

A PROJECT REPORT

ON

”Voice Bot For Mall”

Submitted to
UNIVERSITY OF MUMBAI

In partial fulfillment of the requirements for the degree of
Bachelor of Engineering

BY

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UNDER THE GUIDANCE OF
(Prof. Anas Dange)



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Academic Year : 2022-2023

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CERTIFICATE

This is to certify that the project entitled
"Voice Bot For Mall"
submitted by

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is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Computer Engineering) at **Anjuman-I-Islam's Kalsekar Technical Campus, Navi Mumbai** under the University of MUMBAI. This work is done during year 2022-2023, under our guidance.

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Project II Approval for Bachelor of Engineering

This project entitled *Voice Bot For Mall* by *Gupta Shailesh Shrikrishna, Khan Mohammed Zeeshan Raza Riyaz Ahmed, Khan Mohammed Usman Mohammed Jama, Mohd Yusuf Ashfaque Ahmed* is approved for the degree of *Bachelor of Engineering in Department of Computer Engineering*.

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Declaration

We declare that this written submission represents our ideas in our own words and where other ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

Title: Voice Bot For Mall.

A voice bot for a mall project can be a great addition to enhance the user experience and provide convenience to visitors. The voice bot can be designed to understand the user's needs and assist them with finding locations within the mall. Our voice bot is designed to make your visit to our mall as seamless as possible. Whether you're looking for a specific store, restaurant, or other service, our voice bot is here to help.

Simply tell us what you're looking for, and we'll provide you with the location and directions to the particular shop to get there. With our voice bot, you'll no longer have to navigate through confusing maps or ask for directions. Our voice bot is your personal guide to everything our mall has to offer. Our mall features a wide variety of stores, restaurants, and entertainment options to suit your needs. Whether you are looking for the latest fashion trends, a delicious meal, or some family fun, we have something for everyone.

Keywords: Natural Language Processing, pyttcx3 and Speech Recognition, Voice recognition and Navigation.

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B.E. (Computer Engineering)

University of Mumbai.

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Chapter 1

Introduction

A voice assistant is a digital assistant that uses voice recognition, language processing algorithms, and voice synthesis to listen to specific voice commands and return relevant information or perform specific functions as requested by the user. Based on specific commands, sometimes called intents, spoken by the user, voice assistants can return relevant information by listening for specific keywords and filtering out the ambient noise. Our voice bot utilizes natural language processing to understand user needs and provide location-based services, such as store and restaurant recommendations, directions, and promotions. With our voice bot, users can easily navigate the mall and access information about promotions and events. To provide visitors with an intuitive and efficient way to navigate the mall and find the services they need. Our voice bot leverages natural language processing and location-based services to designed to assist visitors with finding stores, restaurants, services, and events within the mall, as well as provide them with promotions and sales information and services. Through the use of natural language processing and machine learning, our voice bot can understand and respond to visitor queries in a conversational manner, making the process of finding information about the mall quick and easy.

In recent years, shopping malls have become increasingly competitive in their efforts to attract and retain visitors. One way to enhance the visitor experience and increase customer loyalty is through the implementation of a voice bot. A voice bot is an interactive tool that can understand and respond to user requests using natural language processing. When implemented in a shopping mall, a voice bot can provide visitors with personalized and convenient assistance, allowing them to easily navigate the mall and access information about stores, products, promotions, and events. By integrating with existing mall systems and databases, the voice bot can provide real-time information on stores, products, promotions, events, and services within the mall. It can also provide directions, offer suggestions based on user preferences, and assist with routine tasks, such as finding parking or locating a restroom.

In recent times only in the Virtual Assistants we can experience the major changes, the way user interacts and the experience of user. We are already using them for many tasks like switching on/off lights, playing music through streaming apps like Wynk Music, Spotify etc., This is the new method of interacting with the technical devices makes lexical communication as a new ally to this technology. The concept of virtual assistants in earlier days is to describe the professionals who provide ancillary services on the web. The job of a voice is defined in three stages: Text to speech; Text to Intention; Intention to action; Voice assistant will be fully developed to improve the current range.Voice assistants are not befuddled with the virtual

assistants, which are people, who work casually and can therefore handle all kinds of tasks. Voice Assistants anticipate our every need and it takes action.

AI-based Voice assistants can be useful in many fields such as IT Help desk, Home automation, HR related tasks, voice based search etc., and the voice based search is going to be the future for next generation people where users are all most dependent on voice assistants for every needs. In this proposal we have built the AI-based voice assistant which can do all of these tasks without inconvenience. With the merging of broadcast media, mobile communications and the Internet, the amount of information is increasing. Wider and more frequent exchange of information is occurring. Modern communication technology is rapidly developing, although image, video, and other forms of communication and information is more common, the most common form of data communication system is still the voice. It does still occupy a very important position. Because the digitized voice signal is superior to analog form either in transmission or in storage in terms of its reliability, anti-interference, confidentiality, flexibility, and low cost to speech signal.

1.1 Purpose

The purpose of a voice bot for a mall is to enhance the user experience by providing convenient and personalized assistance to visitors. By using natural language processing and location-based services, the voice bot can understand user needs and provide recommendations, directions, and information about promotions and events within the mall.

The voice bot can also provide valuable analytics and feedback to the mall management, allowing them to improve customer service and engagement. The ultimate goal of a voice bot for a mall is to provide a seamless and enjoyable shopping experience for visitors, leading to increased brand awareness, sales, and customer loyalty.

1.2 Project Scope

1. Implementing natural language processing to enable users to interact with the voice bot using conversational language.
2. Providing location-based services such as store and restaurant recommendations, directions, and information about promotions and events within the mall.
3. Integrating with existing mall systems and databases to retrieve relevant information in real-time.
4. Testing the voice bot with a diverse set of users to ensure accuracy and user satisfaction.
5. Incorporating feedback and analytics into the voice bot to continually improve the user experience and provide valuable insights to the mall management.
6. Deploying the voice bot in multiple locations throughout the mall to maximize accessibility and convenience for visitors.
7. Providing ongoing maintenance and support to ensure the voice bot operates smoothly and efficiently.

1.3 Project Goals and Objectives

1.3.1 Goals

Enhance the user experience by providing convenient assistance to visitors. Increase accessibility and convenience for visitors by offering a voice bot that can be accessed from multiple locations within the mall. Providing real-time information on stores, products, promotions, events, and services within the mall. Enhancing brand awareness and customer loyalty by offering a seamless and enjoyable shopping experience. Collecting and analyzing data on visitor behavior and preferences to better understand and serve their needs. Improving the overall accessibility and navigability of the mall. Improving the overall accessibility and navigability of the mall. Through simple voice commands, we can ask them to show the direction which we are looking for, provide the shortest route for the customer to satisfy his/her need and guess every location which is asked by customer. Ensuring data privacy and security by adhering to ethical and legal guidelines for collecting and storing user data.

1.3.2 Objectives

To enhance the overall accessibility and navigability of the mall by providing real-time information on stores, products, promotions, events, and services. To increase customer engagement and loyalty by promoting products and services through the voice bot and providing a more personalized experience. To boost sales for mall stores by recommending products and services based on visitor preferences and interests. To collect and analyze data on visitor behavior and preferences to better understand and serve their needs. Provide a scalable and adaptable solution that can be easily customized to meet the specific needs and its visitors. Ensure data privacy and security by adhering to ethical and legal guidelines for collecting and storing user data. Continuously improve the voice bot by incorporating user feedback and analytics, leading to increased user satisfaction and engagement.

1.4 Organization of Report

The organization of a report for a voice bot for a mall can vary depending on the specific requirements of the project. However, a general structure that can be followed is as follows:

1. **Executive Summary:** A brief summary of the project and its goals, objectives, and key findings.
2. **Introduction:** An overview of the project, its purpose, scope, and background information on the mall and its visitors.
3. **Literature Review:** A review of existing literature and research related to voice bots, mall technology, and customer experience.
4. **Methodology:** A description of the research methods used to gather data and insights, such as user surveys, interviews, and data analysis.
5. **Results:** A detailed analysis of the data collected, including key insights and findings related to user behavior, preferences, and expectations.
6. **Discussion:** A discussion of the results and their implications for the development and implementation of the voice bot for the mall.
7. **Implementation Plan:** A detailed plan for the implementation of the voice bot, including its features, functions, and user interface design.
8. **Evaluation Plan:** A plan for evaluating the effectiveness and impact of the voice bot, including key performance indicators and metrics.
9. **Conclusion:** A summary of the project's key findings, implications, and recommendations.
10. **References:** A list of sources cited in the report.

Overall, the organization of the report should be logical and easy to follow, with clear headings and subheadings that guide the reader through the content. The report should also be visually appealing, with appropriate graphics and images that illustrate key points and data.

Chapter 2

Literature Survey

Voice bots are becoming an increasingly popular technology in the retail industry due to their ability to enhance the customer experience and drive sales. In a mall context, voice bots can provide visitors with real-time information on stores, products, promotions, events, and services within the mall, and guide them to specific locations using location-based services. Voice bots have emerged as a popular technology for enhancing customer experiences in various industries, including retail and hospitality. In recent years, many malls and shopping centers have started implementing voice bot technology to provide personalized and convenient assistance to their visitors.

A study conducted by Accenture found that 46% of consumers would be willing to use voice assistants for shopping and 56% would use them for product research. Additionally, 22% of consumers said that they have already used a voice assistant to make a purchase. A study conducted by Adobe found that voice assistants are increasingly being used for shopping and purchasing products. The study also found that voice assistants are most commonly used to search for products, compare prices, and track orders.

Another study conducted by Mindshare found that 60% of consumers prefer voice assistants over mobile apps when it comes to searching for information, making recommendations, and making purchases. In the mall context, voice bots can help visitors navigate the mall, find their way to specific stores, and receive recommendations based on their preferences. This can lead to increased engagement, loyalty, and sales for mall stores. However, there are also concerns around the privacy and security of user data collected by voice bots. It is important for mall management to adhere to ethical and legal guidelines for collecting and storing user data, and to provide clear and transparent information on how user data will be used.

Overall, these studies suggest that voice bot technology has the potential to enhance customer experiences in various industries, including retail and hospitality. Voice bots offer a unique and innovative solution for enhancing the visitor experience in malls, but it is important for mall management to carefully consider the potential benefits and drawbacks of implementing this technology, and to ensure that it aligns with the needs and expectations of their visitors.

2.1 Artificial Intelligence-Based Voice Assistant

An intelligent virtual assistant (IVA) or intelligent personal assistant (IPA) is a software agent that can perform tasks or services for an individual based on commands or questions. The term "chatbot" is sometimes used to refer to virtual assistants generally or specifically accessed by online chat. In some cases, online chat programs are exclusively for entertainment purposes. Some virtual assistants are able to interpret human speech and respond via synthesized voices. Users can ask their assistants questions, control home automation devices and media playback via voice, and manage other basic tasks such as email, to-do lists, and calendars with verbal commands. A similar concept, however with differences, underlies the dialogue systems.

This paper presents an Artificial Intelligence-based Voice Assistant (AIVA) that utilizes natural language processing and machine learning algorithms to provide a more intuitive and personalized user experience. AIVA is designed to understand and respond to user queries in a conversational manner, and to learn from user interactions to improve its accuracy and efficiency over time. The system architecture of AIVA consists of several modules, including speech recognition, natural language understanding, dialogue management, and speech synthesis. The system is trained on a large dataset of real-world user queries, and utilizes a deep neural network model for speech recognition and a recurrent neural network model for natural language understanding. AIVA is evaluated on a set of benchmark datasets, and achieves state-of-the-art results in terms of accuracy and speed. In addition, user feedback on AIVA's performance and usability is collected through a user study.

