MAHARASHTRA STATE BOARD OF TECHNICAL

"Voice-Based Virtual-Assistant for windows."

A Project Report

Submitted by:

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In partial fulfillment for the award of the Diploma Engineering
in the course Computer Technology at

Department of Computer Technology

K. K. WAGH POLYTECHNIC, NASHIK

Academic Year 2021-22

K. K. Wagh Education Society's

K. K. WAGH POLYTECHNIC

Hirabai HaridasVidyanagari, Amrutdham, Panchavati, Nashik-422003, Maharashtra

Certificate

This is certify that :

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From the institute - K. K. Wagh Polytechnic, Nashik has completed the Project (Capstone Project Planning and Execution (CPE)) for their final year having title **Voice-Based virtual-Assistant for windows** during the Academic Year 2021-22 in the partial fulfillment of Diploma in Computer Technology. The project is completed in a group consisting of **four** persons under the guidance of the Faculty Guide.

Date : 10/05/2022

Place : Nashik

Mrs. R. Y. Thombare
Name & Dated Sign

Prof. G. B. Katkade
HOD - Computer Technology

Seal of Institute

Prof. P. T. Kadave
Principal – K. K. Wagh Polytechnic, Nashik

Participation in Paper presentation at MAHA-VEER 21-22 organized by Mahavir Polytechnic Nashik.

MAHA-VEER 2022

State Level Technical Event organized by

Mahavir Polytechnic, Nashik

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This certifcate is awarded to

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For Participating in Paper Presentation Competition during

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at Mahavir Polytechnic , Nashik on 12 April 2022

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With a deep sense of gratitude we would like to thank all the people who have lit our path with their kind guidance. We are very grateful to these intellectuals who did their best to help during our project work.

It is our proud privilege to express a deep sense of gratitude to Prof. **P. T. Kadave,** Principal, K. K. Wagh Polytechnic, Nashik for his comments and kind permission to complete this project. We remain indebted to **Prof. G.B. Katkade,** Head of Computer Technology Department for his timely suggestion and valuable guidance. We are grateful and remain indebted to our Internal Guide **Mrs.R.Y.Thombare ,** for his consistent instructions, guidance for the completion of the project.

We are thankful to all Faculty members, Technical staff members of the Computer Technology Department for their expensive, excellent and precious guidance in completion of this work. We thanked all the class colleagues for their appreciable help for our working project.

With various industry owners or lab technicians to help, it has been our endeavor throughout our work to cover the entire project work.

We are also thankful to our parents who provide their wishful support for our project completion successfully. Lastly we thank all our friends and the people who are directly or indirectly related to our project work.

1) Dhruv Sharad Salve Class: TYCM-II
2) Karan Jagdish Salve Class: TYCM-II
3) Shankar Santosh Sonar Class: TYCM-II
4) Pratik Vasant Sultane Class: TYCM-II

Vision & Mission

Institute Vision: - Strive to empower students with Quality Technical Education.

Institute Mission :- Committed to develop students as Competent and Socially Responsible Diploma Engineers by inculcating learning to learn skills, values and ethics, entrepreneurial attitude, safe and eco-friendly outlook and innovative thinking to fulfill aspirations of all the stakeholders and contribute in the development of Organization, Society and Nation.

Department Vision: - To impart quality technical education for development of technocrats.

Department Mission :-

To provide quality education and facilities for students to help them to achieve higher academic career growth.

To impart education to meet the requirements of the industry and society by technological solutions.

Develop technical & soft skills through co–curricular and extracurricular activities for improving personality.

Program Educational Objectives:-

Provide socially responsible, environment friendly solutions to Computer engineering related broad-based problems adapting professional ethics.

Adapt state-of-the-art Computer engineering broad-based technologies to work in multi-disciplinary work environments.

Solve broad-based problems individually and as a team member communicating effectively in the world of work.

Program Specific Outcome:-(Version – 1.2)

Computer Software and Hardware Usage: Use state-of-the-art technologies for operation and application of computer software and hardware.

Computer Engineering Maintenance: Maintain computer engineering related software and hardware systems.

Program Outcomes:-

Basic knowledge: Apply knowledge of basic mathematics, sciences and basic engineering to solve the broad-based Computer engineering problem.

Discipline knowledge: Apply Computer engineering discipline - specific knowledge to solve core computer engineering related problems.

Experiments and practice: Plan to perform experiments and practices to use the results to solve broad -based Computer engineering problems.

Engineering tools: Apply relevant Computer technologies and tools with an understanding of the limitations.

PO 5: The engineer and society: Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in the field of Computer engineering.

Environment and sustainability: Apply Computer engineering solutions also for sustainable development practices in societal and environmental contexts and demonstrates the knowledge and need for sustainable development.

PO 7: Ethics: Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice also in the field of Computer engineering.

PO 8: Individual and team work: Function effectively as a leader and team member in diverse/ multidisciplinary teams.

PO 9: Communication: Communicate effectively in oral and written form.

PO10: Life-long learning: Engage in independent and life-long learning activities in the context of technological changes in the Computer engineering field and allied industry.

Abstract

In this modern era, day to day life became smarter and interlinked with technology. We already know some voice assistants like Google and Siri etc. Now in our voice assistant system, it can act as a daily schedule reminder, note writer, calculator and a search tool. This project works on voice input and gives output through voice and displays the text on the screen. The main agenda of our voice assistant makes people smart and give instant and computed results. The voice assistant takes the voice input through our microphone (Bluetooth and wired microphone) and converts our voice into computer understandable language and gives the required solutions and answers which are asked by the user. This assistant connects with the World Wide Web to provide results that the user has questioned. Natural Language processing algorithm helps computer machines to engage in communication using natural human language in many forms.

Keywords:

Virtual Assistant Using Artificial Intelligence, Digital assistant, Virtual Assistant.

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Chapter-1

INTRODUCTION

Today the development of artificial intelligence (AI) systems that can organize a natural human-machine interaction (through voice, communication, gestures, facial expressions, etc.) are gaining in popularity. One of the most studied and popular was the direction of interaction, based on the understanding of the machine by the machine of the natural human language. It is no longer a human who learns to communicate with a machine, but a machine learns to communicate with a human, exploring his actions, habits, behavior and trying to become his personalized assistant.

Virtual assistants are software programs that help you ease your day to day tasks, such as showing weather reports, creating reminders, responding to emails etc. They can take commands via text (online chat bots) or by voice. Voice-based intelligent assistants need an invoking word or wake word to activate the listener, followed by the command. We have so many virtual assistants, such as Apple's Siri, Amazon's Alexa and Microsoft's Cortana.

1.1 Literature Survey:

A virtual assistant is generally self-employed and provides professional administrative, technical, or creative assistance to clients remotely from a home office. A virtual-assistant primarily based approach for performing a command via contextual text or a voice consumer interface on a subset of objects. The subset is selected from a fixed of items, each having an object type at least one tag gable field is associated with the object type and has a corresponding value. The set of objects is saved in the laptop memory. An utterance is acquired from the person and consists of a command, an object type choice, A tag gable field selection, and a price for the tag gable discipline. Responsive to the utterance, specified item is retrieved from the set of gadgets, the item of the sort selected through the user and having a price within the tag gable area selection that matches the tag gable field fee obtained from the user the command is done on the item. The object includes textual content that's converted to voice output. They envisioned that someday computers will recognize natural language and count on

what we need, whilst and where we need it, and proactively whole responsibilities on our behalf.

However, speech recognition and machine getting to know have persevered to be refined, and based records served through packages and content providers have emerged. We agree with that as computer systems turn out to be smaller and greater.

