(RESEARCH ARTICLE)

Artificial Intelligence voice assistant with IOT Integration

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Abstract

Artificially intelligent (AI) voice assistants and home automation have fundamentally altered how individuals utilize and maintain their living spaces. Artificially intelligent (AI) voice-controlled assistants can easily interpret user commands and questions with the aid of sophisticated processing of natural language algorithms, establishing a seamless and straightforward communication channel between users and their intelligent homes.
These assistants employ advanced machine learning techniques to adapt to user preferences and continuously enhance their skills. Beyond conventional paradigms, voice assistants with AI are collaborating with home automation to usher in an era where users may effortlessly control different aspects of their home environment with a simple verbal suggestion. This groundbreaking collaboration not only increases accessibility and boosts the effectiveness of everyday tasks, but it also makes smart electronic equipment more accessible to consumers with varying levels of technical expertise. As AI voice assistants continue to advance, their application in home automation is proof of the profound impact artificial intelligence will have on the course of modern life.

Keywords: Artificial Intelligence; AI voice assistants; Algorithms; Conventional paradigms

1. Introduction

In the age of rapid technological development, the use of AI has gone beyond conventional limits and completely changed how we live and engage with the world around us. The combination of home automation and artificial intelligence (AI) voice assistants is one such innovative use case that has the potential to completely rethink the idea of smart living. This project explores the complexities of creating a cutting-edge and effective A.I helper and residence device mechanization structure that enhances consumer knowledge while meeting the increasing demand for intelligent and seamless home management.

Speaking assistants have become a very popular and developing topic in the present era, particularly in the digital age; as a result, they have become an indispensable part of everyone's everyday life. People can benefit much just by having their directions listened to, and giving instructions isn't that hard—all the user needs to do is speak one language for the voice assistant to work. Spoken English is the language most frequently used for control. Consequently, it can be used to issue commands even by young toddlers. Because it's abstracted, it might also be very helpful to people with physical disabilities.

Just said, this shows that gadgets has been included with the internet planet of thing, for example, someone who is unable to get action can now say the words in their own tone to tell your employees to switch off the glow 3bulb. Additionally, this can help you put instructions, keep in mind where and what to say, how to keep in mind your preferred dining setting up, and much more. It can also strike a chord you of things you need to take you back yourself of or that your assistant needs to take you back.

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The combination of home automation technology with artificial intelligence tone assistant, power-driven by advanced usual words dealing out algorithms, offers an unmatched chance to design a responsive and intelligent living space. The probable uses of this included structure are numerous plus revolutionary, ranging from controlling the temperature and lighting to overseeing security systems and entertainment equipment.

The advent of simple automation systems, which enabled remote control of security, temperature, and lighting, marked the beginning of the transition to intelligent homes. But the use of AI voice assistants takes this idea to the next level, allowing for natural language commands that allow for intuitive interaction with our living spaces. In addition to making daily chores easier, this AI and home automation collaboration promotes an additional customized in addition to flexible livelihood environment. visualize coming residence after a long day and using a single authority to control the thermostat to your desired temperature, play your favorite music, and change the lighting—all expertly coordinated by artificial intelligence.

Our goal as we start this project is to deal with the moral issues and consumer-centric blueprint philosophy that appear through developing an AI voice supporter and house computerization scheme, in addition to showcasing the technical mastery behind the creation. Furthermore, we hope to add to the larger conversation on ethical AI development and sustainable smart home solutions by sharing our approaches and observations.

Not only would a voice assistant save us a great deal of time, but it will also make things simpler. Put differently, multitasking.

Investigate the fascinating realm of artificial intelligence (AI) using Python and Arduino technologies.

Beyond convenience, there are significant ramifications for energy efficiency, accessibility, and security when AI voice assistance and home automation are combined. Elegant home be capable of improve power utilization pattern and minimize misuse as well as ecological effect by utilizing artificial intelligence's analytical skills. Furthermore, voice-activated controls give those with impairments or restricted mobility a new level of independence and accessibility in their homes. AI- driven security systems also give homeowners the assurance that their property is constantly watched over and safeguarded. We enter a world wherever tools not no more than improves our life but as well changes the fundamental structure of our home as well as community as we investigate AI voice assistance and home automation.

