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DESIGN AND DEVELOPMENT OF SMART VIRTUAL ASSISTANT USING LATEST TOOLS AND TECHNOLOGIES

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Abstract

"There is always a requirement of a skilled asset who can organize your chaos"
In today's fast developing world, everyone wants to save time. They know that time is money and they are always looking for ways to save time so they can also make more money. Having a reliable virtual assistant will save time and generate more revenue in a multitude of ways. It allows them to offer more services as digital assistants can take over the more routine tasks. Because digital assistants do the more routine tasks. Virtual Assistant will make human-to-machine interaction as smooth as possible. All you need is a good internet connection and your smart Assistant will do everything for you at an instance. The human brain has more power than computers but the human body drowns and makes mistakes.
Keywords: Smart Assistant, Virtual Assistant, Internet based Assistant, Voice Recognition, Follower

I. INTRODUCTION

The main purpose of Virtual Assistant is to answer the question that users may have. The software uses a device's microphone to receive voice requests while the voice output takes place at the speaker. But the most exciting thing happens between these two actions. It is a combination of several different technologies: voice recognition, voice analysis and language processing. When a user asks a personal assistant to perform a task, the natural language audio signal is converted into digital data that can be analyzed by the software. Then this data is compared with a database of the software using an innovative algorithm to find a suitable answer.

II. KEY OBJECTIVES:

The key objective of the study along with its implementation is given below as:-
2.1 The main purpose of an intelligent virtual assistant is to answer questions that users may have.
2.2 Virtual assistant made human efforts less.
2.3 Voice asks the user "What can I do for you?" and then it responds to verbal input.
2.4 Our virtual assistant will tell right price of stock market.
2.5 Also, it will help placing live orders in stock market.

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III. ANALYSIS

3.1. Function Analysis

In this, a computer system is designed in such a way that typically requires interaction from human. As we know Python is an emerging language so it becomes easy to write a script for Voice Assistant in Python. The instructions for the assistant can be handled as per the requirement of the user. In Python there is an API called Speech Recognition which allows us to convert speech into text. • In the current scenario, advancement in technologies is such that they can perform any task with same effectiveness or can say more effectively than us.

3.2. Non Functional Analysis

3.2.1 Category: Performance

Description:

- A system should not take more than 20 seconds to perform task.

3.2.2 Category: Reliability

Description:

- It should deliver quality services, do the job very well and meet deadlines.

3.2.3 Category: Security

Description:

- Confidentiality of the user should be protected by the access control.

3.2.4. Category: Efficiency

Description:

- The system should handle 10 concurrent users in 1 second
- The system should not exceed 2 mistakes when the new user is performing task

3.2.5. Category: Maintainability

Description:

- The system should be consistent in their interaction with the user
- The system should be easy to scale for adding new functionality
- The system should be consistent in their success and error responses to a user

3.2.6. Category: Portability

Description:

- The system should work on specified smart devices
- The system should work on specified operating system

IV. LITERATURE REVIEW & PROBLEM SOLVING

4.1 Literature Review

There already exist a number of desktop virtual assistants. A few examples of current virtual assistants available in market are discussed in this section along with the tasks they can provide and their drawbacks.

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4.1.1 Siri from Apple[1]

Siri is personal assistant software that interfaces with the user thru voice interface, recognizes commands and acts on them. It learns to adapt to 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 taskbased contexts, to personalize the agent behaviour 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

Improvements Required

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

4.1.2 ReQall [2]

ReQall is personal assistant software that runs on smartphones running Apple iOS orGoogle Android operating system. It helps user to recall notes as well as tasks within alocation and time context.

It records user inputs and converts them into commands, and monitors current stack of user tasks to proactively suggest actions while considering any changes in the environment. It also presents information based on the context of the user, as well as filter information to the user based on its learned understanding of the priority of that information.

Supported Tasks

- Reminders
- Email
- Calendar, Google Calendar
- Outlook
- Evernote
- Facebook, LinkedIn
- News Feeds

Improvements Required

Will take some time to put all of the to-do items in – you could spend more timeputting the entries in than actually doing the revision

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4.2 Problem Solving

Usually, user needs to manually manage multiple sets of applications to complete one task. For example, a user trying to make a travel plan needs to check for airport codes for nearby airports and then check travel sites for tickets between combinations of airports to reach the destination. There is need of a system that can manage tasks effortlessly.

We already have multiple virtual assistants. But we hardly use it. There are number of people who have issues in voice recognition. These systems can understand English phrases but they fail to recognize by their accent. Their way of pronunciation is distinct from others. Also, they are easy to use on mobile devices than desktop systems. There is need of a virtual assistant that can understand English in Indian accent and work on desktop system.