1.2 Existing System

We are familiar with many existing voice assistants like Alexa, Siri, and Google Assistant, Cortana which uses concept of language processing, and voice recognition. They listens the command given by the user as per their requirements and performs that specific function in a very efficient and effective manner.

As these voice assistants are using Artificial Intelligence hence the result that they are providing are highly accurate and efficient. These assistants can help to reduce Human effort and consumes time while performing any task, they removed the concept of typing completely and behave as another individual to whom we are talking and asking to perform task. These assistants are no less than human assistant but we can say that they are more effective and efficient to perform any task. The algorithm used to make these assistant focuses on the time complexities and reduces time.

But for using these assistants one should have an account (like Google account For Google assistant, Microsoft account for Cortana) and can use it with internet Connection only because these assistants are going to work with internet connectivity. They are integrated with many devices like phones, laptops, and speakers etc.

SIRI from Apple

SIRI is personal assistant software that interfaces with the user through voice interface, recognizes commands and acts on them. It learns to adapt to the user's speech and thus improves voice recognition over time. It also tries to converse with the user when it does not identify the user request. It integrates with calendar, contacts and music library applications on the device and also integrates with GPS and camera on the device. It uses location, temporal, social and task based contexts, to personalize the agent behavior specifically to the user at a given point of time.

Supported Tasks

- Call someone from my contacts list
- Launch an application on my iPhone
- Send a text message to someone
- Set up a meeting on my calendar for 9am tomorrow
- Set an alarm for 5am tomorrow morning
- Play a specific song in my iTunes library
- Enter a new note

Drawback

SIRI does not maintain a knowledge database of its own and its understanding comes from the information captured in domain models and data models.

Cortana from Microsoft

Like Apple's digital assistant, Siri, Cortana responds to natural language and can perform a variety of organizational tasks for users, including setting reminders, scheduling calendar events, calculating math problems, and converting measurements and currency.

To make Cortana work, users must enable the speech, inking and typing settings and turn on their location tracker. Users can also manage what information Cortana is able to access.

Supported Tasks

- Use of Natural language
- Multitasking
- Integration with Microsoft Edge
- Reminders
- Calendars
- Accessibility features

Drawback

Cortana can be tricked into installing malware, but it can only be done with physical access to your computer.

1.3 Proposed System:

The significantly conversational ERA is Virtual assistant i.e. voice-based and contextual text. ERA can likewise type your inquiries or solicitations, in the event that you want to not stand up uproarious. While Era's jokes are unbelievable, the virtual aide is getting abler consistently. Presently, you can request that it call individuals, send messages, plan gatherings, dispatch applications and recreations, and play music, answer questions, set brightness and volume, tells news and system info, and give climate conjectures. ERA (which has consolidated capacities from the more seasoned Google now, as now is being eliminated) is unique in relation to Cortana and Siri.

Currently, the project aims to provide the Users with a Virtual Assistant that would not only aid in their daily routine tasks like searching the web, vocabulary help and many others but also help in automation of various activities.

Presently, ERA is being developed as an automation tool and virtual assistant. Among the Various roles played by ERA is Search Engine with voice interactions, Normal human conversations, File Manipulation, Play Media Files, Translation and Answer the Question, Dictionary, Open application through voice assist

Chapter 2
ANALYSIS AND FEASIBILITY

Analysis:

System Analysis is about complete understanding of existing systems and finding where the existing system fails. The solution is determined to resolve issues in the proposed system. It defines the system. The system is divided into smaller parts. Their functions and inter relation of these modules are studied in system analysis.

Feasibility Study:

A feasibility study is part of the initial design stage of any project/plan. It is conducted in order to objectively uncover the strengths and weaknesses of a proposed project or an existing business. It can help to identify and assess the opportunities and threats present in the natural environment, the resources required for the project, and the prospects for success.

The significantly conversational ERA is Virtual assistant i.e. voice-based and contextual text. ERA can likewise type your inquiries or solicitations, in the event that you want to not stand up uproarious. While Era's jokes are unbelievable, the virtual aide is getting abler consistently. Presently, you can request that it call individuals, send messages, plan gatherings, dispatch applications and recreations, and play music, answer questions, set brightness and volume, tells news and system info, and give climate conjectures. ERA (which has consolidated capacities from the more seasoned Google now, as now is being eliminated) is unique in relation to Cortana and Siri.
Personal assistant software is required to act as an interface into the digital world by understanding user requests or commands and then translating into actions or recommendations based on an agent's understanding of the world.

ERA focuses on relieving the user of entering text input and using voice as primary means of user input.

1. **Technical feasibility:** It includes finding out technologies for the project, both hardware and software. For a virtual assistant, the user must have a microphone to convey their message and a speaker to listen when the system speaks. These are very cheap nowadays and everyone generally possesses them. Besides, the system needs internet connection.

   While using ERA, make sure you have a steady internet connection. It is also not an issue in this era where almost every home or office has Wi-Fi.

2. **Operational feasibility:** It is the ease and simplicity of operation of the proposed system. System does not require any special skill set for users to operate it. In fact, it is designed to be used by almost everyone. Kids who still don't know how to write can read out problems for the system and get answers.

3. **Economical feasibility:** Here, we find the total cost and benefit of the proposed system over current over the current system. For this project, the main cost is documentation cost. User Users also would have to pay for microphone for a microphone and speakers. Again, they are cheap and available. As far as maintenance is concerned, JIA won't cost too much.

4. **Organizational feasibility:** This shows the management and organizational structure of the project. This project is not built by a team. The management tasks are all to be carried out by a single person team. That won't create any management issues and will increase the feasibility of the project.

5. **Cultural feasibility:** It deals with compatibility of the project with cultural with the cultural environment. Virtual assistant is built in accordance with the general culture. The project is named ERA so as to represent Indian foreign culture without undermining local beliefs. This project is technically feasible with no external hardware requirements. Also it is simple in operation and does not cost training or repairs. Overall feasibility study of the project reveals that the goals of the proposed system are achievable. Decision is taken to proceed with the project.

Chapter 3

PROJECT REQUIREMENTS:

- **About Proposed Project:**

For implementing the application, we opted for the knowledge of Python from Coursera courses and YouTube. Also learned about GUI development in Python using tkinter. Then we learned about project Management using GitHub, Git commands.

- **Area of implementation:**

We used ERA as an area of implementation to help people automate various activities and make windows easier to handle for Handicap peoples or the people who work in offices to fasten their work and do it efficiently through their daily life.

Project Functional Requirements:

Currently, the project aims to provide the Users with a Virtual Assistant that would not only aid in their daily routine tasks like searching the web, vocabulary help and many others but also help in automation of various activities like call individuals, send messages, plan gatherings, dispatch applications and recreations, and play music, answer questions, set brightness and volume, tell news and system info, do file manipulation, Translation and answer the question, search on Dictionary, Open application through voice assist and gives climate conjectures.

- It should be able to perform call individuals.
- It should be able to perform send messages on Whatsapp and Email.
- It should be able to perform finding meaning in dictionary.
- It should be able to perform setting of Brightness and Volume.
- It should be able to perform Weather Forecasting.
- It should be able to perform playing music.
- It should be able to perform web query.
- It should be able to perform to get info about Covid , System.

Sr No.	Functional Requirements	Functional Input	Functional Output
f_1	User Main window	User have to click on mike and speak the command or query which user want to perform.	The user will be able to access Main user interface and can perform command.

- **Hardware requirements:**
- **Project Development:**

These requirements are separated based on whether you are developing the app or running the app on a device.