In order to handle and manage a wide range of fascinating home appliances, the Super Duper project seeks to develop an intelligent and user-friendly system that reacts remarkably to voice instructions.

2. Review of literature

Aarthi Easwara Moorthy (2014) et al. introduced tone activates private Assistants Acceptable of Usage into a civic Domain. This technology enables users to control domestic appliances with their voice alone, however it might not function as intended in the presence of strangers. Furthermore, voice- activated virtual assistants function as a fundamental translation and provides user support through the computer's personal assistance [1].

Upcoming Digital individual support resolves use artificial intelligence to give extra human-machine communication from side to side speech recognition, photo or video acknowledgment, with gesture detection, according to Veton Këpuska (2018) and colleagues. The helper will decide the best productivity machine, and the user will view the result. There are no system calls [2].

Artificial intelligence (AI) is defined by George Terzopoulos (2019) et al. as the processing of natural language, which will greatly help individuals in their daily lives. Additionally, he recommended smart speaker systems and voice-activated assistants for use in daily life and education. It will be highly beneficial to blind people because its IoT features allow them to perform   daily   tasks.   [3]

Tae-kook Kim (2020) et al. have presented a brief investigate going on a tone manage structure base on top of an non-natural intelligent. It shows that the AI assistant makes use of open programming interfaces (API) plus the provisional auto-run structure, IFTTT (If, This, Then, That). Despite not having structure calls, the Raspberry PI computer board may still be used to operate it. [5].

In 2020, Subhash S. et al. designed an artificial intelligence- powered tone helper. Using a recorded audio file, the author constructed the voice to text feature, later than which the function is process. This plan uses a robust library and Google

Texts to Speak processor. Nevertheless, features like phoning the system and the internet of things are not available. [6].

Benedict D. C. et al. (2020) claim that when computer- controlled virtual assistants mimic human behavior, client decisions are likely to trigger more intense emotional responses from the system. The helpers have Internet of Things features. Although this paper has a number of shortcomings, desire. Voice assistant's most important weakness is so as to they lack structure calls; therefore they have to rely on the Speaker's ability toward communicate the variety of alternatives available for decisions during speech interactions. [7].

Nivedita Singh (2021) et al. demonstrated an audio helper using the speech content component of Python after receiving a variety of API replies and system requests. This resulted in the creation of voice assistants that employ Python, a computer language that allows users to perform any task by speaking without the need for a mouse or else keyboard. This is able to in addition run on mixture systems. Because of this, this document has several shortcomings, including badly executed structure function. [8].

Inside a research going on mainframe aided AI by Abeed Sayyed (2021) et al., a SQL database was merged with a programming language called Python, IOT capabilities and AI aspects. Although this project lacks system and API capabilities, it does provide a database connection and querying method. [9].

In 2021, P. Krishna raj et al. accessible a project on Automat, which is a Graphical User Interface (GUI) for Handheld Voice Processing. The system converts spoken input to text by using the search engine's online speech recognition capabilities and the Python programming language. Consequently, this project has a graphical user interface in addition to a portable base. This text-to-speech (TTS) system lacks Internet of Things capability and has comparatively low accuracy. [10].

In 2021, M. Sermakani et al. suggested the formation of a PC voice detection system utilizing the python encoding verbal communication. This project integrates AI technologies which includes say launch, mechanical language detection, Teach-To- Speech, and tone biometric, by Python action the same as the backend. This assignment features a reliable internet connection in addition to strong cognitive technologies and a conversation management procedure, which is crucial because users often lock themselves out themselves out of their own homes. [4].

A New Python-Based Speech Assistance System to Reduce Current Generation's Device Needs the plan with the intention of Rajdip Paul (2021) et al. suggested was called Real Server. The support application that this author has recommended supports call to the organization, call to the API, as well as a variety of additional features. Its backend is Python. Even though this app reacts to api requests very well, understanding and reliability still need improvement. [11].

