IOT BASED REMOTE
DEVICE CONTROLLING MECHANISM

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CERTIFICATE OF APPROVAL AND CORRECTNESS

This is to officially state that the thesis work contained in this report titled
"**IOT BASED REMOTE
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Dedicated to my exceptional parents and adored siblings whose tremendous support and cooperation led me to this wonderful accomplishment

ABSTRACT

Mobile communication technology is playing a major role in today's world. Device automation has a wide scope in today's and in coming generations. In this article, inexpensive and steadfast home controlling and monitoring system shall be explained which will be using Android based Smart phone Application for accessing and controlling devices remotely. Using this technology shall uplift the living standards of humankind, thus making the home smart, time saving and energy efficient. It shall also be very helpful in aiding the disabled people and making their needs to be fulfilled thus leading a normal life. The proposed system consists of android mobile, Arduino Uno board, Wi-fi Module, firebase database and a relay circuit. We will be using Wi-Fi technology to monitor the device because of its precision and high range instant connectivity. The module controls home appliances with a very easy user Interface.

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Chapter 1

1 Introduction

The intention to make the device like this is to attain maximum grip in the field of hardware and mobile application development and to understand the areas of computer science more deeply to comply with the modern techniques under the shine of a supervisor plus the IOT based mechanism for controlling the devices from a far distance is itself a new addition in the field of computer sciences. We want to add maximum features like we will add voice controller, IP resolver plus the firebase database.

1.1 Purpose

The purpose of this device is to sophisticate and modernize current way of controlling devices and to maintain a database of users to have the data record and the remote controlling from the far distances show the status bar in the application interface. And the purpose is to have a more advanced voice recognition feature in the current technology which makes the device more handful to the disabled persons as well so the purpose is clear and can be understood properly.

1.2 Document Conventions

The main typographical conventions are followed which are provided as a sample to us by the coordinator and the coding commands are highlighted with the headings in order to specify them with the help of separate entity plus the main point are highlighted in apostrophes and written in bold letters. So the main and the simple document conventions are followed.

1.3 Intended audience and reading suggestions

The main audience of this document are the end users for seeking help and understanding the usage in order to use the device easily plus if anyone wanted to startup a setup to maintain a device making process can also seek help in this document by reading it through

the perspective and the main functions that are listed below which can easily give an idea for making the device and using the device.

1.4 Product scope:

As discussed above the scope of the product is very broad and the main areas that will cover are the remote sensing and activating any electronic appliance and the usage of electricity must be reduced in order to save the bill, and the concepts of database (firebase) and mobile application development (android) is also used.

1.5 Primary Objectives:

To design a home automation system using Arduino and firebase in order to make it low cost, low power system.

1.5.1 Academic objectives:

1. Development of an android based application for end users.
2. To have a good hand on using the cloud services i.e. Firebase database

1.5.2 Application / End – goal objectives:

Basically our main goal is giving facilities to such home owners who want their home automated and I think everyone wants to have an automated home so we are creating a prototype model which we will show them in the form of this project. In this way I think we have targeted every person who lives in a home.

1.6 Deliverables

1. Complete working project
2. Android application
3. Documentatio

Chapter 2

2 Literature Review

2.1 Introduction

The Art of remotely controlling electronic home appliances is called home automation system. This concept "Home automation" has started in early 1970's. Recently, the desire and scope of remotely accessing, controlling and monitoring of any network-controlled appliances is increasing day by day. In today's world people are focused to create automatic behavior in all possible things for sake of easiness and wellbeing, that will surely save time and energy of all sorts. The system shall control the lightning, fans and safety alarm in case of any fire detection by our sensors. It is art of making the devices automatic and workable with less human involvement.

2.2 Problem Domain

In order to build an home automation system, the prime objective is to deliver an error free, low-cost and low-power system. For the improvement purposes we are using wifi technology. As the world is going under the umbrella of technology there is a need to make homes smarter like smart phones. The arduino will act as a transmitter between the electronic devices which makes the more reliable and efficient. Due advancement in the field of technology and people want to get things done easily and quickly. The main issue of the modern age is to automate home appliances as everything is easily accessible now a days, our cars are automated, our smart phones are automated, our office workspace is automated, so why not to automate the home too

As a quest to solve the problem of the common man, which is not necessarily lucrative class, but it can be adopted to any class of the country which means it covers a wide area of the audience. We' re targeting the area of people who want to control on their fingertips.

2.3 Shortcomings/issues

1.   Internet connection is essential for the working of IOT Based Remote Device Controlling Mechanism on android phone.

2.   The application is for android based smart phones only.

3.   Location accuracy depends upon the quality of the user's mobile set.

4.   For earlier versions, the contents of the application will be in English language only.

5.   Currently we are using non paid cloud services that may be imprecise in terms of speed and services.

6.   The server will not be available in case of maintenance and testing issues. No backup server configuration is provided.

2.4 Proposed Project

The project is to design a hardware to control the appliances from the distant places and to make electronic devices more sophisticated and handful and can be controlled through the mobile application.

In this system with the help of android application user send signal to Arduino board and a wireless module connected to this Arduino receives these signals and further send to Arduino board for controlling the home appliances using relay board. Arduino node ESP 8266 will be used as a controlling hub. To perform the operations ON/OFF we use the relays. This system will be useful for the handicapped persons as well as they cannot move from one place to another for controlling their devices.

2.5 Deliverables

2.5.1 Software Requirement Specification (SRS)

The purpose of the document is towards the introduction of a comprehensive picture of the IOT Based Remote Device Controlling Mechanism. It describes the persistence and characteristics of the system, the interfaces, the boundaries of the system, whatever the product will do, its processes and workings, noted that the constraints by which it ought to operate and how the system is going to act in response to exterior stimuli. This paper is intended for developers and the participants of the system. It shall describe how the system will primarily aid concerned groups to team up and cooperate with each other.

2.5.2 Software Architecture Document

In this document the overall architecture of the system is discoursed, also including the introduction of various components and subsystems. It is chiefly braced by system Architecture diagram which depicts an insider's viewpoint of the system by unfolding the high-level software components that execute the major functions to make the system operational.

2.5.3 Software Design document

The Software Design Document is a record to give documentation that shall be utilized to help in programming advancement by giving the subtleties to how the product ought to be fabricated. Inside the Software Design Document are narratives and graphical documentation of the product plan for the task. It covers every single practical prerequisite and shows how they communicate with one another adroitly. The low-level design additionally appears with respect to how really we have been executing how we are going to actualize these requirements.