These paper presents an Artificial Intelligence (AI) based voice assistant system that can recognize and respond to user voice commands in natural language. The system employs deep learning algorithms to analyze and interpret user voice inputs, and uses Natural Language Processing (NLP) techniques to generate appropriate responses. The voice assistant is designed to be flexible and adaptable, with the ability to learn and improve over time through user interactions. The system can also be integrated with other AI-based technologies, such as computer vision and machine learning, to provide a more comprehensive and personalized user experience. The voice assistant has been tested in various settings, including a smart home environment, and has shown promising results in terms of accuracy and user satisfaction. The system has the potential to be applied in a wide range of applications, including home automation, healthcare, and customer service. Overall, the AI-based voice assistant system offers a novel and effective solution for enhancing the human-machine interface and enabling more intuitive and efficient interactions with technology.

As of 2017, the capabilities and usage of virtual assistants are expanding rapidly, with new products entering the market and a strong emphasis on both email and voice user interfaces. Apple and Google have large installed bases of users on smartphones. Microsoft has a large installed base of Windows-based personal computers, smartphones and smart speakers. Amazon has a large install base for smart speakers. Conversica has over 100 million engagements via its email and SMS interface intelligent virtual assistants for business.

2.1.1 Advantages of Paper

Here are some advantages of an Artificial Intelligence-based Voice Assistant, as highlighted in an IEEE paper:

1. **Natural Interaction:** Voice assistants provide a natural way of interacting with technology, as they can recognize and respond to natural language voice commands. This allows users to communicate with devices more intuitively, without the need for complex interfaces or menus.
2. **Personalization:** AI-based voice assistants can learn and adapt to users' preferences over time, providing a personalized experience. They can also provide tailored recommendations and suggestions based on users' past behavior and preferences.
3. **Efficiency:** Voice assistants can perform tasks quickly and efficiently, without the need for manual input. This can save users time and effort, and improve their productivity.
4. **Accessibility:** Voice assistants can be particularly beneficial for people with disabilities or mobility issues, as they provide a hands-free way of interacting with technology.
5. **Integration:** Voice assistants can be integrated with other AI-based technologies, such as machine learning and computer vision, to provide a more comprehensive and intelligent user experience.
6. **Availability:** Voice assistants are available 24/7, providing users with access to information and services at any time, from anywhere.

Overall, AI-based voice assistants offer a range of benefits that can enhance the user experience, improve efficiency, and provide greater accessibility to technology. As the technology continues to evolve, we can expect to see more innovative applications of AI-based voice assistants in various domains.

2.1.2 Disadvantages of Paper

Here are some potential disadvantages of an Artificial Intelligence-based Voice Assistant, as discussed in an IEEE paper:

1. **Privacy and Security Concerns:** Voice assistants collect and process large amounts of personal data, which can pose privacy and security risks. It is important to ensure that user data is collected, stored, and used in a secure and ethical manner.
2. **Technical Limitations:** While AI-based voice assistants have advanced significantly in recent years, they still have limitations in terms of accuracy and functionality. They may struggle to understand complex commands or accents, and may make errors or misunderstand user inputs.
3. **Dependence:** Over-reliance on voice assistants can lead to a decrease in critical thinking and problem-solving skills. Users may also become dependent on the technology for basic tasks, which can be problematic if the technology fails or is not available.
4. **Lack of Human Interaction:** The use of voice assistants can lead to a decrease in human interaction, which can have social and psychological implications. Users may become less inclined to engage in face-to-face communication or develop relationships with others.

5. Cost: The development and implementation of AI-based voice assistants can be costly, particularly for small businesses or organizations with limited resources.

Overall, while AI-based voice assistants offer a range of benefits, it is important to consider the potential drawbacks and challenges associated with their use. These issues can be mitigated through careful planning, development, and implementation of the technology, along with ongoing evaluation and refinement.



2.1.3 How to overcome the problems mentioned in Paper

There are some potential solutions to overcome the problems mentioned in an IEEE paper on Artificial Intelligence-Based Voice Assistant are:

1. **Privacy and Security Concerns:** To address privacy and security concerns, it is important to design voice assistants with privacy and security in mind. This can include implementing robust data protection policies, using secure encryption protocols, and ensuring that user data is not shared with third parties without user consent.
2. **Technical Limitations:** To address technical limitations, developers can invest in advanced machine learning and natural language processing technologies to improve accuracy and functionality. Additionally, developers can provide clear instructions for users to follow when interacting with voice assistants, to minimize errors and misunderstandings.
3. **Dependence:** To address dependence on voice assistants, it is important to encourage users to develop critical thinking and problem-solving skills, and to use voice assistants as a tool rather than a replacement for human interaction. Users should also be encouraged to develop a variety of communication skills, including face-to-face communication, to foster meaningful relationships.
4. **Lack of Human Interaction:** To address the lack of human interaction, voice assistants can be designed to encourage social interaction and promote empathy and emotional intelligence. For example, voice assistants can be programmed to use humor or provide emotional support, to enhance the user experience.
5. **Cost:** To address cost concerns, developers can use open source platforms and leverage existing technologies and resources to minimize development costs. Additionally, developers can explore partnerships with other organizations to share resources and collaborate on the development of voice assistants.

Overall, addressing the challenges and problems associated with AI-based voice assistants requires a comprehensive and holistic approach, that takes into account the needs and concerns of users, developers, and other stakeholders. By designing voice assistants that prioritize privacy, functionality, and user experience, we can unlock the full potential of this emerging technology.

2.2 DESIGN OF EMBEDDED VOICE COMMUNICATION SYSTEM

The "Design of Embedded Voice Communication System" is an IEEE paper that describes the design and implementation of an embedded voice communication system. The system is designed to be low-cost, flexible, and scalable, and is intended for use in a variety of applications, such as home automation, healthcare, and security. The paper outlines the main components of the voice communication system, including the hardware and software components. The hardware components include a microphone, a speaker, a microcontroller, and an audio codec. The software components include the voice recognition and speech synthesis algorithms, as well as the communication protocols used to communicate with other devices.

The paper then describes the design and implementation of the voice recognition and speech synthesis algorithms. The voice recognition algorithm is based on a combination of neural network and fuzzy logic techniques, which allows it to accurately recognize and interpret spoken commands. The speech synthesis algorithm is based on a concatenative approach, which allows it to produce natural-sounding speech by concatenating pre-recorded speech segments. The paper also describes the communication protocols used in the system, including the Bluetooth and Wi-Fi protocols. These protocols allow the system to communicate with other devices, such as smartphones and smart home devices, and enable remote control and monitoring of the system.

The paper concludes by describing the performance of the system and its potential applications. The system is shown to have high accuracy and reliability in recognizing and interpreting spoken commands, and is capable of performing a wide range of tasks, such as controlling home appliances, monitoring health status, and providing security alerts. The "Design of Embedded Voice Communication System" paper provides a comprehensive overview of the design and implementation of an embedded voice communication system, and demonstrates its potential for a wide range of applications. The paper highlights the importance of low-cost, flexible, and scalable systems, and demonstrates the effectiveness of combining neural network and fuzzy logic techniques in voice recognition algorithms.

2.2.1 Advantages of Paper

1. **Low Cost:** The system is designed to be low-cost, making it accessible to a wide range of users and applications.
2. **Flexibility:** The system is flexible and scalable, making it suitable for a wide range of applications, including home automation, healthcare, and security.
3. **Accuracy:** The voice recognition algorithm used in the system is based on a combination of neural network and fuzzy logic techniques, allowing it to accurately recognize and interpret spoken commands.
4. **Reliability:** The system is shown to have high accuracy and reliability in recognizing and interpreting spoken commands, making it a dependable solution for voice communication.
5. **Interoperability:** The communication protocols used in the system, such as Bluetooth and Wi-Fi, enable it to communicate with other devices.

2.2.2 Disadvantages of Paper

1. **Data security concerns:** Although consumers are using voice assistants more often, there is still great concern over the data these devices collect and the companies behind the apps on those devices. Consumers are wary of how the data is stored, who looks at it, and what happens to that information. Marketers will have to address those data and privacy concerns, or they will not get access to these prospects and their information.
2. **Disconnected interaction:** Another disadvantage is that voice assistants as a channel provide less enriching interactions than other platforms. The options are voice content only, which typically involves repurposing existing content, versus visual interactions. This may diminish some of the more meaningful engagements that marketers can have elsewhere.
3. **Reliance on device makers:** As a marketer, you are at the mercy of device makers, such as smart speaker brands, wearable device companies, vehicle manufacturers, and smart appliance producers. That means carefully researching which device makers you want to work with for sustainable results before jumping in.
4. **Investment in voice app and skill set:** It can be costly to develop the voice app for this channel. Participating in this channel may also be time intensive in terms of building an internal skill set geared toward the nuances of voice assistants. Therefore, it's important to assess the benefits and costs involved in participating in voice assistant channels.

Curious about integrating voice assistant channels into your marketing strategy? One of the first places to start with voice marketing is to try voice engine optimization (VEO), which is the process of optimizing content so that it turns up in voice searches. It can help you gain a position on these devices by focusing on the most voiced keywords, which tends to involve longer keywords and questions versus statements.

2.2.3 How to overcome the problems mentioned in Paper

In this paper, we propose a simple and convenient method to complete a multi-channel system of the interchange of Analogy voice to ACELP. In tradition, almost method is that put the algorithm of interchange into the inner space of embedded system. It's hard to complete the necessity of real-time and multi-channel. The method we proposed is that put the algorithm of PCM to ACELP into the Server. The rest work we should do is to collect the PCM that multi-channel analogy voice converted and then transmit them to the Server. Obviously, the method we proposed is simple and convenience, and the results also showed that our method is available and stable.

There are some potential solutions to overcome the problems mentioned in an IEEE paper on DESIGN OF EMBEDDED VOICE COMMUNICATION SYSTEM are:

1. Environmental Noise: The system may have difficulty recognizing voice commands in noisy environments. To overcome this, the system could use noise cancellation techniques to filter out background noise and improve voice recognition accuracy.
2. Language and Accent: The system may have difficulty recognizing voice commands spoken in different languages or accents. To overcome this, the system could be trained to recognize different languages and accents, or use a combination of voice recognition and natural language processing techniques to better understand the meaning of spoken commands.
3. Personalization: Different users may have different speech patterns or accents, which can impact the accuracy of voice recognition. One way to overcome this is to implement personalized recognition algorithms that can adapt to a user's specific speech patterns over time.
4. Integration with existing systems: In some cases, it may be challenging to integrate an embedded voice communication system with existing systems, such as home automation or healthcare systems. To address this, standard communication protocols and interfaces can be used to ensure interoperability with other devices and systems.
5. Compatibility: The system may not be compatible with all devices or platforms, limiting its usability. To overcome this, the system could use communication protocols that are widely adopted and supported, such as Bluetooth or Wi-Fi, and ensure that the system is compatible with popular voice assistants, such as Google Assistant or Amazon Alexa.
6. Security: The system may be vulnerable to security threats, such as unauthorized access or data breaches. To overcome this, the system could use encryption and authentication protocols to secure communication between devices, as well as implement security measures to protect against unauthorized access.

2.3 Crowdsourcing Environment to Create Voice Interaction Scenario of Spoken Dialogue System

This university has published the "MMDAgent" voice interaction system toolkit as open source software. Voice Interaction Agent, produced using MMDAgent, is active in various scenarios and provides voice interaction capability. Voice interaction agents produced using MMDAgent talk to people by loading a script file that describes a voice interaction scenario. To increase the agent's vocabulary, it is important to describe many voice interaction scenarios. To date, voice interaction scenarios have been described by a small organization. Therefore, they require high costs to describe many voice interaction scenarios. To resolve this problem, we construct a crowdsourcing[1] model for the creation of a voice interaction scenario. In this study, the works of creation of voice interaction scenario are divided and distributed to numerous people via the internet. Furthermore, we provide in this study a tool for creation voice interaction scenario and test operation of voice interaction agent as a web application service. We hereby reduce the cost of installation MMDAgent and provide a comfortable environment for the creation voice interaction scenario.