Sr. No.	Hardware	Specification
1	Processor	Intel Core-i3
2	RAM	4 GB & Above

- **Project Operations:**

Sr. No.	Hardware	Specification	Operation
1	Processor	Intel Core-i3	To access the website and use the mobile application.
2	RAM	Min 4 GB	To handle the computations.

- **Software requirements:**
- **Project Development:**

Sr no	Software	Specifications	Operation
1	Pycharm	2022.1	To build/develop systems quickly.
2	Python	3.10	To develop the system.
3	Operating System	Windows 7 or above	To run development apps.
4	IDE	Visual Studio Code (1.67)	To edit the project files.

- **Project Operations/Use:**

Sr. No.	Hardware	Specification
1	Processor	Intel Core-i3
2	Operating System	Windows 7 or more

DEVELOPMENT TOOLS

1) PYTHON

Python is a high-level, interpreted, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation.[30]

Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly procedural), object-oriented and functional programming. It is often described as a "batteries included" language due to its comprehensive standard library.

➢ **Features**

1. Easy to code
2. Free and Open Source
3. Object-Oriented Language
4. GUI Programming Support
5. High-Level Language
6. Extensible feature
7. Python is Portable language
8. Python is Integrated language
9. Interpreted Language
10. Large Standard Library
11. Dynamically Typed Language

2) Pycharm

PyCharm is an integrated development environment (IDE) used in computer programming, specifically for the Python programming language. It is developed by the Czech company JetBrains (formerly known as IntelliJ).[5] It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems, and supports web development with Django as well as data science with Anaconda.[6]

PyCharm is cross-platform, with Windows, macOS and Linux versions.

➢ **Features**

- Coding assistance and analysis, with code completion, syntax and error highlighting, linter integration, and quick fixes
- Project and code navigation: specialized project views, file structure views and quick jumping between files, classes, methods and usages
- Python refactoring: includes rename, extract method, introduce variable, introduce constant, pull up, push down and others
- Support for web frameworks: Django, web2py and Flask professional edition only Integrated Python debugger

Chapter 4
PROJECT DESIGN

4.1 Design Concept:

Following are the detailed outline of the software development methodology used in this project following up the various existing software development methodology.

1. **User Interface Module**

   Here user can speak his/her query and give input as voice so ERA will take input and match it with if the query match with defined functions and Return Response to the Main User interface.

2. **Settings Module**

   Here you can change user details like Gender, voice of Assistant, and User can select Chat background color, and there is also one option to close the ERA or back.

3. **Chat Module**

   Here user can type the query or command ERA will match the command with conditions of Defined callback functions and it will respond to the Command using voice and Display the result on the Screen.

4.1.1 System Context Diagram:

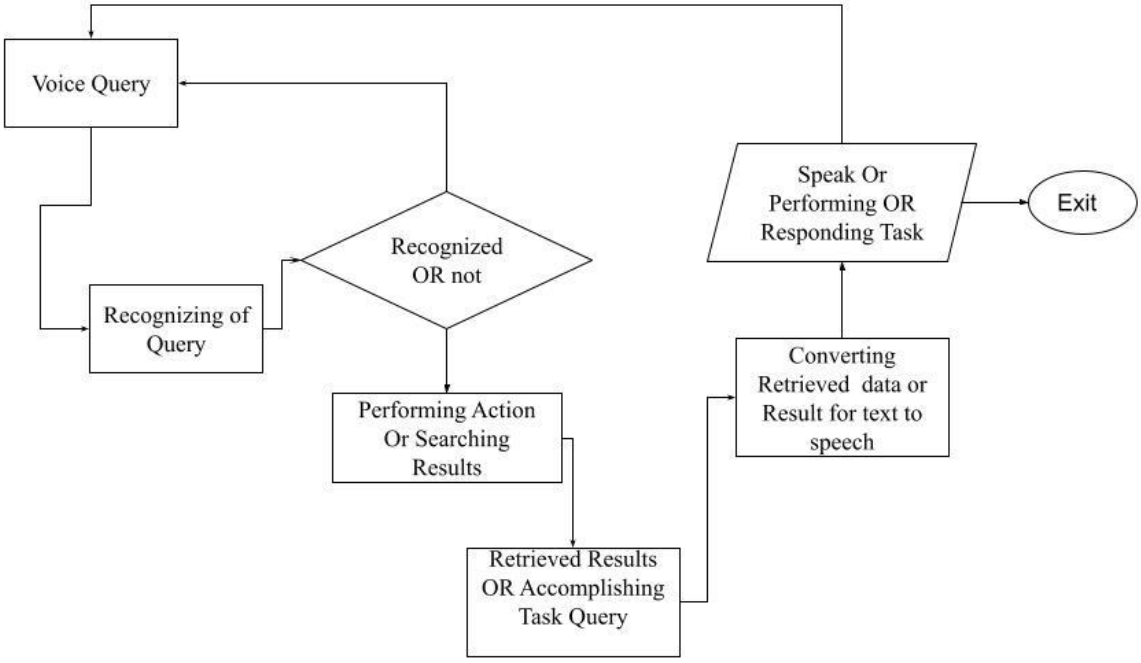


Fig No 1: System Diagram

In this system diagram, we give input as voice query then the system recognizes the query using main keywords. If query is recognized, then desired action is invoked. As a result, the output text is then converted into voice/speech message. The Virtual assistant using Pyttsx3 response (here speak function is used) that to the user.

4.1.2 Block Diagram

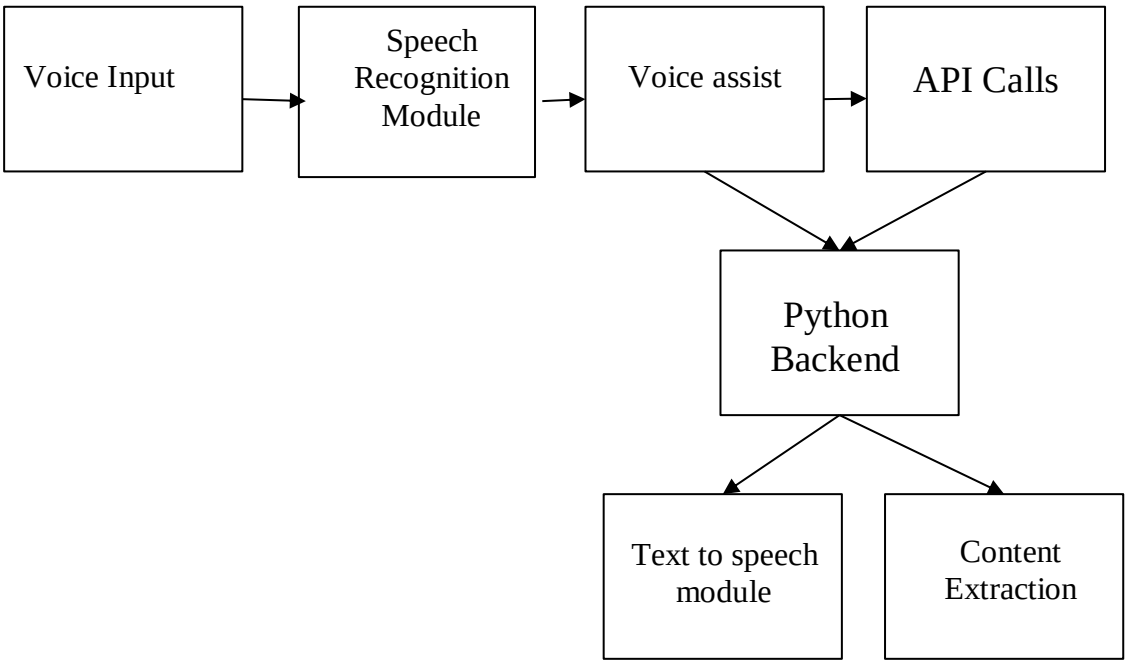


Fig No 2: Block Diagram

In this system diagram, User will give voice command with the help of tools like microphone and then by using speech recognition module query will be recognized with the help of voice assist and then if required API will be called or it will go to Python backend to carry out further operation depending on desired output content will be extracted and at last text to speech will be converted to give user voice message as output or solution

4.2 Component Design, DFD Diagram and UML Diagram:

4.2.1 Data Flow Diagram

DFD Diagram:

In the design phase the architecture is established. This phase starts with the requirement document delivered by the requirement phase and maps the requirements into architecture. The architecture defines the components, their interfaces and behaviors. The deliverable design document is the architecture.

