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KARAIKAL – 609 609

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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Subject Code: CS210		**Subject Name :** Python Programming Laboratory	

PYTHON MINI – PROJECT REPORT

TITLE: VOICE ASSISTANT WITH FACE-RECOGNITION

Introduction:

In today's world, the development of technology has led to an increasing demand for smart devices that can perform various tasks with ease. One of the most popular and innovative technologies is a voice assistant with face recognition technology. This report focuses on the development of a voice assistant with face recognition technology that can perform various tasks, such as responding to general commands, predicting weather conditions, providing weather reports, searching for files in the file explorer using voice commands, opening a web browser, playing songs, answering questions from Wikipedia, opening email and composing emails with voice commands, taking notes in notepad, saving notes, opening a calculator, and controlling system functions such as locking and shutting down.

Objective:

- The main objective of this project is to design a Voice assistant application which the interacts with the users, give response to all the queries which user asks and also recognizes and remembers the user face and wish him/her when they appear in front of the camera.

Motivation:

- A Voice Assistant can be a useful tool in daily life, especially for people with disabilities or elderly people who have difficulty using traditional input devices. The face-recognition feature can also provide an added layer of security.
- Voice assistants are becoming increasingly popular, and building your own with face recognition can be a great way to innovate and create something unique.
- Developing this project will enhance us to learn new things and expand our skillset.

Scope:

- The scope of this project is, this technology can be implemented in modern robots which can be used in various public places which requires human guidance.
- As an example, it can be used in hospitals to guide the patients (if this application is trained to medical related queries) and also acts as a security to monitor patient.
- This technology can also be used at restaurants, when the customer visits the restaurant, it takes the order and remember the customer face and servers the customer based on the face-recognition.
- It is used in homes to control the devices (similar to Alexa) and identifies the owner's face, and acts as security for home.
- And also, can be used in attendance monitoring system in institutes/offices, etc.

Problem Statement:

The development of a voice assistant with face recognition technology that can perform a range of tasks, such as responding to general commands, predicting weather conditions, providing weather reports, searching for files in the file explorer using voice commands, opening a web browser, playing songs, answering questions from Wikipedia, opening email and composing emails with voice commands, taking notes in notepad, saving notes, opening a calculator, and controlling system functions such as locking and shutting down system etc..

The voice assistant must be able to recognize the user's command, identify their face using facial recognition technology, and personalize their experience accordingly. The aim of this project is to create a user-friendly interface that allows users to interact with the voice assistant using voice commands. It should be able to understand a range of commands and perform multiple tasks, making it a versatile tool for users. Additionally, the voice assistant should be accurate and reliable, providing users with the correct information and performing tasks as expected.

The development of this voice assistant with face recognition technology aims to provide users with an intuitive and convenient way to interact with their devices, making it easier for them to access information and perform tasks without the need for traditional input devices. The project aims to meet the needs of users with different levels of technical expertise, including those who may have disabilities or difficulty using traditional input devices.

Product Features:

1). General commands : The voice assistant recognizes the user's voice and responds to general commands given by the user, such as "Hi" or "Hello."
2). Weather Prediction : The voice assistant can predict weather conditions and provide weather reports to the user.
3). File Search : The voice assistant can search for files in the file explorer using voice commands given by the user.
4). Web Browser : The voice assistant can open a web browser when requested by the user and also search whatever user ask.
5). Music Player : The voice assistant can play songs requested by the user.
6). Wikipedia : The voice assistant can answer questions from Wikipedia when requested by the user.
7). Email Management : The voice assistant can open email and compose emails with voice commands given by the user.
8). Notepad : The voice assistant can take notes in notepad and save them for later retrieval.
9). Calculator : The voice assistant can open a calculator when requested by the user.
10). System Controls : The voice assistant can control system functions such as locking and shutting down the device.

The voice assistant is designed to be accurate and reliable, providing users with the correct information and performing tasks as expected. With its various features, the voice assistant aims to provide a convenient way for users to interact with their devices and access information without the need for traditional input devices. Additionally, the face recognition feature adds an extra layer of security, making it harder for unauthorized users to access the device.

Requirements:

- **Voice Recognition:** The application should accurately recognize the user's voice and respond to general commands given by the user. The application should have a high level of accuracy in recognizing the user's voice even in noisy environments.