This university has published the "MMDAgent[2]" voice interaction system toolkit as open source software. This toolkit is a system which comprises a speech recognition engine and a speech synthesis tool with a 3-D CG rendering module. As an application example, a digital signage "Mei-chan" programmed MMDAgent exists at the university main entrance. It guides visitors around this university. Using Mei-chan, a user can enjoy talking comfortably with a voice interaction agent. The voice interaction agent produced by MMDAgent talks to people by loading a script file with descriptions of voice interaction scenarios. This script file is called the Finite State Transducer (FST) script. To increase the agent's vocabulary, it is important to describe many voice interaction scenarios. To date, voice interaction scenarios have been described using a simple organization. Therefore, high costs are incurred when describing many voice interaction scenarios.

To resolve this problem, in this study, we construct a crowdsourcing model for creation of a voice interaction scenario. Crowdsourcing is a process that organizes workflow by assigning a task to many people via the internet. We seek realization of a system that facilitates the editing of voice interaction scenarios by numerous people. However, creating a voice interaction scenario necessitates the installation of MMDAgent. A normal text editor is unsuitable for editing the FST script. Therefore, we provide tools for editing FST scripts and for testing operations of MMDAgent as a web application service, thereby saving users much trouble.

This paper's organization is the following. In section 2, we introduce MMDAgent, which is used for our study. Related works "MMDAgent Scenario Editor" and "Mobile Mei-chan Skype version" are introduced in section 3. We explain our proposed method in section 4. Experience and evaluation of our prototype system are presented in section 5. Finally, conclusions and subjects of future work are explained in section 6.

2.3.1 Advantages of Paper

The advantages of using a crowdsourcing environment to create voice interaction scenarios for a spoken dialogue system can include:

1. **Diverse input:** Crowdsourcing allows for a diverse range of inputs from different individuals, which can help in creating a more comprehensive and varied set of voice interaction scenarios for the spoken dialogue system.
2. **Cost-effective:** Crowdsourcing can be a cost-effective way to create voice interaction scenarios, as it eliminates the need for hiring and training a large team of designers and developers.
3. **Speed:** Crowdsourcing can help in completing the task of creating voice interaction scenarios quickly as it allows for multiple individuals to work on different parts of the project simultaneously.
4. **Feedback and improvement:** Crowdsourcing can provide an opportunity for obtaining feedback from users, which can help in improving the voice interaction scenarios and the overall system.
5. **Scalability:** Crowdsourcing can be scaled up or down as required, depending on the size of the project or the number of voice interaction scenarios required.

These advantages can make crowdsourcing a viable option for creating voice interaction scenarios for a spoken dialogue system in a cost-effective, time-efficient, and user-driven manner.

2.3.2 Disadvantages of Paper

The disadvantages of using a crowdsourcing environment to create voice interaction scenarios for a spoken dialogue system can include:

1. **Quality control:** Crowdsourcing can lead to inconsistencies in the quality of the voice interaction scenarios created, as the input comes from a diverse range of individuals who may not have the same level of expertise or understanding of the project requirements.
2. **Security and confidentiality:** Crowdsourcing can pose a risk to the security and confidentiality of the project, as the input may come from individuals who are not bound by confidentiality agreements or may not adhere to security protocols.
3. **Dependence on the crowd:** Crowdsourcing can create a dependence on the crowd to create the voice interaction scenarios, which can be challenging if the crowd is not available or willing to participate.
4. **Limited creativity:** Crowdsourcing may limit creativity as the input is based on a specific set of guidelines and requirements, which may restrict the creative freedom of the participants.
5. **Time-consuming:** Crowdsourcing can be time-consuming, as it involves coordinating and managing the input from multiple individuals, which can lead to delays in the project completion.

These disadvantages can make crowdsourcing a challenging option for creating voice interaction scenarios for a spoken dialogue system, and it is essential to weigh the pros and cons before choosing this approach.

2.3.3 How to overcome the problems mentioned in Paper

To overcome the problems mentioned in the paper on using crowdsourcing environments to create voice interaction scenarios for spoken dialogue systems, several steps can be taken:

1. **Quality control:** To ensure consistency in the quality of the voice interaction scenarios created, clear guidelines and instructions can be provided to the participants. Additionally, a review process can be put in place to ensure that the scenarios meet the required quality standards.
2. **Security and confidentiality:** To address security and confidentiality concerns, participants can be required to sign non-disclosure agreements and adhere to security protocols. The platform used for crowdsourcing can also have security features in place to protect the data.
3. **Dependence on the crowd:** To address the challenge of dependence on the crowd, alternative methods such as in-house development or hiring dedicated contractors can be considered. This can help ensure that the project timeline is not affected by the availability of the crowd.
4. **Limited creativity:** To address the issue of limited creativity, participants can be given more freedom to explore different scenarios and come up with innovative solutions. This can be achieved by providing a broader set of guidelines and encouraging participants to think outside the box.
5. **Time-consuming:** To address the challenge of time constraints, efficient management and coordination of the crowdsourcing process can be put in place. Additionally, using platforms that facilitate communication and collaboration among participants can help reduce the time required to complete the project.

By taking these steps, the challenges associated with using crowdsourcing environments for creating voice interaction scenarios can be effectively addressed, enabling the creation of high-quality voice-based dialogue systems

2.4 Technical Review

A voice bot for a mall is an AI-powered chatbot that interacts with customers using voice commands to provide assistance, answer inquiries, and facilitate purchases. Here is a technical review of the key aspects of a voice bot for a mall:

1. **Speech Recognition:** The speech recognition module is a critical component of a voice bot. It uses machine learning algorithms to convert spoken words into text. The module needs to be accurate and capable of understanding different accents, dialects, and languages.
2. **Natural Language Processing (NLP):** Once the speech is transcribed, the NLP module processes the text and extracts relevant information. NLP helps the bot to understand the intent of the user's command, determine the context of the conversation, and generate appropriate responses.
3. **Dialog Management:** The dialog management module is responsible for managing the conversation flow between the user and the bot. It uses rules-based and machine learning algorithms to determine the next best action or response based on the user's previous interactions.
4. **Integration with Backend Systems:** The voice bot should be integrated with the mall's backend systems to access product and inventory information, order history, and other relevant data. This integration ensures that the bot can provide accurate information and facilitate purchases.
5. **Text-to-Speech (TTS):** The TTS module converts the bot's response text into speech. The TTS needs to be of high quality and sound natural to enhance the user's experience.
6. **Voice User Interface (VUI):** The VUI is the interface through which users interact with the voice bot. It should be intuitive, user-friendly, and provide clear instructions on how to use the bot.
7. **Security:** The voice bot should be designed with robust security measures to protect sensitive user data, prevent fraud, and ensure compliance with data protection regulations.

Overall, a voice bot for a mall needs to be designed with a user-centric approach to enhance the customer experience. The technical aspects of the bot should be optimized to provide accurate and timely responses, facilitate purchases, and improve customer satisfaction.

2.4.1 Advantages of Technology

Improved Customer Experience: Voice bots can provide customers with personalized and immediate assistance, making it easier and faster for them to find products, services, and information about the mall. With a voice bot, customers can use natural language to interact with the bot and receive relevant information and recommendations.

1. **24/7 Availability:** Voice bots can operate 24/7, providing customers with support even outside regular mall hours. This can help to increase customer satisfaction and loyalty, as customers can get assistance whenever they need it.
2. **Cost-Effective:** Voice bots can help reduce operational costs by automating routine tasks such as answering frequently asked questions, processing orders, and scheduling appointments. This can free up staff to focus on more complex tasks and improve their productivity.
3. **Scalability:** A voice bot can handle multiple customer interactions simultaneously, providing a scalable solution for managing customer inquiries and requests.
4. **Data Collection and Analysis:** Voice bots can collect valuable customer data and feedback, which can be used to improve customer service and support, optimize marketing strategies, and make informed business decisions.
5. **Competitive Advantage:** Offering a voice bot can give a mall a competitive advantage over other malls that do not offer such a service. It can also help to position the mall as a modern and innovative shopping destination, appealing to tech-savvy customers.

Overall, using a voice bot for a mall can help to enhance the customer experience, reduce operational costs, and provide valuable insights into customer behavior and preferences.

2.4.2 Reasons to use this Technology

The main reason for using a voice bot for a mall is to enhance the customer experience by providing personalized and immediate assistance to customers. Voice bots can assist customers in finding products and services, answering inquiries, and facilitating purchases using natural language commands. Using a voice bot can help a mall to differentiate itself from competitors by offering a modern and innovative shopping experience. Voice bots can operate 24/7, providing support even outside regular mall hours, which can improve customer satisfaction and loyalty.

Voice bots can also help to reduce operational costs by automating routine tasks, such as answering frequently asked questions, processing orders, and scheduling appointments. This can free up staff to focus on more complex tasks and improve their productivity. Furthermore, a voice bot can collect valuable customer data and feedback, which can be used to improve customer service and support, optimize marketing strategies, and make informed business decisions. By providing insights into customer behavior and preferences, a voice bot can help a mall to tailor its offerings to better meet the needs and preferences of its customers.

Overall, using a voice bot for a mall can help to enhance the customer experience, reduce costs, and provide valuable insights into customer behavior and preferences.

2.4.3 How to overcome the problems mentioned in Paper

Voice bots for malls can face a number of challenges, but some common ones include difficulty understanding accents or speech patterns, inability to accurately interpret requests or questions, and difficulty with complex or nuanced requests.

To overcome these challenges, there are several strategies that can be employed:

1. **Improve the accuracy of speech recognition:** One way to improve the accuracy of voice bots is to train them on a diverse range of accents and speech patterns. This can be done by using a large dataset of audio recordings, and applying machine learning algorithms to identify patterns in the data. Another approach is to use a pre-trained language model, like GPT-3, to recognize and understand natural language.
2. **Use context to interpret requests:** Voice bots can be programmed to use context to better interpret requests. For example, if a customer says "I'm looking for shoes", the bot can use previous interactions or data about the customer to suggest the most relevant shoes. This can also involve collecting additional information about the customer's preferences or needs.
3. **Provide multiple channels for communication:** While voice bots are becoming more advanced, they may not be suitable for all customers. Providing additional channels for communication, such as chatbots or human assistants, can help to cater to a wider range of customers.
4. **Monitor and analyze interactions:** Monitoring and analyzing interactions with voice bots can help to identify areas for improvement. This can involve analyzing transcripts of conversations, identifying common issues, and using this information to make improvements to the bot's algorithms or programming.

Overall, improving the accuracy of speech recognition, using context to interpret requests, providing multiple channels for communication, and monitoring interactions can all help to overcome challenges faced by voice bots in malls.

Chapter 3

Project Planning

Project Scope: The rise of smart speakers with screens could open the door for voice shopping to actually become what it's forecast to be. Devices like the Echo Show and Google Home Hub are the beginning of the multi-modal voice experience, where you can see a screen and control it with your voice. Extend this to the Fire Stick TV with Alexa on-board, and the TV could easily become the shopping mall of the future.

Voice is also being extended into the web by companies like Voysis. Rather than wasting time with filtering and searching on a retailer's website, customers using Voysis can just ask for "a pair of red men's Nike's trainers under \$100 in a size 9" and Voysis will do the filtering for you.

Then there's the emerging use case of the car. Being able to shop for groceries or order takeout from the car creates a completely new environment where people will be able to shop. With almost all major car manufacturers, including Mercedes, BMW, Tesla and Ford shipping new motors with in-car voice assistants, and devices like the Amazon Alexa Echo Auto equipping older vehicles with a voice assistant, you'll soon be able to order those flowers you forgot for Mother's Day, place a bet on the big game, or impulsively purchase an audiobook to listen to on your way home, all from within your vehicle and all without taking your eyes off the road.