When a virtual assistant is not able to answer questions accurately, it's because it lacks the proper context or doesn't understand the intent of the question. Its ability to answer questions relevantly only happens with rigorous optimization, involving both humans and machine learning. Continuously ensuring solid quality control strategies will also help manage the risk of the virtual assistant learning undesired bad behaviors. They require large amount of information to be fed in order for it to work efficiently.

Virtual assistant should be able to model complex task dependencies and use these models to recommend optimized plans for the user. It needs to be tested for finding optimum paths when a task has multiple sub-tasks and each sub-task can have its own sub-tasks. In such a case there can be multiple solutions to paths, and it should be able to consider user preferences, other active tasks, and priorities in order to recommend a particular plan.

V. TECHNICAL LIBRARIES AND MODULES

In Virtual Assistant following libraries and Modules are use:

5.1. Python

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

5.2. Web browser

In Python, web browser module is a convenient web browser controller. It provides a high-level interface that allows displaying Web-based documents to users.
Web browser can also be used as a CLI tool. It accepts a URL as the argument with the following optional parameters: -n opens the URL in a new browser window, if possible, and -t opens the URL in a new browser tab.

5.3. PyAutogui

PyAutoGUI lets your Python scripts control the mouse and keyboard to automate interactions with other applications. The API is designed to be simple. PyAutoGUI works on Windows, macOS, and Linux, and runs on Python 2 and 3.

PyAutoGUI has several features:
- Moving the mouse and clicking in the windows of other applications.
- Sending keystrokes to applications (for example, to fill out forms).
- Take screenshots, and given an image (for example, of a button or checkbox), and find it on the screen.
- Locate an application's window, and move, resize, maximize, minimize, or close it(Windows-only, currently).
- Display alert and message boxes.

5.4 Flask

Flask is a web framework that provides libraries to build lightweight web applications in python.
It is developed by Armin Ronacher who leads an international group of python enthusiasts (POCCO).
It is based on WSGI toolkit and jinja2 template engine. Flask is considered as a micro framework. 20

5.5 Psutil

Psutil is a Python cross-platform library used to access system details and process utilities. It is used to keep track of various resources utilization in the system. Usage of resources like CPU, memory, disks, network, sensors can be monitored. Hence, this library is used for system monitoring, profiling, limiting process resources, and the management of running processes.

5.6. NSE Tools

NSE National Stock Exchange of India Limited is the leading stock exchange of India, located in Mumbai, Maharashtra. NSE was established in 1992 as the first dematerialized electronic exchange in the country. Nse tools is a library for collecting real time data from National Stock Exchange of India. It can be used in various types of projects which requires fetching live quotes for a given stock or index or building large data sets for further data analytics. We can also build command line interface applications which can provide us live market details at a blazing fast speeds, much faster than any browser.

International Journal of Core Engineering & Management
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VI. UML Modelling

