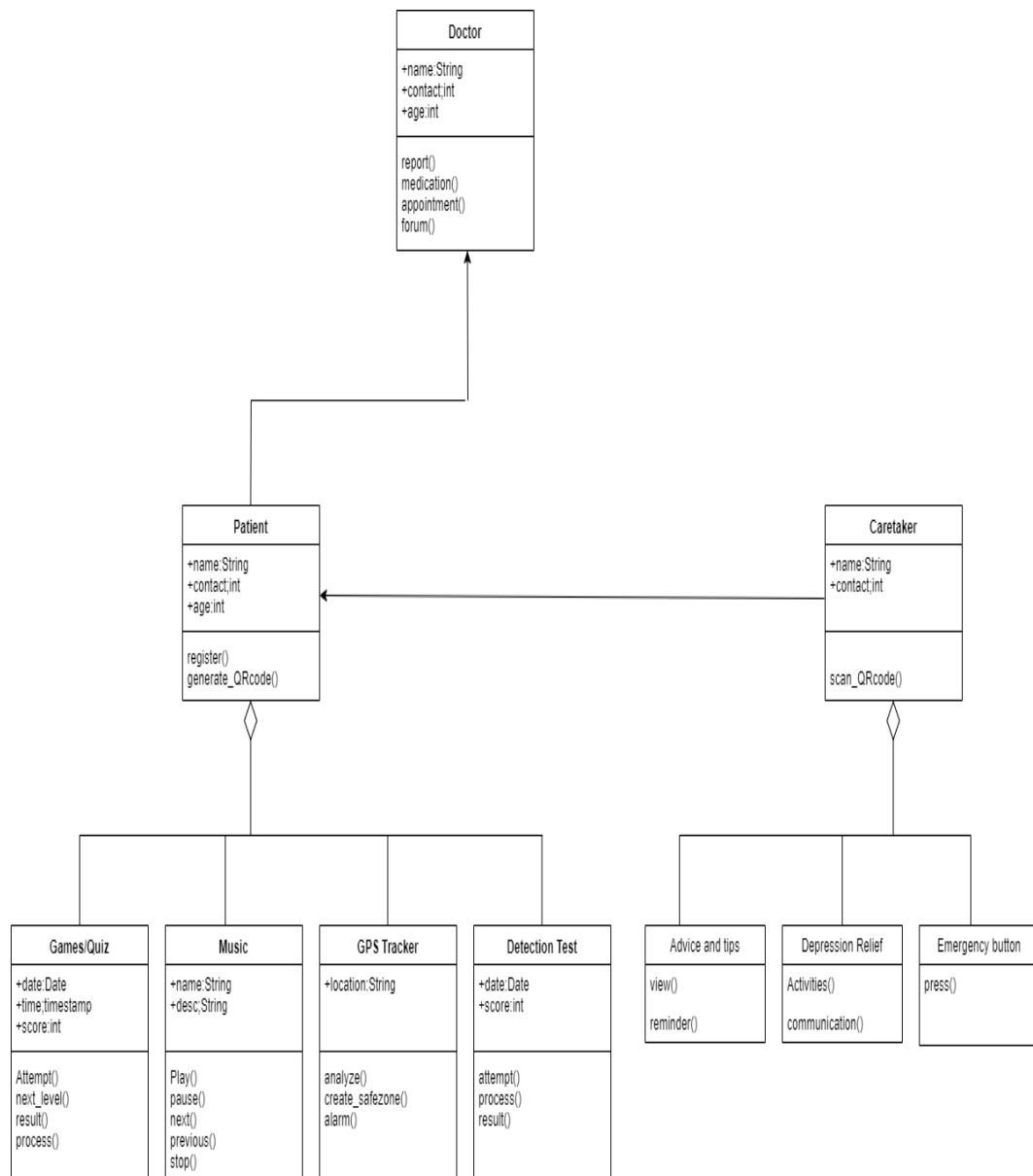


Figure 4.8: Class Diagram

4.4.5 Sequence Diagram

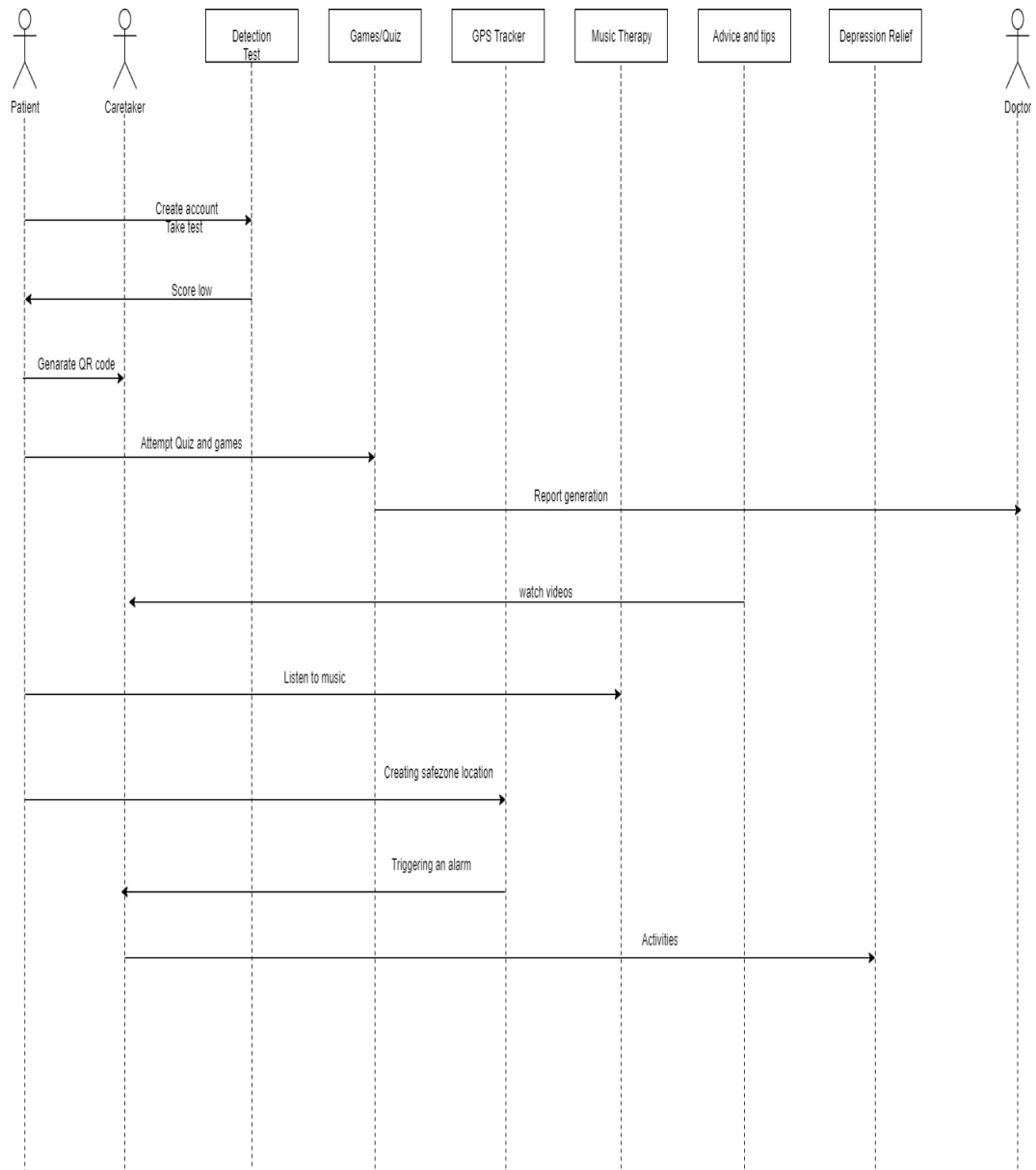


Figure 4.9: Sequence Diagram

4.4.6 Deployment Diagram

Deployment Diagram is a type of diagram that specifies the physical hardware on which the software system will execute. It also determines how the software is deployed on the underlying hardware. It maps software pieces of a system to the device that are going to execute it. The deployment diagram maps the software architecture created in design to the physical system architecture that executes it. In distributed systems, it models the distribution of the software across the physical nodes.

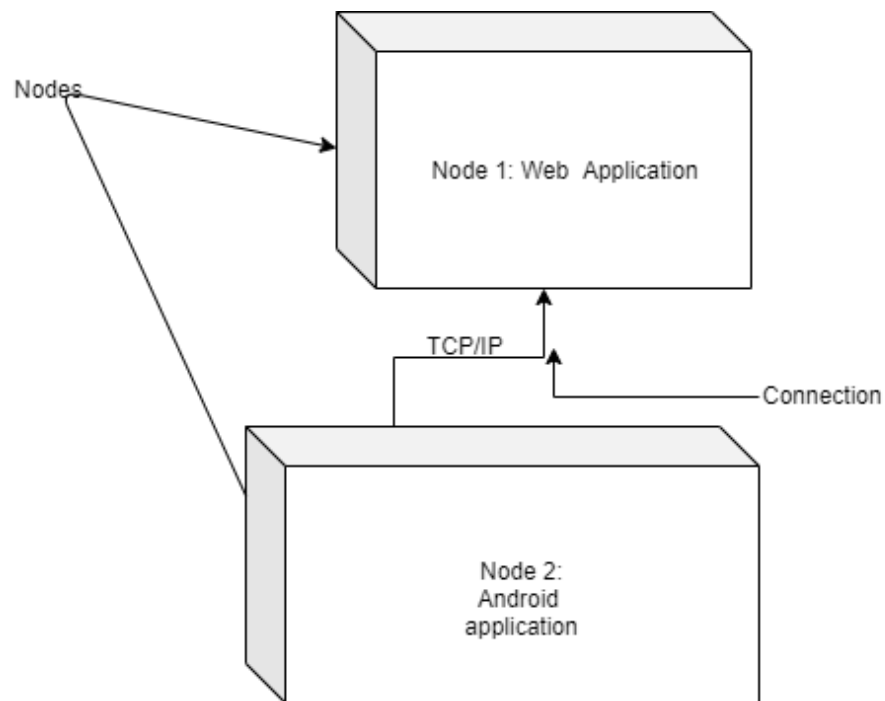


Figure 4.10: Deployment Diagram

5 Project Plan

5.1 Project Estimates

5.1.1 Cost Estimate

Cost will estimate after completing the project that depend on time to complete the project. Also efforts required to complete.

5.1.2 Time Estimate

Time will depend on modules of project. Also project plan of execution. It is about 4 months of continuous development

5.1.3 Project Resources

1. HARDWARE RESOURCES:-

Processor- I3 , I5
Speed - 3.8 GHz
RAM - 8GB
Hard Disk - 1TB
Arduino board - UNO
Senor - Pulse Amped Heart beat sensor
Wifi Module - NodeMCU ESP8266

2. SOFTWARE RESOURCES:-

Operating system:- Windows.
Mobile Operating System:- Android.
Coding language:- JAVA, HTML, CSS, BOOTSTRAP, PHP, JQUERY, AJAX, VANILLA, JAVASCRIPT, PYTHON.
Database:- MySQL, Firebase Realtime Database
IDE:- Android Studio, Pycharm, PHPStorm.

5.2 Risk Management

5.2.1 Risk Identification

For risks identification, review of scope document, requirements specifications and schedule is done. Answers to questionnaire revealed some risks. Each risk can be categorised in types like technical, business, etc.

Technical Risk