3.1 Members and Capabilities

Khan Mohammed Usman Mohammed Jama: Back-End Developer, Natural Language Processing and Map Designing.

Mohd Yusuf Ashfaque: Back-End Developer, NLP Engineer.

Khan Mohammed Zeeshan Raza Riyaz Ahmed: Back-End Developer, Creating Dataset.

Gupta Shailesh Shrikrishna: Back-End developer and Support Engineer.

3.2 Roles and Responsibilities

Khan Mohammed Usman Mohammed Jama: Back-End Development and Project Manager.

Mohd Yusuf Ashfaque: Technical Lead and Natural Language Processing Development.

Khan Mohammed Zeeshan Raza Riyaz Ahmed: Database Administrator, Managing Dataset, Voice User Interface (VUI) Designer and Research.

Gupta Shailesh Shrikrishna: System Architecture, Quality Assurance Tester and Map.

3.3 Assumptions and Constraints

Assumptions:

The team has the necessary expertise in Python, Natural Language Processing and related technologies. Target is to user is interested in using the voice assistance. The team has access to the necessary hardware, software and other resources to build and deploy the platform. The mall has a good and stable internet connection for the voice bot to function properly. The users of the voice bot have a basic understanding of the English language. The voice bot will only provide information about the mall and its products/services and will not be responsible for any transactions or purchases. The team can secure payment processor and other services providers to integrate their services into the platform. The voice bot will be able to accurately recognize the user's voice and respond accordingly.

Constraints:

Limited budget: The project may have a limited budget which could restrict the development of certain features or limit the quality of the system. Time constraints: The project timeline may be limited, which could result in a simplified version of the voice bot being developed or certain features being excluded. Hardware and software requirements: The project may be constrained by the available resources, including hardware and software, which could impact the functionality and accuracy of the voice bot. Security and privacy concerns: The voice bot must ensure the privacy and security of user data, which may require additional resources and measures. Compatibility: The voice bot may need to be compatible with different types of devices and operating systems, which could pose a challenge. Language and dialects: The voice bot must be able to understand and respond to different languages and dialects, which could be a challenge in areas with diverse populations. Technical expertise: Developing and maintaining a voice bot for a mall may require technical expertise, which could be a constraint for some organizations.

3.4 Project Management Approach

1. **Requirement Planning:** This phase involves gathering and analysing user requirement. In this phase, the project manager works closely with the user to identify their needs and expectations. Once the requirements are identified, the project manager creates a plan for the development process.
2. **User Design:** When designing a voice bot for a mall, it's important to keep the user experience in mind. Here are some tips to help you create a user-friendly voice bot.
3. **Define the purpose:** Identify the main purpose of the voice bot. Is it to provide information about the mall, help with navigation, or provide recommendations for stores or products? Once you have a clear idea of the purpose, you can design the conversation flow accordingly.
4. **Use simple language:** Keep the language simple and easy to understand. Avoid using complex vocabulary or industry jargon that might confuse users.
5. **Construction:** Determine the main purpose of the voice bot. Is it to provide information about the mall, help with navigation, or offer recommendations for stores or products?
6. **Choose a voice platform:** There are several voice platforms available, such as Amazon Alexa, Google Assistant, or Microsoft Cortana. Choose a platform that suits your needs and audience.
7. **Create a conversation flow:** Create a conversation flow that guides users through the voice bot experience. The conversation flow should be designed to help users achieve their goals as quickly and easily as possible.

3.5 Ground Rules for the Project

1. **Respect privacy:** The voice bot should not collect or share any personal information without the explicit permission of the user.
2. **Provide clear instructions:** The voice bot should use clear and concise language to provide instructions to users.
3. **Be polite and professional:** The voice bot should use polite language and a professional tone when communicating with users.
4. **Be responsive:** The voice bot should respond quickly and accurately to user requests and queries.
5. **Keep it simple:** The voice bot should use simple language and avoid complex vocabulary or jargon that may confuse users.
6. **Be helpful:** The voice bot should provide helpful information and assistance to users, such as store locations, hours of operation, and sales promotions.

3.6 Project Budget

The project budget for a voice bot for mall can depending on several factors such as the complexity of the system, the hardware and software components used, and the scope of the project. Here are some items that may need to be included in a project budget for a voice bot for mall:

1. Hardware costs: This may include the cost of a server, microphones, speakers, and other necessary hardware.
2. Software costs: This may include the cost of natural language processing (NLP) and machine learning (ML) software, as well as any other software needed for the project.
3. Development costs: This may include the cost of hiring developers, data scientists, and other technical personnel to work on the project.
4. Testing costs: This may include the cost of testing the system and identifying any issues or bugs.
5. Maintenance costs: This may include the cost of ongoing maintenance and updates to the system after it has been developed and deployed.
6. Miscellaneous expenses: This may include any other expenses that arise during the project, such as travel expenses, office supplies, and so on.

It's important to create a detailed budget that takes into account all of the necessary expenses and allows for some flexibility in case unexpected expenses arise.

3.7 Project Timeline

The timeline for developing a voice bot for a mall can vary depending on the complexity of the project and the resources available. Here is a general timeline for developing a voice bot for a mall.

1. Planning and Research: This stage involves identifying the objectives of the voice bot, the target audience, and the features required. It may take 1-2 weeks to complete this stage.
2. Design and Development: This stage involves designing the user interface, developing the bot's voice and personality, and building the necessary integrations with back-end systems. It may take 4-6 weeks to complete this stage.
3. Testing and Quality Assurance: This stage involves testing the voice bot for functionality, usability, and performance. It may take 2-3 weeks to complete this stage.
4. Deployment and Launch: This stage involves deploying the voice bot to production and launching it to the public. It may take 1-2 weeks to complete this stage.
5. Maintenance and Upgrades: This stage involves maintaining the voice bot, monitoring its performance, and making upgrades as necessary to improve its functionality and user experience. This is an ongoing process that may continue indefinitely.

Overall, the timeline for developing a voice bot for a mall can range from 8-14 weeks or more, depending on the complexity of the project and the resources available.

Chapter 4

Software Requirements Specification

4.1 Overall Description

A voice bot for a mall is an interactive conversational interface that uses natural language processing (NLP) and artificial intelligence (AI) to provide information and assistance to mall visitors. The voice bot can be accessed through a variety of channels such as phone, smart speakers, or chat platforms.

The purpose of a voice bot for a mall is to enhance the visitor experience by providing quick and convenient access to information about the mall, such as store locations, hours of operation, sales promotions, and events. The voice bot can also assist with navigation, provide recommendations, and answer frequently asked questions.

The voice bot can be designed to have a unique personality and voice that aligns with the brand image of the mall. It can be programmed to understand various accents, dialects, and languages, making it accessible to a diverse range of visitors.

4.1.1 Product Perspective

From a product perspective, a voice bot for a mall can provide several benefits for both mall management and visitors. Here are some examples:

Increased Efficiency: A voice bot can provide quick and efficient access to information and assistance, reducing the need for visitors to spend time searching for information or waiting in line for customer service.

Improved Visitor Experience: A voice bot can provide a more personalized and engaging shopping experience by providing recommendations, personalized promotions, and navigation assistance.

24/7 Availability: A voice bot can be available 24/7, providing assistance to visitors outside of regular mall hours.

Cost Savings: A voice bot can reduce the need for human customer service representatives, potentially resulting in cost savings for mall management.

Analytics and Insights: A voice bot can provide valuable analytics and insights into visitor behavior, preferences, and needs, which can be used to improve the overall visitor experience and make informed business decisions.

Multilingual Support: A voice bot can support multiple languages, making it accessible to a diverse range of visitors.

4.1.2 Product Features

1. **Store Locator:** The voice bot can provide information on store locations, directions, and hours of operation.
2. **Sales and Promotions:** The voice bot can inform visitors about ongoing sales and promotions, including discount codes and special offers.
3. **Navigation Assistance:** The voice bot can provide assistance with navigating the mall, including directions to specific stores or areas of interest.
4. **Personalized Recommendations:** The voice bot can provide personalized recommendations based on visitor preferences, such as stores or products they have previously shown interest in.
5. **Multilingual Support:** The voice bot can support multiple languages, making it accessible to a diverse range of visitors.
6. **Event Information:** The voice bot can provide information on upcoming events or activities in the mall, including dates, times, and locations.
7. **Weather Information:** The voice bot can provide information on the local weather forecast, including temperature and conditions.
8. **Dining Recommendations:** The voice bot can provide recommendations on nearby restaurants or food options within the mall.
9. **Feedback and Suggestions:** The voice bot can provide visitors with a platform to provide feedback or suggestions on their experience, helping mall management to continuously improve the visitor experience.
10. **Integration with Mobile App:** The voice bot can integrate with a mall's mobile app, allowing visitors to access the voice bot through their mobile device.

4.1.3 User Classes and Characteristics

Visitors: Visitors are individuals who are visiting the mall for shopping or leisure. They may have varying levels of familiarity with the mall and its layout, and may require assistance with finding stores, locating specific products, or navigating the mall.

Tourists: Tourists are visitors who are not familiar with the area or the mall. They may require assistance with finding nearby attractions, transportation, or accommodations.

Shoppers: Shoppers are individuals who are primarily interested in shopping. They may require assistance with finding specific stores, locating products, or learning about sales and promotions.

Foodies: Foodies are individuals who are primarily interested in dining and food options within the mall. They may require assistance with finding nearby restaurants or food options, making reservations, or learning about special promotions or discounts.

Event-goers: Event-goers are individuals who are visiting the mall for a specific event, such as a concert, exhibition, or festival. They may require assistance with finding the location of the event, purchasing tickets, or learning about the schedule.

4.1.4 Operating Environment

Hardware: The voice bot may require hardware components such as microphones, speakers, and processors to operate. These components can be integrated into kiosks or other physical structures within the mall.

Software: The voice bot will require software components to process and respond to user input, such as natural language processing (NLP) and speech recognition software.

Cloud Computing: The voice bot may leverage cloud computing services to process and store data, such as user profiles, visitor behavior, and analytics.

Internet Connectivity: The voice bot will require a stable and reliable internet connection to function properly and respond to user requests in real-time.

Integration with Backend Systems: The voice bot may need to integrate with backend systems such as customer relationship management (CRM) software, point-of-sale (POS) systems, and inventory management systems to provide accurate and up-to-date information to users.

