Bengali Home Assistant

BY

FARHAN AHAD

152-15-5637

RAKIB HASAN

152-15-5967

MD. SAIFUL ISLAM

151-15-5105

This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

Supervised By

Dr. Syed Akhter Hossain
Head Department of CSE
Daffodil International University

DAFFODIL INTERNATIONAL UNIVERSITY
DHAKA, BANGLADESH
APRIL 2019

APPROVAL

This Project titled **"Product Authentication and Verification"**, submitted by Munsi Md. Bayazid, ID No: 152-15-5788, Syed Arfanul Islam, ID No: 152-15-5985, Omar Faruk, ID No: 152-15-6085 & Md. Rashiduzzaman Prodhan, ID No: 152-15-6151 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 03 May 2019.

BOARD OF EXAMINERS

Dr. Syed Akhter Hossain — **Chairman**
Professor and Head
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Md. Tarek Habib — **Internal Examiner**
Assistant Professor
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Moushumi Zaman Bonny — **Internal Examiner**
Senior Lecturer
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Dr. Swakkhar Shatabda — **External Examiner**
Associate Professor
Department of Computer Science and Engineering
United International University

DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Dr. Syed Akhter Hossain, Professor and Head,** Department of CSE, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Supervised By:

_____

Dr. Syed Akhter Hossain
Professor and Head
Department of CSE
Daffodil International University

Co-Supervised By:

_____

Lecturer
Department of CSE
Daffodil International University

Submitted By:

_____

Farhan Ahad
ID: 152-15-5637
Department of CSE
Daffodil International University

_____

Rakib Hasan
ID: 152-15-5967
Department of CSE
Daffodil International University

_____

MD. Saiful Islam
ID: 151-15-5105
Department of CSE

ACKNOWLEDGEMENT

At the beginning, we disclose our gratefulness and our heartiest thanks to almighty Allah for His heavenly blessing causes us to be facile to complete the conclusive year project successfully.

Not with standing, this would not happen to make this possible without the help of abundant individuals, so we would like to propagate our sincere thanks to all of abundant individuals. In reality, we are thankful and need our profound our liability to supervisor **Syed Akhter Hossain**, Head, Department of CSE Daffodil International University, Dhaka. He has deep perception and lot of interest in " Bangla Home Assistant " the field of that influenced us to take this project. His endless assiduity, scholarly guidance, constant and energetic supervision, construct critique, valuable advice, continual encouragement, studying many inferior drafts and correcting them what so ever stage have made it feasible to accomplish this project.

We would also like to wish our deepest heartiest gratitude to the all the faculty members of Department of CSE, for their lot of deepest help to fulfill our final year.

We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Right now we are standing at the edge of the 4th industrial revolution. It been said that this revolution will lead us in a path of where we will let technologies integrate in our day to day life. An intelligent system for home assistant is a desired technology in the 21st century. The main attraction of any home assistant system is reducing human labor, effort, time on their day to day life. The goal of this project is to design a voice control intelligent system based on the only language for which people of Bangladesh gave their lives & blood to gain the rights to talk also the 7th largest language in the world having more than 250 million native speakers. Using remote control system via World Wide Web or Internet gives the ability to control home appliances from anywhere in the world. Various sensor based control, facial recognition, speech pattern recognition can be added to this prototype to improve the intelligence and to improve the ability to make more accurate decision.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter 1: Introduction

1.1 Introduction

A Virtual Home Assistant is a software agent that can perform tasks or services for an individual based on verbal commands. Sometimes the term "ChatBot" is used to refer to virtual assistants generally. Some virtual assistants are able to interpret human speech and respond via synthesized voices. Users can ask their assistants questions, control home automation devices and media playback via voice, and manage other basic tasks such as email, to-do lists, and calendars with verbal commands.

This project "Bengali Home Assistant" aiming to be able to do all basic tasks that a virtual home assistant can take care of in fluent Bengali language. Bengali language is the 7th largest language in the world in terms of number of native speakers & The Bengali Language Movement is one of the only two occurrences in the history where people sacrificed their lives for their mother language (Bengali).

1.2 Motivation

As the technology is being integrated day by day in our daily life, we start using technologies like home assistant every day. But the matter of sorrow that the home assistants that exist in market are lack operating in fluent Bengali language.

As all the people working on this project in by born Bangladeshi & we feel very proud of saying that all of our mother language is Bengali, we decided to take a step forward to make a home assistant in Bengali so that the native speakers of this 7th largest language (Bengali) can have the opportunity to use home assistant in Bengali.

1.3 Objectives

The main task is to make a system which can understand any fluent Bengali language & can answer based on the questions using machine learning technology & give this system internet of things ability so that this system can control automate electrical things via Bengali voice command & also we want to give it a name which will be made of neural network technology so that users can trigger the system come online when that specific name been spoken.

1.4 Expected Outcome

We expect the outcome of our project is absolutely right & specific. The main facilities of this project are available for all the native speakers of Bengali language. We expected a good number of outputs from our system. They are

- We will have a system which people can use in their day to day life & that system will have a vocal input-output interface based in Bengali language.

- The system will be capable of communicate with compatible IOT devices through vocal Bengali language command & also users can make their system come alive by asking the specific given name.
- A home assistant machine learnable system which will get batter day by day as users start using it randomly.
- This project will bring us a new door of digital devices interfacing on Bengali Language & help around 300 million people who are right now speaking Bengali all around the world.

1.5 Report Layout

In this project report we widely explain how our system works step by step. We also explain how our system is taking data & manipulating that. We also made a survey which basically ends up being set of data which we feed our system for initial supervised machine learning. In chapter 2 we explain how our system is best on its kind for our user. In chapter 3 we explain our business process modeling, use case modeling & several descriptions. In chapter 3 we explain our circuit diagram & multiple hardware's are connected inside of our system. In chapter 5 we explain how we made our system & make it work.

Lastly on chapter 6, we come up with some conclusion & plans for future work.

Chapter 2: Background

2.1 Introduction

Bangla Home Assistant is a digital device with Bengali vocal interface, which will go alive when the given name of that device get spoken & also response the command on Bengali language. It can communicate various kind & types of IOT devices based on that command & can make the electrical devices that we use in our day to day life more efficient & reliable & user friendly for the native speakers of 7th largest language named Bengali.

2.2 Related Works

There is a lot of research already been done on the same topic. Some of them are “Alaxa”, “Google Assistant”, “Siri”, “Cortanta” but all of them lags on being efficient & reliable when it comes on interfacing on Bengali Language. We hope our project will bring us a new door of digital devices interfacing on Bengali Language & help around 300 million people who are right now speaking Bengali all around the world.