In 2021, V. Geetha et al. accessible the Voice-Assisted Assistant for PC a Python-based project. The author planned a virtual assistant project that would use Python as the backend programming language to enable us to do things like read the latest news or restart or shut down our computers with a voice command. Although this project provides a backup library, not all APIs will be capable to change the original JSON (JavaScript Object Notation) information into wording. Furthermore, here is a stoppage in dispensation appeal calls. [12].

In 2021, Dilawar Shah Zwakman et al. suggested a feasibility assessment of AI base tone assistant so as to be capable of react correctly in the direction of consumer queries. It can arrange a voice call with a user-specified individual even if it lack API call. [13].

Philipp Sprengholz et al. created the poll instrument, Ok the search engine Google: utilize Virtual Assistance Tools in favor of assembly information in Psychology as well as Behavioral Studies, in 2021. It enhances the capabilities of the Google Assistant in addition to be use to confirm the correctness plus dependability of the data gathered during the assessment. Every kind of question have certain synonyms along with potential responses, thus it can be use near examine a people actions. Considering to facilitate it is a study aid for psychology and interpersonal relationships [14].

In 2021, Dimitrios Buhalis and colleagues submitted a learning name "inside the accommodation Voice-Based AI Virtual Assistant ornamental On-site Resort Service along with Customers' Experience" that examined the usage of voice assistants in hotel amenities. This will exist extremely helpful in the recent COVID-19 age. being interaction is viewed as risky in this COVID era, with losing human interaction while utilizing voice aid is not viewed as beneficial. To control the space's lighting and air conditioning, staff members need advanced connection and training [15].

3. Proposed work

In the modern world, voice assistants are now essential tools for solving problems. Without requiring any more tools or resources, users can quickly find answers to a variety of questions with a simple spoken query. They are also essential for household chores like managing different appliances or setting timers. Given this, having a voice assistant that is driven by AI, such as "Hello NOVA" (Next-Gen Optimal Voice Assistant), is crucial to modern life.

Let examine how a utilize casing plan for this organization is designed. During this case, every consumer interacts with NOVA, the voice assistant, as an actor in the graphic. Understanding and reacting to user inquiries is the foundation of NOVA's functioning? Through a microphone, users can speak commands to NOVA, which records them. After that, the assistant transforms the vocal expressions into text design for additional dealing out using a speech-to-text module. After processing the text through a number of modules, NOVA carries out the required activities in response to the user's demand.
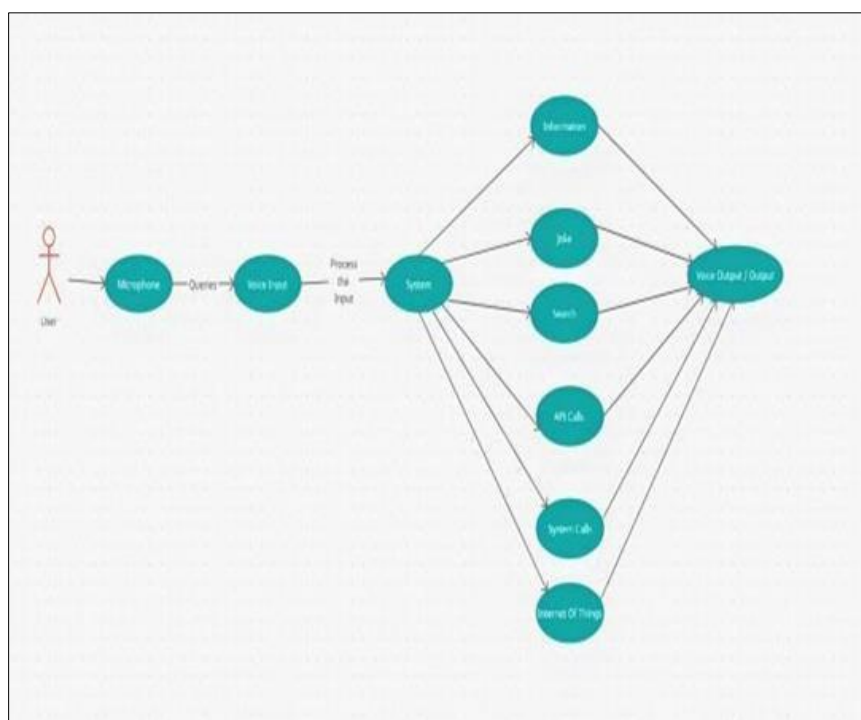
Figure 1 Employ a Casing Figure