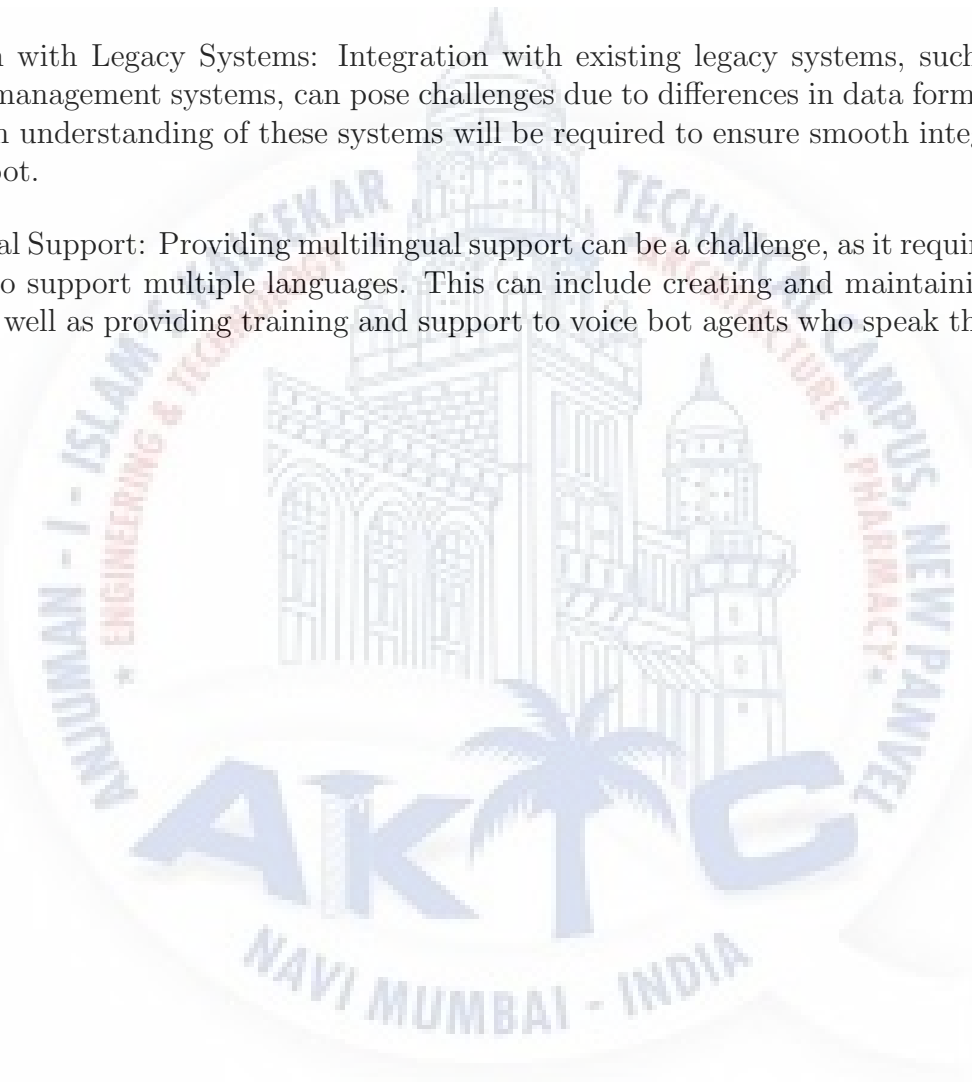
4.1.5 Design and Implementation Constraints

Limited Access to Visitor Data: Privacy concerns may limit the amount of visitor data that can be collected and stored by the voice bot. This may impact the ability of the voice bot to provide personalized recommendations and tailored experiences to users.

Variable Internet Connectivity: The quality of internet connectivity within the mall environment may vary, which can impact the speed and reliability of the voice bot. Strategies for mitigating this constraint can include caching frequently used responses, and implementing a fallback system for when internet connectivity is lost.

Integration with Legacy Systems: Integration with existing legacy systems, such as POS or inventory management systems, can pose challenges due to differences in data formats or APIs. A thorough understanding of these systems will be required to ensure smooth integration with the voice bot.

Multilingual Support: Providing multilingual support can be a challenge, as it requires extensive resources to support multiple languages. This can include creating and maintaining language models, as well as providing training and support to voice bot agents who speak the supported languages.



4.2 System Features

4.2.1 System Feature

1. **Directory and Navigation:** The voice bot can provide visitors with a directory of stores and locations within the mall, as well as provide guidance on navigating to specific stores or locations.
2. **Promotions and Offers:** The voice bot can inform visitors of promotions and offers available within the mall, as well as provide information on how to redeem them.
3. **Product Information:** The voice bot can provide visitors with information on products and services offered by stores within the mall, including pricing, availability, and reviews.
4. **Assistance and Support:** The voice bot can provide visitors with assistance and support for a variety of needs, such as lost and found, first aid, or wheelchair access.
5. **Events and Entertainment:** The voice bot can inform visitors of upcoming events and entertainment within the mall, as well as provide information on ticketing and scheduling.
6. **Feedback and Suggestions:** The voice bot can collect feedback and suggestions from visitors, which can be used to improve the mall experience and better tailor services to visitors' needs.
7. **Personalization:** The voice bot can provide personalized recommendations to visitors based on their previous behavior and preferences within the mall, as well as leverage machine learning algorithms to continually improve the accuracy of these recommendations.

4.3 External Interface Requirements

4.3.1 User Interfaces

The user interface for a voice bot for a mall would consist primarily of a voice user interface (VUI) that visitors can use to interact with the system using their voice. The VUI would be the primary way for visitors to ask questions, receive recommendations, and get assistance with navigating the mall.

The design of the VUI should aim to be simple, intuitive, and conversational, while also providing visitors with the information and assistance they need. Some potential design considerations for the VUI could include:

1. **Clear and natural language:** The VUI should use clear and natural language that is easy for visitors to understand. It should avoid using technical jargon or complex language that could confuse visitors.
2. **Voice recognition and response:** The VUI should be able to recognize visitors' voice commands and respond in a conversational manner. It should be able to understand different accents and dialects, and provide responses that are relevant and helpful.
3. **Multimodal interaction:** The VUI could be integrated with other interfaces, such as digital signage or mobile apps, to provide a multimodal interaction experience. For example, visitors could ask the voice bot for directions to a store and then receive a map on their mobile device.
4. **Personalization:** The VUI could be designed to provide personalized recommendations and assistance to visitors based on their previous behavior and preferences within the mall. For example, it could suggest stores or products based on visitors' previous purchases or browsing history.
5. **Accessibility:** The VUI should be designed to be accessible to all visitors, regardless of their abilities or disabilities. It should support features such as speech-to-text and text-to-speech, as well as provide alternative forms of interaction for visitors who are unable to use voice commands.

4.3.2 Hardware Interfaces

The hardware interface used in a voice bot for mall can also vary depending on the specific implementation and technology used. However, here are some common hardware components that may be used:

1. **Microphone:** A microphone is used to capture the user's voice input.
2. **Speaker:** A speaker is used to provide audio output to the user.
3. **Computing devices:** Depending on the size and complexity of the voice bot, it may be hosted on a range of computing devices, such as servers, cloud instances, or microcontrollers.
4. **Sensors:** In some cases, sensors such as proximity sensors or motion sensors may be used to gather additional data about the user's location and movements within the mall.

5. Network devices: Network devices such as routers, switches, and modems may be used to establish and manage network connections between the voice bot and other devices or services.

Overall, the hardware interface used in a voice bot for mall will depend on the specific requirements and constraints of the project, as well as the technologies and services that are being integrated into the bot.

4.3.3 Software Interfaces

The software interface used in a voice bot for mall can vary depending on the specific implementation and technology include:

1. Natural Language Processing (NLP) platforms: These platforms allow developers to create chatbots and voice bots that can understand natural language inputs and respond accordingly. Examples of NLP platforms include Dialogflow, IBM Watson, and Amazon Lex.
2. Voice recognition software: This software allows the voice bot to recognize and understand spoken words and phrases. Examples of voice recognition software include Google Cloud Speech-to-Text and Microsoft Azure Speech Services.
3. Integrated Development Environments (IDEs): IDEs are software applications that provide a comprehensive environment for coding, debugging, and testing software. Examples of IDEs that may be used for voice bot development include Visual Studio and Eclipse.
4. APIs: APIs (Application Programming Interfaces) provide a set of protocols and tools for building software applications. APIs may be used to integrate various technologies and services into a voice bot, such as location services, weather APIs, and social media APIs.
5. Database management systems: These systems are used to manage and store data related to the voice bot's interactions with users.

4.3.4 Communications Interfaces

1. Voice Over Internet Protocol (VoIP): VoIP could be used to provide voice communication between visitors and the voice bot. This would involve using a network connection, such as Wi-Fi or cellular data, to transmit voice data between the visitor's device and the voice bot's server.
2. Text-based chat interface: Visitors could also interact with the voice bot through a text-based chat interface. This could involve using messaging apps, such as Facebook Messenger or WhatsApp, to send text-based queries and receive responses from the voice bot.
3. Short Message Service (SMS): SMS could be used to provide a simple and reliable communication interface for visitors to interact with the voice bot. This would involve sending text-based queries to a specific phone number associated with the voice bot, and receiving responses back via SMS.
4. In-app messaging: Visitors could also interact with the voice bot through a messaging interface integrated into a mall-specific mobile app. This would provide a convenient and seamless interface for visitors to access mall-specific information and services.

4.4 Nonfunctional Requirements

4.4.1 Performance Requirements

Response time: The voice bot should be designed to provide fast and responsive service to visitors, with minimal delay between the time a query is made and the response is received. Response times should be optimized for the specific use case, taking into account factors such as network latency, processing time, and the complexity of the query.

Scalability: The voice bot should be designed to scale seamlessly with increasing user load and usage patterns. This could involve using cloud-based infrastructure and services to provide elastic scaling capabilities, or designing the system architecture with scalability in mind from the outset.

Availability: The voice bot should be designed to be highly available, with minimal downtime or service disruptions. This could involve using redundant infrastructure and fail over mechanisms to ensure that the system remains operational even in the event of hardware or software failures.

4.4.2 Safety Requirements

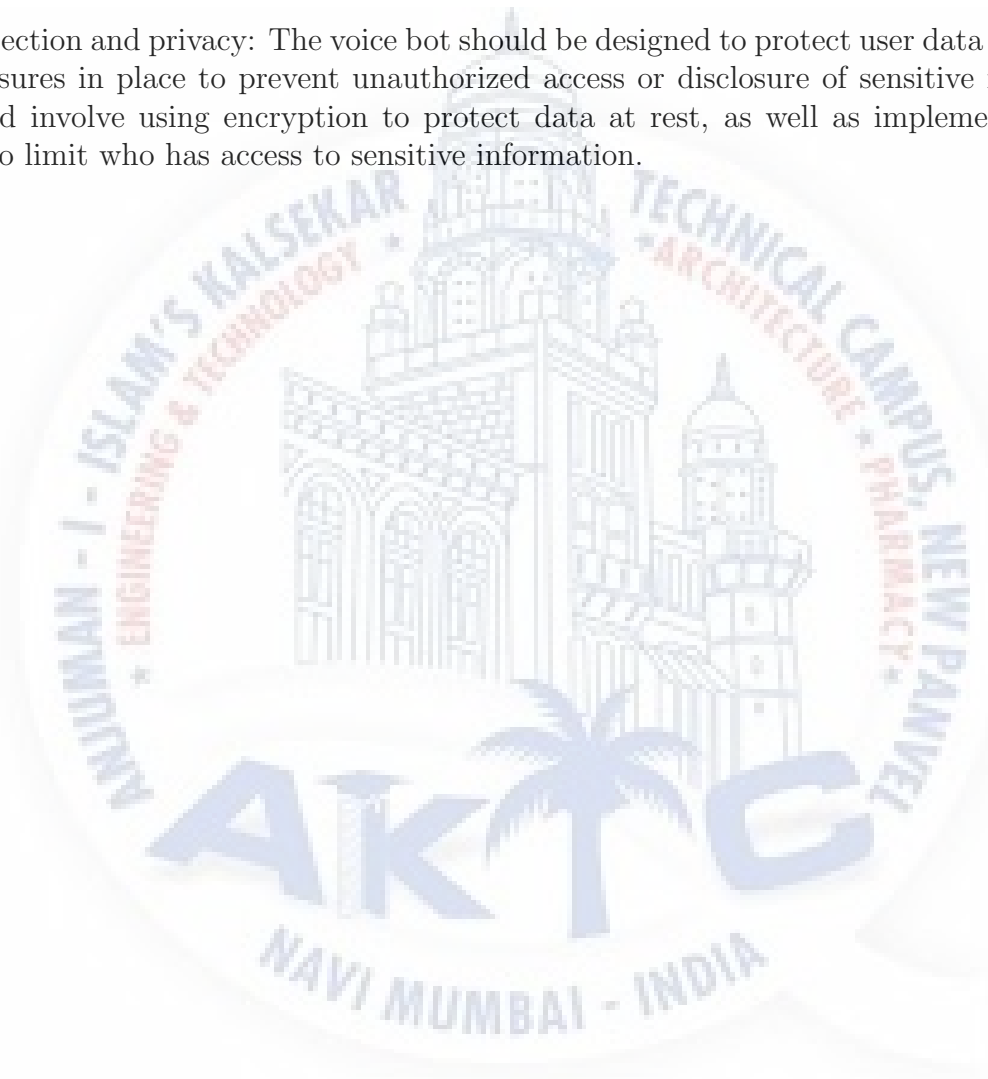
- 1. Privacy and data protection:** The voice bot should be designed to protect user privacy and data, with measures in place to prevent unauthorized access or use of user data. This could involve using secure communication protocols, encryption, and access controls to ensure that user data is protected at all times.
- 2. Compliance with regulations:** The voice bot should be designed to comply with relevant laws and regulations governing the collection, storage, and use of user data. This could involve ensuring that user data is collected and used in accordance with local data protection laws and regulations, as well as any industry-specific regulations that apply to the use of voice bots in a mall setting.
- 3. Clear communication:** The voice bot should be designed to communicate clearly and effectively with visitors, with appropriate warnings and instructions provided as necessary to ensure their safety. For example, if the voice bot is providing directions or recommendations for navigating the mall, it should provide clear and accurate information to ensure that visitors can navigate safely and avoid any potential hazards.
- 4. Robust error handling:** The voice bot should be designed with robust error handling and recovery mechanisms, to ensure that any errors or malfunctions are detected and addressed quickly and safely. This could involve using automated monitoring and alerting systems to detect errors, as well as providing clear instructions for visitors in the event of a malfunction or system failure.