The design document describes a plan to implement the data flow diagram (level 0) shown in fig 3. Level 0 includes the overall functioning of the system. A data flow diagram at its simplest is a representation of a flow of the current system. A data flow diagram shows the steps of all the execution of the data and the processes.

Figure 4. Shows Data flow diagram (level 1). Level 1 includes the brief description of the image processing module, it shows the conversion of video to frame and edge detection. And a data flow diagram shows the steps of all the execution of the data and the processes. Figure 5. Shows Data flow diagram (level 2).

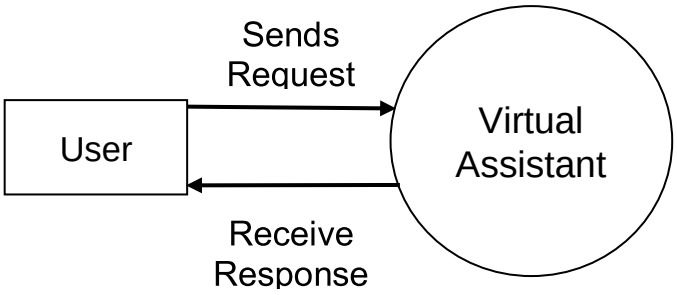


Fig No 3.: DFD Level 0

Explanation:

In Level-0 DFD, the basic functionality of all modules is done. There are four basic modules in the System: -

User Interface Module

Here user can speak his/her query and give input as voice so ERA will take input and match it with if the query match with defined functions and Return Response to the Main User interface.

Settings Module

Here you can change user details like Gender, voice of Assistant, and User can select Chat background color, and there is also one option to close the ERA or back.

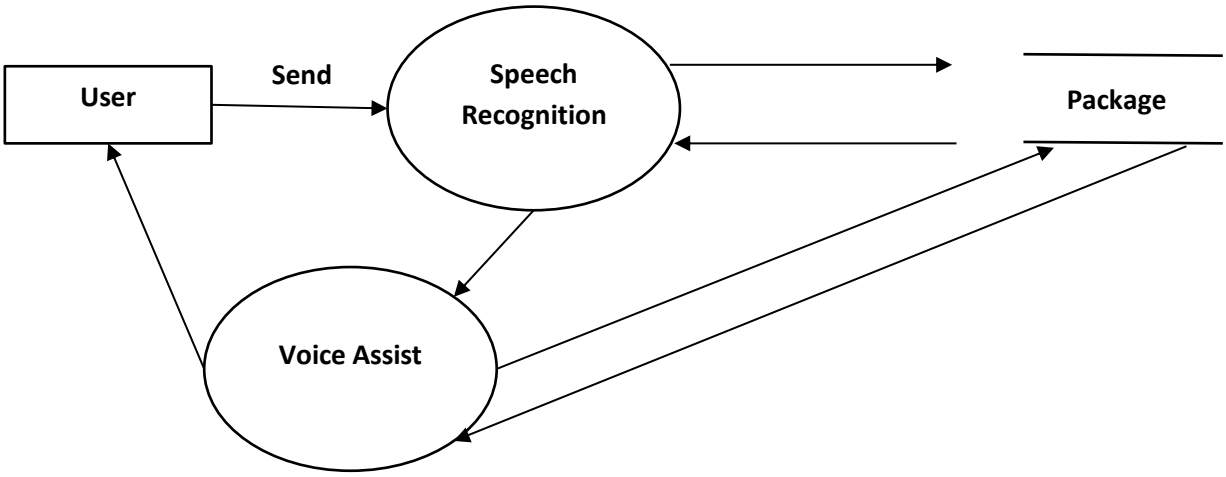


Fig No 4: DFD level 1

Explanation: -

1. In Level-1 DFD, the modules are expanded along with their database and flow of data.

2. The user will enter the query, the Guiassistant module will authenticate the credentials stored in json file.

3. In next flow, the user will enter query properties which will be passed to Speech Recognition Module.

4. After that it will access Voice assist module then it will perform particular operation and return response to user.

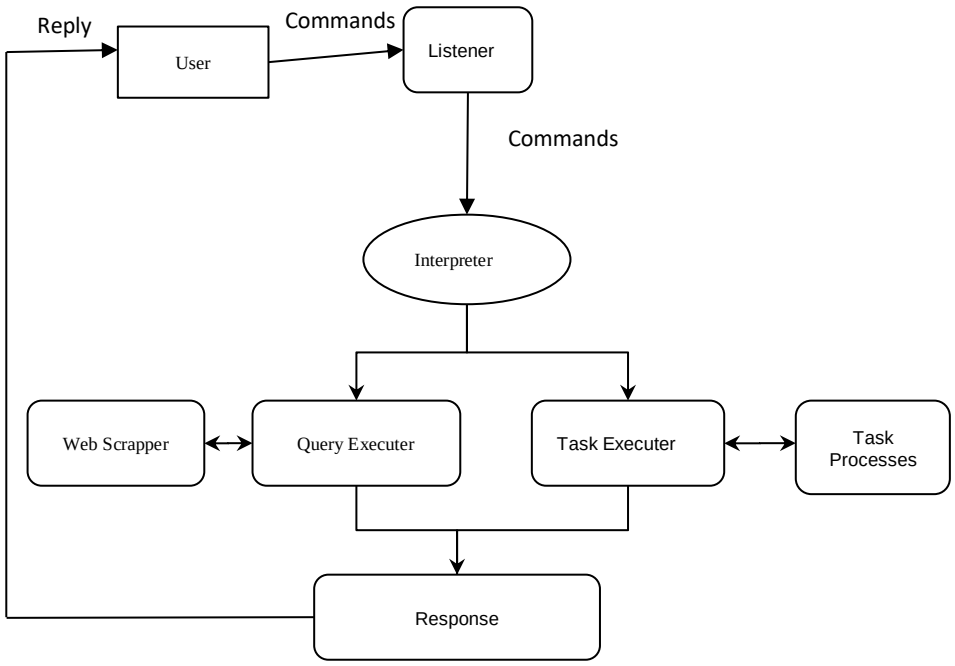


Fig No 5: DFD level 2

In Level-2 DFD, all the modules of the system are mentioned in great detail along with their DB and flow of data. The Level-2 DFD is the in-depth expansion of the core modules mentioned in Level-1 DFD. Difference between the two is some big modules like Manage Screener, User Notification are divided into smaller and detailed sub modules for particular use cases.

4.2.2 UML Diagram (Use Case):

UML is the Unified Modelling Language, a standard that defines the rules and notation for specifying software systems. The notation supplies a rich set of graphic elements for modelling object-oriented elements, and the rules say how those elements may be connected and used.

UML is not a prescriptive process for creating software systems - it does not supply a method or process, simply the language. You can therefore use UML in a variety of ways to specify and develop your software engineering project. Enterprise Architect supports many different kinds of UML elements (as well as some custom extensions).

