

# **VOICE ASSISTANT**

## **A PROJECT REPORT**

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**Submitted by**

**MEHAK GARG**

**2200290140092**

**MUSKAN CHOUDHARY**

**2200290140096**

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## **MASTER OF COMPUTER APPLICATION**

**Under the Supervision of**

**DR. AMIT KUMAR GOEL**

**(Associate Professor)**



**Submitted to**

**DEPARTMENT OF COMPUTER APPLICATIONS**

**KIET Group of Institutions, Ghaziabad**

**Uttar Pradesh-201206**

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## **DECLARATION**

I hereby declare that the work presented in this report entitled “Voice Assistant”, was carried out by me. I have not submitted the matter embodied in this report for the award of any other degree or diploma of any other University or Institute. I have given due credit to the original authors/sources for all the words, ideas, diagrams, graphics, computer programs, experiments, results, that are not my original contribution. I have used quotation marks to identify verbatim sentences and given credit to the original authors/sources. I affirm that no portion of my work is plagiarized, and the experiments and results reported in the report are not manipulated. In the event of a complaint of plagiarism and the manipulation of the experiments and results, I shall be fully responsible and answerable.

Name: Mehak Garg

Roll. No.: 2200290140092

Branch: MCA

Name: Muskan Choudhary

Roll. No.: 2200290140096

Branch: MCA

## **CERTIFICATE**

Certified that **Mehak Garg -2200290140092, Muskan Choudhary (2200290140096)** has carried out the project work having “**VOICE ASSISTANT**” (**Mini Project-KCA353**) for **Master of Computer Application** from Dr. A.P.J. Abdul Kalam Technical University (AKTU) (formerly UPTU), Lucknow under my supervision.

The project report embodies original work, and studies are carried out by the student herself and the contents of the project report do not form the basis for the award of any other degree to the candidate or to anybody else from this or any other University/Institution.

Date:

**Mehak Garg (2200290140092)**

**Muskan Choudhary (2200290140096)**

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

**Date:**

**Dr. Amit Kumar Goyal**

**Associate Professor**

**Department of Computer**

**Applications, KIET Group of**

**Institutions, Ghaziabad**

**Dr. Arun Kumar Tripathi**

**Head**

**Department of Computer**

**Applications, KIET Group**

**of Institutions, Ghaziabad**

## **ABSTRACT**

A Voice Assistant is one of the hot topics in the current world that are programs that listens to human's verbal command and respond to them which makes it a humancomputer/device interaction. In the current days, a voice assistant is everywhere which is a lot useful in these busy days. Nowadays, almost everyone in the current world is using voice assistant because it's everywhere starting from Google smartphone assistant which even 5 years old kids will know how to use because of the current world pandemic which makes them use smartphones till Amazon's Alexa which will be very useful to do works starting from entertaining the users till turning on and off the household products (Internet of Things). One of the greatest features is that it will be very useful to even physically challenged people, for example, people who aren't able to walk use the Internet of Things (IoT) feature to operate the household products and maintain them. So, we tend to develop a voice assistant which will be very useful to the users same as the other voice assistants which are currently in the world.

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**Mehak Garg (2200290140092)**

**Muskan Choudhary (2200290140096)**

## TABLE OF CONTENTS

|                                 |            |
|---------------------------------|------------|
| Title Page                      | i          |
| Declaration                     | ii         |
| Certificate                     | iii        |
| Abstract                        | iv         |
| Acknowledgements                | v          |
| Table of Contents               | vi- vii    |
| List of Figures                 | viii       |
| <b>1. Introduction</b>          | <b>1-4</b> |
| 1.1 Project Overview            | 1          |
| 1.1.1 What is Voice Assistant   | 1          |
| 1.1.2 why do we need it         | 2          |
| 1.1.3 Where to use it           | 2          |
| 1.2 System Design               | 3          |
| 1.3 Objective of Project        | 3-4        |
| 1.3.1 Enhancing User Experience | 3          |
| 1.3.2 Increasing Productivity   | 3          |
| 1.3.3 Improving Accessibility   | 4          |
| 1.3.4 Expanding Market Reach    | 4          |
| 1.3.5 Advancing Technology      | 4          |
| <b>2. Feasibility Study</b>     | <b>5-6</b> |
| 2.1 Technical Feasibility       | 5          |
| 2.2 Operational Feasibility     | 5          |
| 2.3 Economic Feasibility        | 5          |
| 2.4 Organizational Feasibility  | 6          |
| 2.5 Cultural Feasibility        | 6          |

|                                |              |
|--------------------------------|--------------|
| 3. Requirement Specifications  | <b>7-11</b>  |
| 3.1 Functional Requirement     | 7            |
| 3.2 Non-Functional Requirement | 8            |
| 3.3 Software Requirement       | 10           |
| 3.4 Hardware Requirement       | 1            |
| 4. System Design               | <b>12-18</b> |
| 4.1 Flowchart                  | 12-13        |
| 4.2 ER- Diagram                | 14-15        |
| 4.3 Use Case Diagram           | 16           |
| 4.4 Data Flow Diagram          | <b>17-18</b> |
| 4.4.1 DFD Level – 0            | 17           |
| 4.4.2 DFD Level – 1            | 18           |
| 5. Testing                     | <b>19-22</b> |
| 5.1 Unit Testing               | 19           |
| 5.2 Integration Testing        | 19           |
| 5.3 End to End Testing         | 19           |
| 5.4 Regression Testing         | 20           |
| 5.5 Usability Testing          | 20           |
| 6. Conclusion                  | <b>21-22</b> |
| 6.1 Conclusion                 | 21           |
| 6.2 Future scope               | 21-22        |
| 7. Reference                   | <b>23</b>    |

