

# VOICE BASED VIRTUAL ASSISTANT FOR WINDOWS

A Project Report

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## CERTIFICATE

This is to Certify that Project - 1 (203105499) of 6<sup>th</sup> Semester entitled “VOICE BASED VIRTUAL ASSISTANT FOR WINDOWS” of Group No. GROUP NO - 199 has been successfully completed by

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*“The single greatest cause of happiness is gratitude.”*

-Auliq-Ice

“The single greatest cause of happiness is gratitude.” We declare that this Mini project report titled “VOICE BASED VIRTUAL ASSISTANT FOR WINDOWS” submitted in partial fulfillment of the degree of B. Tech in (Computer Science and Engineering) is a record of original work carried out by us under the supervision of DR. VINOB CHANDER R and has not formed the basis for the award of any other degree or diploma, in this or any other Institution or University. In keeping with the ethical practice of reporting scientific information, due acknowledgments have been made wherever the findings of others have been cited.

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## **Abstract**

Voice-based virtual Assistants (VBVAs), which offer a simple and hands-free interface for interacting with digital devices, have become essential tools for improving user experience in today's quickly changing technological landscape.

The creation of a voice-based virtual assistant specifically designed for Windows is presented in this study. It redefines user interaction with the Windows operating system by leveraging cutting-edge speech detection and natural language processing (NLP) technology.

To achieve these objectives, the project will employ a combination of NLP techniques, including speech-to-text conversion, natural language understanding, and dialogue management. These techniques will enable the VBVA.

The main goal of this project is to develop a comprehensive and flexible voice-activated voice assistant (VBVA) for Windows that will enable users to utilize voice commands to accomplish a variety of tasks on their devices.

This covers text dictation, task management, device settings management, and internet information access. By combining state-of-the-art voice recognition and NLP techniques

**Voice Recognition, Windows Operating System, Speech Detection, Natural Language Processing (NLP), Natural Language Understanding (NLU) and User Interface - User Experiences (UI/UX)**

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# Chapter 1

## Introduction

### 1.1 Voice Based Virtual Assistant for Windows

Voice-based Intelligent Virtual Assistance for Windows” project is to create an intelligent virtual assistant optimized for Windows. This virtual assistant employs voice recognition and enables natural language voice commands for various tasks, including:

- 1. Text Dictation:** Voice instructions can be used by users to dictate text, enabling hands-free input in programs like word processors, email clients, and messaging apps.
- 2. Task Management:** By using voice commands to create, amend, and arrange to-do lists or schedules, the virtual assistant may aid users in managing their responsibilities.
- 3. Device Settings Management:** Voice commands allow users to change the display brightness, volume levels, network settings, and system preferences on their Windows devices.
- 4. Access to Online Information:** The virtual assistant allows users to voice-search the internet for information on everything from web searches to weather reports, news headlines, sports scores, and general knowledge questions.
- 5. Application Control:** Voice control can be used by users to open, close, or switch between installed applications on Windows devices.

### 1.2 Intended Audience and Reading Suggestion

The following characteristics are crucial for consumers looking for a voice assistant that is easy to use and comprehend:

- **Intuitive Voice Commands:** To facilitate natural user interaction without requiring substantial training, the voice assistant should enable a broad range of intuitive speech commands for typical tasks.

- **Straightforward Responses:** The voice assistant should give users the information or help they require without needless complexity. Responses should be succinct, straightforward, and simple to understand.
- **Minimal Configuration and Setup:** The voice assistant should have an easy-to-follow setup procedure that doesn't require customers to have any technical knowledge or configuration to get going.
- **Contextual knowledge:** The voice assistant ought to exhibit contextual knowledge, which would enable it to recall prior exchanges and offer pertinent comments in light of the current discourse.

### **1.3 Product Scope**

VBVAs, for Windows, have a lot of potential as they provide a range of features and advantages. Here are a few salient features of their scope:

**Increased Productivity:** By responding quickly to user inquiries and finishing activities in natural language, VBVAs serving as Personal Digital Assistants (PDAs) can greatly increase productivity. This makes it possible for users to carry out a variety of tasks more effectively by using voice commands to send emails, manage calendars, set reminders, and retrieve information.

**Assistance, Both Proactive and Reactive:** VBVAs can provide users with both proactive and reactive support. Based on previous encounters, they can proactively predict users' requirements and offer pertinent recommendations or reminders. Reactively, they can react instantly to user inquiries and commands, offering support and carrying out duties as asked.