4.4.3 Security Requirements

Authentication and authorization: The voice bot should require users to authenticate themselves before allowing access to sensitive information or features. This could involve using methods such as passwords, biometric authentication, or multi-factor authentication to verify user identities.

Secure communication: The voice bot should use secure communication protocols, such as HTTPS or SSL/TLS, to encrypt all data transmitted between the user and the system. This will help protect against interception and eavesdropping by third parties.

Data protection and privacy: The voice bot should be designed to protect user data and privacy, with measures in place to prevent unauthorized access or disclosure of sensitive information. This could involve using encryption to protect data at rest, as well as implementing access controls to limit who has access to sensitive information.



Chapter 5

System Design

5.1 System Requirements Definition

Purpose: The first step is to determine the purpose of the voice bot. Is it going to be used for customer service, wayfinding, promotions, or a combination of these?

User Interface: The voice bot should have a user-friendly interface that is easy to understand and use for all customers, regardless of their technical expertise. This includes providing clear instructions, easy-to-use voice commands, and a conversational tone.

5.1.1 Functional requirements

Customer Service: The voice bot should be able to provide customers with information on products and services, store locations, hours of operation, and other relevant information.

Way finding: The voice bot should be able to provide customers with directions to specific stores, restrooms, or other locations within the mall.

Order Placement: The voice bot should be able to process orders for customers, such as ordering food from a restaurant or purchasing items from a store.

Promotions: The voice bot should be able to provide customers with information on current promotions, discounts, and offers within the mall.

Feedback: The voice bot should be able to collect feedback from customers on their shopping experience and use that feedback to improve its performance over time.

Personalization: The voice bot should be able to personalize its responses based on the customer's shopping history, preferences, and location within the mall.

Booking and Reservations: The voice bot should be able to make reservations or bookings for customers, such as booking a table at a restaurant or scheduling an appointment with a store.

Emergency Assistance: The voice bot should be able to provide emergency assistance to customers, such as calling for medical assistance or reporting a security concern.

Payment Processing: The voice bot should be able to process payments for customers, such as accepting payment for purchases made through the bot.

Analytics and Reporting: The voice bot should be able to track and report on key performance metrics, such as customer engagement, satisfaction, and conversion rates, to enable continuous improvement and optimization of the bot's performance.

5.1.2 System requirements (non-functional requirements)

Performance: The voice bot should be able to respond quickly and efficiently to customer queries, with minimal latency or delay.

Reliability: The voice bot should be available to customers 24/7, with high uptime and minimal downtime for maintenance or upgrades.

Scalability: The voice bot should be able to handle a large volume of concurrent interactions, especially during peak hours or events, without slowing down or crashing.

Security: The voice bot should have appropriate security measures in place to protect customer information and prevent unauthorized access.

Accuracy: The voice bot should be able to accurately understand and interpret customer queries, regardless of accents, dialects, or variations in speech patterns.

Adaptability: The voice bot should be able to adapt to changing customer needs and preferences, with the ability to learn and improve over time.

Accessibility: The voice bot should be accessible to all customers, regardless of their abilities or disabilities, with support for alternative input methods or assistive technologies.

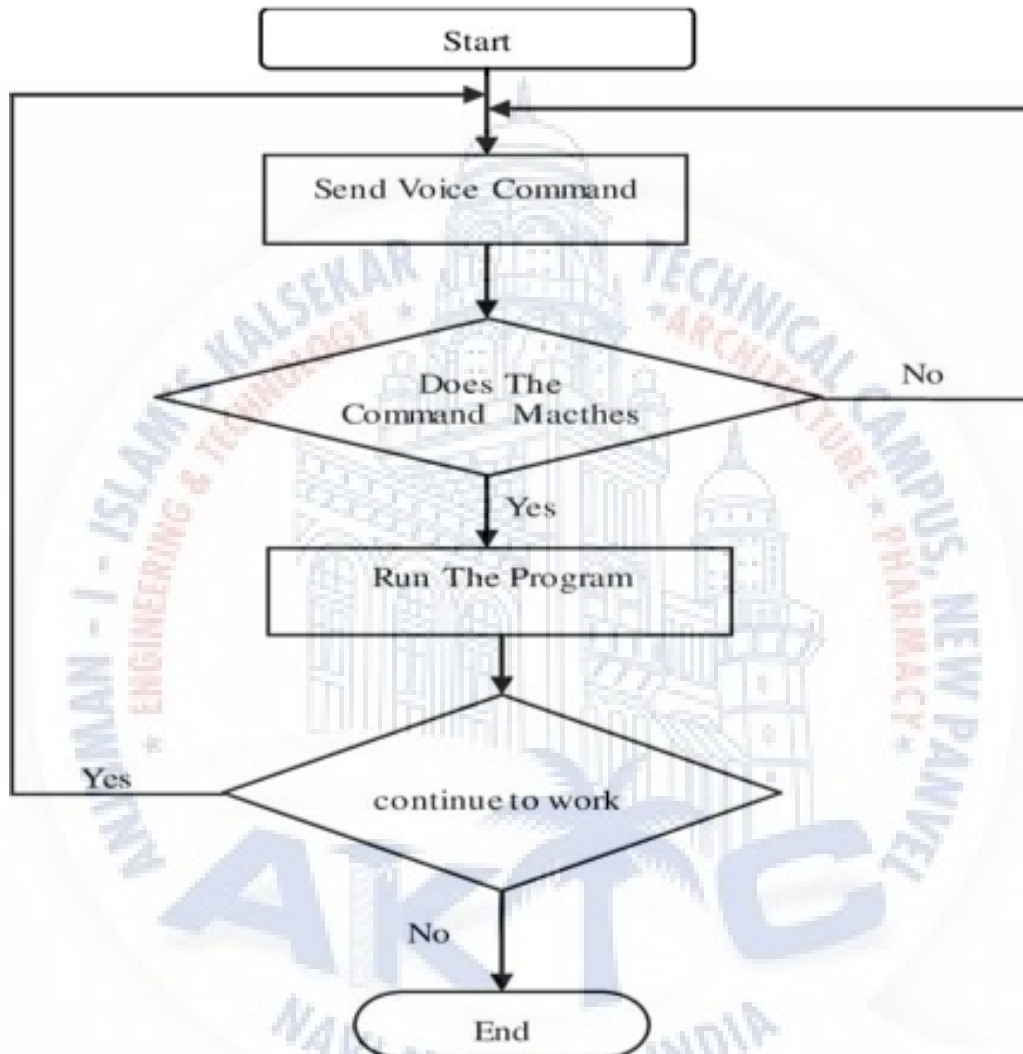
Usability: The voice bot should have a simple, intuitive interface that is easy to use for customers of all ages and technical skill levels.

Maintainability: The voice bot should be easy to maintain and update, with clear documentation and a modular architecture that supports easy upgrades or modifications.

Compliance: The voice bot should comply with all relevant regulations and standards, including data privacy laws and accessibility guidelines, to ensure that it is accessible and usable for all customers.