## LIST OF FIGURES

| <b>Figure No.</b> | <b>Name of Figure</b> | <b>Page No.</b> |
|-------------------|-----------------------|-----------------|
| 4.1               | Flow chart            | 12              |
| 4.2               | ER Diagram            | 14              |
| 4.3               | Use Case Diagram      | 16              |
| 4.4               | DFD Level – 0         | 17              |
| 4.5               | DFD Level – 1         | 18              |



# **CHAPTER 1**

## **INTRODUCTION**

In the 21st century, human interaction is being replaced by automation very quickly. One of the main reasons for this change is performance. There's a drastic change in technology rather than advancement. In today's world, we train our machines to do their tasks by themselves or to think like humans using technologies like Machine Learning, Neural Networks, etc. Now in the current era, we can talk to our machines with the help of virtual assistants. Virtual assistants are software programs that help you ease your day-to-day tasks, such as showing weather reports, giving daily news, searching the internet etc. They can take commands 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 and Amazon's Alexa and this has been an inspiration for us to do this as a project. This system is designed to be used efficiently on desktops. Voice assistants are programs on digital devices that listen and respond to verbal commands. A user can say, "What's the weather?" and the voice assistant will answer with the weather report for that day and location.

### **1.1 Project Overview**

This innovative voice assistant project designed to provide users with a seamless and intuitive way to interact with their devices. Leveraging cutting-edge natural language processing and machine learning techniques, [Project Name] aims to enhance productivity, streamline tasks, and improve user experiences across various domains.

#### **1.1.1 What is Voice Assistant**

A voice assistant, also known as an intelligent personal assistant or a connected speaker, is a new type of device that is based on natural language speech recognition and is offered by popular companies like Apple, Amazon, and Google. We got inspired by that and created one our self.

### 1.1.2 Why do we need it

Usually, typing out and searching or doing day-to-day tasks becomes hectic. But our life doesn't need to be like that. One can ask for help to voice assistants. They let the users to perform a task using a speech command, as well as retrieve information via voice synthesis.

Following are the few reasons to have a voice assistant:

- **Minimal Effort** - It's easier to say a few words than type them on a small smartphone screen.
- **Fast response** - Imagine how much time you have to spend to find some information on a website? Or how many clicks do you need to make before you find the thing you need in a mobile application? Voice assistants don't generate such difficulties. One can ask a question and you have the answer.
- **Accessibility for Elderly or Visually Impaired Users:** Voice assistants provide a more accessible means of interacting with technology for elderly individuals or those with visual impairments. By offering voice-based interaction, they eliminate barriers to accessing digital services that may exist with traditional input methods.
- **Entertainment and Leisure:** Voice assistants offer entertainment and leisure features, such as playing music, podcasts, audiobooks, and games, providing users with options for relaxation and enjoyment during their leisure time.

### 1.1.3 Where to use it

Voice search has been a hot topic of discussion. Voice visibility will undoubtedly be a challenge. This is due to the lack of a visual interface for voice assistants. Users cannot see or interact with a voice interface unless it is linked to the Alexa or Google Assistant app. Search behaviour patterns will change dramatically as a result.

Brands are currently undergoing a transformation in which touchpoints are transforming into listening points, and organic search will be the primary means of brand visibility. Advertising agencies are becoming more popular as voice search grows in popularity. Voice assistants will also continue to offer more individualized experiences as they get better at differentiating between voices. The number of people using voice assistants is expected to grow. According to the Voice bot Smart Speaker Consumer Adoption Report 2018, almost ten percent of people who do not own a smart speaker plan

to purchase one. If this holds true, the user base of smart speaker users will grow 50 percent, meaning a quarter of adults in the United States will own a smart speaker.

## **1.2 System Design**

- a) The voice assistant takes an input word which is called as "signal word" to be activated. so, it takes in the signal word and starts operating for the user commands.
- b) Converting the speech into text will be processed by the assistant. c) The converted text is now processed to get the required results.
- d) The text given by the user should contain one or two keywords that determine what query is to be executed. If the keyword doesn't match any of the queries in the code then the assistant asks the user to speak again.
- e) Finally, the output to the user's query will be given by converting speech to text.

## **1.3 Objective of Project**

The objectives of a voice assistant project can vary depending on the specific goals and target audience. One of the main advantages of voice searches is their rapidity. In fact, voice is reputed to be four times faster than a written search: whereas we can write about 40 words per minute, we are capable of speaking around 150 during the same period of time. In this respect, the ability of personal assistants to accurately recognize spoken words is a prerequisite for them to be adopted by consumers. Here are some common objectives:

### **1.3.1 Enhancing User Experience:**

The primary objective of a voice assistant project is often to improve the overall user experience by providing a more natural and intuitive way for users to interact with devices and applications.

### **1.3.2 Increasing Productivity:**

Voice assistants aim to streamline tasks and automate processes, ultimately helping users save time and effort in their daily activities. The project may focus on identifying key tasks that can be optimized through voice commands and implementing efficient solutions.