### **1.4 Advanced Speech Recognition**

VBVA's sophisticated speech recognition engine is the cornerstone of its voice understanding power. The foundation of VBVA's capacity to reliably and effectively understand and react to user voice commands is this technology.

The following are important facets of VBVA's voice recognition abilities:

**Modern Speech Recognition Engines:** VBVA uses state-of-the-art speech recognition engines that integrate the most recent developments in the industry. To accurately translate spoken words into text, these engines use complex algorithms and machine learning models that have been trained on large datasets.

**Sturdy Performance in a Variety of Settings:** VBVA's voice recognition technology is made to function consistently in a variety of settings, such as loud ones and ones with a wide range of accents. High levels of accuracy can be maintained by VBVA even under difficult circumstances by utilizing adaptive algorithms and sophisticated signal processing techniques.

**Natural Language Understanding (NLU)**Beyond simple speech-to-text conversion, Natural Language Understanding (NLU) plays a crucial role in VBVA's functionality by enabling it to decipher human intent. VBVA can produce appropriate and contextually relevant responses by using advanced natural language understanding (NLU) techniques to extract the underlying meaning and context from user utterances. VBVA applies NLU in the following ways to improve its comprehension of user intent

# **Chapter 2**

## **Literature Survey**

### **2.1 Paper 1**

**ARIVA: Artificial Intelligence Enabled Voice Assistance System Using Natural Language Processing.** [<sup>1</sup>]

#### **2.1.1 Abstract:** -

In this modern era, the regular lives of people have become more competent and are interlinked with technology. There are many voice assistants like Google and Siri. etc., getting used in the present day. Here, the proposed Artificial Intelligence Enabled Voice Assistance System (ARIVA) using Natural Language Processing facilitates domains such as drug prescribers, to-do lists, note-writing, calculators, and searching tools.

The ARIVA model takes input as a voice signal and yields output in numerous ways, like voice and a visual display. This virtual assistant aims to provide users with instant, accomplished results. The proposed ARIVA system accepts the command via the microphone of the executing system converts human voice into computer-understandable language, and then generates the required solutions for the said queries.

The speech recognition and processing are carried out using an NLP algorithm that aids computer systems in interacting through natural human speech in different forms.

#### **2.1.2 Key points**

1. Taking orders through the executing system's microphone.
2. converting human speech into a language that computers can understand.
3. Producing prompt and precise answers to user inquiries.

## 2.2 Page 2

### Voice-Based Virtual-Controlled Intelligent Personal Assistants. [<sup>2</sup>]

#### 2.2.1 Abstract: -

Virtual assistants are improving and providing consumers with greater advantages. The comprehension and fulfillment of requests by virtual assistants will increase as voice recognition and natural language processing continue to grow. Virtual assistants are projected to be employed in more commercial activities as speech recognition technology advances. The main goal of developing personal assistant software (virtual assistant) is to use web-based semantic data sources, user-generated content, and knowledge from knowledge libraries. The main objective of making this Voice-Based Virtual Assistant is to make life easier and have a personal assistant for everyone who can perform many tasks. As the end user interacts with a virtual assistant, the AI programming learns from the data provided and improves its ability to forecast the end user's needs. Virtual assistants are often used to do things like add tasks to a calendar, provide information that would normally be found on a website, and operate and monitor Smart Home devices like lighting cameras and thermostats. Massive volumes of data are required to fuel virtual assistant technologies, which feed Artificial Intelligence (AI) platforms such as machine learning, natural language processing, and speech recognition. Speech recognition has a lengthy history and has seen several key advancements. On smartphones and wearable devices, speech recognition for dictation, search, and voice commands has become a standard feature. Design of a small, large vocabulary speech recognition system that can run quickly, accurately, and with minimum latency on mobile devices.

#### 2.2.2 Key points

Virtual assistant systems include cross-platform compatibility, improving security measures, and personalization and adaptation to individual user preferences and habits.

## **2.3 Paper 3**

**Intelligent Personal Assistant - Implementing Voice Commands Enabling Speech Recognition.**  
[<sup>3</sup>]

### **2.3.1 Abstract: -**

An intelligent personal assistant (IPA) is a software agent performing tasks on behalf of a human or individual based on commands or questions that are similar to chatbots. They are also referred to as Intelligent Virtual Assistants which interpret human speech and respond via synthesized voices. IPAs and Implementing Voice Assistants (IVAs) find their usage in various applications such as home automation, managing to-do tasks, and media playback through voice.