2.5.4 Implementation code Document

The implementation code document provides details about the pseudo code for the application and project prototype.

2.5.5 Software Testing Document

This document has testing modules in which there are certain test cases which depicts the correctness and accuracy of the project.

2.5.6 Final Project Report

This is the thesis report which compiles all the previous and current working for the project. Thesis report provides the whole summary for the project and also give details about each and every aspect of the project starting from introduction of the project, literature review, requirements leading to design discussions then testing and lastly future work and conclusion.

2.5.7 User Manual

User Manual gives details about the use of the product. It contains details as how to use the product. Its functionalities and details of every aspect as how that works and how to use it. User Manual is for users to get to know the product.

2.6   Technological Requirements

 IOT Based Remote Device Controlling Mechanism entails subsequent software and hardware requirements specifications.

2.6.1 User Interfaces

The first and the foremost interface will be the mobile application which will be used as a front end in the usage of this device. And the primary user interface will be the application so it will be designed according to the trends and keeping the simplicity in the mind so that each and every user can get maximum benefit of the device. According to us, it will be the crucial point in the development of the device which will be helpful for the users as well.

2.6.2 Software Interfaces

As discussed above, the main bridge (connection between the hardware and the software application) will be the firebase database which is online available database to maintain the entities of the software and the mode to transfer data will be in the form of wifi signals emitted by the device and intercepted by the controller which then turn on and off the devices, so that we can say that there is as such no data transfer but the signals will communicate in the form of data (one's and zero's) and the database will change the entities accordingly.

1. IOT Based Remote Device Controlling Mechanism shall work on Firebase database management system.
2. IOT Based Remote Device Controlling Mechanism app shall be able to execute on all android devices with basic hardware requirements fulfilled that run Android OS 5.0 or above.

2.6.3 Hardware Interfaces

2.6.3.1 Mobile Device

The hardware, software and technology used must possess the subsequent specifications:

1. Android Device (Smartphone or Tablet) running Android 5.0 or later, color display.
2. Touch Screen with haptic feedback on key presses (Android Keyboard)
3. Operating System: Android
4. Capability to link to Wi-Fi or mobile communication network.
5. Touch screen intended for accessibility or keypad (if touch pad is not accessible)
6. Processor that possess the speed of 1 GHz
7. Ability to take over input from user
8. Device needs to have at least 1 GB of RAM

The main hardware that we will use for making this device will be 8266 microcontroller and the bridge between the hardware and software (application) will be the firebase database system which

is also easy to use and understand so the physical devices will be the controller and the electric components but the software will be the application and the online database.

2.6.4 Communications Interfaces

According to estimate there will be no encryption issues as there is no need of as such conventional data transfer only the signals will transverse and change the status of the controller and the devices and for that simple HTTP protocol (built-in) will be used which provides the basis of the firebase system.

1.   A connection shall be established between the System and the cloud services of Firebase.
2.   To access the services of the application we need to establish connection between the application running on mobile device and firebase database cloud computing.
3.   Communication between application and the database is provided by cloud services of Firebase.

2.6.5 Programming Interface

Programming interfaces for project are:

MIT App inventor

Arduino IDE

Chapter 3

3 Overall Description

3.1 Product Perspective

This product is helpful for the electronic device users and this is something can be referred as the home automation in terms of usage and shop automation in terms of mobility and automated electronic device controller so the broader perspective allows the users and the developers to seek help in the automation of devices and this product may resembles with the previous projects but it is unique in a sense that it is made using the latest technological market trends and chosen by us to have a well know how to use the hardware encoding as our future goals.

3.2 Product Functions

The main function that will be performed using this project are listed below:

- It will allow the user to control the devices which are far to reach physically.
- It will allow a user to maintain devices record
- It will allow the user to reduce the electricity cost

3.3   User Classes and Characteristics

Anyone who wants to automate the electric components whether used in home, shops and any other place can use the device and no such educational barrier is needed but the technique to use the mobile phone application is compulsory in order to use the device more efficiently and no other background is certain in order to use this device, so we can say that this application is completely user friendly but depends upon the affordability of the user but we are trying to make it as low cost as we can so that everyone can adopt this friendly device to reduce the fuss and flaw.

3.4 Operating Environment

OE-1*:* We are using NODE esp 8266 microcontroller which is the main hardware plus the relays and can be placed in any environment but not coexist with moisture and high temperature. Software environment is very friendly because it can be run on any android device so just one dependency of android phone is there which is also very common and can be used by anyone and anywhere.

OE-1: IOT Based Remote Device Controlling Mechanism back-end utility i.e. online server that can be bought and database can be maintained there. All the data will be accessed on the cloud server and data manipulation can be done on the same server.

OE-2: IOT Based Remote Device Controlling Mechanism will be managed with Firebase database management system.

OE-3: IOT Based Remote Device Controlling Mechanism will run on any Android smart phone with a working internet connection.

The hardware, software and technology used should have following specifications:

- Operating System: Android
- Capability to link to Wi-Fi or mobile communication network.
- Touch screen intended for accessibility or keypad (if touch pad is not accessible)
- Processor that possess the speed of 1 GHz
- Ability to take over input from user
- Device needs to have atleast 512 MB of RAM

3.4.1 Technology Platform:

3.4.1.1 Android-Based Front End:

IOT Based Remote Device Controlling Mechanism's front-end would be developed for android-based smart phones, providing the users with the interface to control the home appliances with the clicks on mobile phone and with voice. Android development tools (MIT App Inventor) would be used as the development environment.