### **1.3.3 Improving Accessibility:**

Another important objective of voice assistant projects is to enhance accessibility for users with disabilities. By offering a hands-free and voice-based interface, voice assistants can enable individuals with mobility or vision impairments to access technology more easily.

#### **1.3.4 Expanding Market Reach:**

Voice assistants can serve as a platform for delivering additional services and content, thereby expanding the market reach of a company or organization. The project may include strategies for integrating with third-party services, developing voice-activated applications, or providing personalized content recommendations.

#### **1.3.5 Advancing Technology:**

Voice assistant projects often aim to push the boundaries of technology by leveraging advancements in natural language processing, machine learning, and artificial intelligence. The objective may be to improve the accuracy and responsiveness of voice recognition systems, enhance language understanding capabilities, or develop new features and functionalities.

## **CHAPTER 2**

### **FEASIBILITY STUDY**

Feasibility study can help you determine whether or not you should proceed with your project. It is essential to evaluate cost and benefit. It is essential to evaluate cost and benefit of the proposed system. Five types of feasibility study are taken into consideration.

#### **2.1 Technical feasibility**

Technical feasibility for a voice assistant project involves assessing the availability and suitability of hardware and software technologies required for its development and deployment. It includes finding out technologies for the project, both hardware and software. For virtual assistant, user must have microphone to convey their message and a speaker to listen when system speaks. These are very cheap now a days and everyone generally possess them.

Besides, system needs internet connection. While using, 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.

#### **2.2 Operational feasibility**

Operational feasibility for a voice assistant project hinges on designing a user-friendly, intuitive system that can be easily operated by users of all backgrounds and skill levels. 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 to write can read out problems for system and get answers.

By focusing on simplicity, accessibility, and adaptability, voice assistants can become valuable tools for enhancing productivity and convenience in various contexts.

#### **2.3 Economic feasibility**

Here, we find the total cost and benefit of the proposed system over current system. For this project, the main cost is documentation cost. User also, would have to

pay for microphone and speakers. Again, they are cheap and available. As far as maintenance is concerned, it won't cost too much.

## **2.4 Organizational feasibility**

Organizational feasibility for a voice assistant project refers to the management and organizational structure necessary for its successful implementation. A single-person management approach can enhance the organizational feasibility of a voice assistant project by promoting efficiency, accountability, and flexibility. The management tasks are all to be carried out by a single person. That won't create any management issues and will increase the feasibility of the project.

However, it's essential for the manager to possess the necessary skills, expertise, and resources to successfully execute the project solo.

## **2.5 Cultural feasibility**

It deals with compatibility of the project with cultural environment. Virtual assistant is built in accordance with the general culture. 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**

### **REQUIREMENT SPECIFICATION**

#### **3.1 Functional Requirements**

Functional requirements are the backbone of any software or system, outlining the specific features and functionalities that it must possess to meet the needs of its users. These requirements define the behaviour of the system and specify what it should do, rather than how it should be implemented. Here are some common functional requirements:

##### **3.1.1 Speech Recognition:**

Implement speech recognition functionality to convert audio input into text. Use libraries like Speech Recognition to perform accurate speech recognition.

##### **3.1.2 Natural Language Understanding (NLU):**

Parsing and understanding user intents and entities from the text input. Utilizing natural language processing (NLP) techniques to extract meaning from user commands. Integration with NLU framework like NLTK for intent classification and entity extraction.

##### **3.1.3 Task Execution:**

Ability to perform various tasks or actions based on user commands. Implementing logic to execute tasks such as sending emails, open youtube, or controlling music playlist.

##### **3.1.4 Response Generation:**

Generating appropriate responses or actions based on the user's input and the identified intent. Crafting responses in natural language that are relevant and informative to the user's query. Leveraging templating or text generation techniques to generate dynamic responses.

##### **3.1.5 Information Retrieval:**

The voice assistant should be able to retrieve information from various sources such as the internet, databases, or third-party APIs in response to user queries, including weather forecasts, news updates, and general knowledge questions.

These functional requirements provide a comprehensive framework for building a voice assistant using Python. Depending on the specific use case and target audience, additional requirements can be implemented.

## **3.2 Non-Functional Requirements**

Non-functional requirements, also known as quality attributes or constraints, describe the characteristics of a system beyond its specific functionalities. Here are some non-functional requirements:

### **3.2.1 Performance:**

The system should have low latency in processing voice commands to provide real-time responses. The voice recognition and natural language processing algorithms should be optimized for speed and efficiency. The system should be able to handle concurrent user requests without significant degradation in performance.

### **3.2.2 Reliability:**

The voice assistant should be highly reliable, minimizing the occurrence of errors or crashes. It should have mechanisms for error handling and graceful degradation in case of unexpected failures. Regular backups and redundancy measures should be in place to prevent data loss.

### **3.2.3 Security:**

Voice data collected by the system should be encrypted during transmission and storage to ensure confidentiality. User authentication mechanisms should be implemented to prevent unauthorized access to sensitive information. The system should adhere to privacy regulations and best practices for handling personal data.

### **3.2.4 Usability:**

The voice assistant should have a user-friendly interface with clear voice prompts and feedback. It should support multiple languages and dialects to cater to diverse user demographics. The system should be accessible to users with disabilities, following relevant accessibility guidelines.



### **3.2.5 Maintainability:**

The codebase should be well-structured, modular, and thoroughly documented to facilitate ease of maintenance. Version control systems should be used to track changes and manage codebase evolution. Automated testing suites should be implemented to ensure the reliability of code changes and updates.