1. Connectivity of Arduino, android application and web server can cause an associated risk.
2. Accuracy of information collection of a patient.
3. Accuracy of the progress graph generated.
4. Accuracy of GPS Tracker.
5. Identification of different stages of Alzheimer's.
6. Server failure

Operational Risk

1. Failure of the system.
2. Misuse of personal information of patients.
3. Compatibility of the platform during system up-gradation.
4. Risk while using the heart rate sensor by the caretaker.

Business Risk

1. The system does not generate large revenue.
2. Uncertainties due to change in technology demand.
3. Legal risk of documentation and copyrights.

5.2.2 Risk Analysis

1. Risk ID : 1

Description : Connectivity of Android application , web server , Arduino

Analysis : Used cloud hosted NoSQL database offered by Firebase real time database that helps to store and synchronize data between the users. It makes easier for developers to access data using any of device and helps developing collaborative features. It also provides fast and secure web hosting.

2. Risk ID: 2

Description : Security of personal information of patients

Analysis : Used Firebase Authentication where only authorized users are given access to patient data. It provides an easy sign in process which aims to simplify and secure it better. It also provides identity solution for the emails, passwords.

3. Risk ID : 3

Description: Accuracy of progress graph generated , GPS tracker

Analysis : Performed unit testing , integration testing , acceptance testing as well as validation to avoid errors and false results.

4. Risk ID : 4

Description : Risk in using heart rate sensor by patient

Analysis : Selected Pulse Amped sensor for heart rate monitoring which is plug and play sensor and free from danger of short circuits or any other risk.