This paper aims to propose speech recognition systems and deal with creating a virtual personal assistant. The existing system serves on the Internet and is maintained by a third party. This application shall protect personal data from others and use the local database, speech recognition, and synthesizer. A parser named SURR(Semantic Unification and Reference Resolution) is employed to recognize the speech. Synthesizer uses text to phoneme.

### **2.3.2 Key points**

Enhancing privacy concerns, Storage data optimization, Ethical and responsible practices.

## **2.4 Paper 4**

### **Intelligent Voice Assistant by Using OpenCV Approach. [<sup>4</sup>]**

#### **2.4.1 Abstract: -**

An AI personal assistant is a program created to understand oral or written instructions and carry out user-assigned activities. Given that it can only carry out tasks that are given to it by the user, it reflects a sort of weak artificial intelligence.

Python is the most widely used programming language in the area of speech recognition and natural language processing in these types of assistants because of its versatility.

The creation of these AI systems is largely the responsibility of developers, who employ their knowledge of AI technology to craft intelligent assistants that can comprehend and respond to user requests.

Like the one mentioned, intelligent voice assistants usually take care of end users' basic chores. These jobs could be making notes for a to-do list, or getting data from the internet.

#### **2.4.2 Key points**

Improving the OpenCV approach, It specifically recognizes speech input, In essence, intelligent voice assistants serve as helpful aids by automating routine tasks and providing information or assistance as requested by users, thereby enhancing productivity and convenience in daily activities.

## **2.5 Paper 5**

**Voice-based Virtual Assistant with Security.** [<sup>5</sup>]

### **2.5.1 Abstract:** -

With the advancements in speech recognition and AI technology, there is a growing demand for convenient and efficient ways to interact with technology. A Voice-based Virtual Assistant is a technologically advanced solution that uses speech recognition and artificial intelligence to provide users with a convenient and efficient way to interact with devices, access information, and perform tasks.

It makes use of the Generative Pre-trained Transformer (GPT-3) language processing model by OpenAI to respond intelligently. With the help of spoken commands and natural language processing, users can communicate with the virtual assistant using this technology, which is intended to function as a chat interface. However, as with any technology that collects and stores personal information, security is a major concern.

The added security feature addresses this concern by incorporating encryption, authentication, and access controls to ensure that personal data remains secure.

This not only protects the user's privacy but also helps to prevent unauthorized access to sensitive information, such as bank account numbers, passwords, and other confidential data.ice recognition technology was Medical dictation devices.

### **2.5.2 Key points**

Maintaining user Education and awareness, Domain-specific applications, and Enhanced Security measures. This aims to protect personal data by using a local database, speech recognition, and a synthesizer.

## 2.6 Summary

In above papers they focused on some main features to enhancing the VBVA and also is address the concerns, and it proposed VBVA incorporates to ensure the security of personal data.

Some of the main tools they used here, Natural Language Processing (NLP), Natural Language Understanding (NLU), Security.

The research papers presents a solution that combines the convenience of voice-based interaction with robust security measures to address the evolving needs of users in an increasingly connected and digital world.

Now, we aiming to protect user privacy and prevent from unauthorized access to sensitive information, such as bank account numbers and passwords. Now we mainly focusing on security features and we will improve, and Last version VBVA is hard to use Uneducated people so, we are making it easier and Voice Assistant will improve Language understanding programs that the user gives as input and it gives output in the user's convenient language like NLP and NLU. in NLP **spaCy** is fast and efficient tool and **Microsoft LUIS (Language Understanding Intelligent Service)** is a cloud-based NLU service provided by Microsoft Azure.

The features we will enhance in security are Encryption, User Authentication, Secure Voice Recognition, Secure Voice Data, and Transmission of the data.

# **Chapter 3**

## **Analysis / Software Requirements Specification (SRS)**

### **3.1 Software Requirements**

To accomplish its lofty objectives, VBVA project will employ a variety of technologies and tools in its software components. Among the particular software elements that could be included are:

#### **3.2 Speech Recognition Engine**

This part is in charge of translating spoken words into written language. Speech recognition engines that are often used include Microsoft's Speech API, Google's Speech Recognition API, and open-source tools like CMU Sphinx.

#### **3.3 Natural Language Processing (NLP) Libraries**

Understanding the intent and meaning behind user commands requires the NLP libraries. Natural Language Toolkit (NLTK), spaCy, and Stanford CoreNLP are a few well-known NLP libraries.