### **3.2.6 Compatibility:**

The voice assistant should be compatible with various operating systems and hardware platforms commonly used by end-users. It should integrate seamlessly with third-party services and APIs for extended functionality. By addressing these non-functional requirements, we can ensure that the voice assistant meets the desired performance, reliability, security, and usability standards while providing a seamless and satisfying user experience.

## **3.3 Software Requirements**

- **Python 3.5 & Above:**

Python serves as the primary programming language for developing the voice assistant application. Make sure to install Python on your development environment.

- **Windows 7 And Above**

- **Various Python Libraries**

- **Operating System:**

- ❖ Window
- ❖ macOS
- ❖ Linux'

- **Integrated Development Environment (IDE):**

Choose an IDE or code editor for writing and debugging your Python code. Popular options include PyCharm, Visual Studio Code, Sublime Text, and Atom.

- **Version Control System:**

Use a version control system like Git for managing code changes and collaborating with other developers. Platforms like GitHub, GitLab, or Bitbucket can host your project repositories.

### 3.4 Hardware Requirements

The hardware requirements for a voice assistant project are relatively minimal but crucial for its functionality. Here's a breakdown of the hardware components needed:

- **Microphone:** A microphone is essential for capturing the user's voice commands or queries. It serves as the input device through which users interact with the voice assistant system. Most laptops, smartphones, tablets, and standalone microphones can be used for this purpose.
- **Speaker or Headphones:** A speaker or headphones are necessary for the voice assistant to provide audible feedback to the user. After processing the user's input, the voice assistant synthesizes the response into spoken words, which are then played back through the speaker or headphones. Built-in speakers on devices or external speakers/headphones can be used for this purpose.
- **Internet Connectivity:** Internet connectivity is required for the voice assistant to access online services, such as speech recognition APIs, natural language understanding platforms, and external data sources. A stable internet connection enables the voice assistant to retrieve information, perform actions, and provide accurate responses to user queries. This can be achieved through Wi-Fi, mobile data, or wired internet connections, depending on the device and environment.

## **CHAPTER 4**

### **SYSTEM DESIGN**

#### **4.1 Flowchart**

A flowchart for a voice assistant system could be designed to illustrate the various stages of interaction between the user and the voice assistant, as well as the processes involved in fulfilling user requests. Here's a description of the flowchart:

- 1. Start:** The flowchart begins with the initiation of the voice assistant system.
- 2. User Input:** The user speaks a command or query to the voice assistant.
- 3. Speech Recognition:** The voice input is processed by the system's speech recognition component to convert the spoken words into text.
- 4. Natural Language Understanding (NLU):** The system analyses the text to understand the user's intent and extract relevant information from the input.
- 5. Intent Classification:** Based on the user's input, the system determines the user's intent or the action to be performed (e.g., fetching information, executing a command).
- 6. Query Processing:** If the user's input requires fetching information, the system processes the query to retrieve relevant data from the internet or other sources.
- 7. Action Execution:** The system executes the appropriate action based on the user's intent, which may involve tasks such as providing information, controlling smart devices, or performing other functions.
- 8. Response Generation:** The system generates a response based on the processed input or the action taken. This response could be in the form of spoken words, text displayed on a screen, or a combination of both.
- 9. Output to User:** The response is presented to the user through the voice assistant's output mechanism, such as speech synthesis (TTS) or text displayed on a screen.
- 10. End:** The flowchart concludes after the system provides the response to the user, and it may loop back to the beginning to await the next user input.