2.3 Comparative studies

We have developed our project based on totally machine learning technology so that our system can be more efficient day by day as more people start using our system. We also place an option from where users can change the name of what he/she wants to call the system by which the system will come alive. We also fed the system more than 1000 sets of data from which the system starts to working. We made the system dedicated to only for the people speaking Bengali & that’s why our system working now more efficiently on Bengali language than any other popular system on market that does that same things.

2.4 Scope of the Problem

The main aim of our project is to give all Bengali language speaking people a device by which they can communicate their smart electronic devices through Bengali language & make the system more efficient as they start using it more & more. Which is exactly all the big companies on the market lack doing in Bengali language.

2.5 Challenges

As we using machine learning technology & neural network technology on our system, the more our system gets efficient by feeding data, the more this system start consuming more & more electric power & processing speed. As this system will come with digital interfacing device, the main challenge is to make this much heavy system work on such device that is in touch of buying ability to all such stage of people.

Chapter 3: Requirement Specification

Requirement specification state what needs to be done by a system. The requirement specification states what needs to be done in order for the organization to fulfill their purpose.

3.1 Business Process Modeling

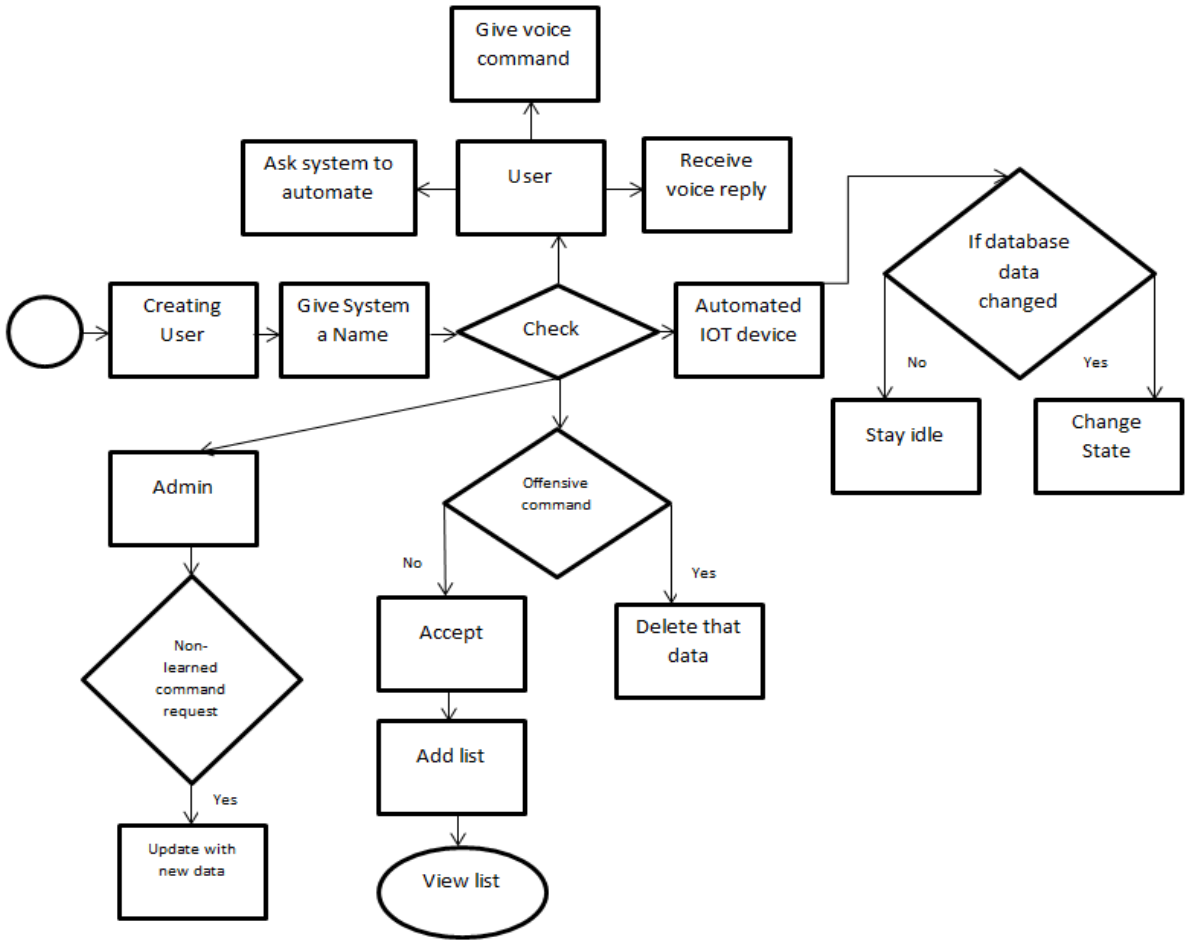

Figure 3.1.1: Business Process Modeling

3.2 Requirement Collection and Analysis

When it comes to any type of project, requirement collection plays a key role. Requirements collection is not only important for the project, but it is also important for the project management function. Requirement collection is the most important step of a project. If the project team fails to capture all the necessary requirements for a solution, the project will be running with a risk. This may lead to many disputes and disagreements in the future. Therefore, take requirement collection as a key responsibility of the project team. So we collected our project requirements as soon as possible. Then we started our work.

3.3 SOFTWARE DEVELOPMENT LIFE CYCLE (AGILE)

The agile model is a popular version of the systems development life cycle model for its linear sequential criteria, which means each phase must have to be totally completed before the next phase has start. At the end of every phases, a review was taken to determine the project is on the right path.