This use case diagram's layout essentially shows how consumers engage with NOVA, the voice assistant, to complete a variety of tasks with ease. By using cutting-edge technologies, NOVA improves user experience with voice-activated interactions and streamlines daily tasks.

3.1. Essential characteristics of a Voice Assistant

3.1.1. You should give the consumer every details they request

We immediately require knowledge fast sometimes, don't we? For example, let's say you are working on a project and require information from the internet. Finding and going through everything may take an eternity. But then you have a voice helper! In an instant, you have what you need. Thus, it is true to have a voice assistant save moment.

3.1.2. Delivering the most important reports of the day to the user's position

You recognize how it is, you desire to learn about local events, but it takes a long time to sift through news websites or switch across channels. I mean, why don't we just get to the important part? A voice assistant can be quite helpful in this situation. No fuss, no muss, it delivers the reports straight as of your collar of the wood or anything reports you're interested in.

3.1.3. Making a joke to lighten the mood

We've all experienced such stressful times, don't we? Such as during times of stress or after a disagreement with a loved one. A nice joke can often be all that is needed to lighten the mood or break the ice. To be honest, it's difficult to dispute with the statement that laughter is the best medicine.

3.1.4. Accessing the desired file or folder:

Man, life is busy. Each of us has tasks to complete but insufficient time. Have you ever had to search through your computer for a box file or directory? It's a pain. Through a voice assistant, however, you simply inform it what you require, and it provides it. Don't waste any more time looking for things; just finish it and go on.

3.1.5. Notifying the user about the local weather and temperature

Although it may seem insignificant, knowing the weather is actually quite significant. You know, it helps you organize your day? You catch an umbrella if it's going to rain. You pull out the blinds if it's sunny. An AI voice assistant that provides you with weather updates. That's just common sense.

3.1.6. Looking up the user's query:

Everyone has questions, don't we? And occasionally, we require quick responses. Using Google can take a very long time, other than ask your voice assistant? Simple and quick. It's also useful on behalf of staying informed about global events. Simply tell it what you want to know, and the answer will appear.

3.1.7. Internet of Things:

Now, picture this: you want to turn on the fan while relaxing at home, but you are unable to move because the switch is so far away. Isn't that a bummer? IoT, however, allows you to just instruct your voice assistant to do it for you. Convenience is important, but so is making everyone's life easier, especially for individuals who may require a slight additional assistance. Moreover that's really awesome.

These are the voice assistant's key features, but we can do a lot more with it that goes beyond this.
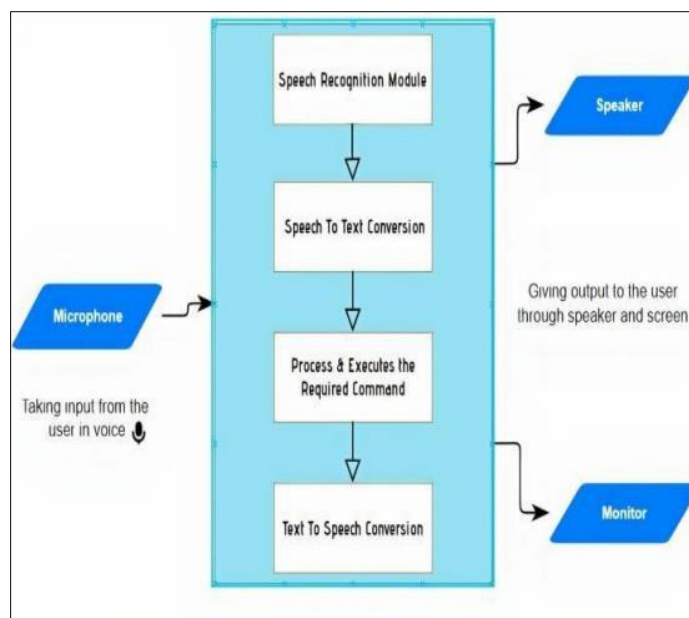
Figure 2 Workflow Model