5.3 Project Schedule

5.3.1 Project Task Set

Major Tasks in Project stages are :

1. Task 1 : Requirement Analysis
2. Task 2 : Project Specification
3. Task 3 : Technology study and design

4. Task 4 : Coding and implementation (Module Development)
5. Task 5: Testing and Validation

5.3.2 Task network

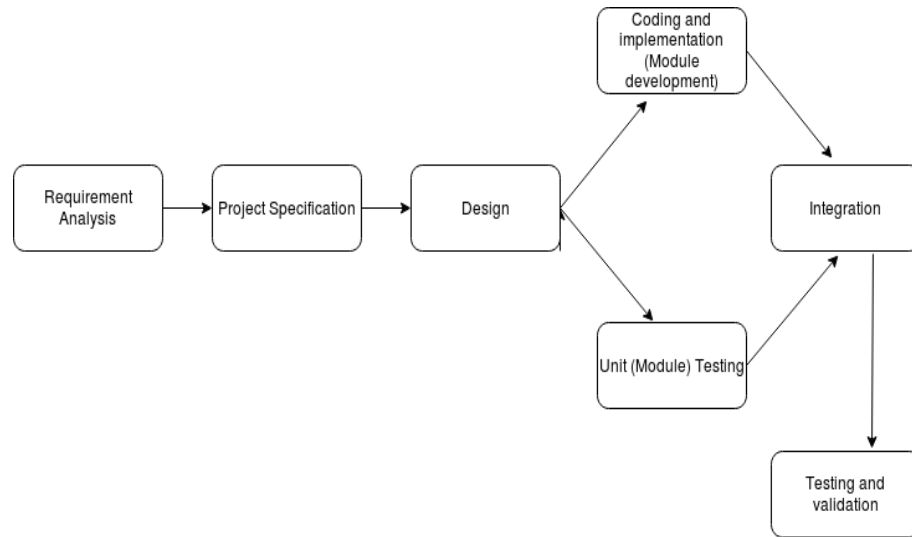


Figure 5.1: Task Network

5.3.3 Time Line

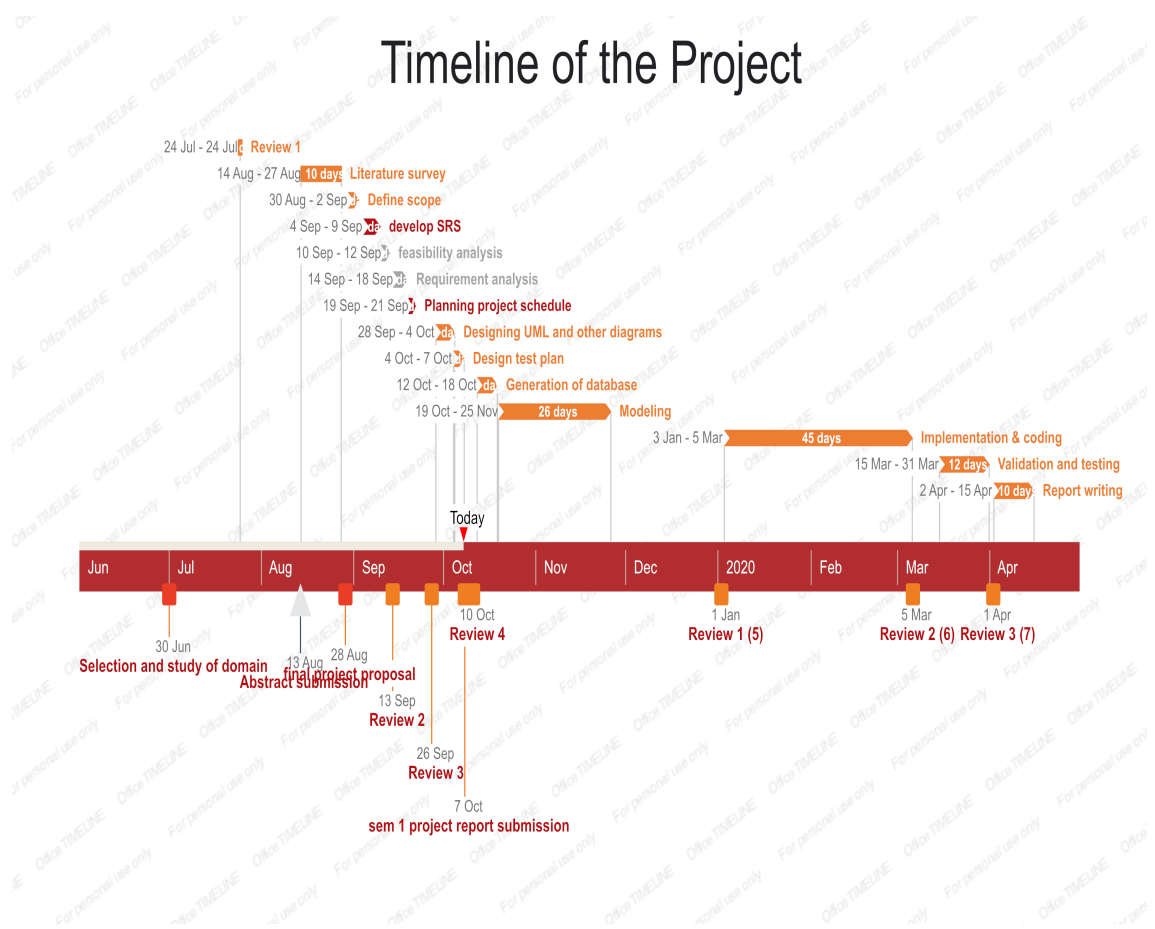


Figure 5.2: Time Line of Plan

Task	Start Date	Due date	Duration
Selection and study of domain	30/06/2019	30/06/2019	-
Review 1	24/07/2019	24/07/2019	1
Abstract submission	13/08/2019	13/08/2019	-
Literature survey	14/08/2019	27/08/2019	10
final project proposal	28/08/2019	28/08/2019	-
Define scope	30/08/2019	02/09/2019	2
develop SRS	04/09/2019	09/09/2019	4
feasibility analysis	10/09/2019	12/09/2019	3
Review 2	13/09/2019	13/09/2019	-
Requirement analysis	14/09/2019	18/09/2019	3
Planning project schedule	19/09/2019	21/09/2019	2
Review 3	09/26/2019	26/09/2019	-
Designing UML and other diagrams	28/09/2019	04/10/2019	5
Design test plan	10/04/2019	07/10/2019	2
sem 1 project report submission	07/10/2019	07/10/2019	-
Review 4	10/10/2019	10/10/2019	-
Generation of database	12/10/2019	18/10/2019	5
Modeling	19/10/2019	25/11/2019	26
Review 1 (5)	01/01/2020	01/01/2020	-
Implementation and coding	03/01/2020	05/03/2020	45
Review 2 (6)	05/03/2020	05/03/2020	-
Validation and testing	15/03/2020	31/03/2020	12
Review 3 (7)	01/04/2020	01/04/2020	-
Report writing	02/04/2020	15/04/2020	10