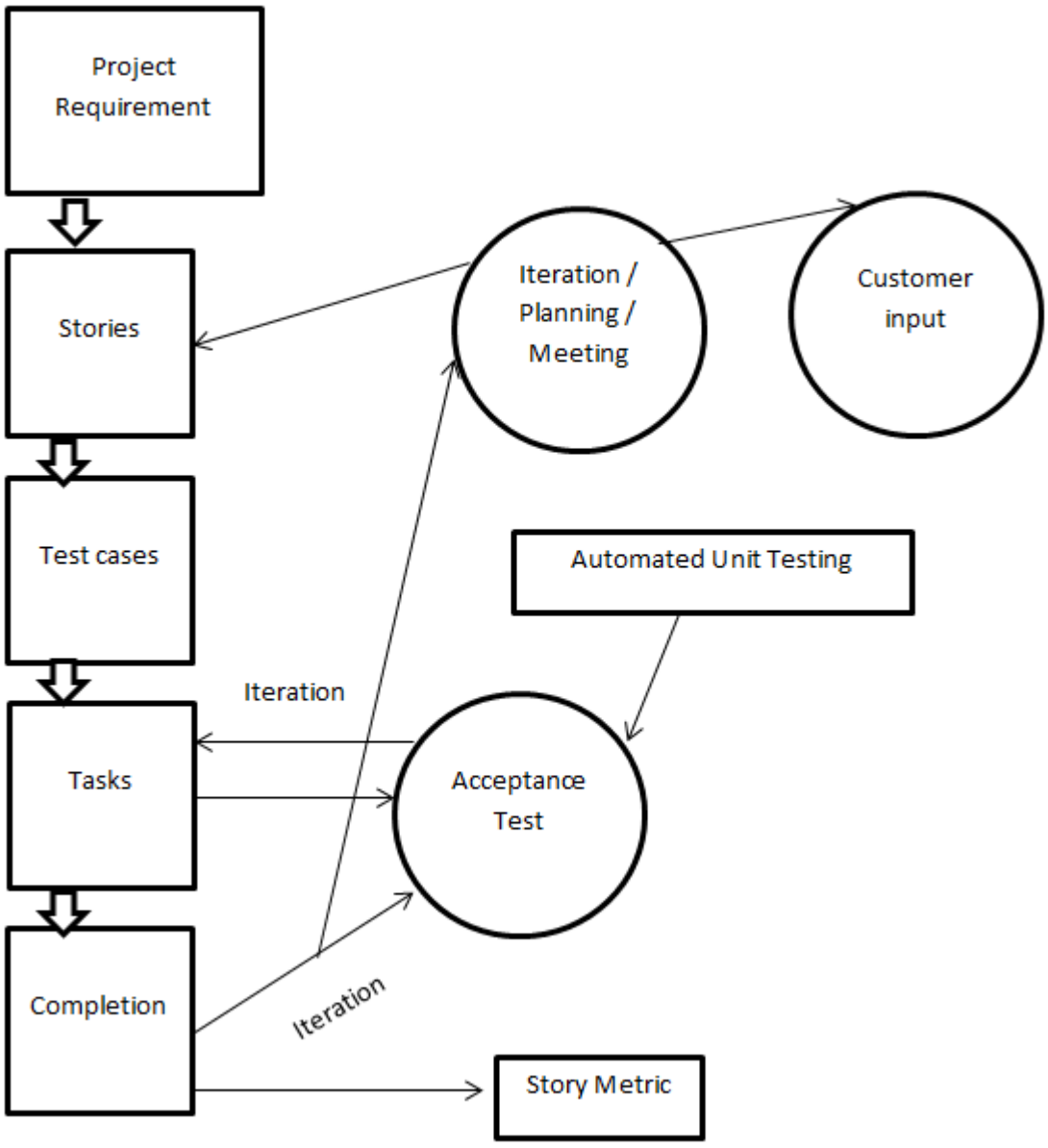

Figure 3.3.1: Agile software development life cycle

3.4 Design Requirements

Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. In this chapter overall system design of our application has been showed, where architectural design, use case diagram, flow chart and data flow diagram included. Whole design of this project is user friendly. Modern and updated design tools have been used for this project. Also new concepts have been considered to make it user friendly. In future any kind of edit is allowed as time permits.

3.5 Flow Chart

The process of our Bengali Home Assistant is given below:

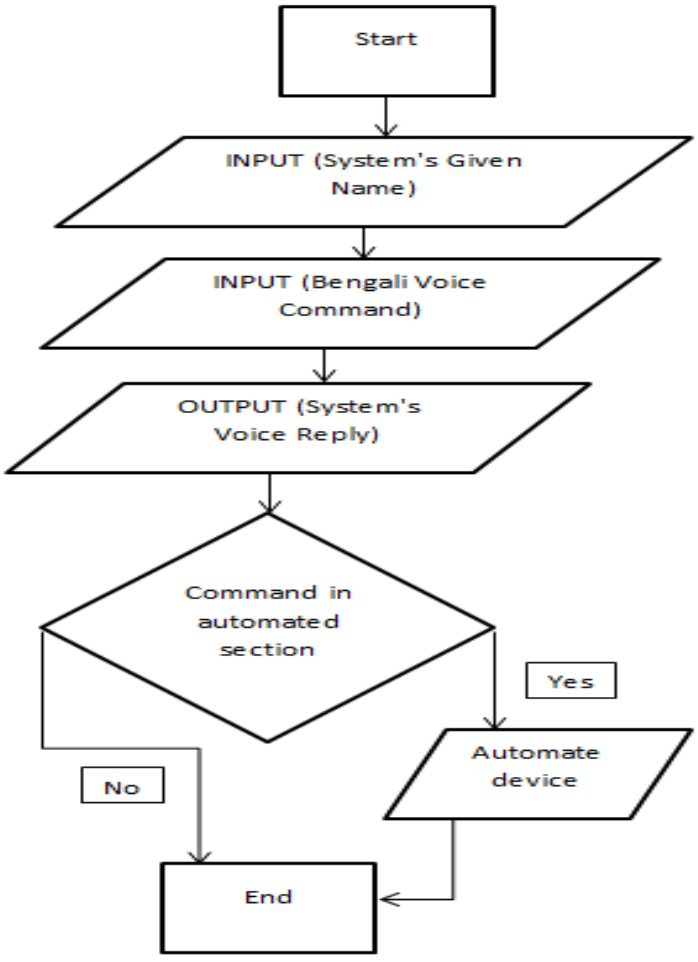

Figure 3.5.1: Flow chart for Bengali Home Assistant

3.6 Dataflow Diagram

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. A DFD is often used as a preliminary step to create an overview of the system, which can later be elaborated. DFDs can also be used for the visualization of data processing (structured design).

The below DFD shows what kind of information will be input to and output from the system, where the data will come from and go to, and where the data will be stored.