The virtual assistant replies via use the wakeup statement to start Speech to Text (STT) as well as converting the user's voice input addicted to content once the user uses a recording device. During TTS, which stand for artificial intelligence (AI) voice instructions, it also understands the sound participation as well as keeps performing the assignment that the consumer has frequently stated.

Limitations

Voice-controlled gadgets have been around for a long in modern technology, as well as the platform to facilitate be currently in utilize include extremely little drawbacks.

- The voice recognition characteristic isn't always flawless. You recognize, the supporter doesn't at all times get it correct the initial time you ask it a question. You may need to repeat yourself at times, or it may misinterpret your words and provide you with an incorrect response. For example, it sometimes fails to distinguish between words like "their" and "there" that sound alike but have different meanings.
- Background noise is another problem. Have you ever noticed that speaking with the voice assistant requires being in a calm room? This is because a lot of background noise causes it to become confused. It could confuse your words with those of someone else or with other noises in the room, which could lead to mistakes and chaos.
- There is also security. The idea that a few people who can communicate with the gadget can contact your private information is a little unsettling. It has the ability to read your calendar events, emails, and other confidential information. That alone raises serious security issues. There are additional dangers, such as hackers attempting to eavesdrop on your talks and interfere with the assistant. We have to keep an eye out for that.

4. Applying the suggested work

4.1. The purpose of python

Because Python's capabilities for Object Oriented Programming makes development easier and less intimidating, we decided to use it on which our voice assistant is built. Due to of Python's flexibility, we can customize the assistant's questions to meet the specific requirements of every user. In order for the assistant to comprehend user requests, speech recognition is essential because it transforms audio into text. Because of Python's broad use, its capabilities go beyond a single task; its many libraries allow us to explore intricate fields like information knowledge, machine learning, artificial intelligence, and natural language processing.

Python is not restricted to a single purpose because it is utilized in a wide variety of scenarios. It may currently take part in several of the mainly common and complex processes, including data analysis, machine learning (ML), artificial intelligence (AI), as well as natural language processing, seeing that a product of its rising status. Python provides an abundance of libraries that would be needed for this project.

These are the voice assistant's primary features; albeit there are many more things we can do with it. The following is a list of tasks that the assistant can complete:

- Play any video that the user asks to be shown.
- At the start of the day, a random piece of information is presented to allow the user to begin their work in an instructive way and learn something new. Every assistant will have the ability to play games with customers so they may pass the time through their without charge moment into an entertaining method.
- User may not remember to turn off a system that may control crucial information, except by way of a voice-activated assistant, we be capable of accomplish this without leaving the device's position by just telling the virtual assistant to do accordingly.

4.2. What is the voice assistant capable off?

A quick explanation of how the features that must be included in a voice assistant be accomplished in this employment is provided underneath.

4.2.1. Call from API'S

We can find and obtain news articles from all across the internet with the help of the reports demand API, a simple Restful (Representations Status Transfers) API based on JSON. We retrieved news data from this API using our API credentials. It can be used to find the latest news on a particular topic, distribute the majority current reports on news websites, also retrieve climate predictions commencing release climate map platform with the intention of use well-known APIs. With the use of convolution machine learning, this system can provide all the weather information needed to make wise decisions anywhere in the world. It can accurately retrieve data and give the user results.