3.4.1.2 Programming languages:

1. C, JAVA

3.4.1.3 Programming Environment

1. MIT App Inventor

2. Arduino IDE

3.4.1.4 Database

1. Firebase Database

3.5 Design and Implementation Constraints

The design is pretty much simple and the maintenance is not that much difficult and can be easily repaired anywhere across Pakistan. And no legal or law boundaries are there to use the device because it cannot be implemented in any of the skeptical activity or the activity which bounds the user lawfully.
No copyright issues will be there because the dependent software are easily open source available, so most of the thing are easy to understand and no changing required after successful installation. Dependent software are also easy to handle, like we are using the firebase database which is available online for everyone to use and no issues with the piracy

is also the plus point of the firebase database and most of these kind of devices are already using the firebase online database.
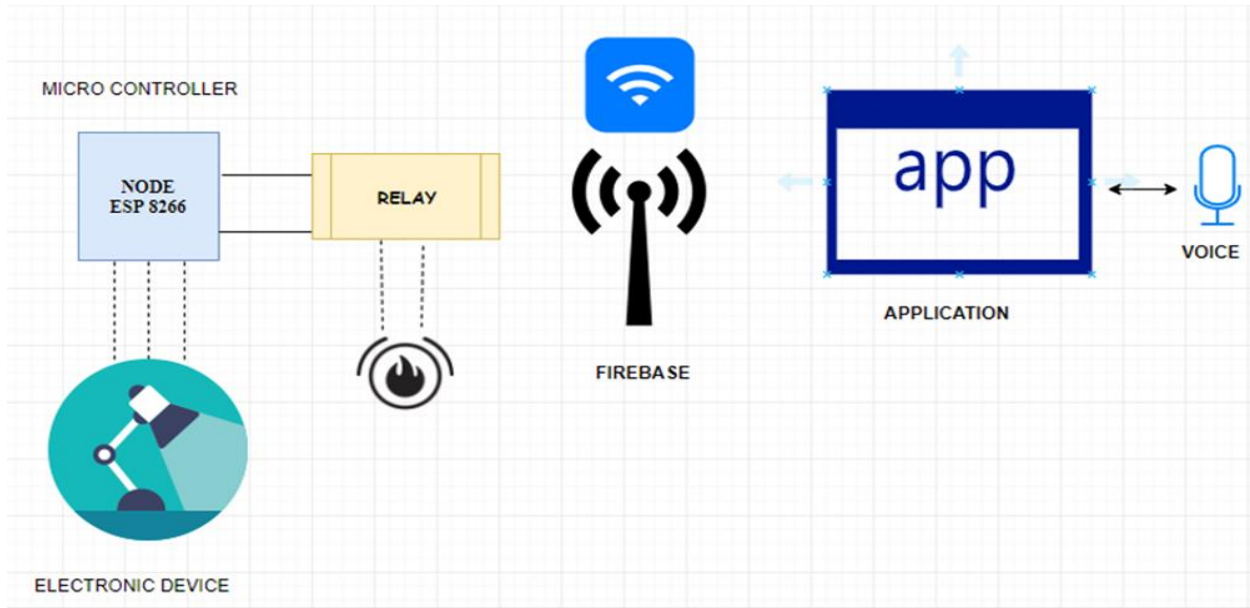
Figure 1 Project Design Implementation

3.6   User Documentation

SRS can also be used as a user manual so there is as such no need to design different manual to use but we will deliver a small instructions set to the users to use this device properly.

UD- version 1.0: Ultimate publication shall be complemented with a user manual to enlighten users how to use IOT Based Remote Device Controlling Mechanism. User documentation that would be delivered along with the final product

- User manual

3.7 Assumptions and Dependencies

At this point of the development the main assumption is how we make the application which can control the device from a distance. Let me explain further, the type of device that we are developing mostly restricts the user to connect with the same IP address from which the device and mobile both are connected for the use and function. So we will resolve this problem once after getting done with the hardware.

Second assumption is the requirement of static IP addressing for the device and the mobile phone from which the device is connected because dynamic IP address can never work, so for resolving this dependency we are planning to buy a static IP address for the device and mobile phone these are the two assumptions and dependencies that we think might occur.

Chapter 4

4 Software Requirements Specification

4.1 System Features

4.1.1 Controlling the Devices

As such there is no such factor of risk associated with this feature but the main part of the system is controlling the devices, so the main and the first feature is the controlling itself.

4.1.2 Stimulus/Response Sequences

Signal generation through the application installed in the mobile phone will enable the first feature to work so that the stimulus (Signal) will be generated through the application and the response will be generated in the controller.

4.1.3 Functional Requirements

Functional requirement which is most important in this device is the internet connection and the connection of wifi with the mobile and device simultaneously which is the most important functional requirement and second will be the proper hold and command over the google voice recognition which will also be the basis of the device.

4.2 Other Non-functional Requirements

4.2.1 Performance Requirements

The secondary requirements for the system may be the performance requirements of the systems, so according to our perspective the most important performance requirement will be the memory and the stable internet connection for transferring the signals between the device and the mobile application so the performance requirements for this system is not that much costly or high, that makes the system integrity and compatibility constraint is also improved.

4.2.2 Safety Requirements

This system may promote the lethargic culture but the main safety concern is not to be totally relied on the system but the confirmation is also needed as a preemptive measure to make sure that the system is performing well, secondly the system is one time investment so the necessary measures to protect the system from damage is also prescribed for the safety of the device.

4.2.3 Security Requirements

As far as the security is concerned the main database (firebase) provides the best security feature where the user database is maintained and there is no doubt that the firebase system is well protected, which provides the mobile application to authenticate the user and allow access to the device plus data integrity is not a big issue because there is no as such data transfer between the application and the database so signals are completely secure and safe.

4.2.4 Software Quality Attributes

Software quality depends upon the front end and partially on the back end of the product so that the design of the application is very important in this regard, we are trying to make user friendly application which will allow the user to make any change and save the record in very easy manner the application will be uploaded to the play store so that the availability will be so easy and the usage is also stated to be made as easy as we can.

Availability: System shall be operating on any time.

Reusability: The components of the system shall be written in a way that they are easy to reuse.

Reliability: The system defect rate shall be as less as possible.

4.2.5 Business rules:

Every customer can use it as he wants but labelling one's work to own is a global rime and must be punished in every manner so that making copies will be prohibited and other than that everything is permissible. Basic business rule of open ended entity will be applied to make this technology easily available to everyone.

4.3 Software Quality Attributes

Quality attributes of IOT Based Remote Device Controlling Mechanism are portrayed underneath. In the wake of these characteristics, the quality of IOT Based Remote Device Controlling Mechanism shall be enhanced.

4.3.1 Runtime System Qualities

At execution IOT Based Remote Device Controlling Mechanism ought to offer its users with features that they can publish and search for the desired services. Some of the qualities that needs to be counted in the development of IOT Based Remote Device Controlling Mechanism are portrayed here.

4.3.1.1 Functionality

IOT Based Remote Device Controlling Mechanism must provide functions to publish and search the different services. IOT Based Remote Device Controlling Mechanism ought to offer the feature of authentication of user.