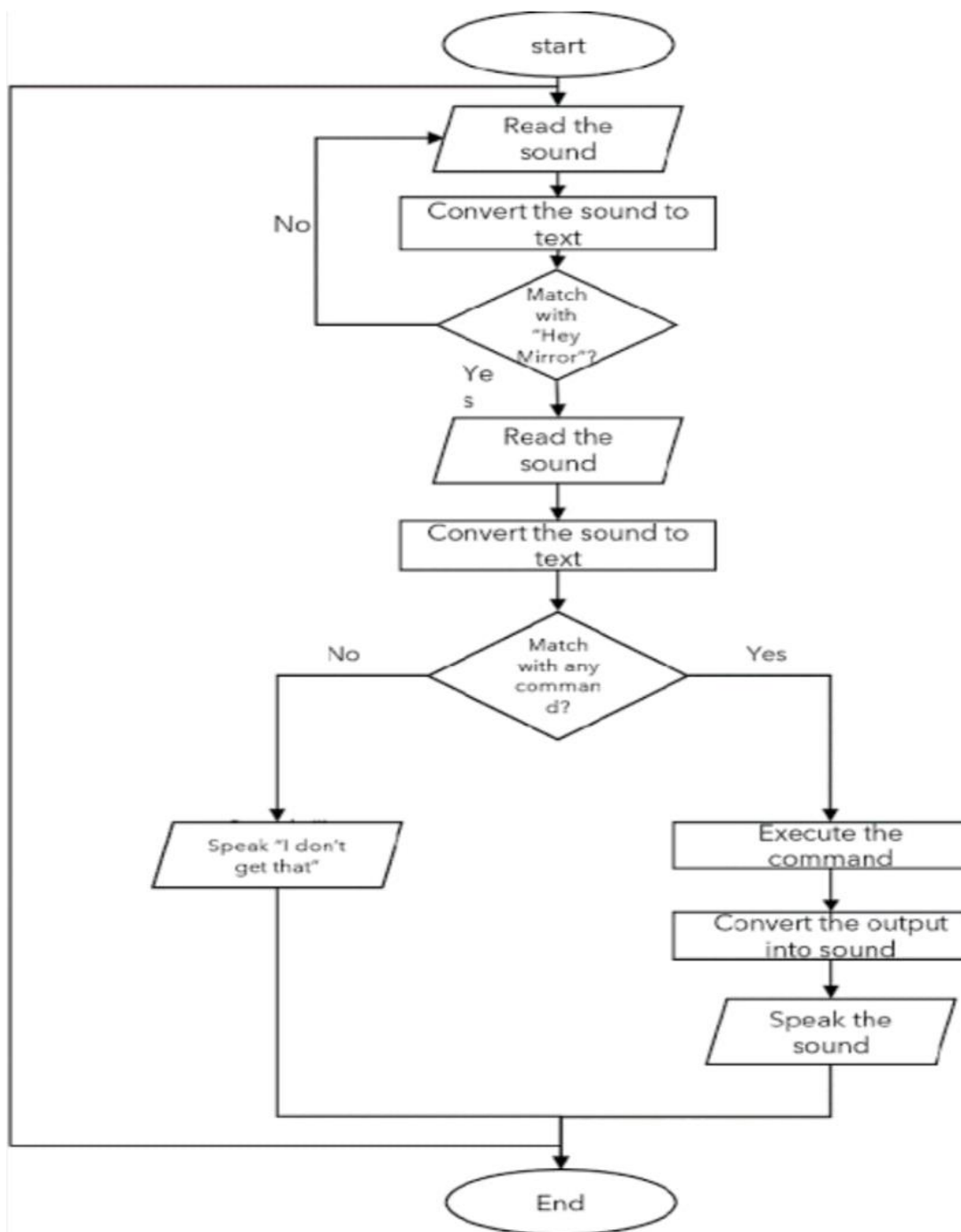


Fig 4.1 Flowchart

## 4.2 ER-Diagram

In this ER diagram:

### Entities:

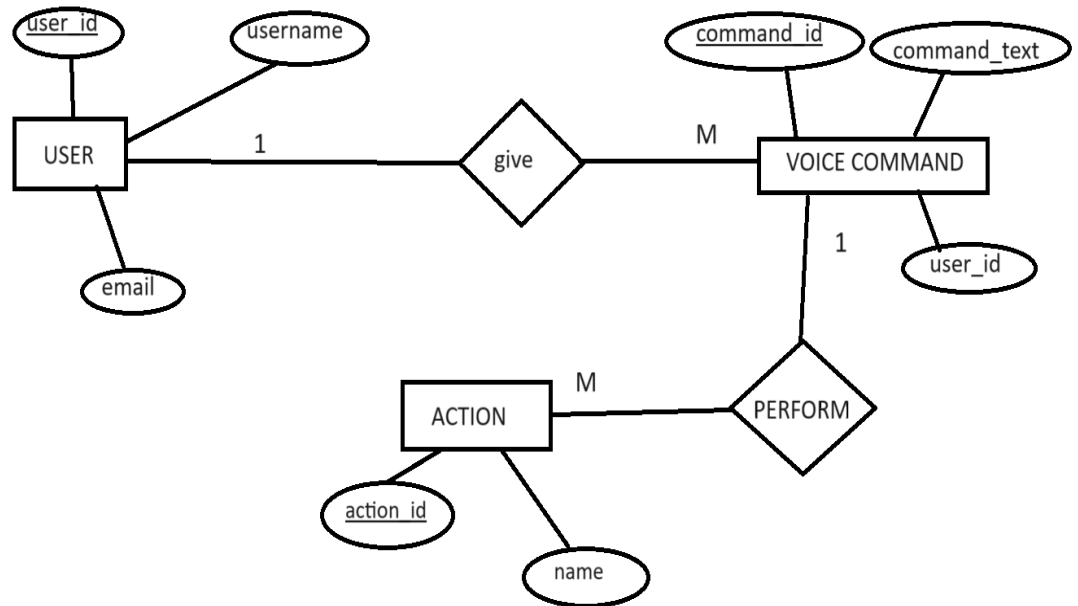
- User: Represents the users interacting with the voice assistant system.
- Voice Command: Represents the commands spoken by the users.
- Action: Represents the actions triggered by the voice commands.

### Relationships:

- One User can have multiple Voice Commands (one-to-many).
- One Voice Command can trigger multiple Actions, and one Action can be triggered by multiple Voice Commands (many-to-many).