4.2.2. System calls

Through the Operating System (OS) as well as Internet Browser Modules, this feature enables us to access our desktop, calculators, process management, command prompts, and user folders. This be able to also start again the computer along with open the Chrome browser.

4.2.3. Extracting content

It is possible to extract information commencing YouTube, Wikipedia, in addition to Google Chrome by with a web driver module on or after Selenium, which provide every possible implementation meant for the web drive, such as searching on behalf of a definite clip to play, obtaining detailed in Google, or via the website Wikipedia. The virtual assistant begins by asking the user what they hope to get out of it. When a user requests a search using the online browser, the internet opens, locates the query for that element using the element's path, and the user clicks on that element. The assistant types it out once the user asks it to look for something.

Once the virtual assistant has received the request input, it utilizes the search button's route to get on the button the similar manner so as to it press on the search window. The assistant use a web browser into this manner.

For example, while a consumer asks the virtual assistant to start live a YouTube film, the assistant launches YouTube in the browser, finds the video they want to play, along with then clicks the search icon. It taps on the first clip use the clip's pathway.

4.2.4. Serial modules

In the end, the serial port component was used to implement the Internet of Things (IoT) capabilities used for the current task.

It is a component that accesses the serial port on the Arduino board for communication by using COM5 and Arduino port number 9.

4.2.5. Algorithm

- Speech Recognition element

Recognizer is the class is working with. It converts audio files into wording, which is a really cool thing. After that, we turn the text into speech using a module.

The energy threshold function is a crucial consideration. This essentially establishes a threshold for the amount of sound required to qualify as speech. Anything over that threshold is acknowledged as speech, while anything below it is considered silence.

We're utilizing a clever Recognizer instance now. Even in a busy environment, it adapts to the surrounding noise to ensure that it detects the music we desire. Additionally, duration is a wonderful feature. It functions similarly to a dynamic energy threshold adjustment. In essence, it adjusts according to the audio it is processing, ensuring that it is constantly at the ideal volume to capture speech and eliminate background noise.

Voice into Texts and Texts into Voice Pyttsx3 is a Python text-to-speech translation instrument. You might change the speech, speed, and loudness by following specific instructions. Long or large audio recordings can be converted into text for further processing by using Python's Voice Identification API function. Python has a voice recognition API. The same data may be handled by the available Talk TTS Engines and Sapi5.