4.3.1.2 Availability

IOT Based Remote Device Controlling Mechanism should be available 24/7.

4.3.1.3 Usability

Usability is an important criterion in the development of IOT Based Remote Device Controlling Mechanism. The system should present all functionalities in such a way that nothing is missed by the user. The graphical user interface of app is to be designed with usability as the priority. The app will be presented and organized in a befitting manner.

4.3.1.4 Non-Runtime System Qualities

These are characteristics of IOT Based Remote Device Controlling Mechanism which are required to make this software useful for further enhancements. It will also be helpful in future development as well as extending system to different environments.

4.3.1.5 Portability

The system should work on WIFI as well as 3G network.

IOT Based Remote Device Controlling Mechanism should be capable to operate on various mobile gadgets that are operating via android operating system.

4.3.1.6 Testability

Various quality assessments ought to be executed so that IOT Based Remote Device Controlling Mechanism is exempt of flaws and operate agreeing to requirements.

Chapter 5

5 System Design Specifications

5.1 System Architectural Design

Layard architecture will be used with each layer providing a set of functionalities. These layers will be composed of multiple services which will communicate with each other via message passing. Abstractly, the services can be observed as components of the complete solution. Though, on the inside, each facility is made up of software components, exactly as any other application, additionally these components can make use of each other without being aware of the internal implementation.
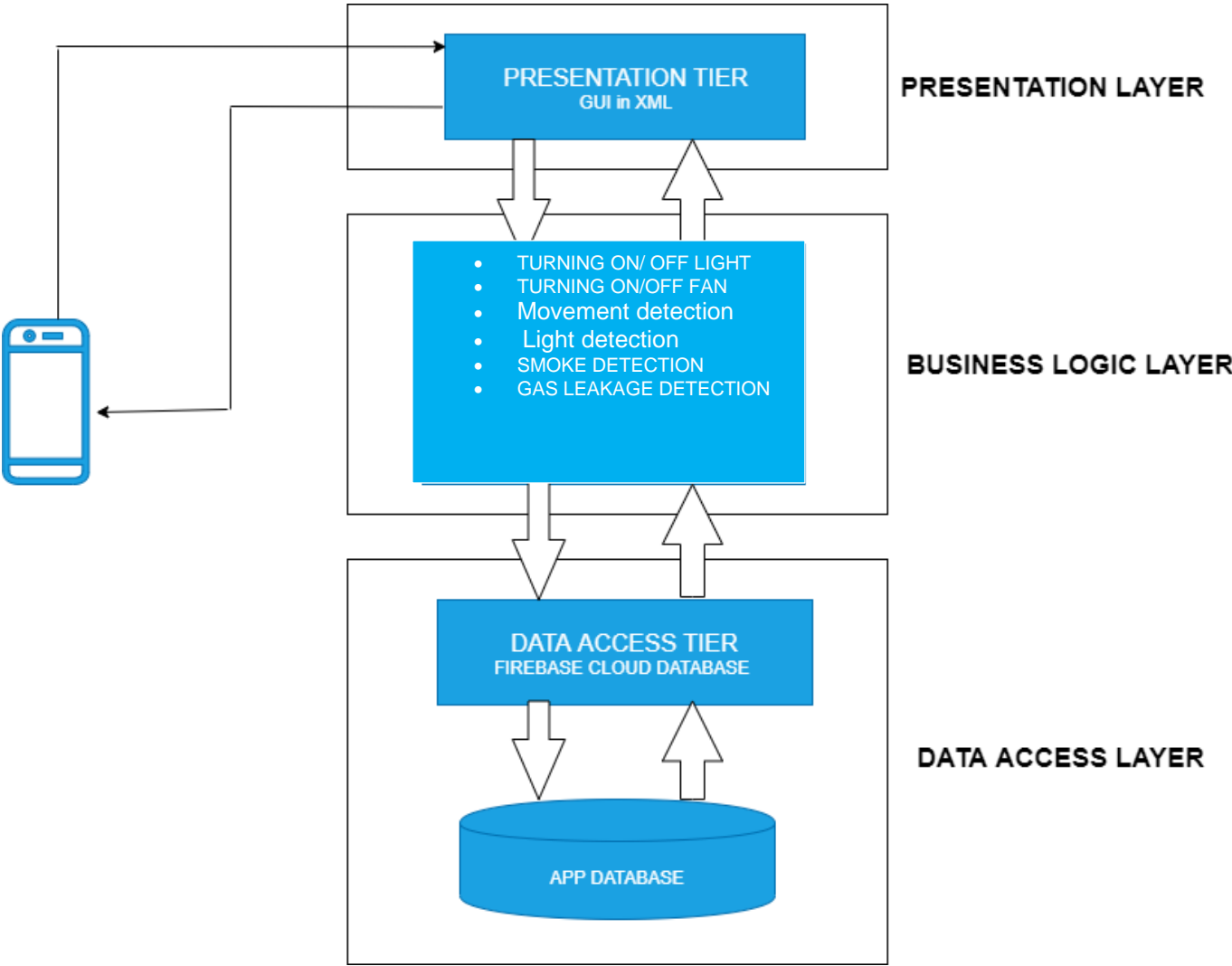

Figure 2 System Architecture

5.1.1 Presentation Layer

This layer act as a manifesto for the communication of the user and system. This layer presents data to the user and recognizes input from the user.

5.1.2 Business Logic

It provides the core functionality to application which a user is required to have from the application.