Together with the links and connectors between elements, these form the basis of the model. In addition to the base UML elements, the modelling environment can be extended using UML Profiles. A Profile is a set of stereotyped and tagged elements that together solve some modelling problem or scenario. Examples are UML Profiles for modelling XML Schema or Business Process Modelling.

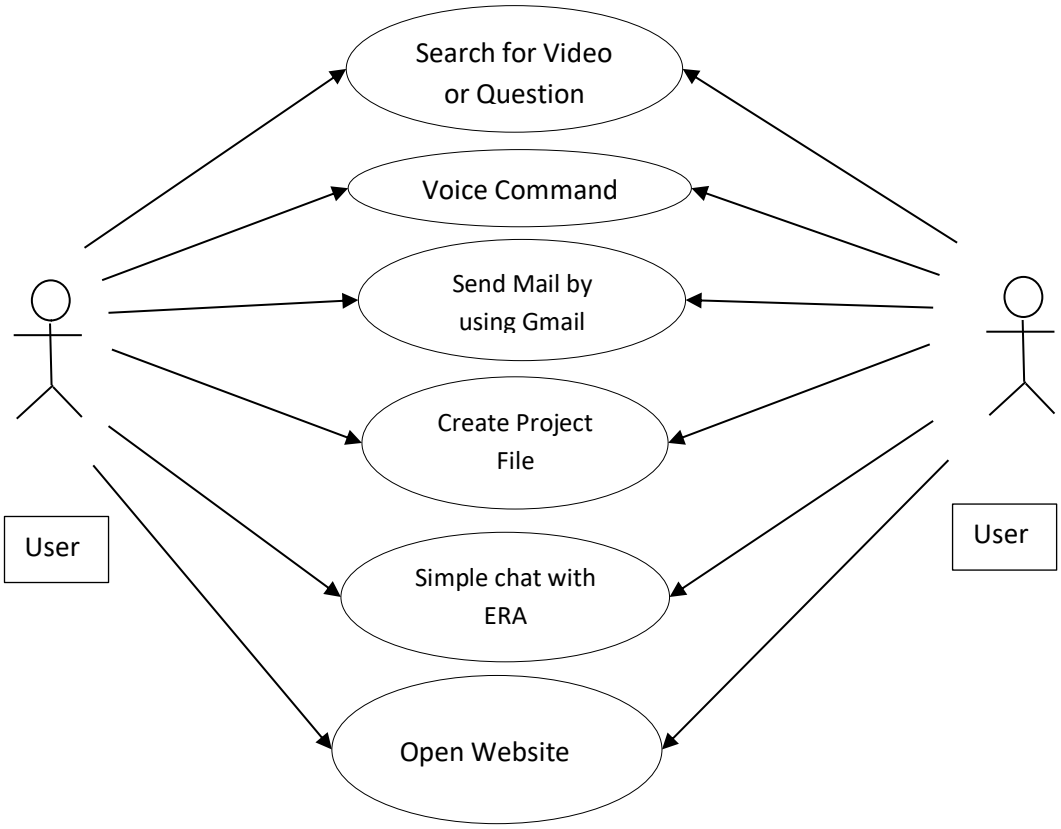


Fig No 6: UML Diagram

The UML diagram shows the flow of how the user will access the functionalities and will be redirected accordingly.

1. The user will enter the query, the Guiassistant module will authenticate the credentials stored in json file.

2. In next flow, the user will enter query properties which will be passed to Speech Recognition Module.

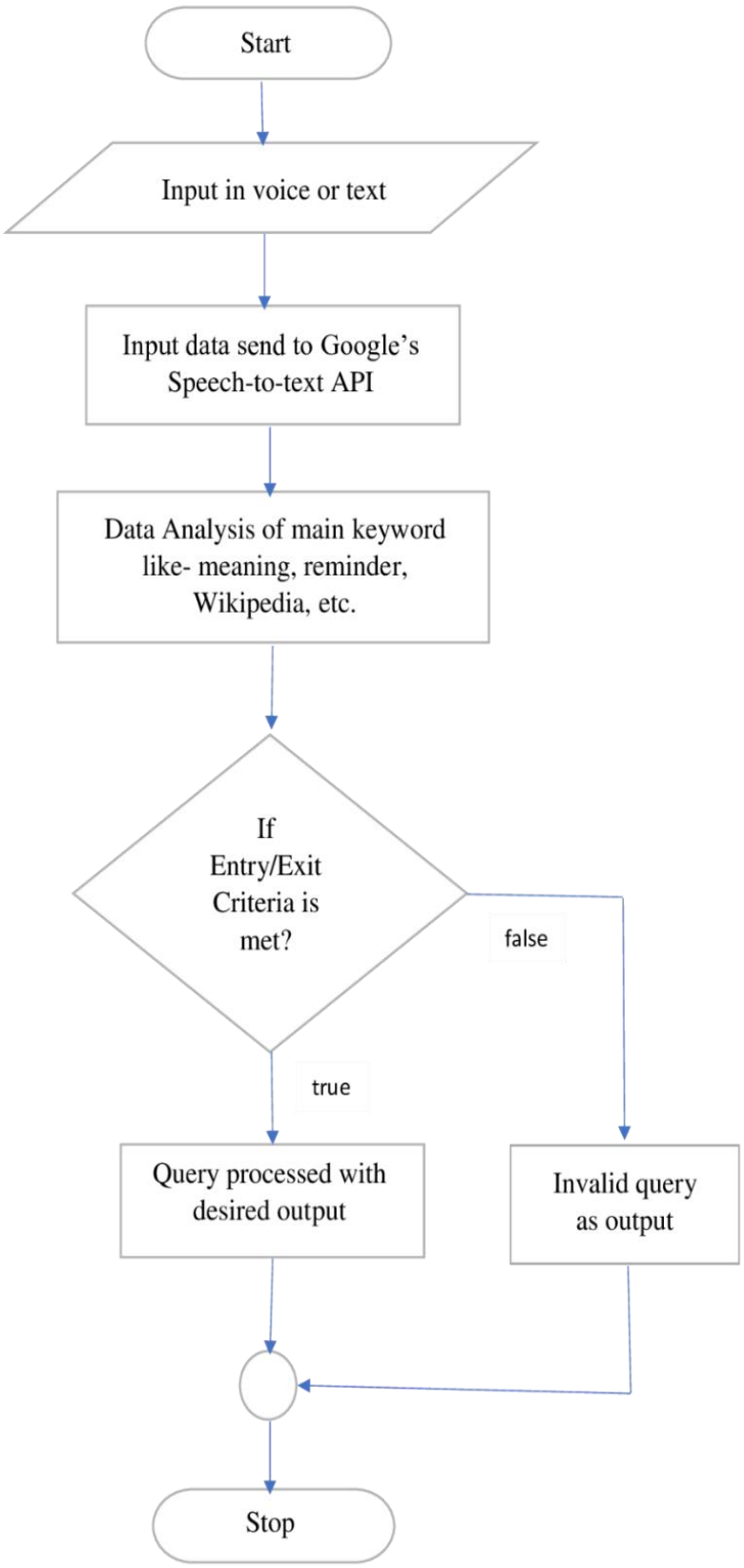
3. After that it will access Voice assist module then it will perform particular operation and return response to user.

4. User can search video on web using Web Scrapper Module.

5. User can send Mail using SMTP Predefined Module.

6. If the user wants to view or edit the details of the profile, the Setting Module will help to do so.

Flowchart:


Start
Input in voice or text
Input data send to Google's Speech-to-text API
Data Analysis of main keyword like- meaning, reminder, Wikipedia, etc.
If Entry/Exit Criteria is met?
false
true
Query processed with desired output
Invalid query as output
Stop

4. 3Module Analysis:

4.3.1 Module Name: Main Chat Module:

4.3.1.1 Purpose of module:

This module will handle the User commands by taking input and responding to query or command.