Table 1: Plan

5.4 Team Organization

5.4.1 Team Structure

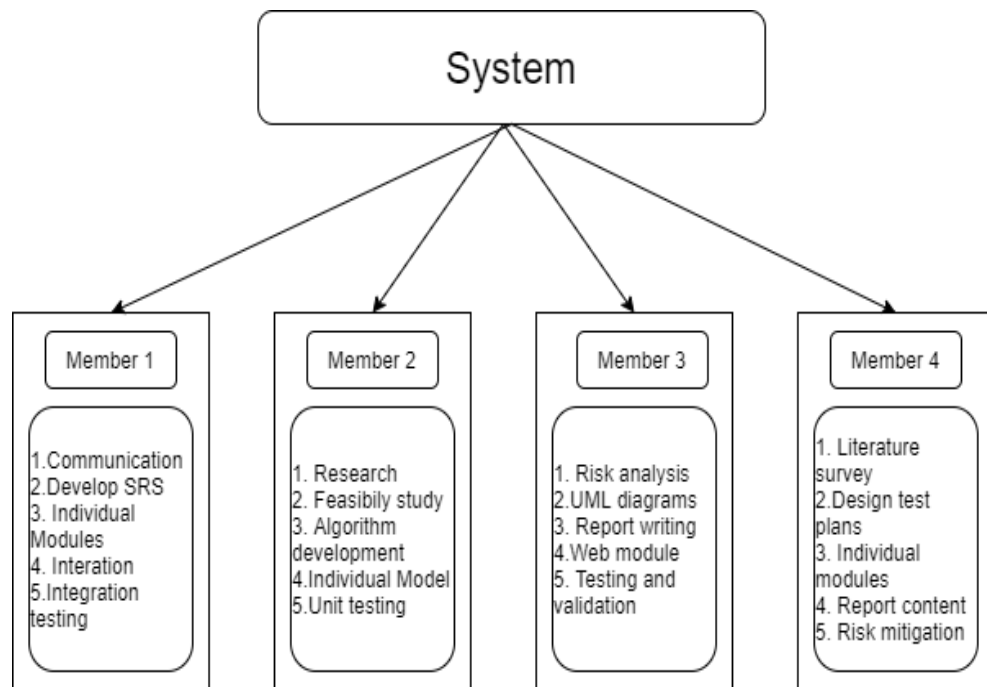


Figure 5.3: Team Structure

6 Project Implementation

6.1 Overview of Project Modules

1. Patient Module:- The main targeted customers for whom the system is being developed. This type of customer requires special attention, care, and treatment.
2. Caretaker Module:- A caretaker is a person (maybe a family member) assigned to the patients for taking their personal care. This customer plays a vital role in keeping track of patients' daily activities, appointments, etc.
3. Doctor Module:- The top layer of the system consists of professional doctors. They are the ones who treat the patients and prescribe medicines to them.

6.2 Tools and Technologies Used

6.2.1 Technology Description

Android Studio is the official integrated development environment for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. 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.

6.2.2 Hardware Specification

Processor- I3 , I5

Speed - 3.8 GHz

RAM - 8GB

Hard Disk - 1TB

Arduino board - UNO

Senor - Pulse Amped Heart beat sensor

Wifi Module - NodeMCU ESP8266

6.2.3 Software Specification

Platform: Andorid Studio,Xampp

6.3 Algorithms

6.3.1 Memory Based Cognitive Games

Step 1 - START

Step 2 - Load cards

Step 3 - Shuffle the cards

Step 4 - Allow user to select first card

Step 5 - Get the tag of selected first card and increment turn

Step 6 - Allow user to select second card

Step 7 - Get the tag of selected second card and increment turn

Step 8 - If tag of first card == tag of second card and turn %2==0 then increment score and make card invisible to user Else go to Step1

Step 9 - Check end if all cards are invisible display score and go next level of the game.

Step 10 - STOP

6.3.2 Adaptive Quiz

Step1 - Start the Quiz at moderate level.

Step2 - Choose any random question within the same level, check whether the question is previously used or not and check whether it is a imageQuiz question or text question.

Step3- Display Question and options .

Step 4- If answered correctly, increment the score and choose the next question from the same level.

Step 5- If answered incorrectly, decrement the level.

Step6- If 2 questions of same level are answered correctly, then increment the level

Step7- Repeat step 2 to 6 for 6 questions and store the result.

Step8- Exit.

6.3.3 Location Tracking

- Step1 - Check permissions, if allowed goto setp3
- Step2 - Grant permissions
- Step3 - Call new background thread to start GPS service
- Step4 - Pass key through intent to thread
- Step5 - Obtain Latitude and Longitude Coordinates
- Step6 - Send coordinates to server
- Step7 - Repeat Step 4-6
- Step8 - Stop

6.4 Code Snippets

6.4.1 Quiz

```
public void onClick(View v) {
    counter++;
    if(answer.equals("1")){
        // Toast.makeText(MainActivity.this,"Correct",Toast.LENGTH_SHORT).show();
        score=score+level;
        option1.setBackgroundColor(getResources().getColor(R.color.green));    //to correctly mark as green
        if(flagCorrect==0){
            flagCorrect++;
            qno=randomQue(level);
            new Handler().postDelayed(new Runnable() {
                @Override
                public void run() {
                    printQue(level,qno);
                }
            },1000);
        }else {
            flagCorrect=0;
            if (level != 4) {
                qno = randomQue(level + 1);
                new Handler().postDelayed(new Runnable() {
                    @Override
                    public void run() {
                        printQue(level+1,qno);
                    }
                },1000);
            } else {
                qno = randomQue(level);
                new Handler().postDelayed(new Runnable() {
                    @Override
                    public void run() {
                        printQue(level,qno);
                    }
                },1000);
            }
        }
    }
}
```