- **Face Recognition:** The application must recognize the user's face accurately and allow access to the device. The application should be able to differentiate between the user's face and other faces.

- **Weather Prediction:** The application should accurately predict weather conditions and provide weather reports to the user. It should use reliable weather data sources and provide weather information for the user's location.

- **File Search:** The application should be able to search for files in the file explorer using voice commands given by the user.

- **Web Browser:** The application should be able to open a web browser when requested by the user. It must have capability to navigate to specific URLs and perform web searches using voice commands.

- **Music Player:** The application should be able to play songs when requested by the user.

- **Information Retrieval:** The application should be able to answer questions from Wikipedia when requested by the user. It should use reliable sources for information retrieval and should provide accurate and relevant information.

- **Email Management:** The application must be capable to open email and compose emails with voice commands given by the user.

- **Notepad:** The application should be able to take notes in notepad and save them for later retrieval.

- **Calculator:** The system should be able to open a calculator when requested by the user.

- **System Controls:** The application should be able to control system functions such as locking and shutting down the device and should require the user's permission before performing these functions.

- **User Interface:** The application should have a user-friendly interface that is easy to use. The interface should be designed to be intuitive and should support voice commands for all functions.

- **Performance:** The application should perform quickly and efficiently without causing the device to slow down. It should be optimized to minimize resource usage and to provide a responsive user experience.

- **Compatibility:** The application should be compatible with various devices and operating systems.

- **Reliability:** The system should be reliable and not crash or malfunction. The system should be tested extensively to ensure that it is stable and reliable.

- **Documentation:** The system should have clear documentation to help users understand how to use the features and troubleshoot any issues. The documentation should be accessible and easy to understand for users of all skill levels.

Concepts Used:

1) Object-oriented programming (OOPs) :
   → To encapsulate the two different threads (face-recognition & voice assistant)
2) File – Operations :
   → To search user asked file in file-manager.
3) Pickle database :
   → To fetch songs ID (unique) when user wants to listen music.
4) Logic :
   → Logic of creating commands and give accurate responses.
5) NumPy :
   → Used to find the face pattern (in NumPy array format) for Face-recognition.
6) Tkinter :
   → To create graphical user interface which attracts the user.
7) Importing programmer written module :
   → Has a KNN algorithm code written in separate module and imported.
8) Multi-threading concept :
   → To access camera & microphone of the system at a time.

Implementation:

Architecture Design:

This application was designed to have a modular architecture, with each feature implemented as a separate module. This project consisted of two main components: the voice recognition module, the face recognition module.

- The voice recognition module used Google's Speech-to-Text API to convert the user's voice commands into text.
- The face recognition module used OpenCV to detect and recognize faces.

Technologies used:

- This project was implemented using Python, which provided a wide range of libraries and APIs for implementing the various features, such as pygame, time, webbrowser, Wikipedia, wolfram alpha, NumPy, PIL, etc.

Feature Implementation:

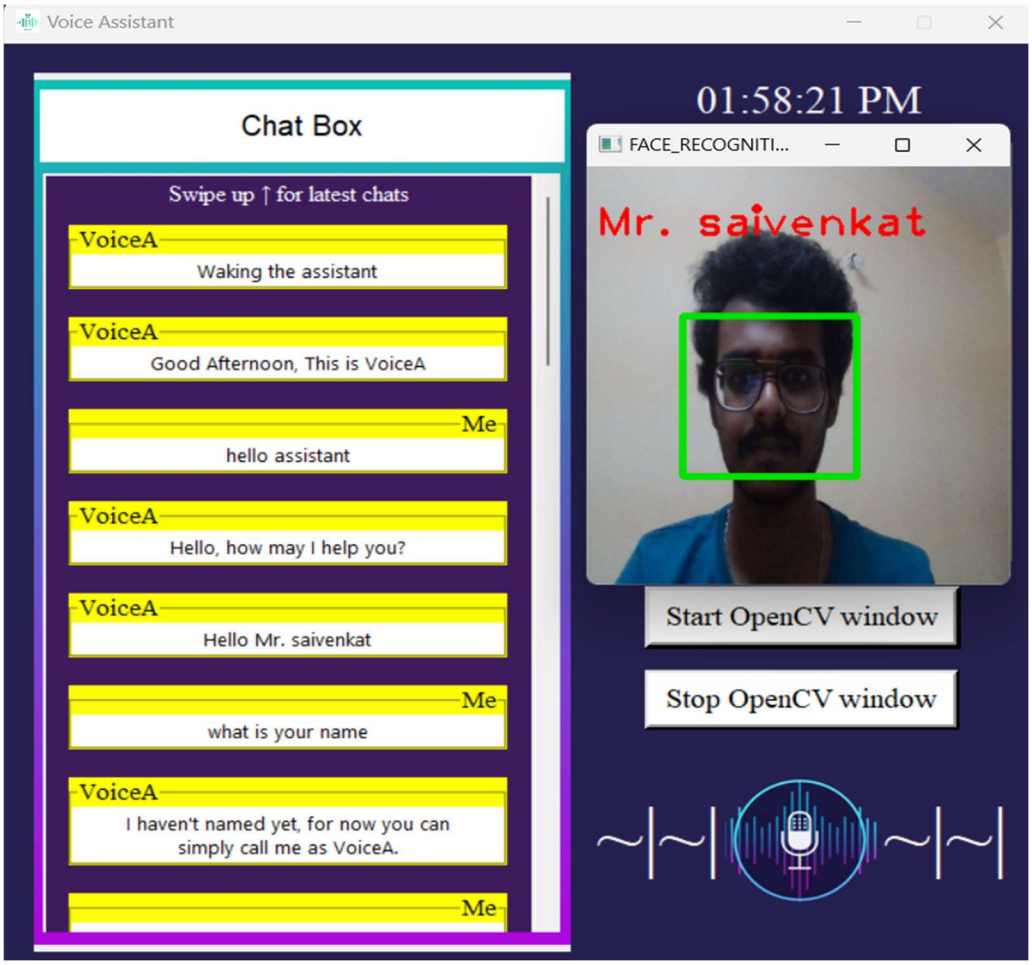
- Each feature of this project was implemented as a separate module, with its own set of voice commands and functionality.
- The following features were implemented:
  1) ***Voice Recognition*:** The voice recognition module used Google's Speech-to-Text API to convert the user's voice commands into text.

2) ***Face Recognition:*** The face recognition module used OpenCV to detect and recognize faces. The module was trained using a dataset of face images to improve its accuracy in recognizing the user's face.
3) ***File Search:*** The file search feature used the os library to search for files in the file explorer. The user could specify the file name using voice commands.
4) ***Web Browser:*** The web browser feature used the webbrowser Python library. To search queries using voice commands, the user must include the web browser word when giving the command.
5) ***Information Retrieval:*** The user response for query from wikipedia feature used the Wikipedia API to retrieve information on various topics. The user could ask questions using voice commands must include the Wikipedia word when giving the command.
6) ***Notepad:*** The notepad feature used the Python os library to create and edit text files. The user could create new notes and save them to the file system using voice commands.
7) ***Calculator:*** The calculator feature used the Python `eval` function to perform mathematical calculations.
8) ***System Controls:*** The system controls feature used the Python os library to control system functions such as locking and shutting down the device.

Testing:

- The testing was carried out in several phases, including unit testing, integration testing, and system testing.
- The unit testing involved testing each module and feature in isolation, while the integration testing involved testing the interaction between the various modules and features.
- The system testing involved testing the system as a whole, with all modules and features integrated.