6.1.1 Use Case Diagram

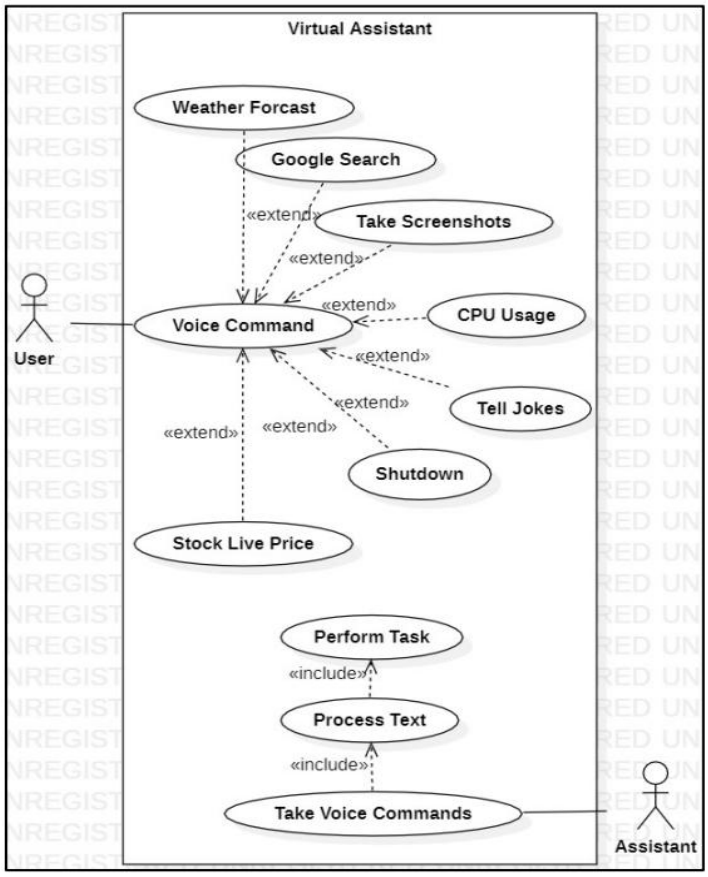
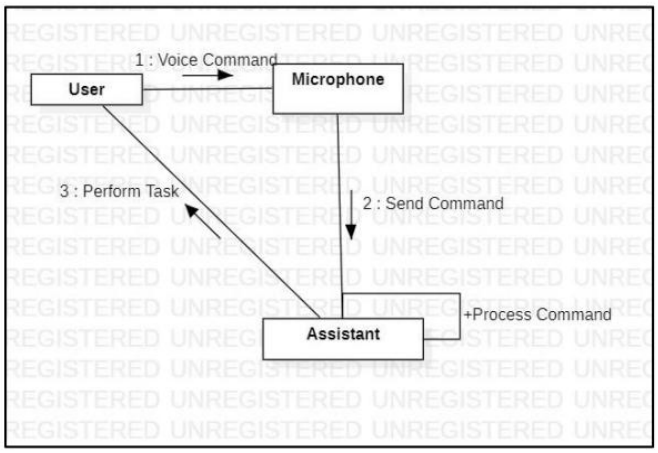


Fig 6.1: USE CASE MODEL OF SYSTEM

6.1.2 Collaboration Diagram



International Journal of Core Engineering & Management
Volume-7, Issue-1, 2022 ISSN No: 2348-9510

Fig: 6.2 COLLABORATION DIAGRAM OF SYSTEM

6.1.3 Class Diagram

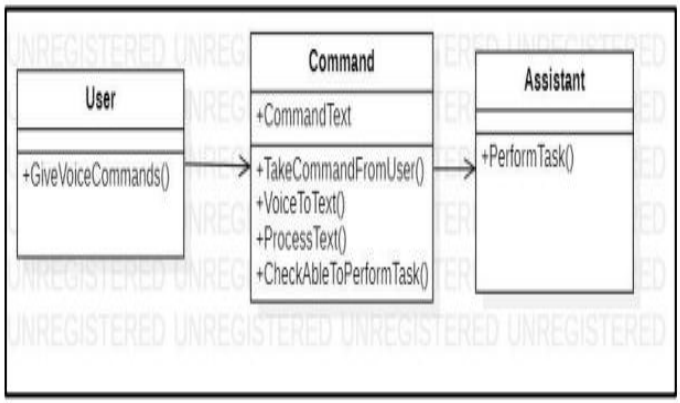


Fig: 6.3 CLASS FLOWOF SYSTEM

6.1.4 Sequence Diagram

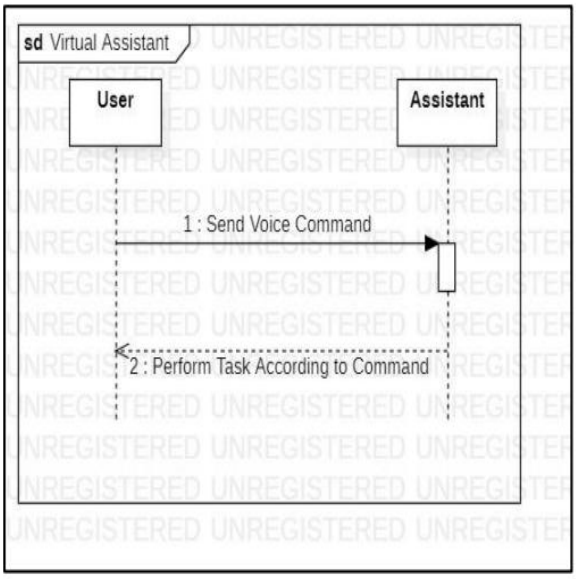


Fig: 6.4 SEQUENCE FLOW OF SYSTEM

International Journal of Core Engineering & Management
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6.1.5 Activity Diagram