### Attributes:

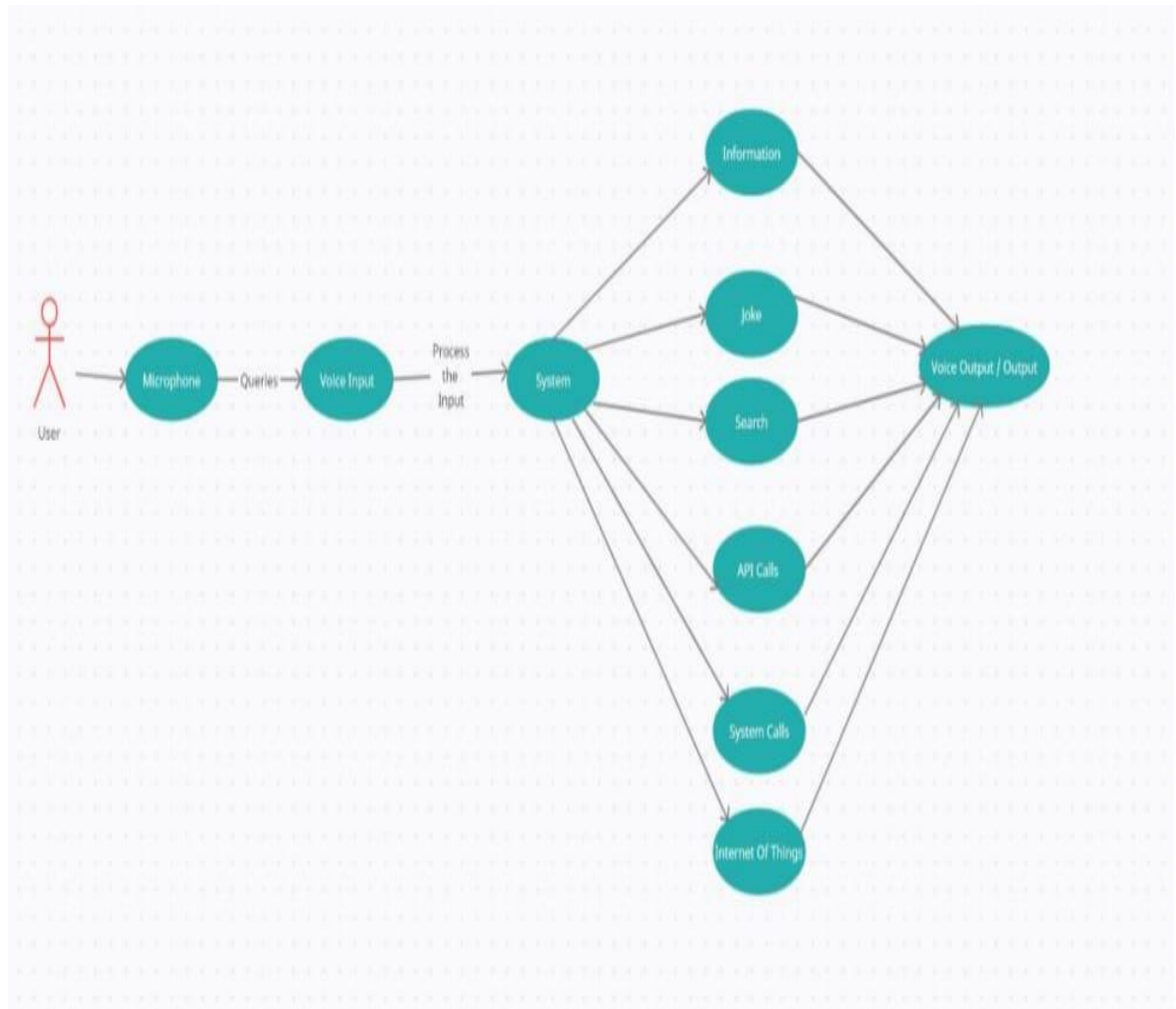
- User: user\_id (Primary Key), username, email.
- Voice Command: command\_id (Primary Key), command\_text, user\_id\_fk (Foreign Key referencing User).
- Action: action\_id (Primary Key), name.



**Fig 4.2: ER Diagram**

### 4.3 Use Case Diagram

In this project there is only one user. The user queries command to the system. System then interprets it and fetches answer. The response is sent back to the user.