5.1.3 Data Access Layer

This layer entertain the request from the Service Layer and sends report back data after querying from the database server.
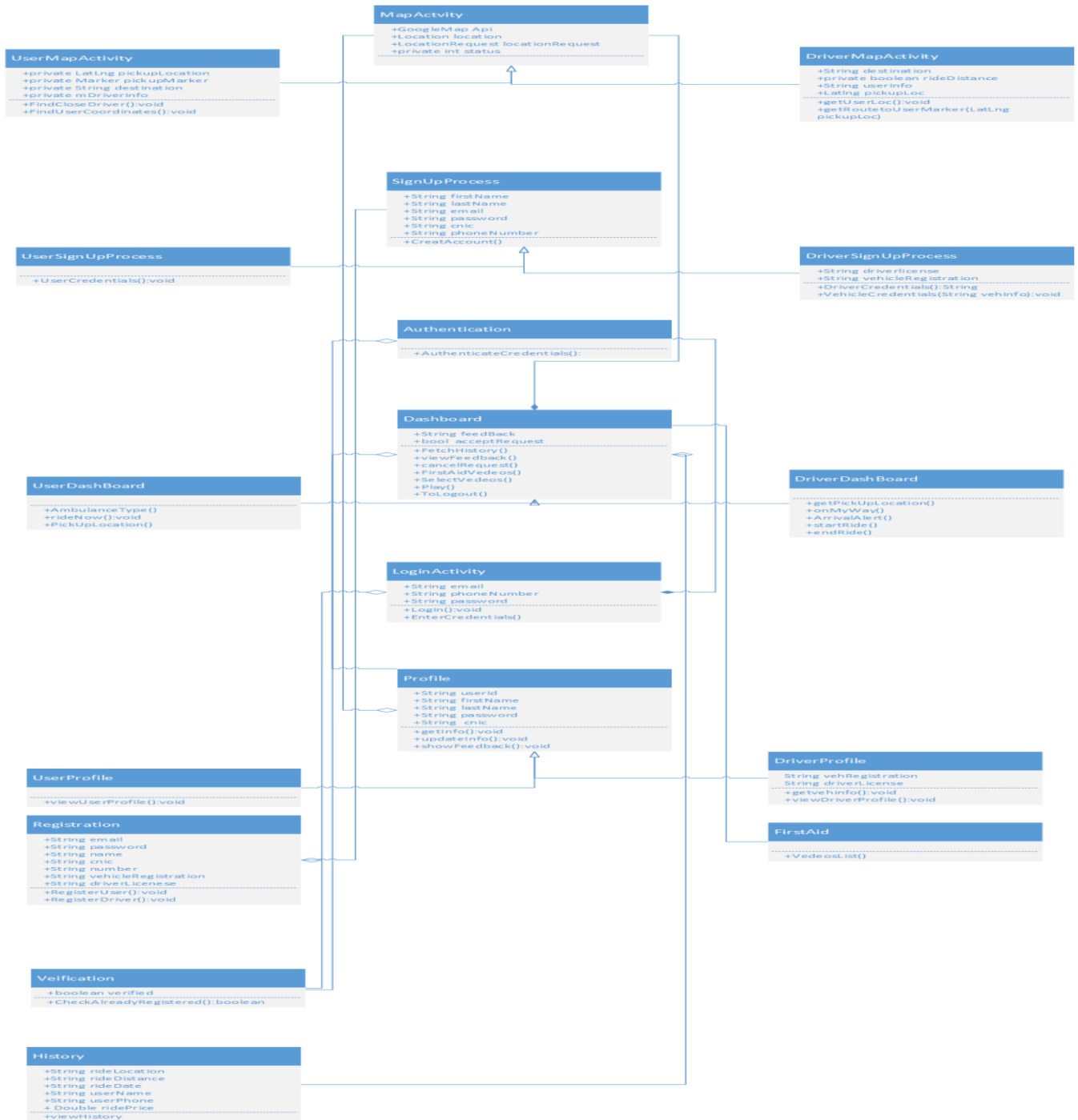
5.2 Class Diagram

Figure 3 Class Diagram

The description for class diagram is shown on the next page:

Class name	Description
	App class contains all the information that IOT Based Remote Device Controlling Mechanism has to perform. It is the main class which will be acting as a gateway to all the other classes
SignUp and Login	This class contains the functions for sign in and sign up processes for the users
System interface	It contains all the information to enable user to interact with IOT Based Remote Device Controlling Mechanism. It has links to all the functions of different classes that on selection lead to different actions.
Dashboard	It contains the functions with intents to the Profile and also Logging out of the application
Registration and Authentication	Registration and verifications are included as the functions in the signup and registration class Registration is to save data in database and verification is to verify the stored data at the time of the login.

Table 1 System Features
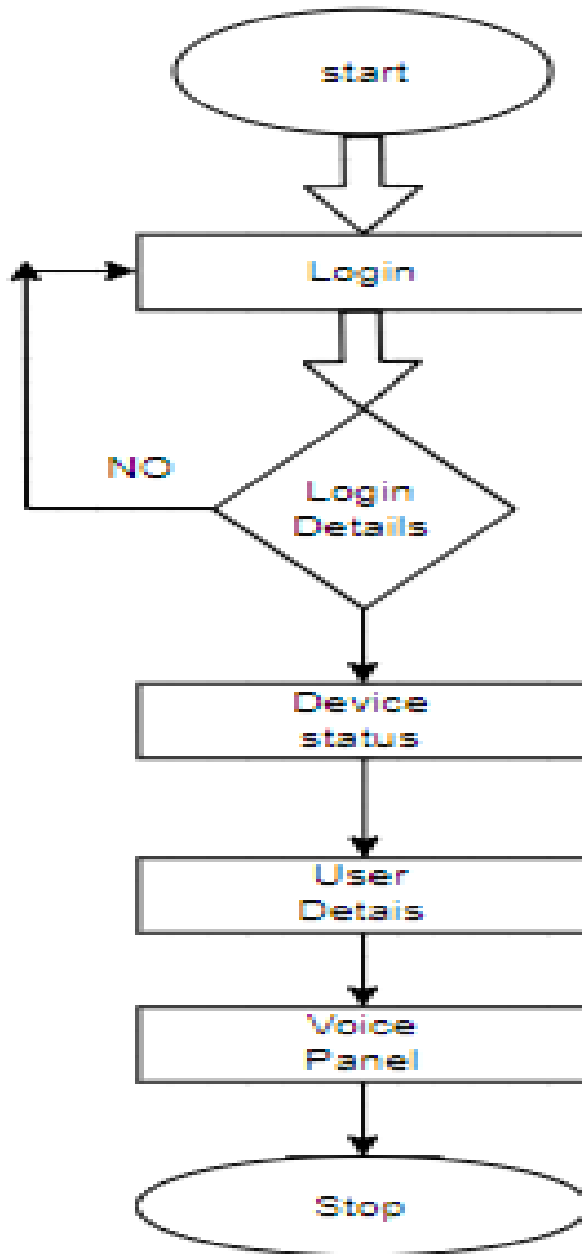
5.3 Data Flow Diagram

Figure 3 Data flow

5.4 Design Rationale

The layered architecture design is a strong broadly useful example, making it a decent beginning stage for most applications, especially when you don't know what architecture design is most appropriate for your application. In any case, there are a few interesting points from a architecture design viewpoint while picking the pattern.