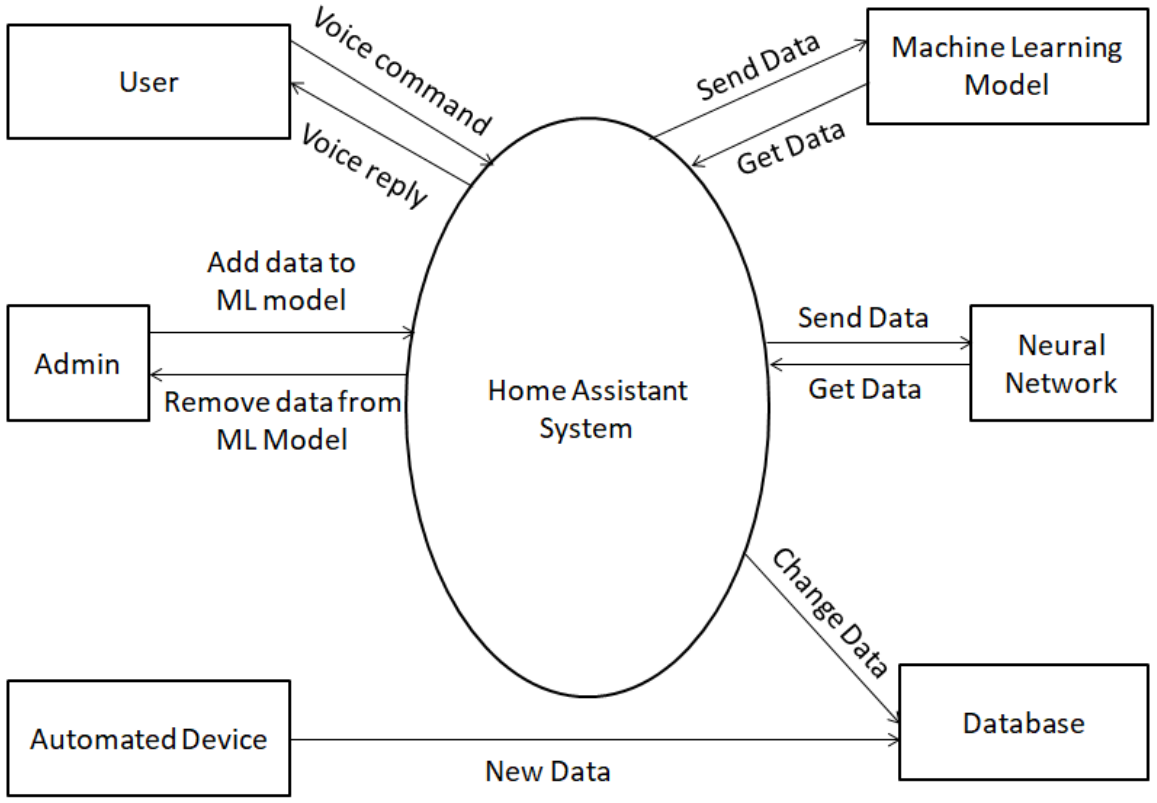

Figure 3.6.1: Dataflow diagram for Bengali Home Assistant

3.7 Use Case Modeling and Description

This system after carefully analysis has been identified to be presented with the following actor.

The actors involved are:

- User
- Admin
- Automated device

Use Case for User

User can command the system to do something in Bengali language & then the system will response in same Bengali language to fulfill the command.

Table 3.1: Use case description for user

Use case name	User command
Actor	User
Pre-condition	Must be registered user & system must be triggered by saying “GHOR”
Command from user	“ কয়টা বাজে বলতে পারো “
Reply from Bengali Home Assistant	“ তারিখ ও সময় “ + real time

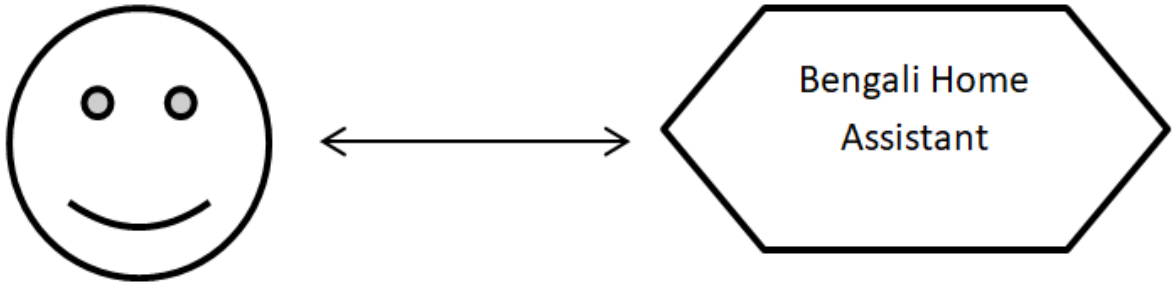

Figure: 3.7.1: use case diagram for user

Use Case for Admin

Admin can add data & also remove data from machine learning model in the same time. For the purpose of testing if training is doing as it supposed to be, admin can also check if certain command it driving to the exact intend that meant to be called for specific command.

Table 3.2: Use case description for admin

Use Case Name	Admin Command
Actor	Admin
Pre-condition	Must be registered user & have access to ML console
Command from admin	“ তোমার নামটা একটু শুনতে পারি “
Reply from Bengali Home Assistant	“ আমার নাম ঘর “
Show intent name	তোমার নামটা একটু বলা যাবে
Show intent action	NONE

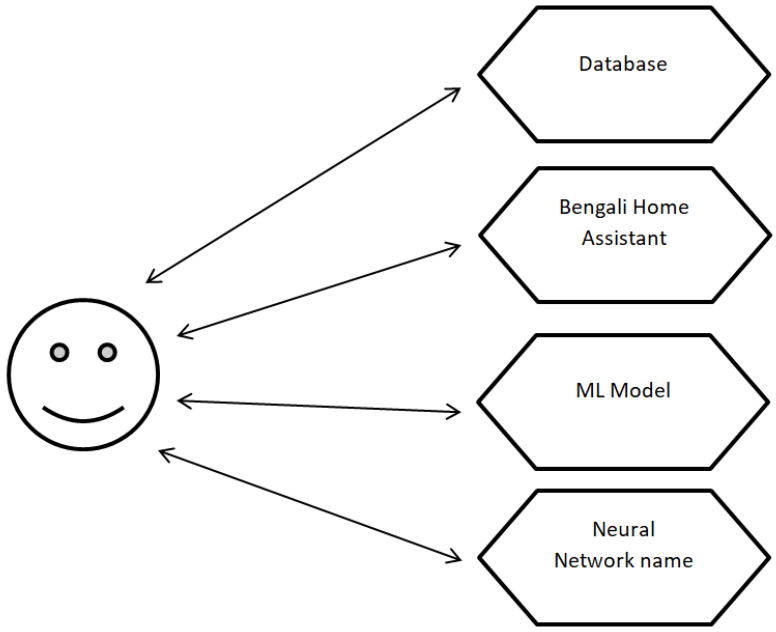

Figure 3.7.2: Use case diagram for admin

Use Case for Automated Device

Automated devices have the right to read database. If Bengali Home Assistant system ever writes something that needs to be done by automated devices then devices can read that data & change its state according to that data.