#### **3.4 Dialog Management Framework**

Frameworks for dialog management aid in controlling the user-virtual assistant dialogue flow. It will be possible to use frameworks such as Microsoft Bot Framework, Rasa, or custom dialog managers.

### **3.5 Text-to-Speech (TTS) Engine**

This part speaks the written responses that the assistant generates into spoken language. Useful TTS engines including Microsoft Speech Platform, Google Text-to-Speech, and open-source programs like eSpeak or Festival.

### **3.6 Windows API Integration**

The virtual assistant can connect with different system capabilities, such as accessing files, managing apps, or changing system settings, by integrating with Windows APIs.

### **3.7 User Interface (UI) Development Tools**

Tools for planning and developing the virtual assistant application's user interface (UI) are known as user interface (UI) development tools. This could include desktop application development frameworks such as PyQt, Tkinter, or Electron.

# Chapter 4

## System Design

### 4.1 System Design/Architecture

VBVA for Windows must take's into account several important factors, such as user experience, architecture, functionality, and operating system integration. An outline of a Windows-specific VBVA system design is provided below.

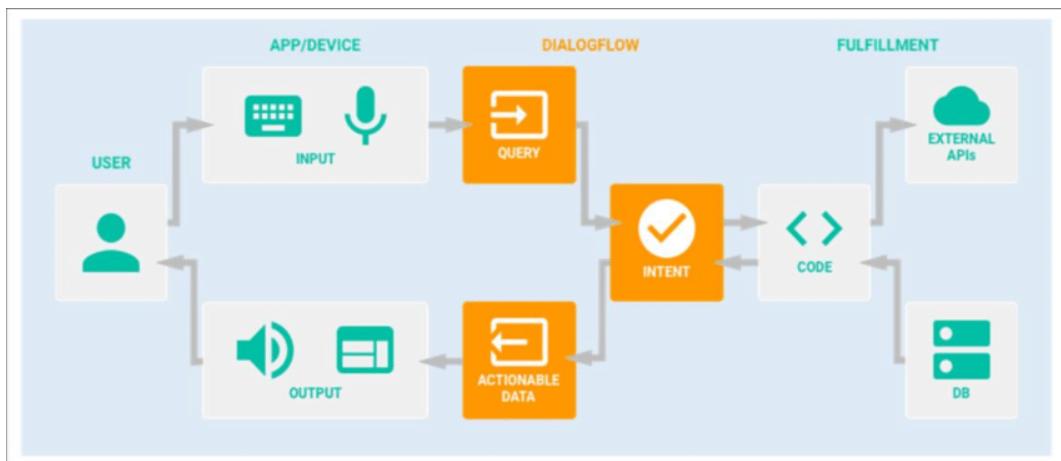


Figure 4.1: System Architecture

### 4.2 Architecture/Building

Client-server architecture is one way to arrange the VBVA system. Speech input and user interactions are managed by the client side, which is located on the user's Windows device. The user's commands are processed, NLP tasks are carried out, and responses are generated by the server side.

### 4.3 Speech Recognition

Translate spoken words into text, using speech recognition engines. Using NLP techniques to interpret user commands and determine context and intent.