Processes and execute the requisite Instruction The aforementioned rule is transformed into text by speech recognition software as well as store in a temporary file. The while loop is then executed after temp has been used to evaluate the user's text and make a decision what the consumer needs base on the contribution provide. This is how these instructions are followed.
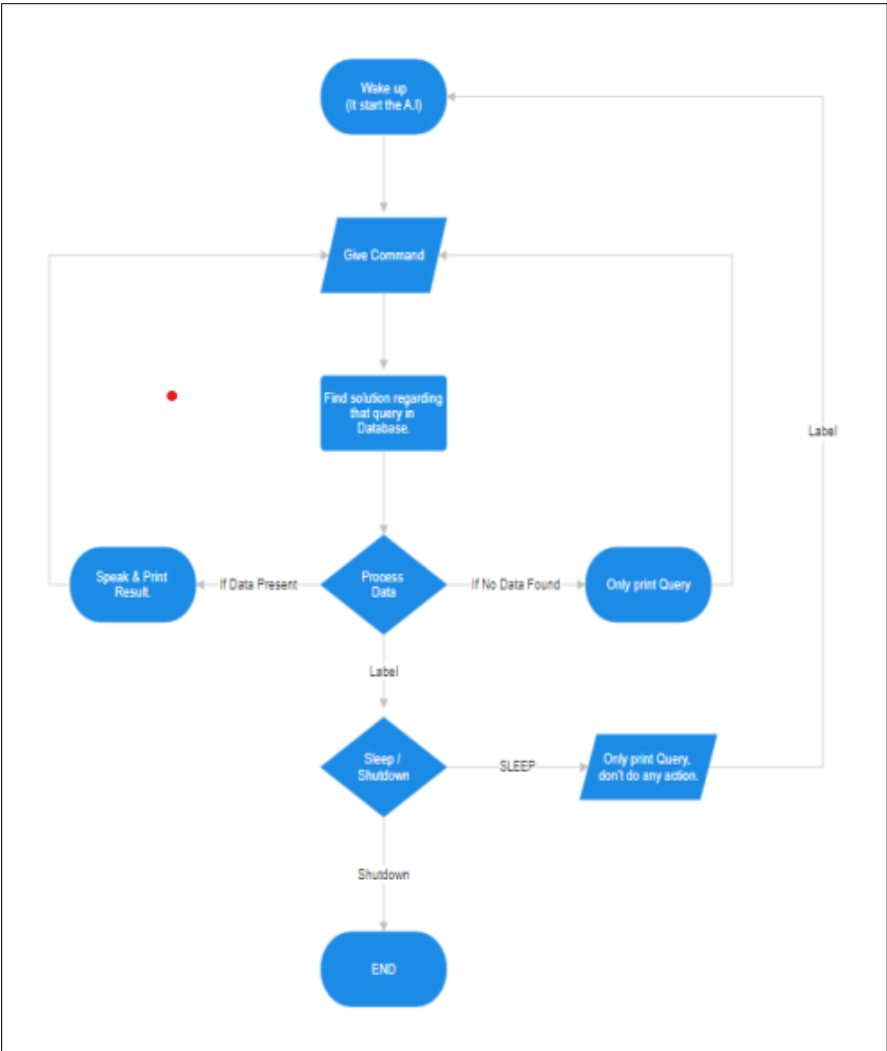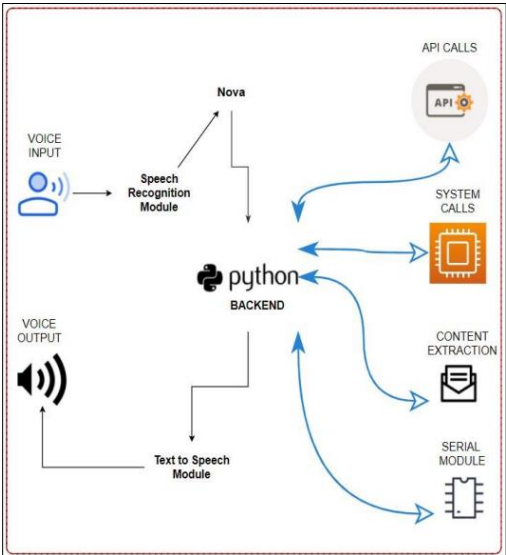
Figure 3 Flow Diagram