The main thing to keep an eye out for is what is known as the architecture sinkhole anti-pattern. This anti-pattern depicts the circumstance where solicitations course through different layers of the design as straightforward go through preparing with practically zero rationale performed inside each layer. For instance, accept the introduction layer reacts to a solicitation from the client to recover client information. The introduction layer passes the solicitation to the business layer, which essentially passes the solicitation to the constancy layer, which at that point makes a basic SQL call to the database layer to recover the client information. The information is then passed right back up the stack with no extra handling or rationale to total, compute, or change the information.

Each layered architecture will have probably a few situations that fall into the design sinkhole hostile to design. The key, be that as it may, is to examine the level of solicitations that fall into this classification. The 80-20 standard is normally a decent practice to follow to decide if you are encountering the design sinkhole against design. It is commonplace to have around 20 percent of the solicitations as straightforward go through preparing and 80 percent of the solicitations having some business rationale related with the solicitation. In any case, in the event that you find that this proportion is switched and a dominant part of your solicitations are basic go through handling, you should consider making a portion of the design layers open, remembering that it will be progressively hard to control change because of the absence of layer confinement.

Another thought with the layered design is that it will in general loan itself toward solid applications, regardless of whether you split the introduction layer and business layers into isolated deployable units. While this may not be a worry for certain applications, it represents some expected issues as far as sending, general strength and dependability, execution, and versatility.

5.5 Database Schema

5.5.1 Tables, Fields and Relationships

Tables include the username and passwords, name of the user and the device status which will be yes for turned on or no for turned off.

5.5.2 Databases

Firebase database (online) is used to maintain databases.

5.5.3 New Tables

The new tables are not needed because we need a small amount of concept for making the device so that the database is just used to maintain the application.

5.5.4 New Field(s)

Table Name	Field Name	Data Type	Allow Nulls	Field Description
Username	Name	Varchar(50)		For storing the name and username
Passwords	Password(encrypted)	Varchar(50)		Password are encrypted and stored
Status	Device Status	Bool	Yes	Yes or No simple

Table 2 New Field(s)

5.6 Component Design
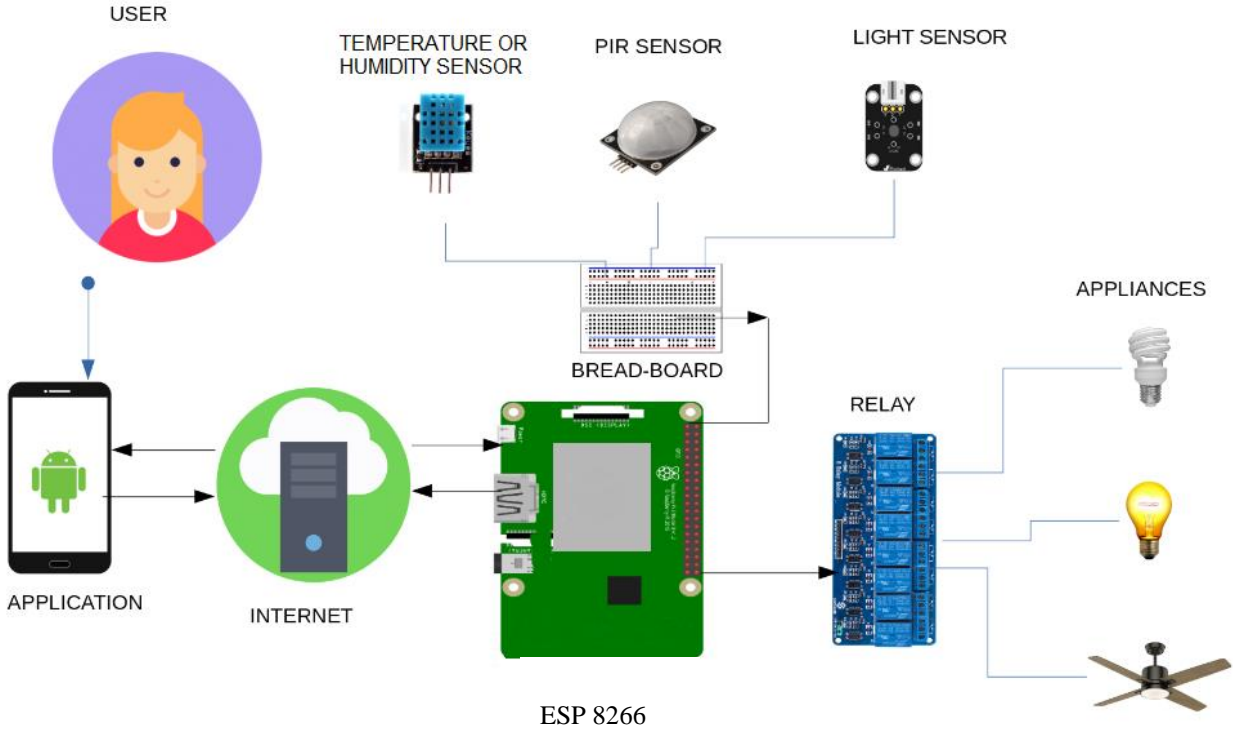

Figure 5 Component Design diagram

Chapter 6

6 System Implementation

6.1 Technology Used

6.1.1 Programming Language Used

Firebase database has been used for handling all the data storing, retrieval and fetching that is used to operate the application. The android application for the project was written using Java.

6.1.2 Development Tools

Application is developed using MIT App Inventor Toolkit. Database access is provided by web interface of the cloud computing services of Firebase.

6.1.3 Database

The systems Database shall be designed and maintained using Firebase.

6.1.4 Operating System

Android application developed shall be able to run all devices operating on Android 5.0 i.e. KitKat or later versions.

6.2 Complete System Implementation

The system comprises of two main components. An android application in which separate modules are designed for signup and login. The other major modules are the sensors and home appliances programmed through Arduino IDE. The Android Application will be discussed in detail in the succeeding sections.

6.2.1 Login Module

This is the main module, which greets the user following successful login. This is used to access all the different functionality of the application.

Create Account

User has to create an account on the home screen to access the main menu.