4.3.1.2 Inputs and Outputs for Module:

A. The input for the registration module will be:

1. Input will be as voice command.

2. Also we can type the command by using keyboard tab to provide command or query.

B. The output of the module will be either an error message like “I Couldn’t understand your query” or Result on main Window.

4.3.1.3 Algorithm of Module:

1. Start.

2. Give input as voice command.

3. Verify and perform operation on given query.

4. Return error or Output on screen.

5. Stop.

4.3.2 Module:

Pyttsx3

Sapi5

Speech recognition

Pyaudio

Wikipedia

Webbrowser

4.3.3 Procedural steps:

1. How to run the project?
   1. You will see a 'requirements.txt' which contains all the packages to run this project.
   2. Install every package using command, (pip install packagename)
   3. Now just open the GUIASSISTANT.py file to run
2. Now Give Input as Voice Input.
3. ERA will take Input, recognize it and it will return output on Screen.

System Requirements:

Hardware Requirement for Development of Project:

Processor	: Intel CORE i3 /i5
RAM	: 4GB
Hard Disk	: 64GB

Software Requirement for Development of Project:

Operating System - Windows 7/10

Simulation Tools - Visual Studio Code

Python - Version 3.9.0

Packages -

1. Pyttsx3
2. Speech Recognition
3. Wikipedia
4. Pyaudio
5. Web browser

Advantages of this Project:

1. Platform independence
2. Increased flexibility
3. Saves time by automating repetitive tasks
4. Accessibility options for Mobility and the visually impaired
5. Reducing our dependence on screens
6. Adding personality to our daily lives
7. More human touch
8. Accessible and inclusive
9. Aids hands free operation

Limitations/Constraints of Project:

1. Requires Internet connection.
2. Microphone threshold is set 4000 so User should Speak Command Properly.

- **Software Development Methodology**

  Methodology is a formalized approach to implement the System. There are many different systems development methodologies, and each one is unique based on the order and focus it places on each SDLC phase. Some methodologies are formal standards used by government agencies, while others have been developed by consulting firms to sell to clients.

  Many organizations have internal methodologies that have been honed over the years, and they explain exactly how each phase of the SDLC is to be performed in that company. There are many ways to categorize methodologies. One way is looking at whether they focus on the business process or the data that support the business.

  There are three types of system development methodologies, it is called Structured Design, RAD (Rapid Application Development), and Agile Development.

- **Types of Software Development Methodologies**

- **Structured Design**

  This is the first type of system development; it was introduced in the 1980s. This methodology adopts the formal step by step approach to the SDLC, it moves logically from one phase to another phase.

- **Waterfall Model**

  This is the original structured design of methodology, with this methodology, the analyst and users proceed in sequence from one phase to the next phase. The key deliverables for each phase are typically very long and are presented to the project sponsor for approval as the project moves from phase to phase. This methodology is referred to as waterfall development because it moves forward from phase to phase in the same manner as a waterfall.

  Advantages of using waterfall model:

- It identifies system requirements long before programming begins
- It minimizes changes to the requirements as the project proceeds.

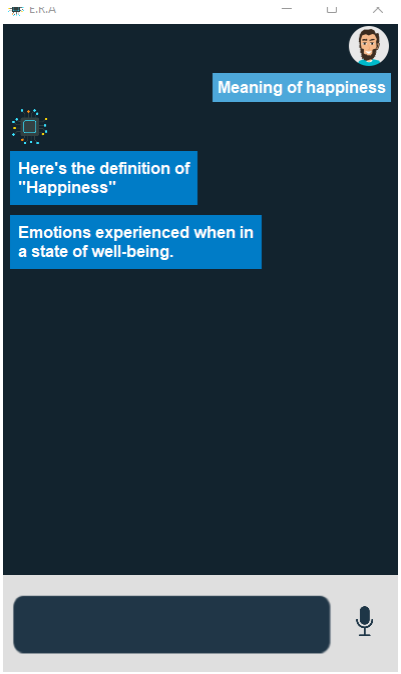
Disadvantages of using waterfall model:

- The design must be completely specified before programming begins
- This model required significant rework, if there are changes in the business environment, in order to go back to the initial phase need to go through each of the subsequent phases in return.

Chapter 5

Result

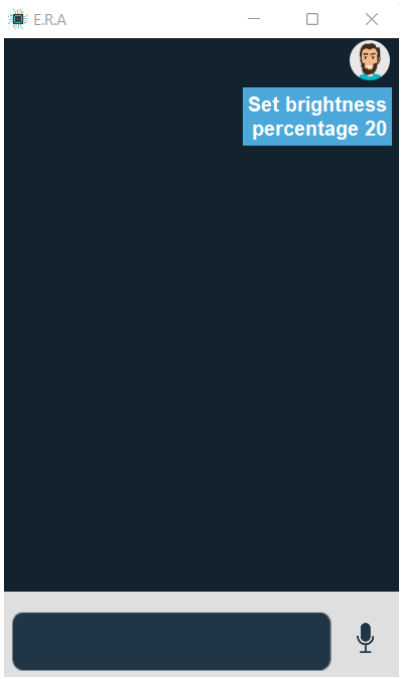
In this Chapter, we have included the result and Outputs in the form of screenshot with description and sample code of our project.



Sample code:

```
if isContain(text, ['meaning', 'dictionary', 'definition', 'define']):
    result = dictionary.translate(text)
    speak(result[0], True, True)
    if result[1]==": return
    speak(result[1], True)
    return
```

Query: Meaning of happiness. After the query is processed the meaning of happiness is fetched from a json file where there are more than a thousand words with meanings.

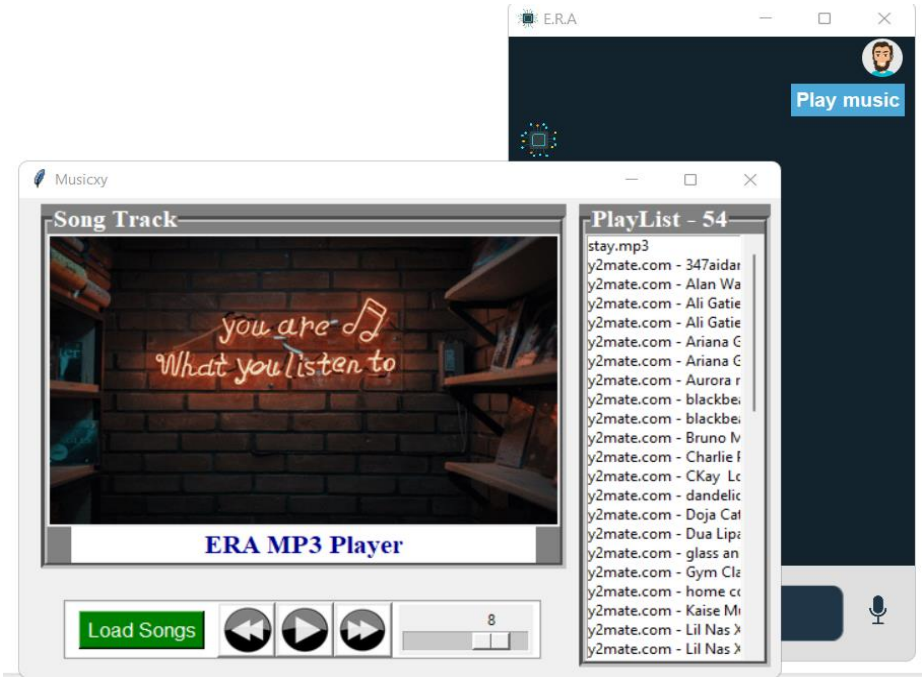


Sample code:

```
if isContain(text, ['set brightness percentage ']):
    current_brightness = pct.get_brightness()
    speak(f"Current brightness percentage is
    "+{current_brightness})
    text = text.replace("set brightness percentage ", "")
    level_no = int(text)
    if level_no >= 0 and level_no <= 100:
```

```
                pct.set_brightness(text)
                speak(f"Brightness percentage is set to {text}")
                attachTOframe('Brightness set to '+{level_no}, True)
            else:
                speak("Invalid command!!")
```