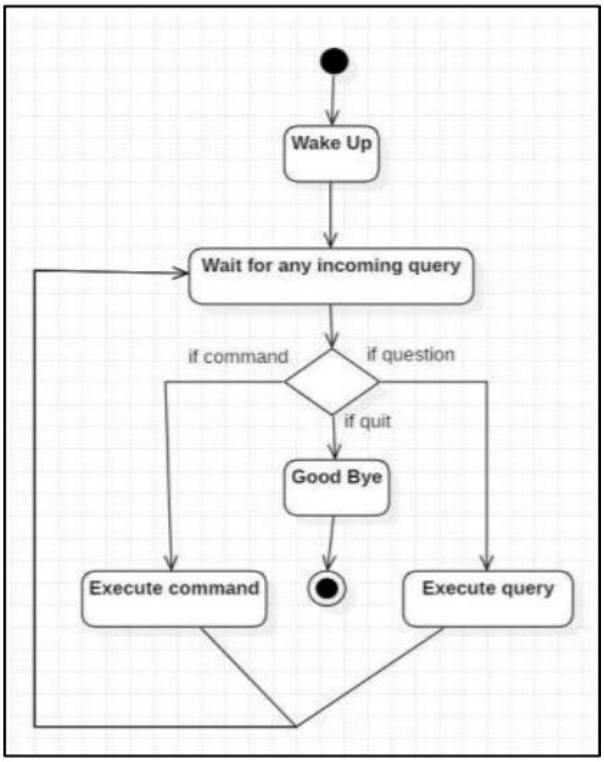

Fig: 6.5 ACTIVITY FLOW OF SYSTEM

6.2 Data Modeling

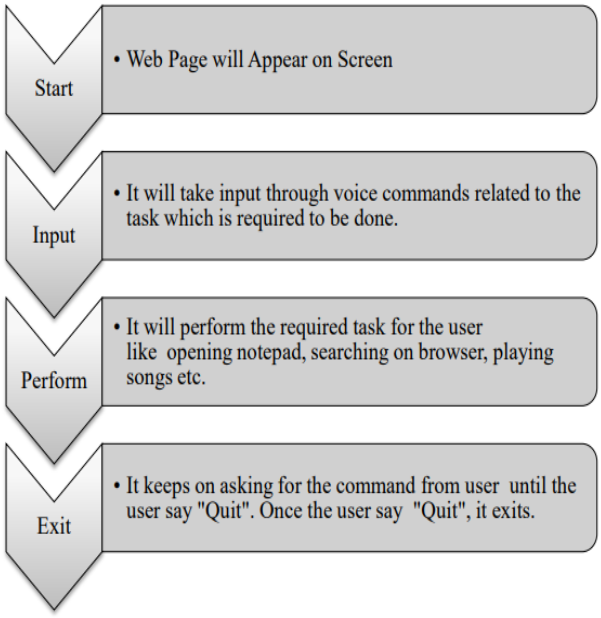

Fig: 6.6 DATA FLOW OF SYSTEM: ABSTRACT VIEW

International Journal of Core Engineering & Management
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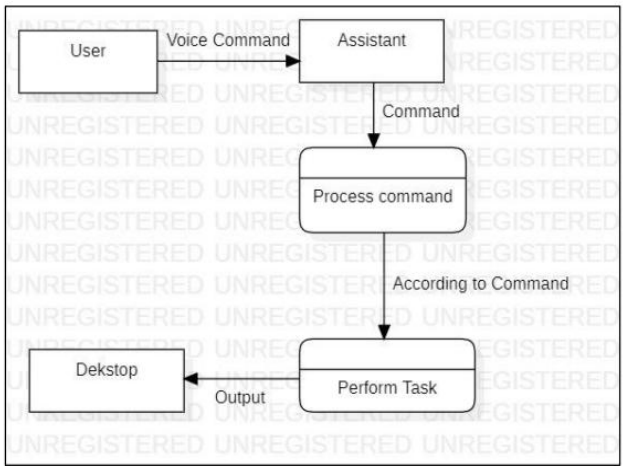

Fig: 6.7 DATA FLOW DIAGRAM

VII. IMPLEMENTATION

7.1 Tools & Technologies

7.1.1 Tools Used

- VS Code
- API's
- Frontend
- Backend

7.1.2 Technology

In Virtual Assistant, following python libraries were used:

- Pyttsx3: It is a python library which converts text to speech.
- Speech recognition: it is python module which converts speech to text.
- Pywhatkit: it is python library to send Whatsapp message at a particular time with some additional features.
- Date time: This library provides us actual date and time.
- Wikipedia: it is a python module to search anything on Wikipedia.
- Smtplib: simple mail transfer protocol that allows us to send mails and to route mail between mail servers.

7.3.3 Testing Approach

The system testing is done on fully integrated system to check whether the requirements are matching or not.