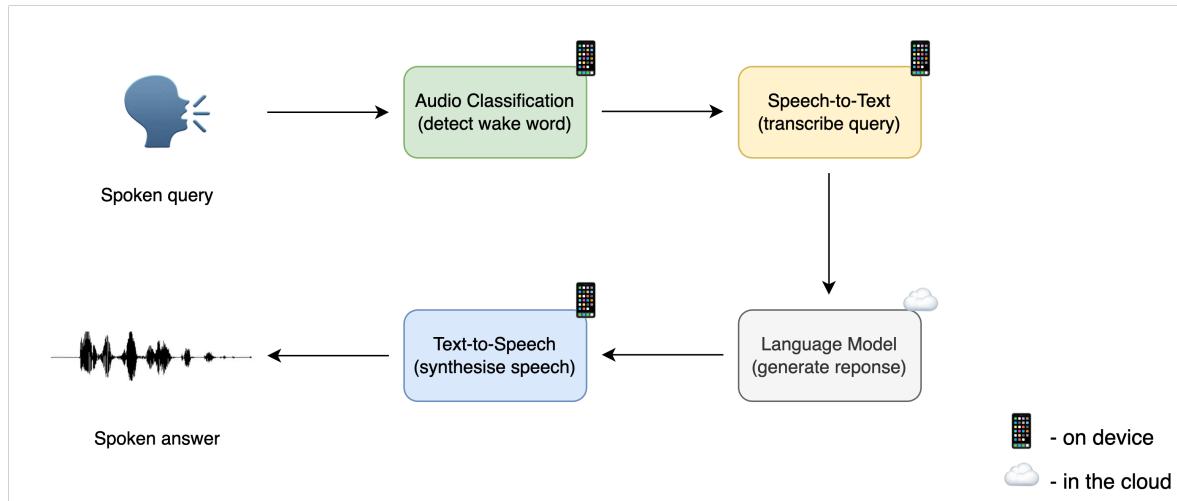


Figure 4.2: Caption

### 4.4 Dialog management

Control the dialogue that takes place between the user and the virtual assistant, making sure it makes sense and stays on topic.

### 4.5 Examining and Implementing

**Testing:** To guarantee the dependability, accuracy, and usefulness of the VBVA system, conduct thorough testing, including unit, integration, and user acceptability testing.

**Installation:** Install the VBVA system on Windows-powered devices to guarantee compatibility and top performance on various hardware setups and Windows OS versions.

## 4.6 Data Flow

The data flow of a VBVA involves several key components working together to process user input, perform actions, and provide responses. Below is a simplified overview of the typical data flow and some types are:

1. Audio Input
2. Speech Recognition
3. Natural Language Understanding (NLU),
4. Action Execution
5. Response Generation

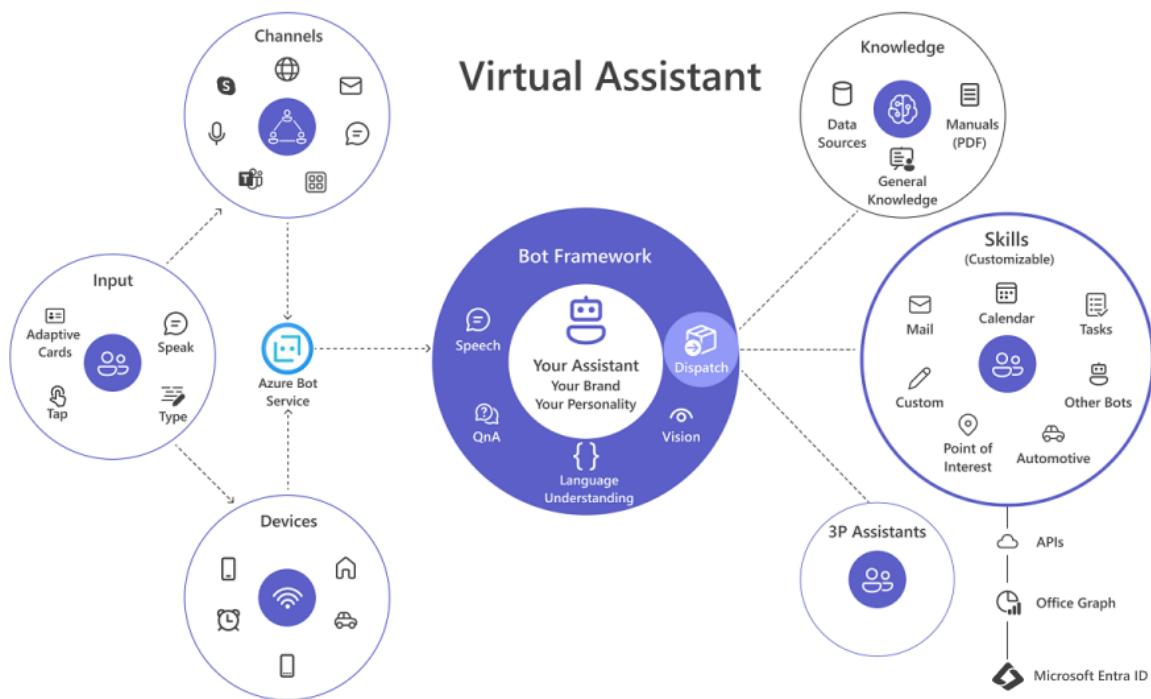


Figure 4.3: Data Flow

# **Chapter 5**

## **Methodology**

### **5.1 Introduction**

VBVA processing multiple steps in the process of creating a VBVA for Windows, including planning, designing, implementing, testing, and deploying. A thorough protocol detailing the processes necessary is provided below:

### **5.2 Acquisition of Requirements**

Utilizing market research, user surveys, and stakeholder interviews to gather needs.