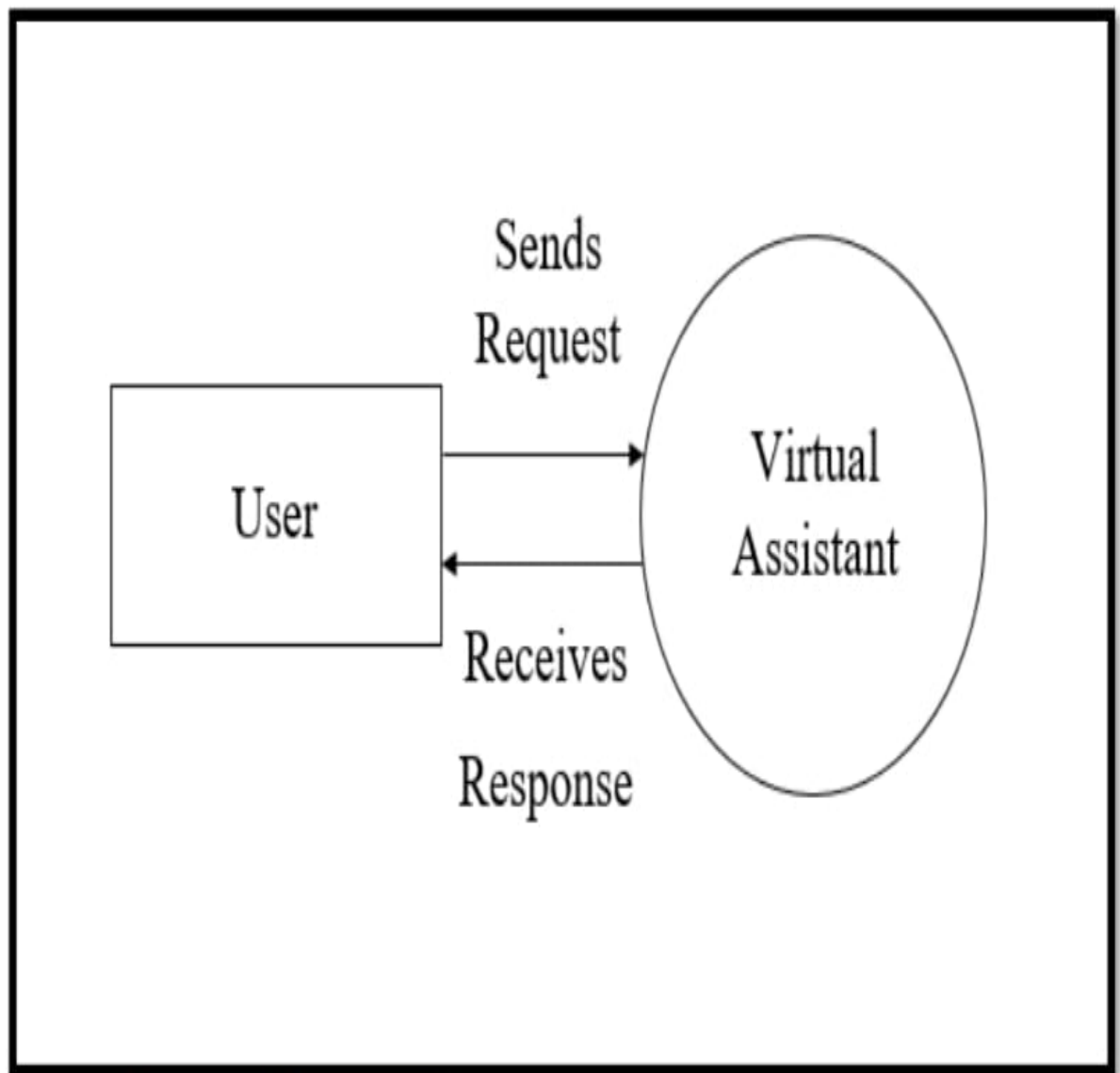


**Fig 4.3: Use Case Diagram**

## 4.4 Data Flow Diagram

### 4.4.1 DFD Level-0

A Data Flow Diagram (DFD) Level 0 provides an overview of the entire system, showing the high-level processes and how they interact with each other. It represents the flow of data and the major processes or functions within the system.