Table 3.3: Use case description for automated devices

Use case name	Automated Device Command
Actor	Automated Device
Pre-condition	Must be compatible automated device
Command from user	“ কষ্ট করে বেড রুমের লাইটটা বন্ধ করো “
Action	Turn off the light

Figure 3.7.3 : Use case diagram for automated devices

3.8 ARCHITECTURE DESIGN

The architecture design of a system emphasizes the design of the system architecture that describes the structure, behavior, and more views of that system and analysis.

- Our application’s architectural design shows that-
- User can make system come alive by saying system’s given name
- System can give the answers based on user’s query
- System can automate compatible devices through changing the shared database’s dedicated value.
- System log queries to learn new things.

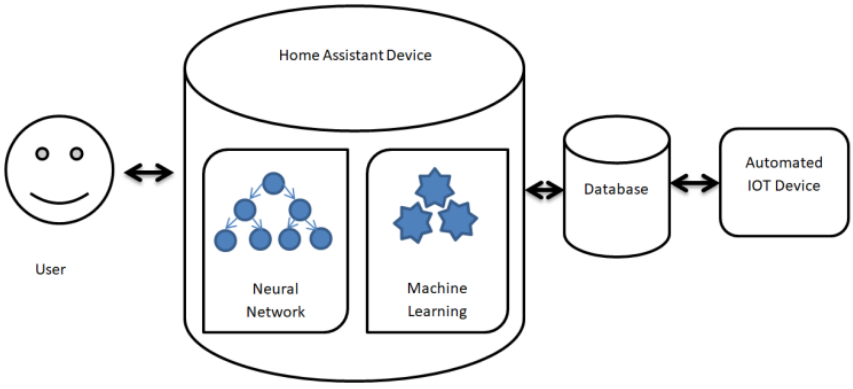

Fig 3.8.1: Architecture design of system

Chapter 4: Design Specification

4.1 Hardware Introduction

After completing our project with success we end up using these listed devices which seems working fine with the environment.

- **Raspberry Pi 3 Model B**

It is a single board computer with more the 1ghz processing power & integrated Wi-Fi, which makes this board capable enough to run & test our system.

- **Rode Video Micro**

It is a very high quality professional grade shotgun microphone.

- **32 Gb Class 10 SD card**

It's a storage device that acts like the container for our system.

- **10000mAh power bank**

A 10000mAh power bank that can keep our device alive for more then 20 hours.

- **USB to FTDI Module**

USB to TTL converter module that is use to program hardware automated devices.

- **USB Sound Card**

It's a USB device that gives our system to produce high quality vocal output through USB.

- **Relay Module**

Relay is a device that have the potential to switch high current AC devices. So, we are using it in the core of our automated devices.

- **ESP 8266 Based Board**

ESP8266 is one of the most popular Wi-Fi chip with microcontroller SOC. It's also stays inside of automated devices.

- **MP3 Extension cable**

It is a wire that makes regular mp3 cable longer.

- **A good quality sound box**

To make sure our device sound enjoyable.

4.2 Hardware communication

Here is how the hardware are connected with each other.

Inside of the Bengali Home Assistant system

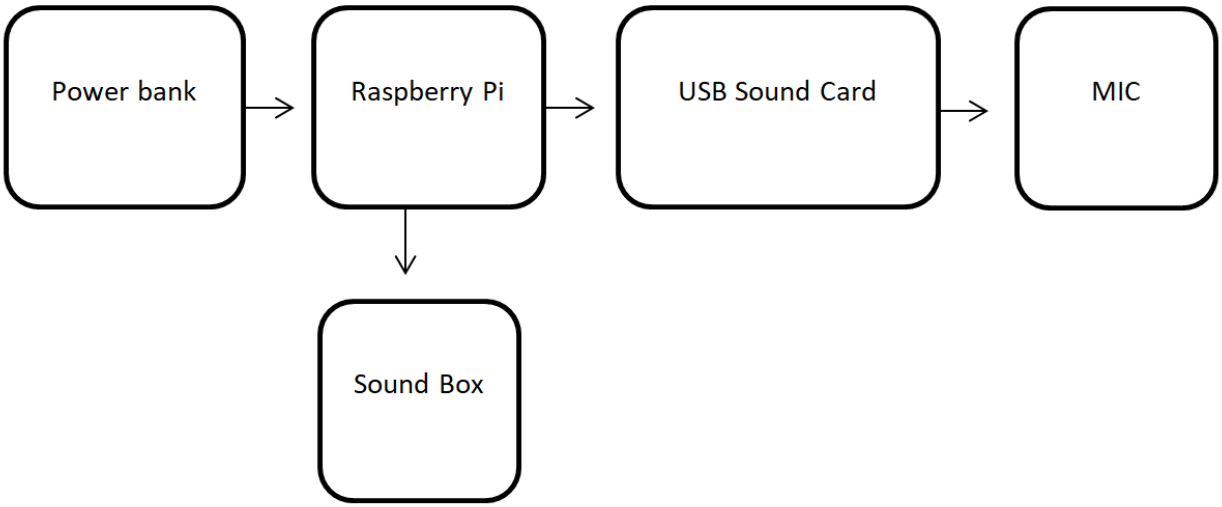

Figure 4.2.1: Hardware communication of system

Inside of the automated devices

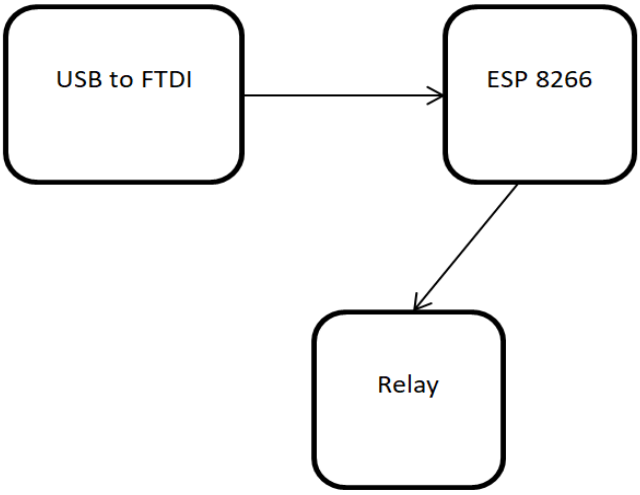

Figure 4.2.2: Hardware communication of automated devices

4.3 Circuit Diagram of Automated Device

Circuit diagram of a device state that how different types of IC & components are connected inside of that device