Query: Set brightness percentage to 20. After the query is processed the screen brightness is set to 20%



Sample code:

```
    def play_song(self, event=None, songs_list=None):
        if event is not None:
            self.current = self.list.curselection()[0]
            for i in range(len(self.playlist)):
                self.list.itemconfigure(i, bg="white")
        print(self.playlist[self.current])
```

```
self.songplaying = self.playlist[self.current]

mixer.music.load(self.songplaying)

self.songtrack['anchor'] = 'w'

self.songtrack['text'] = os.path.basename(self.songplaying)


self.pause['image'] = play

self.paused = False

self.played = True

self.list.activate(self.current)

self.list.itemconfigure(self.current, bg='sky blue')

mixer.music.play()
```

Query: play music. After the query is processed the music player module is invoked and a music player interface appears.

Sample code:

```
def voiceMedium():
    while True:
        query = record()
        if query == 'None': continue
        if isContain(query, EXIT_COMMANDS):
            speak("Shutting down the System. Good Bye "+ownerDesignation+"!", True, True)
            break
        else: main(query.lower())
    appControl.Win_Opt('close')
```

Query: Shutdown. After the query is processed ERA the virtual assistant exits with “Shutting down the system Goodbye Sir” message.

Chapter 6

SOFTWARE TESTING

"Testing is the process of executing a program with the intent of finding errors." Software testing is a processor, a series of processes, designed to make sure computer code does what it was designed to do and that it does not do anything unintended. Software should be predictable and consistent, offering no surprises to users.

Purpose of testing can be quality assurance, verification and validation, or reliability estimation. Software testing is to assess and evaluate the quality of work performed at each step of the software development process. The goal of software testing is to ensure that the software performs as intended, and to improve software quality, reliability and maintainability.

- **Objectives of Software Testing**

The major objectives of software testing are as follows:

1. Finding defects which may get created by the programmer while developing the software.
2. Gaining confidence and providing information about the level of quality.
3. To prevent defects.
4. To make sure that the end result meets the business and user requirements.
5. Gain the confidence of the customers by providing them a quality product.
6. To ensure that if satisfies the BRS that is Business Requirement Specification and SRS that is System Requirement Specification.

Types of Software Testing

1. White Box Testing
2. Black Box Testing

Some special types of software testing strategies are as follows:

A. Unit Testing
B. Integration Testing

C. Smoke Testing

D. Rogation Testing

A. Unit Testing:

- Unit Testing is a software testing method by which individual units of source code, sets of one or more computer program modules together with associated control data, usage procedures, and operating procedures, are tested to determine whether they are fit for use.
- Unit Testing is also known as “Module Test” because it tests individual units of code that comprise of application.
- Unit test focuses on “Functionality” and “Reliability” and Entry and Exit criteria can be the same for each module.
- Unit testing identifies most number of defects before integration testing

B. Integration Testing:

- Integration Testing is a logical extension of unit testing.
- In its simplest form, two units that have already been tested are combined into components, which are then aggregated into an even larger part of the program.
- Integration Testing identifies problems that occur when units are combined. This method reduces the number of possibilities for a far simpler level of analysis.

  There are four types of integration testing:
- Non-Incremental Integration testing
- Incremental Integration Testing
- Top- Down Integration Testing
- Bottom-Up Integration Testing
- Bi-directional Integration Testing

6.1 Unit Testing

Test Case ID	Test Case Description	Steps to be executed	Test Input Data	Expected Result	Actual Result	Status
TC_1	To check if ERA response to users registered voice	Give voice command in main module such as- ERA	1. Enter in ERA application 2. Give voice command in main module such as- ERA	It must be able to respond to user voice	It is able to respond to user voice	Pass
TC_2	To check if user is able to perform task of sending Email	Give voice commands in the main module such as-send email.	1. Enter in ERA application 2. Give voice command such as- ERA send email to specified person	It must send email to specified person	It sends email to specified person	Pass
TC_3	To check if ERA is able to open websites like Google, YouTube, etc.	Give voice command in main module such as- ERA open YouTube website	1. Enter in ERA application 2. Give voice command such as- ERA open YouTube website	It must open specific website	It opens specified website	Pass

TC_4	To check if ERA is able to set a reminder	Give voice command in main module such as- ERA set reminder of 10 minutes	1. Enter in ERA application 2. Give voice command such as- set reminder to 07:30 pm	It must set reminder according to time specified by user	It sets reminder according to time specified by user	Pass
TC_5	To check if ERA is able to reply to simple human conversation	Give voice commands in the main module such as- ERA "How are you?"	1. Enter in ERA application 2. Give voice commands such as- ERA How are you?	It must reply to simple human conversation	It replies to simple human conversa-tion	Pass
TC_06	To check if user is able to perform task of sending Email	Give voice command in main module such as- ERA send email.	1. Enter in ERA application 2. Give voice command such as- ERA send email to specified person	It must send email to specified person	It sends email to specified person	Pass
TC _07	To check if ERA is able to translate sentences in different languages like	Give voice command in main module such as- ERA translate "Hello, how are you?" in Hindi	1. Enter in ERA application 2. Give voice command such as- ERA translate	It must translate the sentence i.e., "Hello,	It translates the sentence i.e., "Hello,	Pass

	English to Hindi		specified sentence	how are you?" in Hindi	how are you?" in Hindi	
TC _08	To check if user is able to gives us the result/answer of the question asked	Give voice command in main module such as- ERA answer the question "What is the definition of Machine Learning?"	1. Enter in ERA application 2. Give voice command such as- ERA answer the question	It must answer for the question asked	It answers for the question asked	Pass
TC _09	To check if ERA is able to set a reminder	Give voice command in main module such as- ERA set reminder of 10 minutes	1. Enter in ERA application 2. Give voice command such as- ERA set reminder of 10 minutes	It must set reminder according to time specified by user	It sets reminder according to time specified by user	Pass
TC _10	To check if ERA is able to reply to simple human conversation	Give voice command in main module such as- ERA "How are you?"	1. Enter in ERA application 2. Give voice command such as- ERA How are you?	It must reply to simple human conversation	It replies to simple human conversa-tion	Pass

TC _11	To check if ERA is able to open new/existing window	Give voice command in main module such as- ERA open a new file/ existing file named files	1. Enter in ERA application 2. Give voice command such as- ERA open a new file/ existing file named files	It must open new file/ existing file named files	It opens new file/ existing file named files	Pass
TC _12	To check if ERA is able to close opened window	Give voice command in main module such as- ERA close file that should be opened firstly	1. Enter in ERA application 2. Give voice command such as- ERA close file	It must close file	It closes file	Pass
TC _13	To check if ERA is able to maximize the opened window	Give voice command in main module such as- ERA maximize the window	1. Enter in ERA application 2. Give voice command such as- ERA maximize the window	It must maximize the opened window	It maximizes the opened window	Pass
TC _14	To check if ERA is able to minimize the opened window	Give voice command in main module such as-	1. Enter in ERA application 2. Give voice command such	It must minimize the	It minimizes the	Pass