Picture 1



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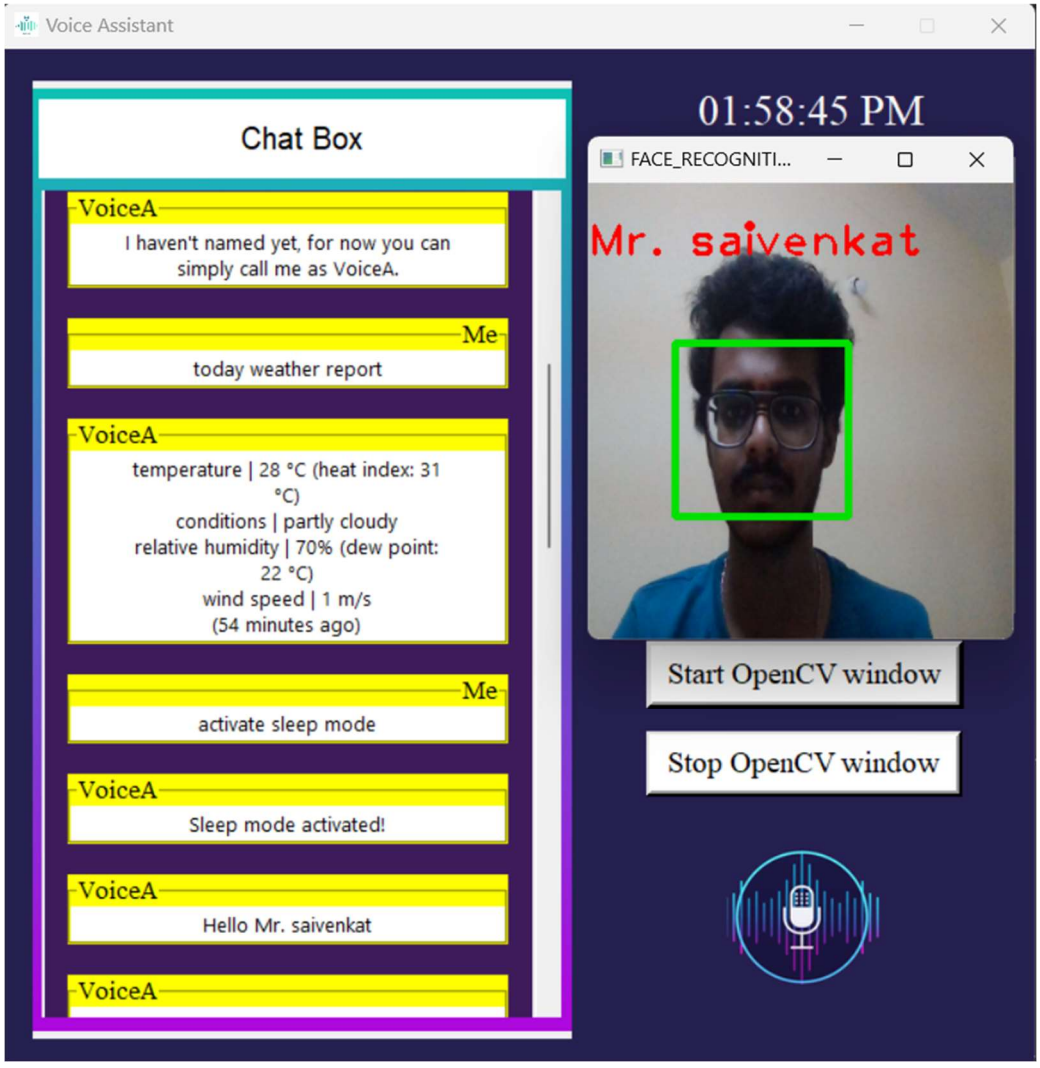