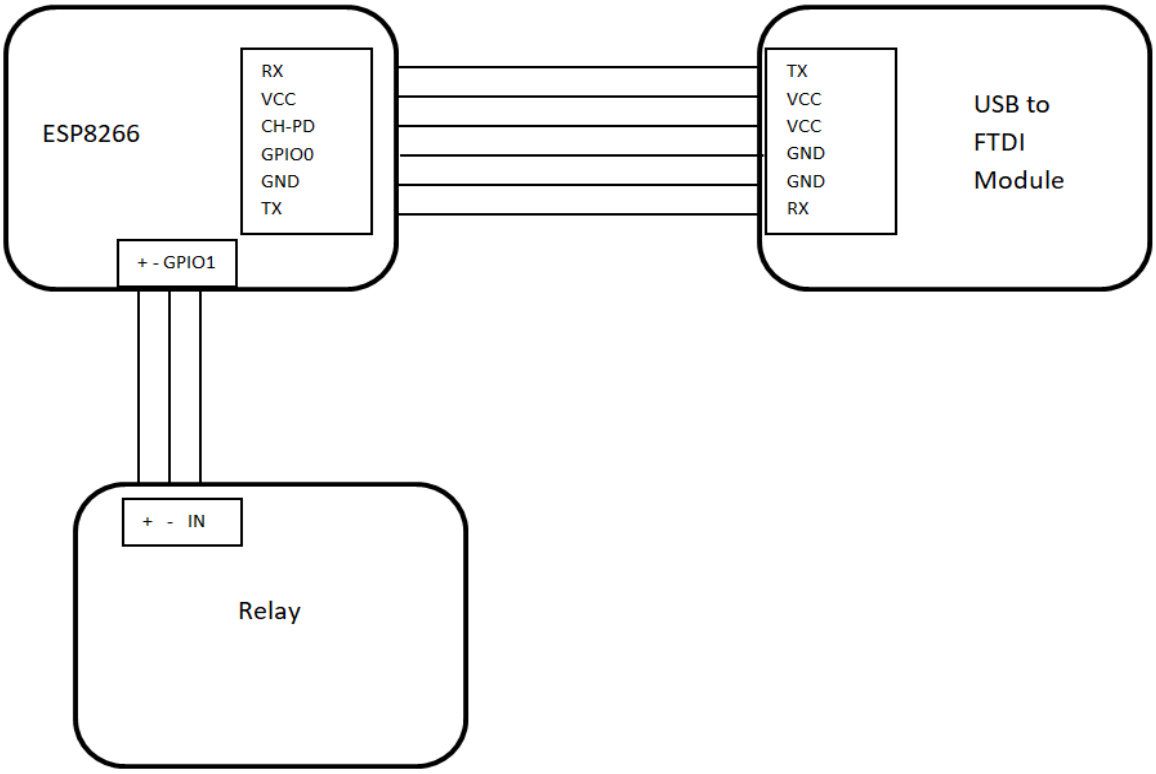

Figure 4.3.1: Circuit diagram of automated devices

4.4 Interface Design & UX

Design

We designed the whole project as user friendly as possible. As we are using vocal communication user interface in our system, we can assume that this user interface will be way more comfortable for any other technology interface that exists in market right now.

Completion

This project is going to inform about Bengali Home Assistant. Every panel of the system will be updated any time.

Project Deliverables

Project deliverables are the outputs from a project that normally provide beneficial change. Deliverables can be process improvements, new or improved services, service quality improvements, image and reputation artifacts, risk reduction benefits, increases to the flexibility or effectiveness of staff or policy compliances.

Resource Allocation

In software planning, resource allocation is a plan for using available resources, for example human resources, especially in the near term, to achieve goals for the future. It is the process of allocating resources among the various projects or business or educational units.

4.5 Implementation Requirement

Requirements analysis in systems engineering and software engineering encompasses those tasks that go into determining the needs or conditions to meet for a new or altered product or project, taking account of the possibly conflicting requirements of the various stakeholders analyzing, documenting, validating and managing software or system requirements.

Non-Functional Requirement

Our system has very little nonfunctional requirement such as long delay on conversation for slower internet connection also though our system has supervised ML technology where it can learn by itself but for now it has very little ML dataset.

Efficiency Requirement

When our system implemented in house then they use this system for making their life easy & comfortable.

Reliability Requirement

The system should provide a reliable environment to every user and authority. All User & automated devices should be updated their information through the admin without any errors.

Usability Requirement

Our Bengali Home Assistant system is designed by modern futuristic user-friendly environment and very easy to use.

Implementation Requirements

Implementation of the system using Python, C++. Python will help the whole system run flawlessly & C++ will make sure our automated device working as expected.

Delivery Requirement

The whole system is expected to be delivered in four months of time with a weekly evaluation by the project guide.

Chapter 5: Implementation & Testing

5.1 Implementation of environment

Environment selection is very important for testing purpose of any physical object or devices. As our system includes a number of physical electronics devices, we took a scenario of two rooms which includes one master bed room & one drawing room.

We also considered as bed room has two automated devices, one is a light & a fan. Similarly drawing room also has a light & a fan. There four electrical devices are automated, means they all can be controlled over our system through voice command in Bengali.

Our main system also considered situated in the middle of bed room.

We can assume that if our system can operate in our considered scenario then our system will be stable enough to run on any basic household.