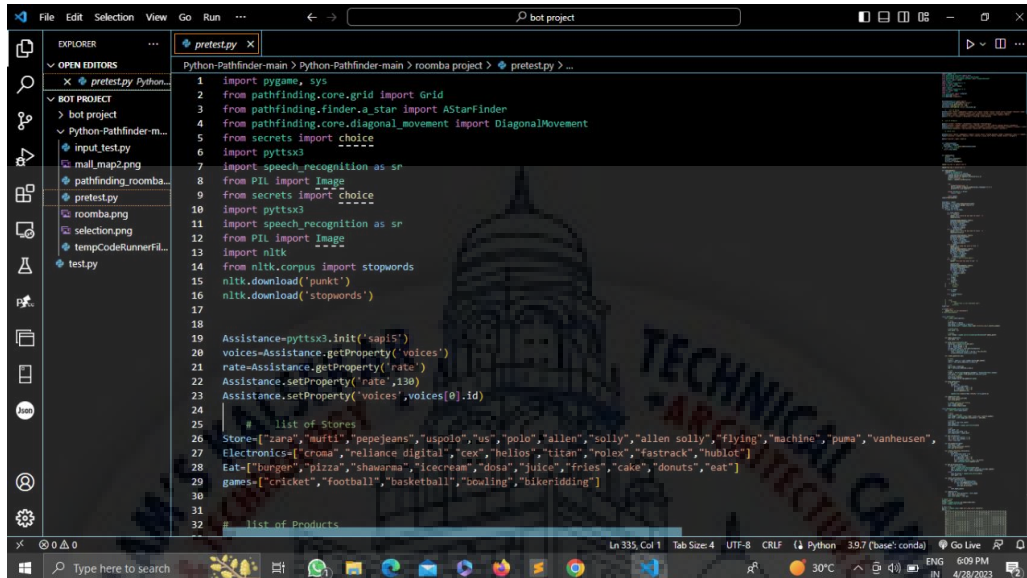


5.2 System Architecture Design



5.3 Sub-system Development

5.3.1 Module1

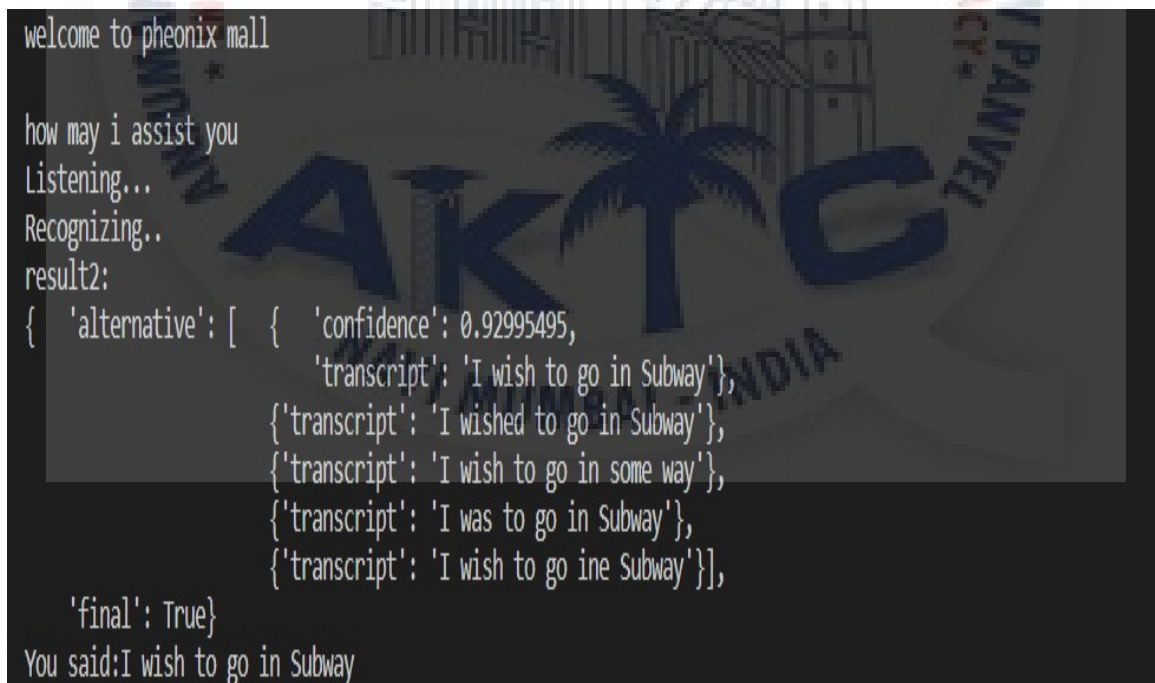


```

1 import pygame, sys
2 from pathfinding.core.grid import Grid
3 from pathfinding.finder.a_star import AStarFinder
4 from pathfinding.core.diagonal_movement import DiagonalMovement
5 from secrets import choice
6 import pyttsx3
7 import speech_recognition as sr
8 from PIL import Image
9 from secrets import choice
10 import pyttsx3
11 import speech_recognition as sr
12 from PIL import Image
13 import nltk
14 from nltk.corpus import stopwords
15 nltk.download('punkt')
16 nltk.download('stopwords')
17
18 Assistance=pyttsx3.init('sapi5')
19 voices=Assistance.getProperty('voices')
20 rate=Assistance.getProperty('rate')
21 Assistance.setProperty('rate',130)
22 Assistance.setProperty('voices',voices[0].id)
23
24 # list of Stores
25 Store=["zara","mufti","pepejeans","uspolo","us","polo","allen","solly","allen solly","flying","machine","puma","vanheusen"]
26 Electronics=["croma","reliance digital","cecx","helios","titan","rolex","fastrack","hublot"]
27 Eat=["burger","pizza","shawarma","icecream","dosa","juice","fries","cake","donuts","eat"]
28 games=["cricket","football","basketball","bowling","bikeriding"]
29
30
31
32 # List of Products

```

5.3.2 Module2



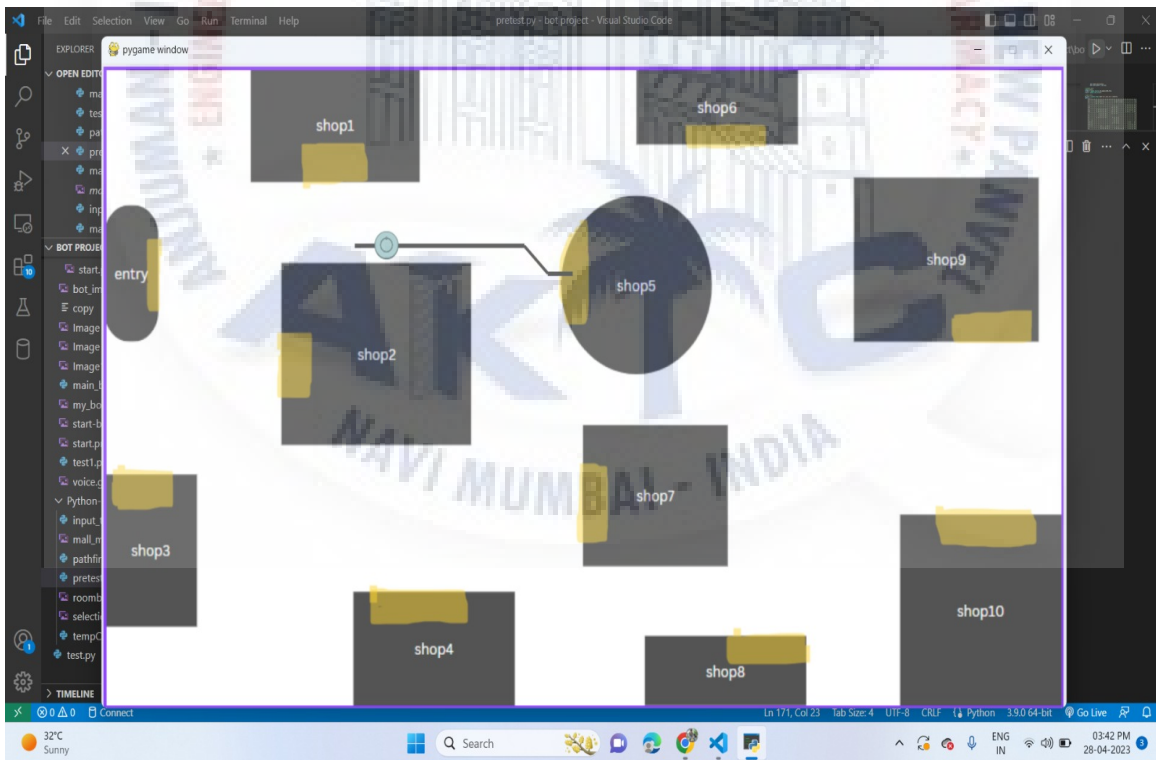
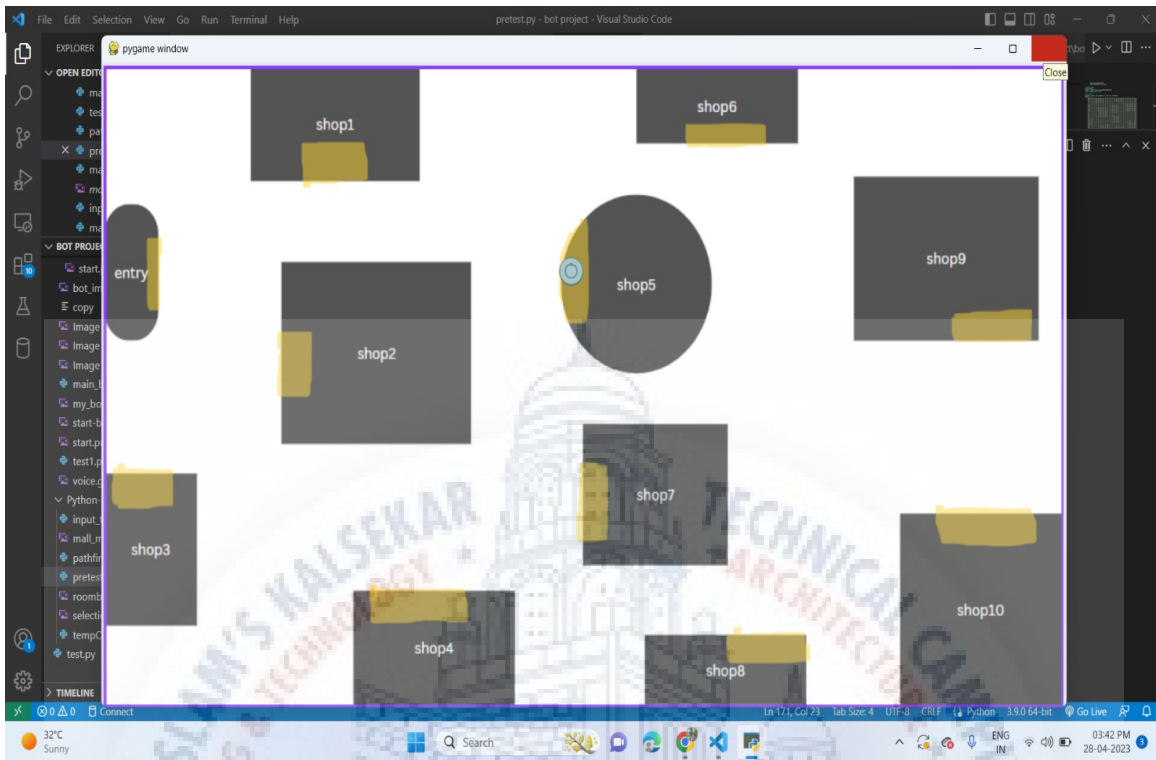
```

welcome to pheonix mall

how may i assist you
Listening...
Recognizing..
result2:
{ 'alternative': [ { 'confidence': 0.92995495,
                    'transcript': 'I wish to go in Subway'},
                  {'transcript': 'I wished to go in Subway'},
                  {'transcript': 'I wish to go in some way'},
                  {'transcript': 'I was to go in Subway'},
                  {'transcript': 'I wish to go ine Subway'}],
  'final': True}
You said:I wish to go in Subway

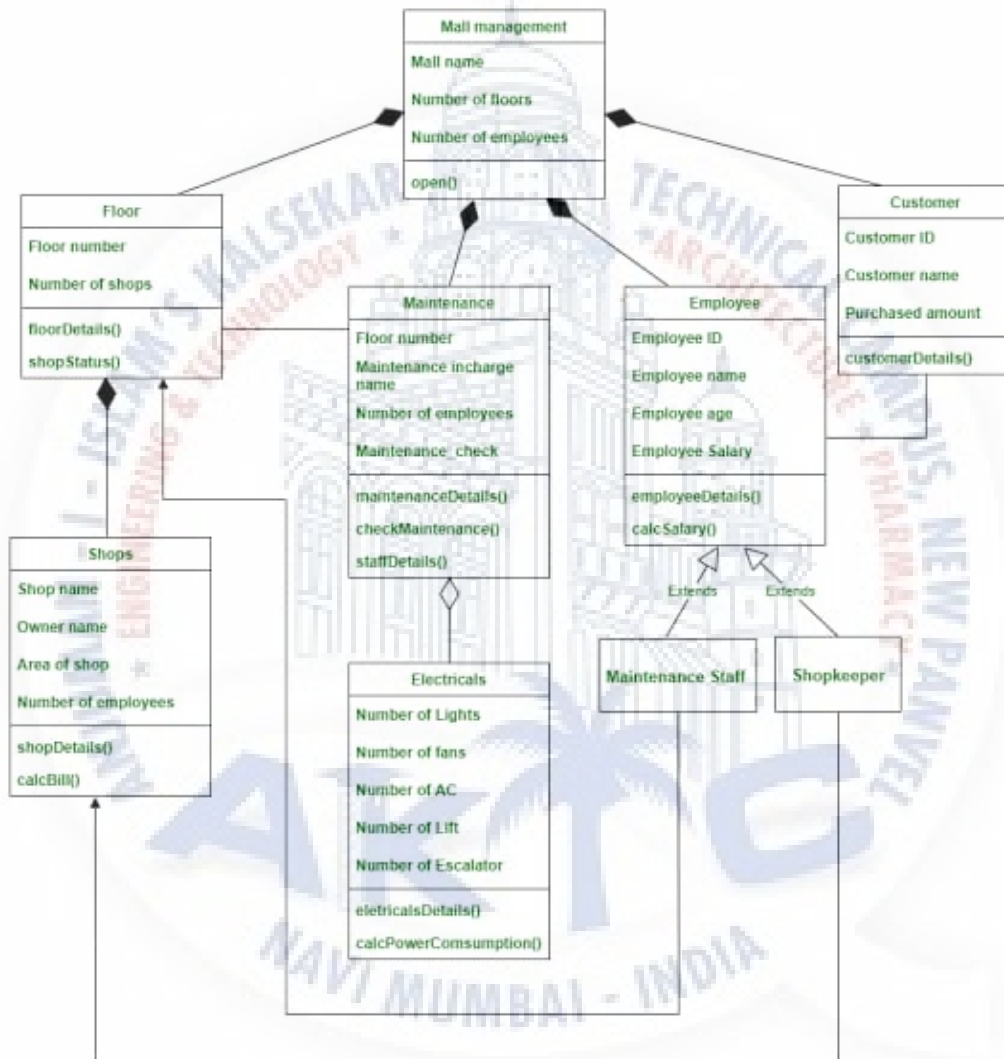
```