Log In

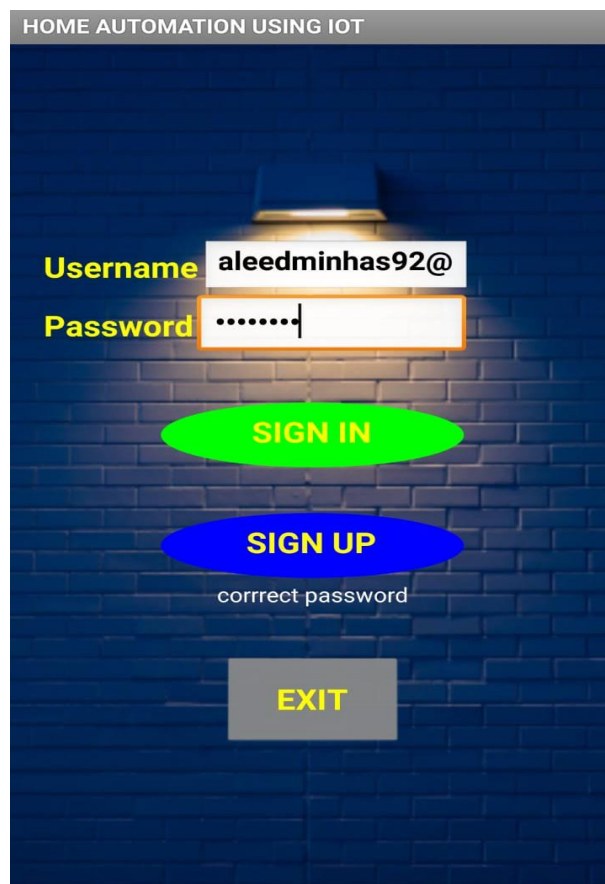After creation of the account user can login to the system after entering the correct credentials.

Figure 6 Login Module

6.2.2 Dashboard

When the user successfully login to the system main menu is displayed which shows the status of the appliances and sensors
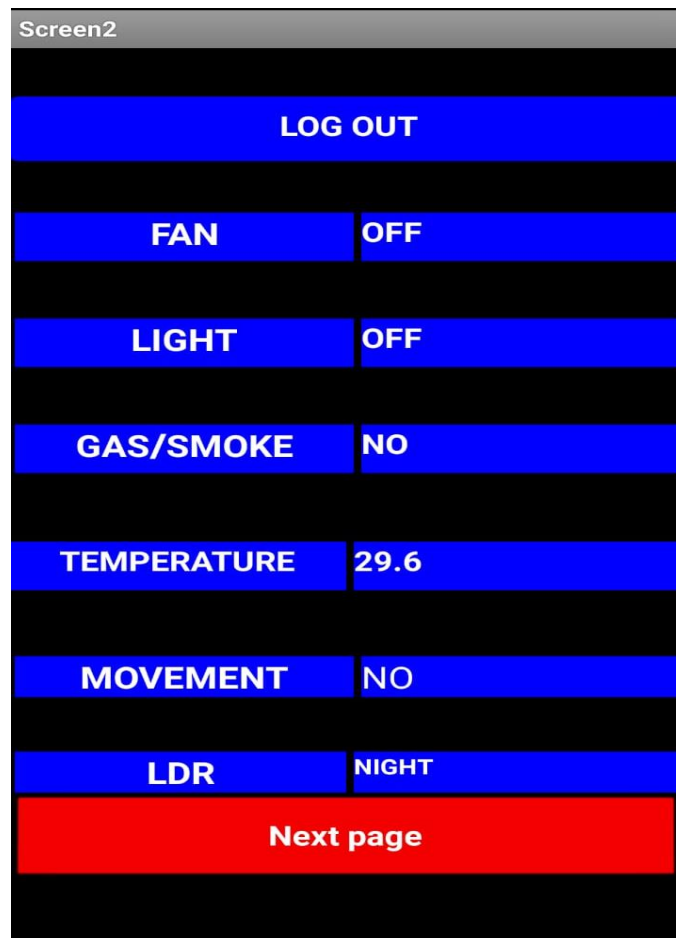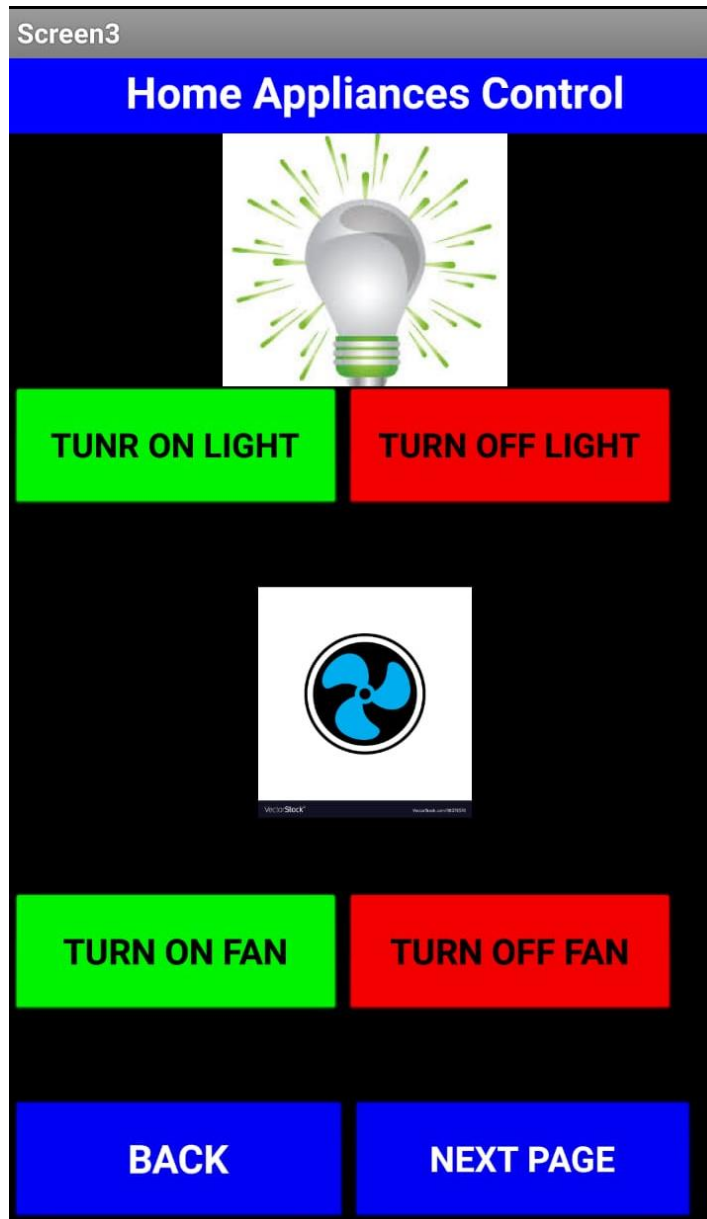