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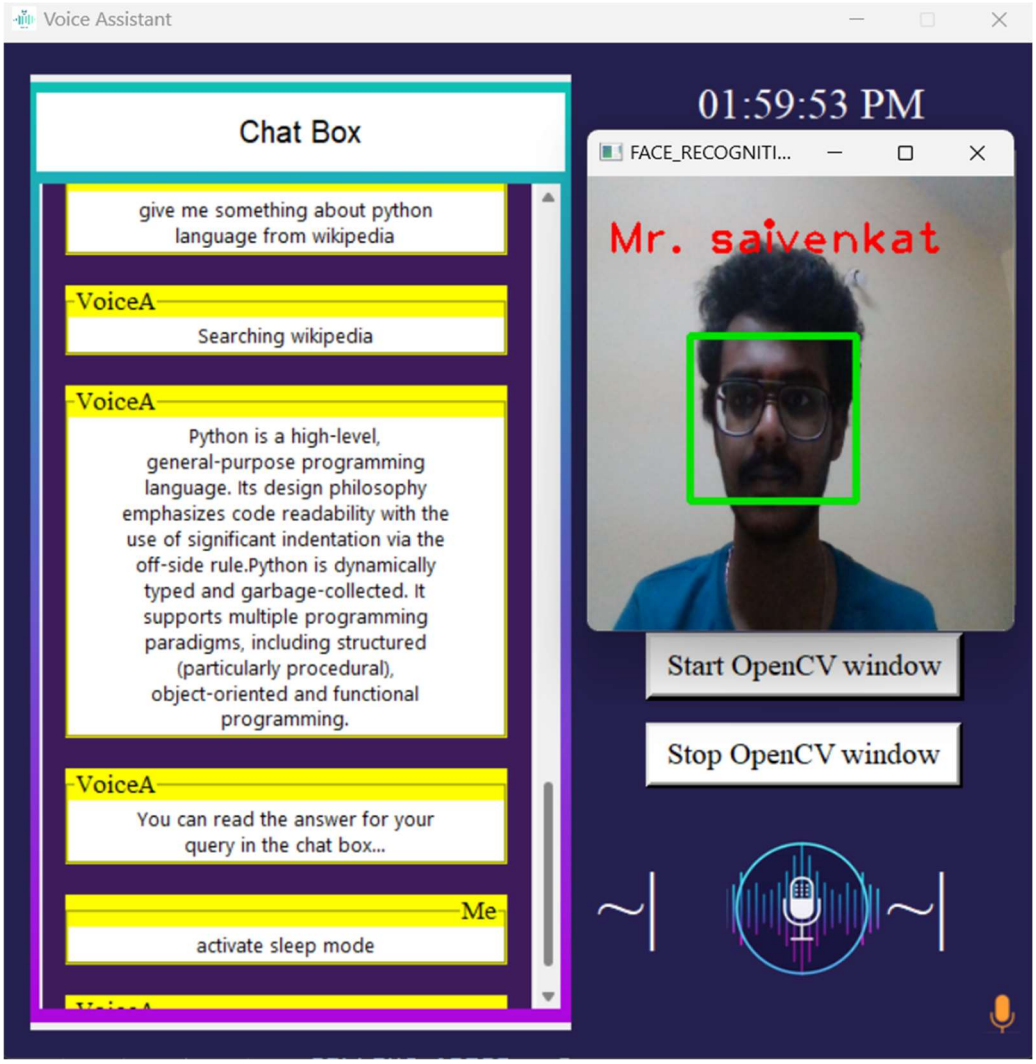

Test Cases:

1) ***Voice Command Recognition:***

- Application correctly recognizes and interprets voice commands.
- It provides appropriate responses to the user after recognizing the command.

2) ***Face Detection and Recognition:***

- Application can detect faces in an image or video stream.
- It can also recognize faces that have been previously trained on.
- This application can also handle images or video streams that contain multiple faces.

3) ***User Feedback:***

- Application provides appropriate feedback to the user, such as confirming commands or reporting progress.
- It can handle interruptions or unexpected user inputs.
- It can recognize when the user is done with a particular task and is ready to move on to the next one.

Project Outcomes:

- The voice assistant with face recognition project was successfully implemented, with all features implemented and tested.
- The application was able to recognize and respond to voice commands, detect and recognize faces, and perform various tasks such as weather prediction, music playing, and email management, etc.
- The application was tested extensively and was found to be stable and reliable.
- The application was also found to be user-friendly, with a simple and intuitive interface that allowed users to interact with the application using voice commands.

Conclusion:

In conclusion, the voice assistant with face recognition project successfully achieved its objectives of creating a powerful and intuitive voice assistant that could recognize faces and respond to voice commands.

The application was tested thoroughly and found to be stable and reliable, with a simple and intuitive interface that allowed users to interact with the application using voice commands.

Furthermore, the project has future scope opportunities that include integration with more APIs, improved natural language processing, multi-language support, and hardware integration. These future scope opportunities will enable the system to provide additional functionality and improve user experience.

Overall, the voice assistant with face recognition project was a successful project that provided users with a powerful and intuitive voice assistant that could perform a range of tasks, including weather prediction, music playing, and email management, etc. It demonstrated the potential of using artificial intelligence and machine learning to create sophisticated voice assistants that can make our lives easier and more convenient.

Future Scope:

The voice assistant with face recognition project has several future scope opportunities. Some of these majors include:

a) *Integration with more APIs*: The application can be integrated with more APIs to provide additional functionality, such as news updates, stock market updates, and social media updates.
b) *Improved Natural Language Processing:* The application can be improved by using more advanced natural language processing techniques to better interpret user commands and provide more accurate responses.
c) *Multi-language support:* The application can be extended to support multiple languages, allowing users to interact with the system in their native language.
d) *Hardware integration:* The application can be integrated with hardware such as smart home devices, allowing users to control their home using voice commands.