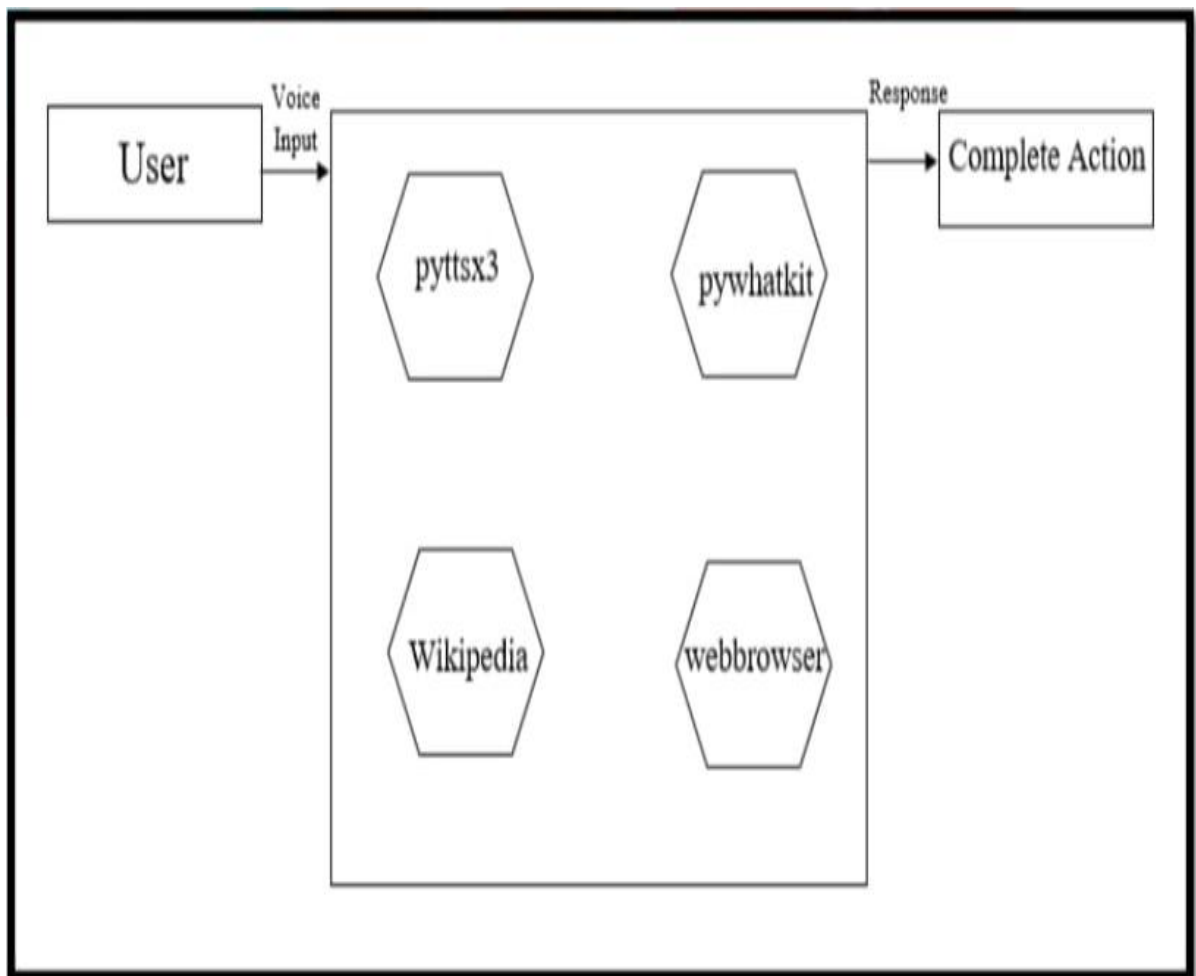


**Fig 4.4: Data Flow Diagram- Level-0**



#### 4.4.2 DFD Level-1

A Data Flow Diagram (DFD) Level 1 provides a more detailed view of the system compared to Level 0. It breaks down the high-level processes identified in Level 0 into sub-processes or subprocesses and illustrates how data flows between them.



**Fig 4.5: Data Flow Diagram- Level-1**

## CHAPTER 5

### TESTING

Testing is a crucial aspect of developing a voice assistant using Python to ensure its reliability, accuracy, and performance. Here's an overview of testing methods that has employed in this voice assistant project:

#### **5.1 Unit Testing:**

Unit testing involves testing individual components or units of code in isolation to verify that they work as expected. For a voice assistant project, unit tests can focus on testing functions responsible for speech recognition, natural language processing, dialogue management, and task execution. Python's built-in unit test framework or third-party libraries like pytest can be used for writing and executing unit tests.

#### **5.2 Integration Testing:**

Integration testing verifies the interaction and integration between different components/modules of the voice assistant. It ensures that the voice assistant functions correctly as a cohesive system when all components are combined. Integration tests can simulate user interactions with the voice assistant, including sending voice commands and validating the responses. Mocking frameworks like unit test. mock can be used to simulate interactions with external dependencies or services.

#### **5.3 End-to-End Testing:**

End-to-end testing evaluates the entire system's functionality from user input to output, simulating real-world usage scenarios. It involves testing the voice assistant application as a whole, including speech recognition, natural language understanding, dialogue flow, and task execution. End-to-end tests can be automated using test frameworks or scripts that simulate user interactions with the voice assistant and verify the correctness of responses. Tools like Selenium or PyAutoGUI can be used for automating end-to-end tests involving graphical user interfaces or web-based applications.

#### **5.4 Regression Testing:**

Regression testing ensures that changes or updates to the voice assistant application do not introduce new bugs or regressions. It involves re-running previously

executed tests to verify that existing functionalities still work as expected after modifications. Continuous integration (CI) pipelines can be set up to automatically run regression tests whenever new code changes are pushed to the repository.

### **5.5 Usability Testing:**

Evaluate the user interface and interaction flow of the voice assistant system to ensure it is intuitive and user-friendly. Test common user interactions and commands to assess the system's ease of use.

Gather feedback from real users to identify any usability issues or areas for improvement. Incorporate user feedback to enhance the user experience of the voice assistant system.

## **CHAPTER 6**

### **CONCLUSION**

#### **6.1 Conclusion**

In summary, this voice assistant project using Python represents not only a technical achievement but also a valuable tool for empowering users, improving accessibility, and driving innovation in human-computer interaction. By embracing the collaborative spirit of open-source development and embracing emerging technologies, developers can continue to push the boundaries of what is possible with voice-enabled computing, ushering in a new era of intelligent and interactive applications.

In the end, this voice assistant project is not just about lines of code or technological prowess – it's about making a meaningful difference in the lives of others. Whether it's helping users streamline their daily routines, stay informed, or connect with the world around them, this project serves as a testament to the profound impact that technology can have on shaping a brighter, more connected future.

#### **6.2 Future Scope**

We are entering the era of implementing voice-activated technologies to remain relevant and competitive.

Voice-activation technology is vital not only for businesses to stay relevant with their target customers, but also for internal operations. Technology may be utilized to automate human operations, saving time for everyone. Routine operations, such as sending basic emails or scheduling appointments, can be completed more quickly, with less effort, and without the use of a computer, just by employing a simple voice command. People can multitask as a result, enhancing their productivity.

Furthermore, relieving employees from hours of tedious administrative tasks allows them to devote more time to strategy meetings, brainstorming sessions, and other jobs that need creativity and human interaction.

- **Sending Emails with a voice assistant:**

Emails, as we all know, are very crucial for communication because they can be used for any professional contact, and the finest service for sending and receiving emails is, as we all know, GMAIL. Gmail is a Google-created free email service. Gmail can be accessed over the web or using third-party apps that use the POP or IMAP protocols to synchronize email content.

To integrate Gmail with Voice Assistant we have to utilize Gmail API. The Gmail API allows you to access and control threads, messages, and labels in your Gmail mailbox. 30

- **Scheduling appointments using a voice assistant:**

The demands on our time increase as our company grows. A growing number of people want to meet with us. We have a growing number of people who rely on us. We must check in on certain projects or set aside time to chat with possible business leads. There won't be enough hours in the day if we keep doing things the old way.

We need to get a better handle on our full-time schedule and devise a strategy for arranging appointments that doesn't interfere with our most critical job. By working with a virtual scheduler or, in other words, a virtual assistant, we let someone else worry about the organization and prioritize our schedule while we focus on the work.

## **CHAPTER 7**

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