Determine the VBVA's intended use cases, target audience, and functionalities.

### **5.3 Design Architecture**

The VBVA system's general architecture, it will be taking into account component interactions, microservices, and client-server architecture, and also interfaces, communication protocols, and data flow among the system's constituent parts.

Ascertain the tools and technological stack needed for implementation.

### **5.4 Conversation Design**

The VBVA's dialog flow and user interaction scenarios, answers, prompts, and error-handling techniques for a range of user inputs.

For the VBVA, develop a persona that will direct the encounters' tone and manner.

### **5.5 Connectivity with the Windows Operating System**

Windows services and APIs to interface with to access system features.

Integration points for activities including device control, calendar access, file management, and

notification systems.

## **5.6 Integration of Speech Recognition**

Incorporate Application Programming Interfaces (APIs) or speech recognition systems to translate spoken words into text. Set up language support, noise cancellation, and accuracy for speech recognition. Test the effectiveness of voice recognition in various settings and circumstances.

# **Chapter 6**

## **Implementation**

### **6.1 Introduction**

VBVAs for Windows require careful planning and execution of several important tasks. An overview of the process for creating a VBVA that is especially suited for the Windows platform may be seen below:

### **6.2 Analysis of Requirements**

Choosing the features and functionalities that will be used, taking into account both simple activities (like making notes and retrieving information) and complex ones (like context-aware answers and natural language comprehension).

### **6.3 Speech Recognition**

Incorporate speech recognition features to translate spoken words into text. To accurately transcribe audio input, use speech recognition engines or APIs (e.g., Google Speech Recognition, Microsoft Speech API).

Take care of audio preprocessing and noise reduction to increase recognition accuracy, particularly in loud settings.

### **6.4 Implementation**

Choosing the right frameworks, libraries, and programming languages for the VBVA development. Informing the development and use of the VBVA, the survey's primary goal will be to identify the most recent developments, methods, and best practices in these fields.

## **6.5 Connectivity using Windows APIs**

Integrating with Windows features like file management, system settings, calendaring, and notifications, use Windows API bindings or SDKs.

### **Constant Deployment and Integration:**

Using tools such as Travis CI, GitHub Actions, or Jenkins to implement CI/CD pipelines for the automated testing, development, and deployment of the VBVA application.

## **6.6 Tools for Collaboration and Documentation**

Utilizing collaboration services like GitHub for version control, issue tracking, and team collaboration, as well as documentation tools like Sphinx or MkDocs for project documentation.

## **6.7 Tests and User Input**

To enhance the VBVA's usability, performance, and user experience, gather user feedback through usability and beta testing

# **Chapter 7**

## **Conclusion**

In terms of human-computer interaction, the VBVA project is a trailblazing effort. The project's goal is to completely transform the way Windows users interact with their devices by relentlessly pursuing cutting-edge technologies and adhering to a user-centric design philosophy.

The project aims to redefine voice-based interface in computing by promoting natural, intuitive, and individualized interactions.

The VBVA project promises to provide Windows users with unmatched hands-free control, increased productivity, and a highly customized computing experience, potentially redefining human-computer interaction.

By using a comprehensive strategy that includes in-depth analysis, creative design, and careful testing, VEVA is ready to provide a revolutionary virtual assistant that works with Windows and adapts to the demands of its users.

Our virtual assistant offers users the convenience of interacting with their Windows devices through natural speech commands, enabling hands-free operation and efficient multitasking. By harnessing the power of voice recognition and AI, users can perform a wide range of tasks such as scheduling appointments, setting reminders, searching the web, controlling applications, and accessing system functionalities with ease.

# **Chapter 8**

## **Future Work**

The VBVA project is dedicated to developing its potential and expanding the realm of human-computer interaction in the future. Here are some crucial aspects that still require improvement and development

**Increasing the Functionality of VBVA:** The goal of the project is to increase the functionality and versatility of VBVA for Windows users by including new features and functionalities.

This entails implementing proactive support to foresee users' requirements before they even inquire, context-aware responses, and tailored recommendations based on user preferences and behavior.

**Improving Natural Language Understanding:** For VBVA to understand user instructions and queries more effectively, the natural language understanding module must be improved.

To handle intricate language patterns, nuanced phrases, and domain-specific terminology more effectively, the project will invest in improving the NLU algorithms.

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