Figure 7 Dashboard

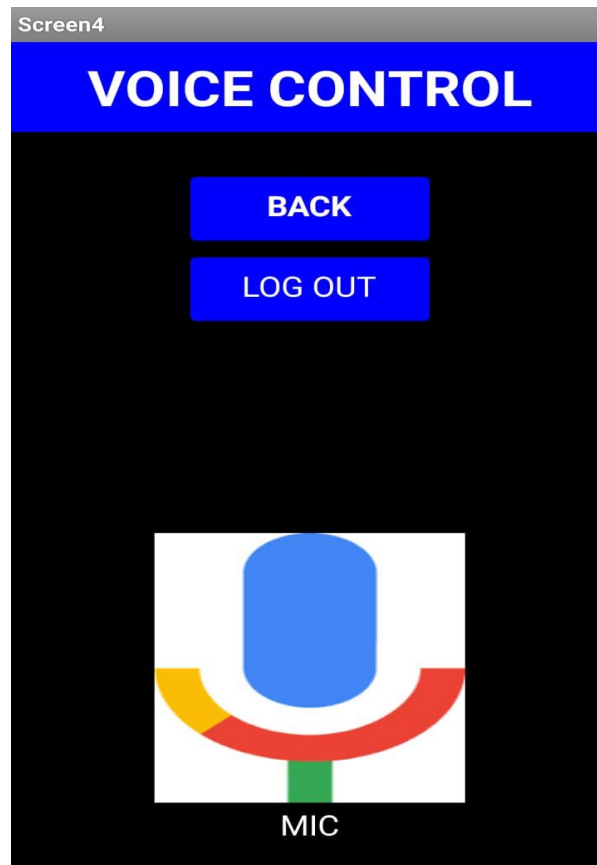### 6.2.3 Home Appliances Control

Next screen contains the buttons to turn the fan and light on or off.

Figure 8 Home Appliances Control

6.2.4 Voice Control

The screen shows a mic to control the appliances with voice commands e.g. user has to say "turn off the fan".

Figure 9 Voice Control

Chapter 7

7 System Implementation

7.1 Overview

Testing of software project include different levels of testing to ensure that the software which is being developed is free of errors and faults. The different levels at which testing was performed is argued here.

7.2 Unit Testing

It includes the testing of each module at completion.

7.2.1 Login Feature Testing

Test Case Name:	System Login Testing	
Test Case ID:	01	
Description of Case	This module enables user to login to the system by providing his credentials. As per the sequence of authorization the credentials are checked with the database, noted that access shall be granted only to verified credentials.	
Testing technique used:	Black Box Testing	
Preconditions:	System operating normally and connectivity of system and database is already established.	
Input values:	Username: String	

	Password/PIN: String	
Valid Inputs:	Registered Users/legal Users credentials Registered password/legal password	
Steps	1. Enter username 2. Enter password 3. Click SIGN IN	
Expected Output	After successful verification of the user credentials from the database, the user shall be directed to the dashboard.	
Actual Output	User logged in successfully.	
Status	POSITIVE/PASS	

Table 3 System Login Testing

7.2.2 Light Detection Resistor (LDR) Sensor testing

Test Case Name:	**Light Detection Resistor (LDR) Sensor testing**
Test Case ID:	02
Description:	When we connected LDR with arduino as per the circuit we constructed. The values in the serial monitor reaches to zero in the darkness or when reaches to low values when there is less bright and "Night" signal will be visible. If the intensity is more than the values are increases rapidly based on intensity on the LDR and the "Day" signal will be visible on the Dashboard.
Testing technique used:	Black Box Testing
Preconditions:	System shall be operating normally, and connectivity of system arduino and firebase database is already established with android app.
Input values:	When Light is turned off or during darkness in the room show "Night" signal on the android app after getting signal from the firebase database and during light or brightness in the room show "Day" signal on the android app.

Valid Inputs:	LDR Sensor should not be exposed to induced darkness as it will disturb the functionality of the sensor and will misjudge the day or night status.	
Expected Output	LDR sensor status should be stored on the firebase database and same should be visible on dashboard of android app.	
Actual Output	Status provided by the LDR on Arduino board is successfully sending the data to the firebase and eventually to the android app dashboard.	
Status	PASS/POSITIVE	

Table 4 Light Detection Resistor (LDR) sensor Testing

Chapter 8

8 Conclusion and Future Work

8.1 Conclusion

Our goal was to develop a system to find out innovative and creative solution for users to make full use of the android phones to their comfort. A system needs to be developed that will allow common people to control all their household appliances using cell phones with just a few taps.

We accomplished our objectives, successfully developing an Android Application that lets users control their appliances and turn them on and off as needed.

Due to constraints of time and team size and budget, the scope of the project was kept small. Initially it can only assist in turning devices ON and OFF and informing the user about any gas leakage or fire in the house, but in later patches we can include security system of the house as well to keep watch on house and control entrances of the house.

We firmly believe that our project can genuinely bring about a significant change in the lives of people.

8.2 Future work

Due to certain intrinsic limits in terms of project development time and team size and budget, a lot of things had to be omitted from the scope of this project. However, this leaves room for a group of improvements or expansions and functionality add-on's.

First of all, at the moment the Project only accommodates specific appliances but, in future however, functionality could be expanded to include CCTV Cameras to cover the house and entrances etc..

In the future, an application can be developed for iOS, Windows Mobile, Ubuntu Mobile. This would enable smartphone users on all major platforms to take advantage of the application.

Among minor changes, the application's User Interface could be modified to be even more user friendly and the application could be improved to run faster and enhance performance on lower end devices.

Glossary

API	Application Programming Interface
App	Application
AS	Assumption
CO	Constraints
DEP	Dependency
FRs	Functional Requirements
IDE	Integrated Development Environment
iOS	Mobile Operating System created and developed by Apple
MCS	Military College of Signals
NFRs	Non Functional Requirements
NUST	National University of Science and Technology
OE	Operating Environment
OS	Operating System
Parse	Cloud Server
REQ	Requirement
SR	Safety Requirements
SRS	Software Requirements Specification
UD	User Documentation
UML	Unified Modelling Language

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