The system testing for desktop assistant focuses on the following four parameters:

1. Functionality

In this we check the functionality of the system whether the system performs the task which it was intended to do. To check the functionality each function was checked and run, if it is able to execute the required task correctly then the system passes in that particular functionality test.

For example to check whether ICONIScan search on Google or not, as we can see in the figure 7.1, user said "OpenGoogle", then Iconis asked, "What should I search on Google?" then user said,"What is Python", Iconis open Google and searched for the required input.

2. Usability

Usability of a system is checked by measuring the easiness of thesoftware and how user friendly it is for the user to use, how it responses toeach query that is being asked by the user. It makes it easier to complete any task as it automatically do it by usingthe essential module or libraries of Python, in a conversational interaction way. Hence any user when instruct any task to it, they feel like giving task to human assistant because of the conversational interaction for giving input and getting the desired output in the form of task done. The desktop assistant is reactive which means it know human language very well and understand the context that is provided by the user and gives response in the same way, i.e. human understandable language, English. So user finds its reaction in an informed and smart way. The main application of it can be its multitasking ability. It can ask for continuous instruction one after other until the user "QUIT" it. It asks for the instruction and listen the response that is given by user without needing any trigger phase and then only executes the task.

3. Security

The security testing mainly focuses on vulnerabilities and risks. Aniconism is a local desktop application, hence there is no risk of data breaching through remote access. The software is dedicated to a specific system so when the user logs in, it will be activated.

4. Stability

Stability of a system depends upon the output of the system, if theoutput is bounded and specific to the bounded input then the system is said tobe stable. If the system works on all the poles of functionality then it isstable

7.3.3.1 TEST CASES

TEST CASE 1
Test Title: Response Time
Test ID: T1
Test Priority: High
Test Objective: To make sure that the system respond back time is efficient.
Description: Time is very critical in a voice-based system. As we are not typing inputs, we are speaking them. The system must also reply in a moment. User must get instant response of the query made.

TEST CASE 2
Test Title: Accuracy
Test ID: T2
Test Priority: High
Test Objective: To assure that answers retrieved by system are accurate as per gathered data.
Description: A virtual assistant system is mainly used to get precise answers to any question asked. Getting answer in a moment is of no use if the answer is not correct. Accuracy is of utmost importance in a virtual assistant system

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TEST CASE 3
Test Title: Approximation
Test ID: T3
Test priority: Moderate
Test Objective: To check approximate answers about calculations.
Description: There are times when mathematical calculation requires approximate value. For example, if someone asks for value of PI the system must respond with approximate value and not the accurate value. Getting exact value in such cases is undesirable.

Note: There might include a few more test cases and these test cases are also subject to change with the final software development.

VIII. MAJOR FUNCTIONALITIES

8.1.1 Google Search
8.1.2 Wikipedia Search
8.1.3 Play Songs
8.1.4 Send SMS
8.1.5 Take Screenshots
8.1.6 CPU Usage
8.1.7 Restart/Shutdown/Logout System
8.1.8 Weather
8.1.9.1 Live Stock Price for any symbol

IX. RESULTS

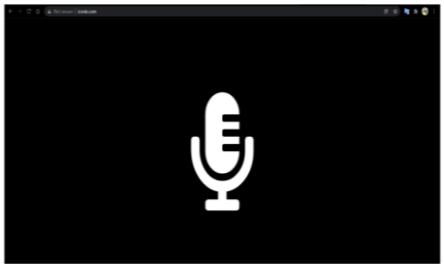

Fig: 9.1 Testing Images of System : Extracting Figure

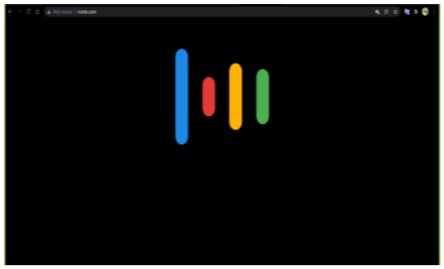

Fig: 9.2 Testing Images of System : Running Figure

X. CONCLUSION AND FUTURE SCOPE

The above design provides a virtual assistant, which is very flexible and useful for daily use and also provides a better interface to deal with.

10.1 FUTURE SCOPE

10.1.1 More AI based relevant algorithms can be added to enhance the capabilities of system.
10.1.2 More Voice Terminal can be added to the system.
10.1.3 Different voice encryption algorithms can be added to maintain security in the system.

"Enough research will tend to support your conclusions" –*Arthur Bloch*

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