Figure 6.1: Adaptive Quiz

6.4.2 Memory Game

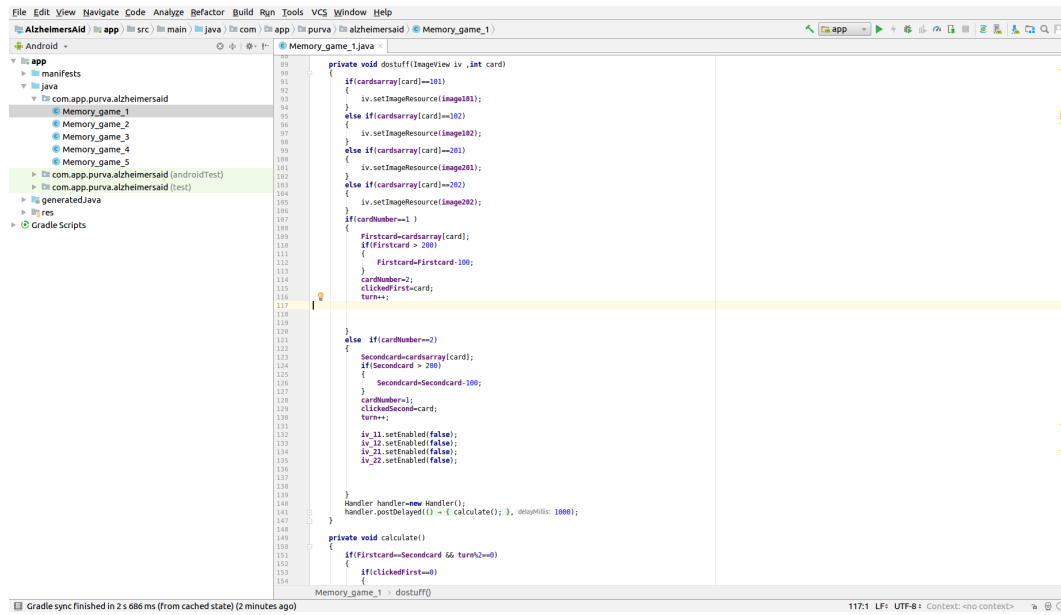


Figure 6.2: Memory Game

6.4.3 GraphScore Function

```
use Kreait\Firebase\Factory;
use Kreait\Firebase\ServiceAccount;
$id = $_GET["f_id"];

$dbname = 'Score/CDT/'.$id.'/Level1';
$serviceAccount = ServiceAccount::fromJsonFile(__DIR__ . '/secret/remiscev2-25d6df496928.json');
$firebase = (new Factory)
->withServiceAccount($serviceAccount);
$database = $firebase->createDatabase();
$reference2 = $database->getReference($dbname);
$snapshot2 = $reference2->getSnapshot();
$value32 = $reference2->getChildrenKeys();
$temp=array();
for($i=0;$i<count($value32);$i++)
{
    $temp[$i]=array("y" =>$snapshot2->getChild($value32[$i])>getValue(),"label" => $value32[$i]);
    //$dataPoints=$dataPoints + $temp[0];

    //$dataPoints=$temp0 + $temp1;
}

$dbname = 'Score/MIS/'.$id;
$serviceAccount = ServiceAccount::fromJsonFile(__DIR__ . '/secret/remiscev2-25d6df496928.json');
$firebase = (new Factory)
->withServiceAccount($serviceAccount);
$database = $firebase->createDatabase();
$reference2 = $database->getReference($dbname);
$snapshot2 = $reference2->getSnapshot();
$value31 = $reference2->getChildrenKeys();
$temp1=array();
for($i=0;$i<count($value31);$i++)
{
    $temp1[$i]=array("y" =>$snapshot2->getChild($value31[$i])>getValue(),"label" => $value31[$i]);
    //$dataPoints=$dataPoints + $temp[0];

    //$dataPoints=$temp0 + $temp1;
}
}
```

Figure 6.3: Graph Score Function

7 Software Testing

7.1 Types of Testing

7.1.1 Unit testing

Unit Testing is a level of software testing where individual units/ components of a software are tested. The purpose is to validate that each unit of the software performs as designed. A unit is the smallest testable part of any software. It usually has one or a few inputs and usually a single output. In procedural programming, a unit may be an individual program, function, procedure, etc. In object-oriented programming, the smallest unit is a method, which may belong to a base/ super class, abstract class or derived/ child class. Some treat a module of an application as a unit. Unit Testing is the first level of software testing and is performed prior to Integration Testing.

7.1.2 Integration Testing

Integration Testing is a level of software testing where individual units are combined and tested as a group. The purpose of this level of testing is to expose faults in the interaction between integrated units. Test drivers and test stubs are used to assist in Integration Testing.

7.1.3 Functional Testing

Functional testing is a type of software testing whereby the system is tested against the functional requirements/specifications. Functional testing is centered on the following items: Valid input : identified classes of valid input must be accepted. Invalid input : identified classes of invalid input must be rejected. Functions: identified functions must be exercised. Output : identified classes of application outputs must be exercised. System/Procedures : interfacing systems procedures must be invoked. Functions (or features) are tested by feeding them input and examining the output. Functional testing ensures that the requirements are properly satisfied by the application. This type of testing is not concerned with how processing occurs, but rather, with the results

of processing. It simulates actual system usage but does not make any system structure assumptions.

7.1.4 System Testing

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process description and flows, emphasizing pre-driven process links and integration points.

7.1.5 White box Testing

White Box Testing also known as Clear Box Testing, Open Box Testing, Glass Box Testing, Transparent Box Testing, Code-Based Testing or Structural Testing) is a software testing method in which the internal structure/design/implementation of the item being tested is known to the tester. The tester chooses inputs to exercise paths through the code and determines the appropriate outputs. Programming know-how and the implementation knowledge is essential. White box testing is testing beyond the user interface and into the nitty-gritty of a system. This method is named so because the software program, in the eyes of the tester, is like a white/transparent box; inside which one clearly sees. For unit testing white box technique is used. Integration testing can also be performed using White box testing technique

7.1.6 Black box Testing

Black Box testing also known as Behavioral testing is a software testing method in which internal structure/design/implementation of the item being tested is not known to the tester. This method is named so because the software program, in the eyes of the tester, is like a black box; inside which one cannot see.

7.1.7 User Acceptance Testing

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements. All the test cases mentioned above passed successfully. No defects encountered

7.2 Test Cases and Test Results

7.2.1 Login Module

1. Module Id: 01
2. Description: Login of user with valid credentials

Test Case ID	Decription	Input	Actual Output	Expected Output	Test case Result
101	Enter valid mail	arhvjckc@gmail.com	Login Successful	Login successful	P
102	Enter invalid credentials	Invalid password	Toast: enter valid Data	Toast: enter valid Data	P

Table 2: Login Module

7.2.2 Music Module

1. Module Id: 02
2. Description: Music player functionalities with various inputs

Test Case ID	Decription	Input	Actual Output	Expected Output	Test case Result
201	Play a song	Click on song	Music player plays the song	Song starts playing	P
202	Pause the song	Pause button pressed	Song is paused	Song stops playing	P
203	Play next song	Click on next Button	Next song starts playing	Next song Played	P

Table 3: Music Module

7.2.3 Quiz Module

1. Module Id: 03
2. Description: Interactive Adaptive Quiz module with various test cases like correct answer, wrong answer, exit, etc.

Test Case ID	Decription	Input	Actual Output	Expected Output	Test case Result
301	Selecting correct option	Clicked on correct option	Option color changed to green score incremented	Change color to green score increases	P
302	Selecting wrong option	Clicked on wrong option	Option color changed to red	Change color to red	P
303	Exiting from the Quiz	Click on Quit Button	Quiz exit	Stop the Quiz	P

Table 4: Quiz Module

7.2.4 MIS Module

1. Module Id: 04

2. Description: MIS module with various test cases

Test Case ID	Description	Input	Actual Output	Expected Output	Test case Result
401	Speech recognition	Patient clicks on speech button & speaks	Speech is converted into text	Speech to text conversion	P
402	Evaluation	Correct word	Score incremented by 1	Score increased	P

Table 5: MIS Module

8 Result

8.1 Outcomes

The system successfully bridges the gap between doctor, patient and caretakers. Automatic report generation helps doctors to keep check on patient's progress daily through web portal. Stress relief activity helps caretaker's to stay free from the anxiety and stress. The forum helps to connect relatives of patients with doctors across the globe which can help in sharing various ideas, new innovations, researches, etc.