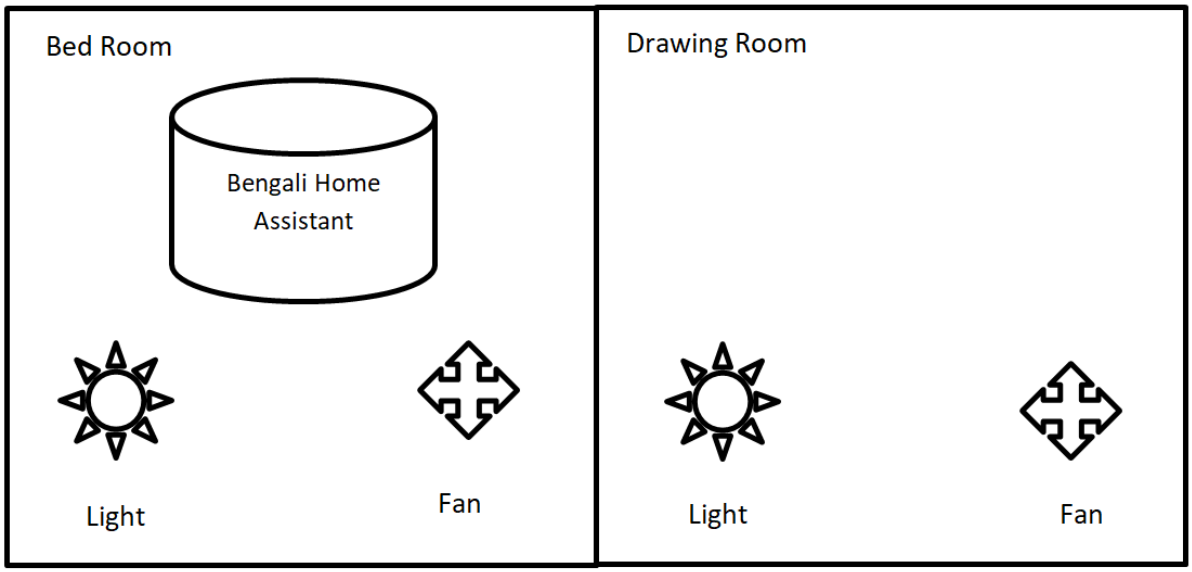

Figure 5.1.1: Implementation of environment for testing

5.2 Implementation of programming language

There are many high level programming language that can be used for making this types of complex system but the language we choose to implement for our system is " Python ". There are a good number of reasons that comes as a fact why we choose python as our first choice.

First of all python has a very supportive community over internet. Even python has a developer forum with a good number of developers talking about their problems frequently.

Again python has very high quality libraries. When working on such this much heavy projects, these types of libraries can be very helpful & saves a lot of time. This type of libraries are open source, which means we can manipulate & make changes this high powerful compatible libraries

to work with the system we are developing.

Python is so much reliable & efficient. Python can run almost any environment with zero performance loss which is the thing we really want to have in our system. With this potential we can have a vision that we can finally run our system at any digital devices.

If we look at the users of python programming language worldwide:

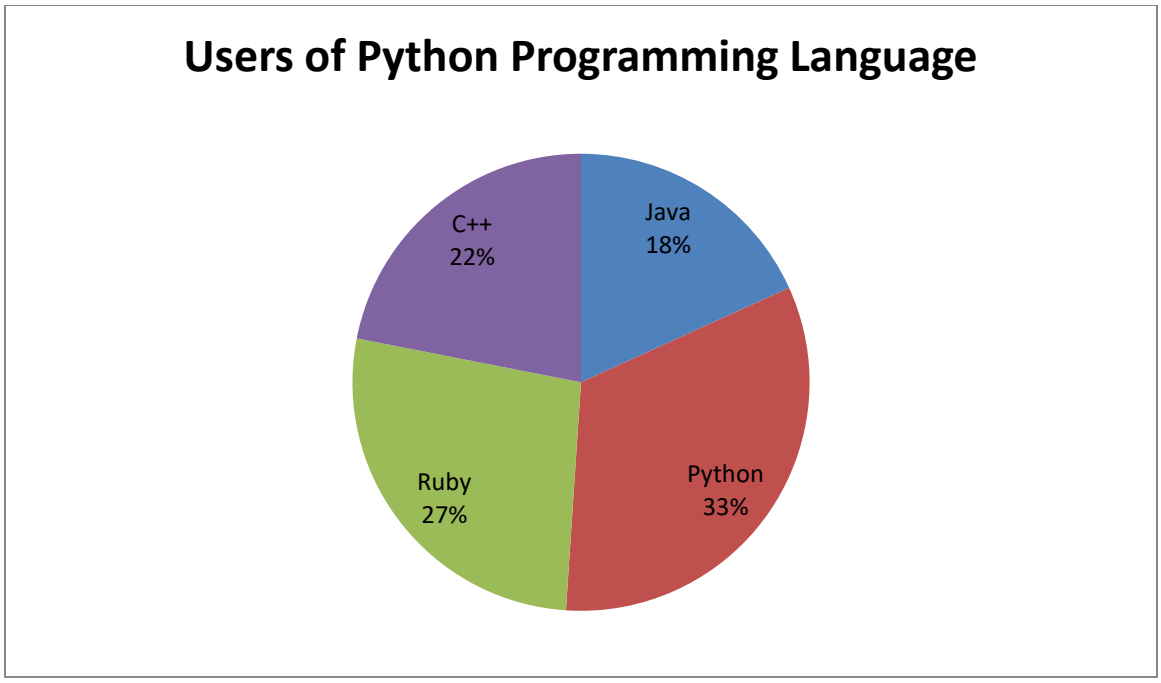

Figure 5.2.1: Users of Python Programming Language

There are two most popular version of python programming language. The one we used is Python 3. Also for hardware purpose we used micropython. Here is the list of python language releasing schedule.

Table 5.1: Releasing schedule of Python language

Python 2.7.16	Latest documentation released on 02 March 2019
Python 3.7.3	Latest documentation released on 25 March 2019
Micropython 1.10	Latest documentation released on 25 Jan 2019

5.3 Implementation of STT & TTS

STT states that Speech to Text & TTS states that Text to Speech. STT & TTS is very important for our system as this two matched actually working in order to make interface of our system.

What STT does is very simple, it takes users speech in a wave or any readable voice file then convert it into text format. TTS does the same thing in reverse. It makes voice file from text. So when we use this two methods back & forth & run different types of algorithm in between it seems like a device is taking.

There is good number of STT & TTS tools & libraries for python available online & free.

5.4 Implementation of Neural Network Based naming of system

What naming system actually does is it gives any system a name. It can make a system understand if a certain name is been spoken! In computer science we call it " Hotword Detection "

In real world every human being has a name of his/her own. We consider asking that person's name before we start conversation with that person.

We also give our system a name, that is "GHOR" . It is a Bengali word which means home. The reason we choose this name is we are making a home assistant in Bengali language.

When someone speaks by the name "GHOR", our system will get triggered & start listening what the person in front of it is saying. That saying will be accepted as command for our system.

By giving a name with this method we can make our system a way more user friendly & easy to use & privacy protected.

There is a lot of way of implementing this type of naming system method but the best one is using neural network in order to detect that.