Figure 4 Diagram of the Architecture

Table 1 Working Table

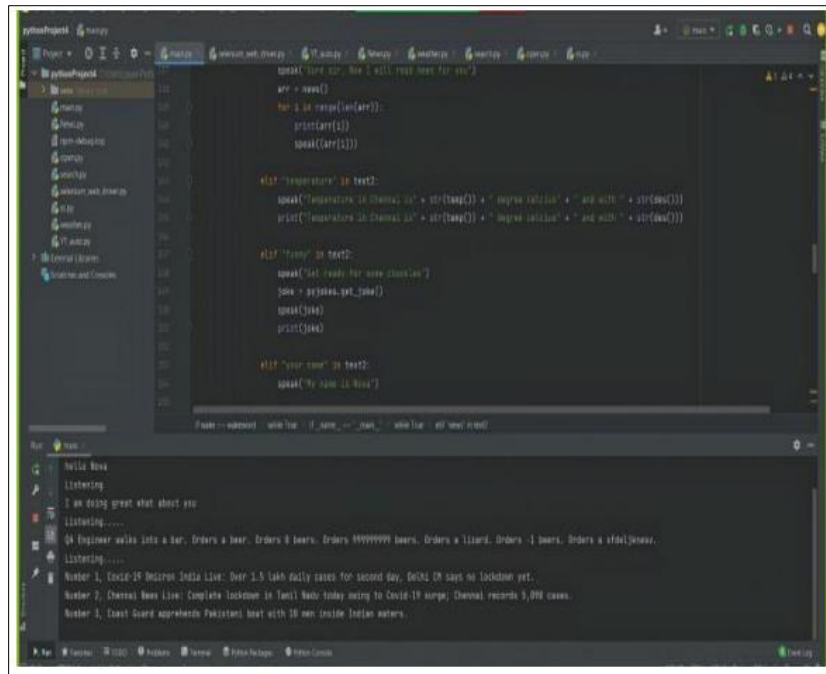| A.IVOICEASSISTANTMODULE		
1.	The Speech Input Method	Microphone captures user voice commands.
2.	Speech Recognition and Interpretation	Pythonusesvoice recognitionpackagesto handle spoken words.
3.	Natural Language Understanding(NLP)	NLPalgorithmdeciphers userintentand context.
COMMUNICATION HUB		
4.	Encodingand Decoding	Convert commands to make them compatible with Arduino and Python.
ARDUINOHOMEAUTOMATION		
5.	Device Control	Actuators communicate with household appliances in response to commands.
	USERFEEDBACKMODULE	
6.	Voice Output	The speaker acknowledges commands or provides information through verbal answers.
INTERACTIONFLOW		
7.	User speaks command	Speech Input Processing Module capture.
8.	Speech Recognition	Transform spoken language into text.
9.	Arduino Action	Devices are controlled by commands that are received.
10.	Feedback	The user can verify the activity with a voice answer or visualcues.

Table 2 Basic Working Commands

	COMMANDS	WORKING
1.	Wake up	It begins to listen, takes orders, and speaks the appropriate outcome.
2.	Turn on LED	An Arduino instruction causes the LED to turn on.
3.	Turn off LED	An Arduino instruction causes the LED to turn off.
4.	Search " " on Google, YouTube, Wikipedia	Use these to search for it, then speak and print the results.

5. Results and Discussion

We have described the project work on our voice assistant in this report, emphasizing its potential dependability and use in helping users with a variety of activities.

We've shown how this technology may be easily incorporated into our everyday routines, facilitating people's ability to effectively handle their homes in addition to errands. As we've seen, the voice assistant is always changing, which gives us optimism for even more significant developments soon.

We are happy to announce that the program is almost finished and that preliminary testing has produced encouraging results. We believe to our voice assistant will continue toward gain use plus evolve into an important technology in today's constantly changing environment, even though some more work may be required for future advancements.

Figure 5 Environment for Voice Assistants

Figure 6 Arduino Demo Images for components

6. Conclusion

To sum up, the combination of home automation and AI voice help represents a major advancement in the field of smart living. We have examined the complex mechanisms of these technologies throughout this study, as well as their potential to improve daily living. We have seen how homes may be turned into intelligent ecosystems that respond to our wants and wishes by utilizing artificial intelligence in conjunction with smooth automation.

"Voice assistants are among the most significant issue solvers," as was previously stated, and the concepts and examples show that this is indeed the case in the contemporary world. Once more, the examples that have been presented demonstrate that voice assistants are one of the main types of intelligent machines that are now being developed in the modern day. The ability to tell the time and do web searches with results was formerly the best feature of voice-activated gadgets. Nonetheless, we may draw the conclusion that voice assistant programs are still evolving in the modern world considering the variety of tasks that they can already complete.

In order to improve the virtual assistant beyond its current condition, the main objective of this study is to incorporate more sophisticated applications into it. Consequently, customers will save a great deal of work. Let me conclude by saying that we will make every effort to deliver one of the best voice-activated assistants on the market.

It is clear by the aim of the combination of AI voice assist out in adding to home automation decide only develop further in the future, offering countless chances for advancement and creativity. The options are genuinely limitless, ranging from improving efficiency and convenience to advancing sustainability and security. We can unleash the entire potential of these tools and guide in a new age of intelligent living wherever homes genuinely turn into extensions of us by continuing research and development and adhering to user-centric design

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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