8.2 ScreenShots

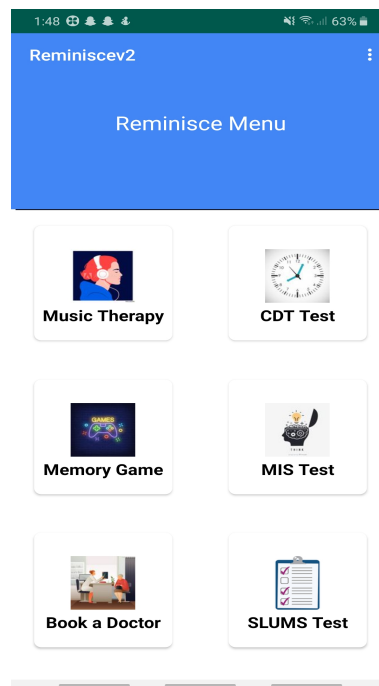


Figure 8.1: Dashboard

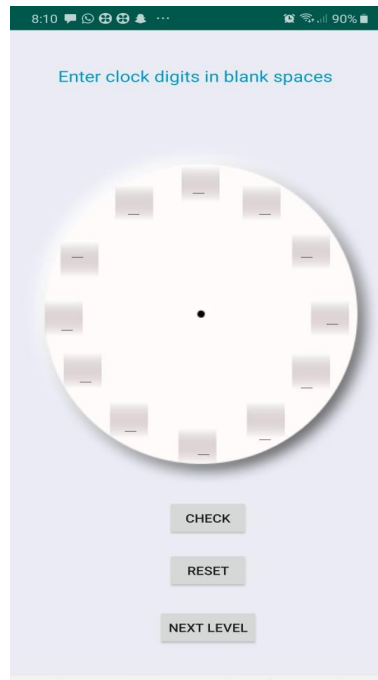


Figure 8.2: CDT

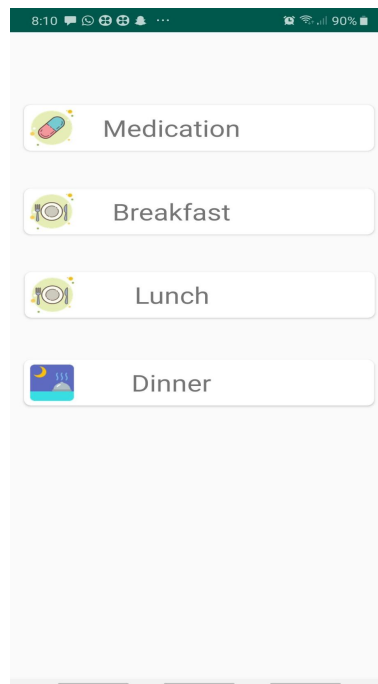


Figure 8.3: Reminder

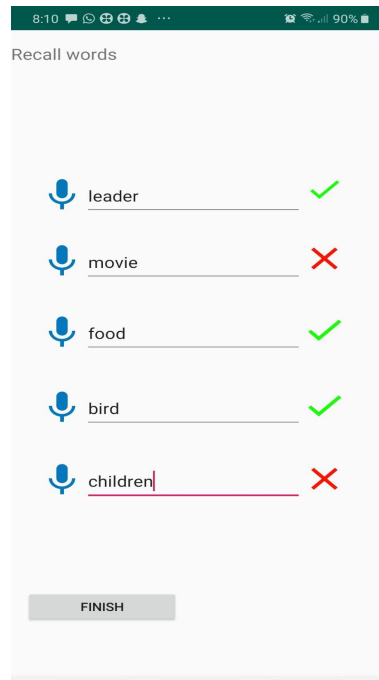


Figure 8.4: MIS

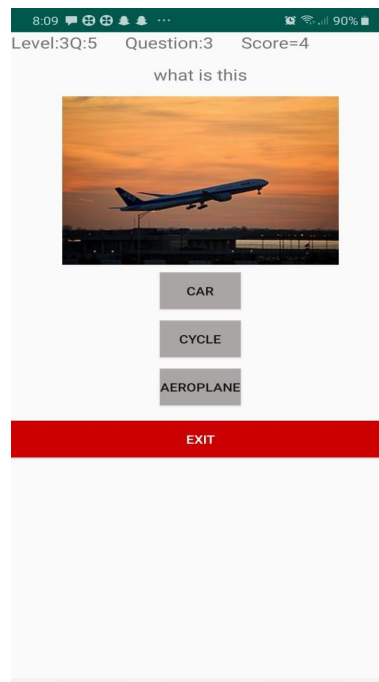


Figure 8.5: Quiz

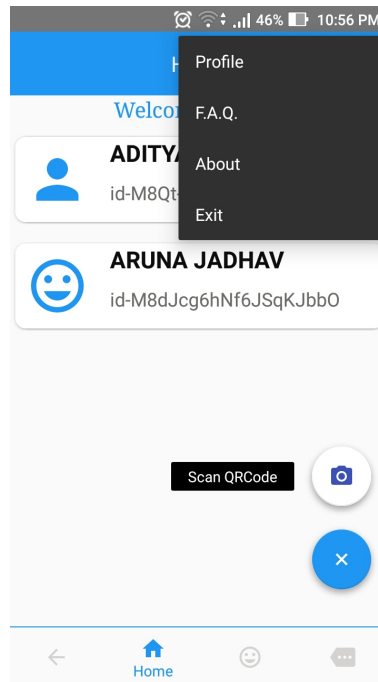


Figure 8.6: Caretaker Dashboard

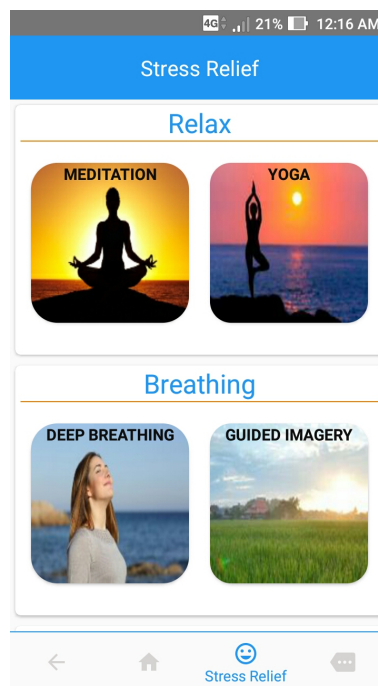


Figure 8.7: Stress Relief

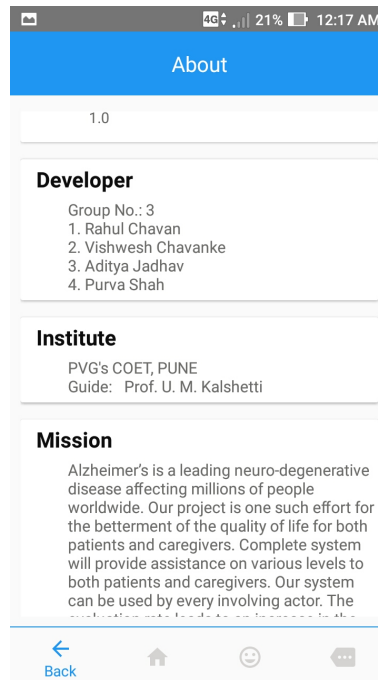


Figure 8.8: About

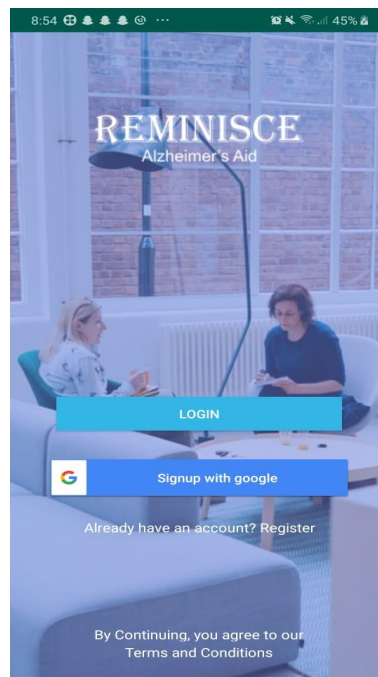


Figure 8.9: Login

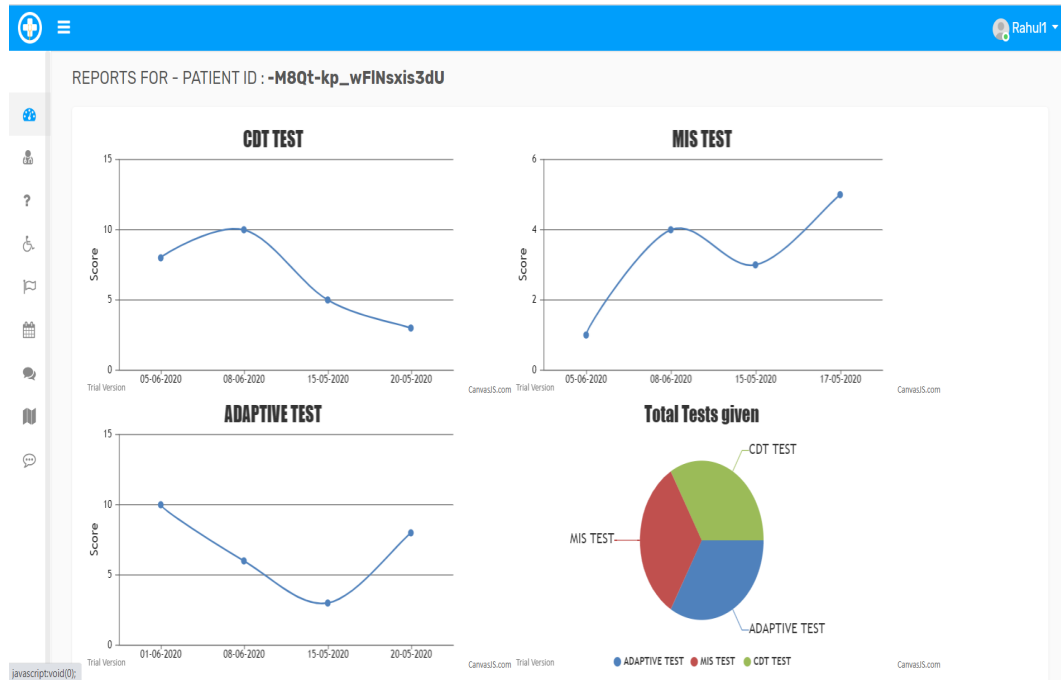


Figure 8.10: GraphPlot

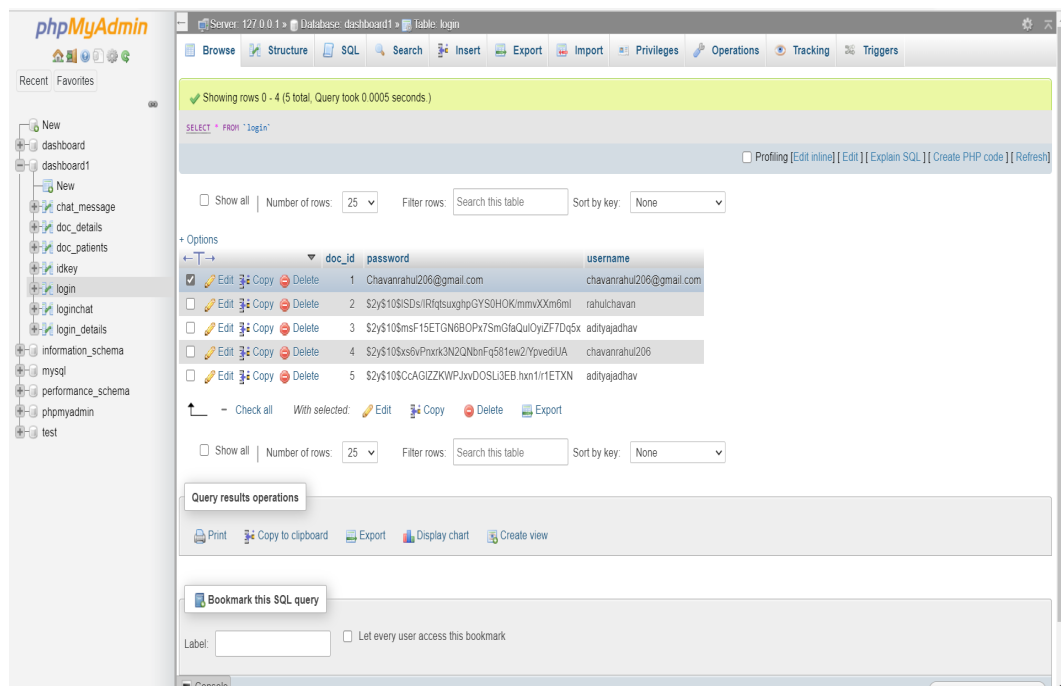


Figure 8.11: Encrypted password

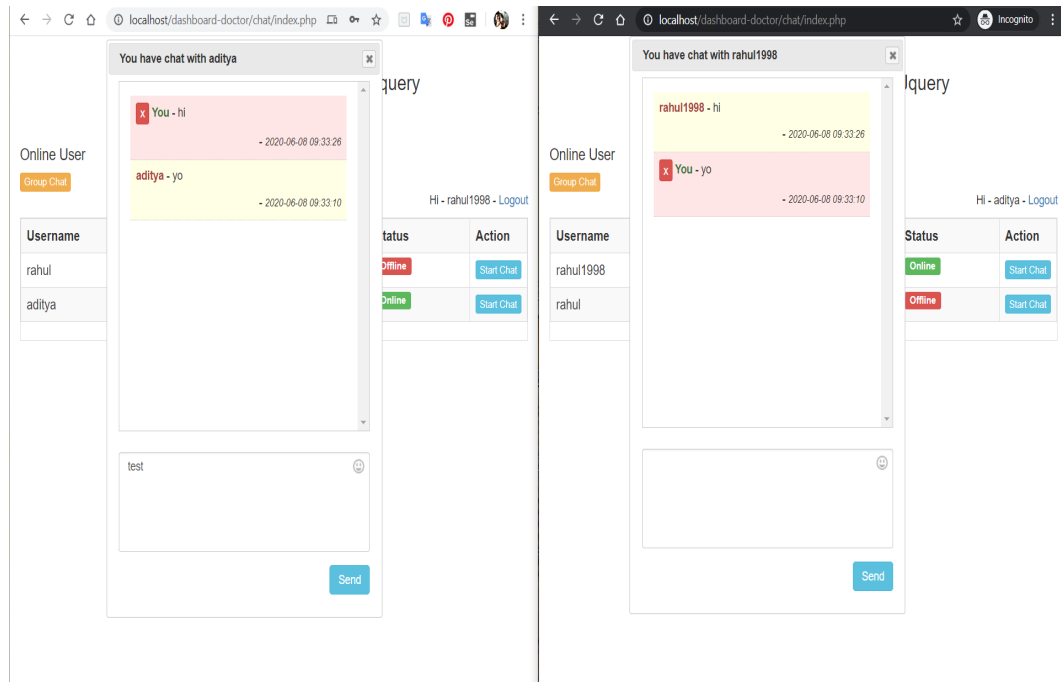


Figure 8.12: Chat

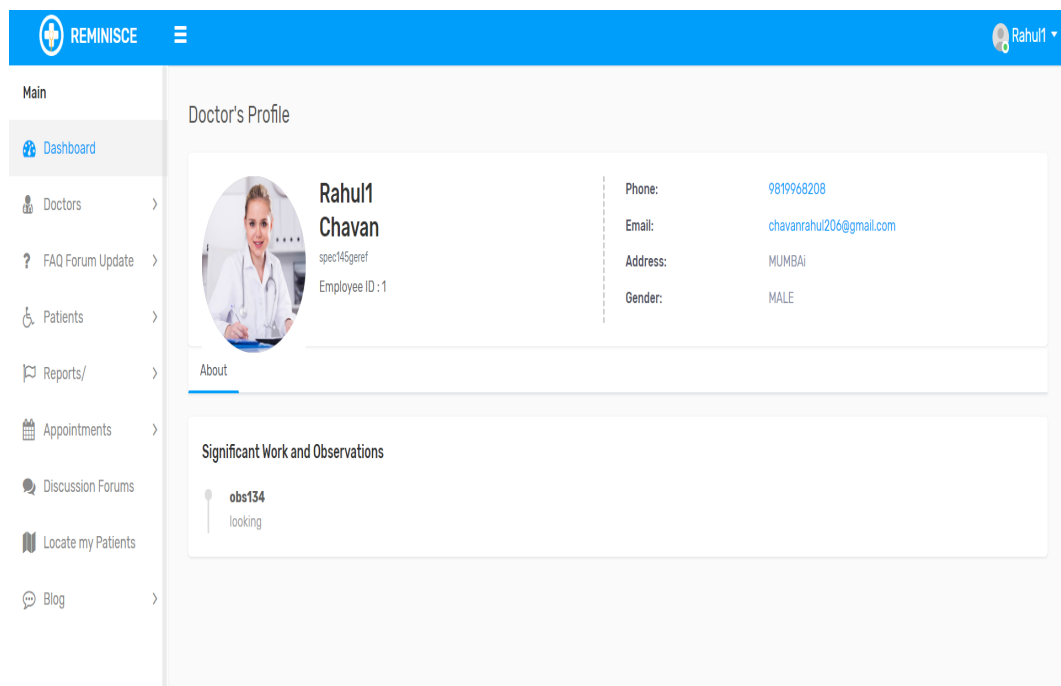


Figure 8.13: Doctor Profile

9 Conclusion

9.1 Conclusion

In recent years, emphasis on improving quality of care provided by hospitals has increased significantly and continues to gain momentum. Therefore, the demand now is creating new needs to help and make better choices as using the mobile application in health care sector. Detection tests provided proves to be helpful in order to detect and determine severity of Alzheimer's disease and connect to doctor. Alzheimer's patients suffer from problem of memory loss and this problem leads to deterioration of their health. Our system is proposing the reminder application prototype that includes various features helping them to remember easily and contribute for keeping their health in long run. Patient wandering problem is reduced to some extent as the patient is helped by caretaker using GPS feature provided. The use of motion based technology stimulates brain and improve lives of people suffering from Alzheimer's. With the help of interactive adaptive quiz progress of patient is enhanced as generated reports make improvement in patient health. Music therapy as well helps patient to reveal their past memories. Caretaker is provided feature of emergency help and stress relief activities to improve their quality of life. Finally we hope that this work up to the target groups and help them to overcome their problems and to live their lives better.