5.5 Implementation of Machine Learning Model

Machine learning is a field of an application on artificial intelligence that gives the system an ability to learn from its experience without being programmed previously. It basically focused on computer program development that can access various structured or unstructured data & learn from it.

The way it helps a program to learn is begins with observation of data, examples, instructions so that it can look for the patterns of data to make batter decision for future based on given data.

At the end the aim of using machine learning in our system is give our system ability to decide what & how to response on commands that still not on its database & learn time by time as more people start using this system.

Basically there is 4 types of machine learning algorithms. The one we are going is "supervised machine learning algorithm ". In this algorithm the system can predict the learn from its previous experience & can predict how to response for future events as it faces new unknown data.

5.6 Implementation of Database

Database is a storage device placed connected with internet where we can store our structured data of information in order to make use of it more frequently.

As our system itself has some electronics automated devices that can be controlled through our Bengali Home Assistant system, it needed some form of digital data sharing method which our system & automated devices can use.

When any command our system face that needs to communicate with automated devices to fulfill, our system let that command know our automated devices by writing that into the database. Automated devices then read the data from database & then change its state based on that command.

Though most of the databases are comes with some premium charge to use. Still there are some of them kind enough of letting developers like us use small amount of storage on database for free.

Table 5.2: List of top free database

Vendor	Open Source	Lock-In	Support	Documentation	Free trial
Firebase	X	✓	✓	✓	✓
Parse	✓	X	X	✓	✓
Back4app	✓	X	✓	✓	✓
Kinvey	X	✓	✓	✓	✓
Backendless	X	✓	✓	✓	✓
Kuzzle	✓	X	✓	✓	✓
Pubnub	X	✓	✓	✓	✓

Kumulos	X	✓	✓	✓	✓
Game Sparks	X	✓	✓	✓	✓
Hoodie	✓	X	✓	✓	✓
Deployd	✓	X	X	✓	✓

5.7 Testing Implementation

Testing is a process by which we make sure our system's architecture & implementation working as expected. By testing we come up with the list of limitations & spaces that need to be fixed as soon as possible. Here are some tests for our system:

Table 5.3: Test Case

Test Case	Test Input	Expected Outcome	Obtained Outcome	Pass/fail
Ask Question	User ask system's name	System will reply its name	Successfully handled query	Pass
Automate device	User ask any automated device to change state	System will reply that it is doing that certain task	Automate that device	Pass
Ask time	User will ask the system about recent time	System will answer the recent time	Successfully tell the time	Pass

5.8 Test Results and Reports

Test report is required to mirror testing creates a formal way, which supplies a scope to estimate testing result rapidly. It is a paper that records data acquired out of your evaluation experiment inside an organized manner, describe the environment or operating conditions and show the compare of test result with test objectives.

Test report is more important that is needed to understand the machine is prepared or not ready

for implementation. We must let you know several types of testing. There are numerous types of testing. If the system passed through all these types of testing it is finally ready to lunch so at the end, we can carry out the result as the benefits of usability testing.

Table 5.4: Testing topics

Testing Topic	Yes	No
Easy to use	√	
Accepted by users	√	
Easy for new users	√	
Interactive UI	√	

CHAPTER 6: CONCLUSION AND FUTURE SCOPE

6.1 Discussion and Conclusion

We consider the Bengali Home Assistant will be integrated helpful, supportable, servable system to every native Bengali language speakers to make their life more comfortable. Withal, we believe Bengali Home Assistant will reduce the time, cost, effort, and potentials in our traditional electronic devices & make them smart enough to understand Bengali language. With that we access to good performance to our main purpose of our day to day life. Bengali Home Assistant system achieves a many of well-done communications, a lot of technologies and facilities, and access to effective goals of our day to day process. We can say it will be large integrating information system particularly for the speakers of 7th largest language in the world.

6.2 Scope for Further Developments

We will continue developing our project as the time rolls, will try to make sure our system stays stable as the system's machine learning model starts learning & operating new things. Later on we have some ground breaking thoughts to integrate in our system such as fire alarm on SOC, making call for the users & many more.

References

[1] SDLC Agile Model, available at << https://www.tutorialspoint.com/sdlc/sdlc_agile_model >>last accessed 1-4-2019 at 5.00AM

[2] Python 3, available at << https://www.python.org/doc/ >>, last accessed 1-4-2019 at 5.00AM

[3] Python libraries, available at << https://pypi.org/ >>, last accessed 1-4-2019 at 5.00AM

[4] Raspberry pi forum, available at << https://www.raspberrypi.org/forums/ >>, last accessed at 1-4-2019 at 5.00AM

[5] ESP8266 based board, information available at << https://en.wikipedia.org/wiki/ESP8266 >> last accessed at 15-4-2019 at 3.44AM

[6] Speech Recognition, information available at <<https://en.wikipedia.org/wiki/Speech_recognition >> last accessed at 15-4-2019 at 3.44AM

[7] Database, available at << https://en.wikipedia.org/wiki/Database >> last accessed at 15-4-2019 at 3.44AM

[8] ANN, available at << https://en.wikipedia.org/wiki/Artificial_neural_network >> last accessed at 15-4-2019 at 3.44AM

[9] ML, available at << https://en.wikipedia.org/wiki/Machine_learning >> last accessed at 15-4-2019 at 3.44AM

[10] ML on chatbot, available at << https://www.newgenapps.com/blog/how-is-machine-learning-applied-to-a-chatbot >> last accessed at 15-4-2019 at 3.44AM

[11] Micropython, available at << http://micropython.org >> last accessed at 15-4-2019 at 3.44AM

[12] Top home assistant of 2019, available at << https://www.reviews.com/voice-assistant/ >> last accessed at 15-4-2019 at 3.44AM

APPENDICES

Appendix A: Project Reflection

ML: Machine Learning

UI: User Interface

SRS: Software Requirement Specification

STT: Speech To Text

TTS: Text To Speech

NLP: Natural Language Processing

API: Application Programming Interface

SOC: System On Chip

ANN: Artificial Neural Network

FINAL YEAR PROJECT

ORIGINALITY REPORT

28%	21%	1%	26%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Daffodil International University Student Paper	11%
2	Submitted to University Tun Hussein Onn Malaysia Student Paper	3%
3	en.wikipedia.org Internet Source	2%
4	dspace.ewubd.edu Internet Source	2%
5	ijircce.com Internet Source	2%
6	dspace.daffodilvarsity.edu.bd:8080 Internet Source	1%
7	Submitted to Higher Education Commission Pakistan Student Paper	1%
8	www.tutorialspoint.com Internet Source	1%