		ERA minimize the window	as- ERA minimize the window	opened window	opened window	
TC _15	To check if ERA is able to open various applications that are available on the system	Give voice command in main module such as- ERA open notepad application	1. Enter in ERA application 2. Give voice command such as- ERA open notepad application	It must open specified applicatio n	It opens specified applicatio n	Pass
TC _16	To check if ERA is able to search for websites like Google, YouTube, etc.	Give voice command in main module such as- ERA search YouTube website	1. Enter in ERA application 2. Give voice command such as- ERA search YouTube website	It must search for specific website	It searches for specific website	Pass
TC _17	To check if ERA is able to open websites like Google, YouTube, etc.	Give voice command in main module such as- ERA open YouTube website	1. Enter in ERA application 2. Give voice command such as- ERA open YouTube website	It must open specified website	It opens specified website	Pass

TC _18	To check if ERA is able to search on websites like Google, Wikipedia, YouTube, etc.	Give voice command in main module such as- ERA search K. K. Wagh Institute Nashik channel on YouTube website	1. Enter in ERA application 2. Give voice command such as- ERA search K. K. Wagh Institute Nashik channel on YouTube website	It must search on specified website	It searches on specified website	Pass
TC _19	To check if ERA is able to play available media on appropriate application.	Give voice command in main module such as- ERA play Google interview video on VLC media application	1. Enter in ERA application 2. Give voice command such as- ERA play Google interview video on VLC media application	It must play specified media on appropriate application	It plays specified media on appropri-ate applicatio n	Pass
TC _20	To check if ERA is able to respond to System specific questions	Give voice command in main module such as- ERA “What’s my battery life?”	1. Enter in ERA application 2. Give voice command such as- ERA “What’s my battery life?”	It must respond to system specific questions	It responds to system specific questions	Pass

1. Stress Testing:

Step	Test Case ID	Description	Input Data	Expected Result	Actual Result	Status
1	TC_1	Check the project is running on Windows 7 and above	-	It should run	It is running	PASS
2	TC_2	Check the project is running on 4GB RAM	-	It should run	It is running	PASS

Chapter 7

COST ESTIMATION

Cost Estimation is a well-formulated prediction of probable manufacturing, developing cost of a specific project. A cost estimation is a powerful management tool for providing an idea for a budget. It accounts for all the items from various stages of cost estimation.

I. **Conceptual Estimation**

It is the process of determining the cost before project execution.

II. **Detailed Estimation**

It is the process of determining the cost by breaking each stage of operation & finding cost of each component by using a format.

7.1 COCOMO Model:

Step 1: Measure the size in terms of the amount of functionality in a system. Function points are computed by first calculating an unadjusted function point count (UFC).

Sno.	Function points	Number	Description
1	User inputs	3	Voice Based, Text Input By Typing.
2	User outputs	1	Main GUI.
3	User requests	1	Speak Query
4	Internal Files	1	Json Files for Dictionary and Normal Chat Module.
5	External interfaces	3	Display the chat, input and Output.

Step 2: Multiply each number by a weight factor according to complexity of the parameter, associated with that number. Complexity considered is average.

Sno.	Function points	Number	Weight Factor	Multiplication
1	User inputs	3	4	12
2	User outputs	1	5	5
3	User requests	1	5	5
4	External interfaces	3	8	24
5	Internal files	1	9	9

Step 3: Calculate the total UFP (Unadjusted function points) by adding the multiplication column in above table

UFP = 12+5+5+24+9 = 55

Step 4: Calculate the total TCF (Technical Complexity Factor) by giving a value between 0 and 5

Sr no.	Technical Complexity Factor	Value
1	Data communication	4
2	Distributed Data Processing	5
3	Performance criteria	4
4	Heavily Utilized Hardware	0
5	High Transaction Rates	4
6	Online Data Entry	5
7	Online Updating	4
8	End user efficiency	3
9	Complex Computations	2
10	Reusability	3

11	Ease of Installation	5
12	Ease of Operation	5
13	Portability	3
14	Maintainability	4

Step 5: Sum the resulting numbers to obtain DI (degree of influence) by adding the value column in above table

DI = 51

Step 6: TCF (Technical Complexity Factor) by given formula

TCF = 0.65+0.01*DI

= 0.65+0.01*51

= 1.16

Step 7: Calculate FP (Function Points) using the given formula

FP = UFP*TCF

= 55*1.16

= 63.8

Step 8: To find KLOC (Lines of code) using language factor and FP

Language factor of php = 56

KLOC= Language factor * FP

= 56*63.8

= 3.57

Step 9: To calculate the effort and nominal development time using given formula and constants

Effort = $a_1*(KLOC)^{a_2}$ PM

Tdev =$b_1*(Effort)^{b_2}$ Months

Development mode considered is Organic.

Values of the constants in the Organic Development mode:

a_1=2.4 a_2=1.05 b_1=2.5 b_2=0.38

Effort = 2.4*(3.57)^^1.05

= 9.13 PM

Tdev =2.5*(9.13)^^0.38

= 5.79 Months

Step 10: Calculate the cost required to develop product by multiplying development time and average salary of engineers

Average salary is 2600

Cost required to develop the product = 5.79 * 2600

= 15054

Hence the total cost required to develop the product is ₹15,054/-

Chapter 8
APPLICATIONS

---

1. It can perform the task of an Email sender that is to send email or receive email and also messages.

2. It can also translate sentences in different languages.

Example- From the English sentence "Hello, how are you?" to Hindi sentence “नमस्तेकै सी हो

तुम?”

3. The Virtual assistant can also give us the result/answer of the question asked to it like- What is this the definition of Machine Learning?

    a. What is the meaning of Natural Language Processing?

4. It can set a reminder of 10 seconds or 2 minutes and so on.

5. It can also respond to "What's my battery life".

6. It can open/close as well as maximize/minimize the window.

7. The Virtual assistant can open various applications like notepad, paint, calculator, etc. that are available on the system.

8. It can open and search on websites like Google, YouTube and search on Wikipedia.

9. The Virtual assistant using smart reply feature can respond to -

    a. How are you?

    b. Who are you?

    c. Tell me something

10. It can also play the music that is present on the system.

Chapter 9:
FUTURE ENHANCEMENT

Virtual Assistant as a software has a very wide scope for enhancement. We can provide businesses with their own personalized requirements Virtual Assistant can help you to manage customer relations and deal with the incoming inquiries, respond to phone calls and emails, provide technical support and live chat services, maintain the information of your website, monitor user conversation on different social platforms. The Virtual Assistant will continue to play an important role in the development strategy of business because it provides a double-edged solution to improve profitability by effectively lowering cost and increasing revenue through efficiency. Virtual Assistant can also evolve into an automation tool or even could be delivered into IOT devices.

Chapter 10:
CONCLUSION

An intelligent virtual assistant (IVA) is a software agent that can perform tasks or services for an individual based on commands or questions. The term "chatbot" is sometimes used to refer to virtual assistants generally or specifically accessed by online chat. 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 (spoken?) commands. The project is built using open source software modules with PyCharm community backing which can accommodate any updates shortly. The modular nature of this project makes it more flexible and easy to add additional features without disturbing current system functionalities.

Chapter 11

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Page 12: Published/Presented Paper page:

1) Summary of Paper Published/Presented.

Sr. No.	Title of Paper	Level (International/National /State/District) and publication details	Date of publication	Venue	Award won
1	AI Virtual Assistant	State	12-4-22	Online	Participation

2) Base Paper (Hard copy):