9.2 Applications

1. The project is used to monitor patients health records, track their progress, heart rate.
2. It connects the patients, caretakers and Doctors providing a platform for connecting them with each other allowing easier access to each other .
3. Patients medical history will be useful for future studies and analysis and for automation and more accurate algorithms.
4. Advance research can be done to search the relation between Alzheimer's and its symptoms.

5. A forum allowing patients, doctor, their families to connect with each other helping people to exchange, brainstorm thus creating an online community for fighting the disease.
6. The project can even be used even for the field of geriatrics and dementia.

9.3 Future Scope

1. We can integrate the system with the database of the hospital for better working with effective use.
2. Wear OS can be integrated with system for increasing effectiveness of system.
3. Sleep tracking with sensors can be introduced in the system for better results.
4. The system can be used at global level with advancements with leading research institutes like Alzheimer's society.

10 Appendix A

Problem statement feasibility assessment using, satisfiability analysis and NP Hard,NP-Complete or P type using modern algebra and relevant mathematical models.

10.1 Feasibility Study

10.1.1 Technical Feasibility:

The feasibility study is an influencing factor that contributes to the analysis of system implementation. The consideration of whether to design and implement a particular system depends on the feasibility study on a targeted system. Technical feasibility study is carried out to determine whether the proposed system has the capability, in terms of software, hardware, personnel, and expertise to handle the completion of a task.

10.1.2 Operational Feasibility:

Operational feasibility is a measure of how well a proposed system solves the identified problems, and takes advantage of the opportunities identified in the scope of research. The system should also satisfy the requirements identified in the requirement analysis phase of system development. Since the software is intended at making operations easy faster, the intended user must have the fundamental knowledge of the computer, and operating systems environment.

10.1.3 Economic Feasibility:

Economic Feasibility is concerned with the cost incurred for development and implementation of the proposed system, the maintenance of the system, and the benefits derived from it. The software required for the implementation of the proposed system is open source and for the implementation we are taking already available dataset. So cost incurred is comparatively less.

There are two types of problems:

Polynomial (P): The Proposed system accepts input, and we get the output in fixed polynomial time the input format is fixed so that our system takes fixed computational time. Applications of polynomial type are rare. One such example is hash table. The hash table finds index for a data to be inserted in fixed amount of time because it uses hash function to find index. So, for finding index 1 or 100 the time is fixed which is not in case of sequential search for index.

Non-Polynomial (NP): There are two sub-types of NP Problems:

NP-Hard: The system accepts input, but there is no guarantee that we will get the output. Such systems do not exist because no one will use the system if there is no guarantee the system works for any inputs. Hence our application is again not of NP-Hard type because we want to build a system that never fails and guarantees output. Example:

Turing Machine Halting problem.

NP-Complete: The system accepts input, and we get the output in variable non-polynomial time. Almost all or maximum systems are of NP Complete type our application is not NP complete type because it guarantees output but in fixed amount of time. The time required for the output is directly proportional to the size of the input. So, our output time doesn't vary with the input.

10.2 Conclusion:

Hence problem is NP- Complete type.

11 Appendix B

12 Appendix C

12.1 Plagiarism Report

1. 5,783 words.
2. 38,060 characters
3. 84.68% unique.
4. Plagiarism check done by <https://www.duplichecker.com>.

13 References

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