5.3.3 Module3

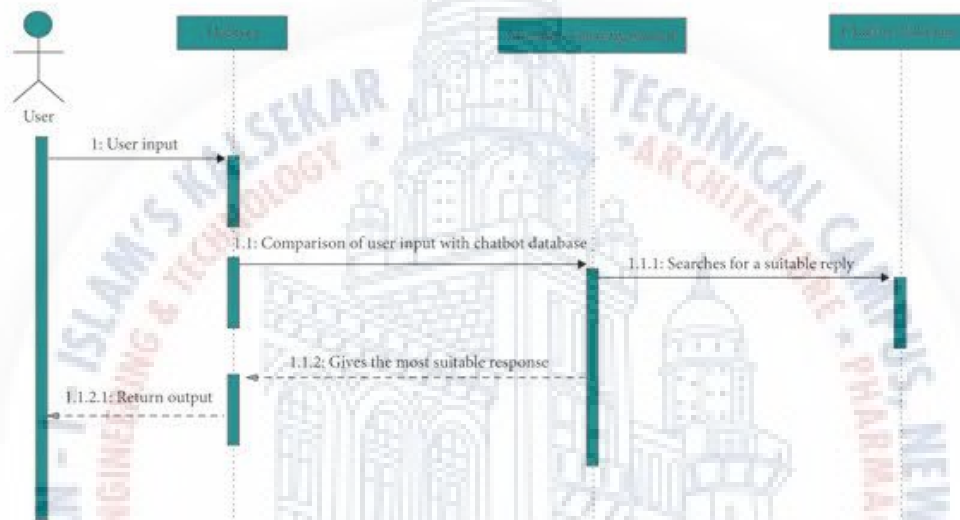


5.4 Systems Integration

5.4.1 Class Diagram



5.4.2 Sequence Diagram



Chapter 6

Implementation

Implementing a voice bot for a mall can be a great way to enhance the shopping experience of customers. Here are some steps to consider:

1. **Define the purpose of the voice bot:** Before you begin, it's important to define the purpose of the voice bot. Will it be used to provide information about the mall, answer customer queries, or guide customers to different stores and sections within the mall?
2. **Choose a platform:** There are many platforms available for building voice bots, including Google Assistant, Amazon Alexa, and Microsoft Cortana. Choose a platform that aligns with your business requirements and budget.
3. **Design the conversation flow:** Design the conversation flow of the voice bot. This involves mapping out the different paths the conversation can take and scripting the responses of the voice bot.
4. **Develop and test the voice bot:** Develop the voice bot using the platform's tools and test it thoroughly to ensure it functions as expected.
5. **Integrate with the mall's systems:** Integrate the voice bot with the mall's systems, such as the inventory system, to ensure that the bot has access to the latest information.
6. **Launch and promote:** Once the voice bot is ready, launch it and promote it to customers. This can be done through in-mall signage, social media, and other marketing channels.
7. **Monitor and refine:** Monitor the usage of the voice bot and refine it over time based on customer feedback and usage data. This will help to improve the customer experience and ensure that the voice bot continues to meet the needs of shoppers.


```

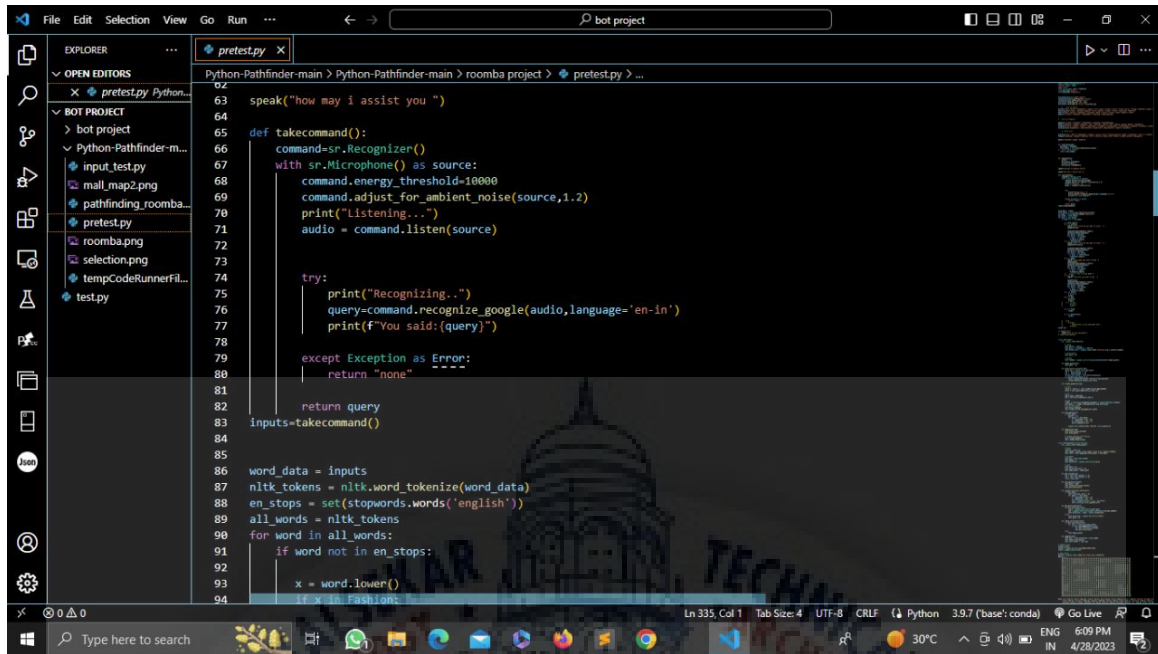
1 import pygame, sys
2 from pathfinding.core.grid import Grid
3 from pathfinding.finder.a_star import AStarFinder
4 from pathfinding.core.diagonal_movement import DiagonalMovement
5 from secrets import choice
6 import pyttsx3
7 import speech_recognition as sr
8 from PIL import Image
9 from secrets import choice
10 import pyttsx3
11 import speech_recognition as sr
12 from PIL import Image
13 import nltk
14 from nltk.corpus import stopwords
15 nltk.download('punkt')
16 nltk.download('stopwords')
17
18
19 Assistance=pyttsx3.init('sapi5')
20 voices=Assistance.getProperty('voices')
21 rate=Assistance.getProperty('rate')
22 Assistance.setProperty('rate',130)
23 Assistance.setProperty('voices',voices[0].id)
24
25 # list of Stores
26 Stores=["zara","mufti","pepejeans","uspolo","us","polo","allen","solly","allen solly","flying","machine","puma","vanheusens",
27 Electronics=["croma","reliance digital","cex","helios","titan","rolex","fastrack","hublot"]
28 Eats=["burger","pizza","shawarma","icecream","dosa","juice","feies","cake","donuts","eat"]
29 games=["cricket","football","basketball","bowling","bikeridding"]
30
31
32 # list of Products

```

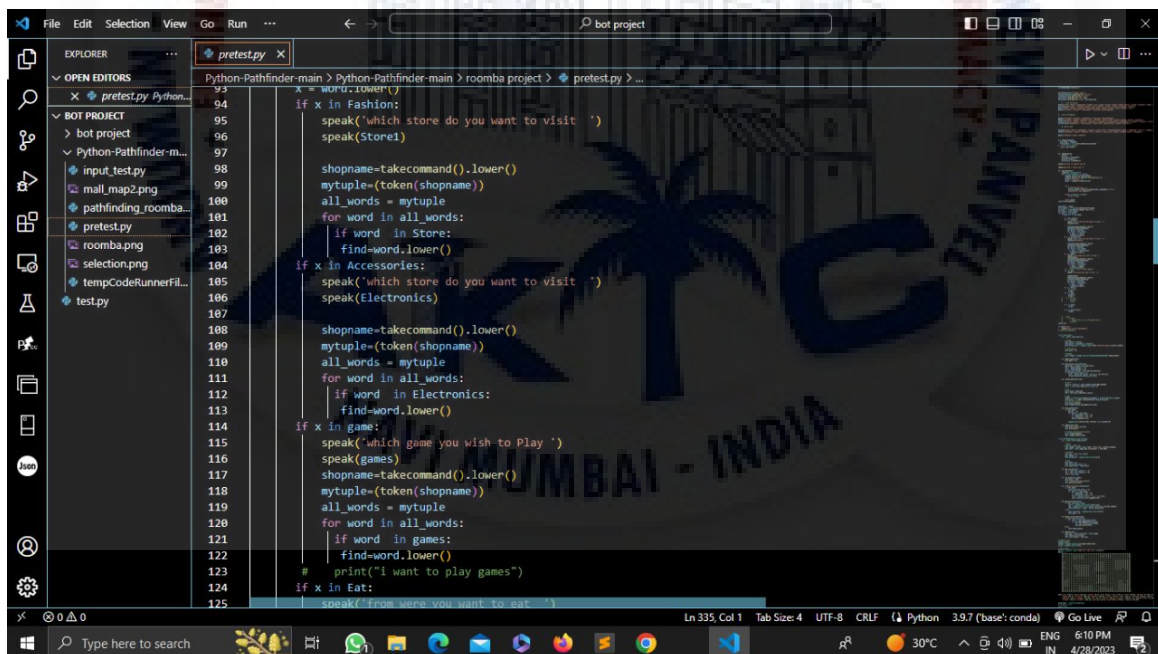
```

31
32 # list of Products
33
34 games=["cricket","football","basketball","bowling","bikeridding"]
35 Food=["mcdonald","subway","dominos","kfc","natural","pizza","hut","khiva","dunkin donuts","malgudi"]
36 Fashion=["shirt","jeans","tshirt","innerwear","slippers","casualshoes","formalshoes","sandals","clothes","cloth"]
37 Accessories=["headphones","smartwatches","pendrives","memorycards","camera","watches"]
38
39 # extra list
40 Store1=["zara","mufti","pepejeans","uspolo","allen solly","flying machine","puma","vanheusens","levi's","reebok","diesel","g
41 Food1=["mcdonald","subway","dominos","kfc","natural","pizza hut","khiva","dunkin donuts","malgudi"]
42
43 game=["timezone","game","games"]
44
45
46
47 def token(shopname):
48     word_data = shopname
49     nltk_tokens = nltk.word_tokenize(word_data)
50     # print(nltk_tokens)
51     return nltk_tokens
52
53
54
55 def speak(audio):
56     print(" ")
57     Assistance.say(audio)
58     print(f'{audio}')
59     Assistance.runAndWait()
60
61 speak("welcome to pheonix mall")
62

```



```
62 speak("how may i assist you ")
63
64
65 def takecommand():
66     command=sr.Recognizer()
67     with sr.Microphone() as source:
68         command.energy_threshold=10000
69         command.adjust_for_ambient_noise(source,1.2)
70         print("listening...")
71         audio = command.listen(source)
72
73     try:
74         print("Recognizing..")
75         query=command.recognize_google(audio,language='en-in')
76         print(f"You said:{query}")
77
78     except Exception as Error:
79         return "none"
80
81     return query
82
83 inputs=takecommand()
84
85
86 word_data = inputs
87 nltk_tokens = nltk.word_tokenize(word_data)
88 en_stops = set(stopwords.words('english'))
89 all_words = nltk_tokens
90 for word in all_words:
91     if word not in en_stops:
92
93         x = word.lower()
94         if x in Fashion:
```

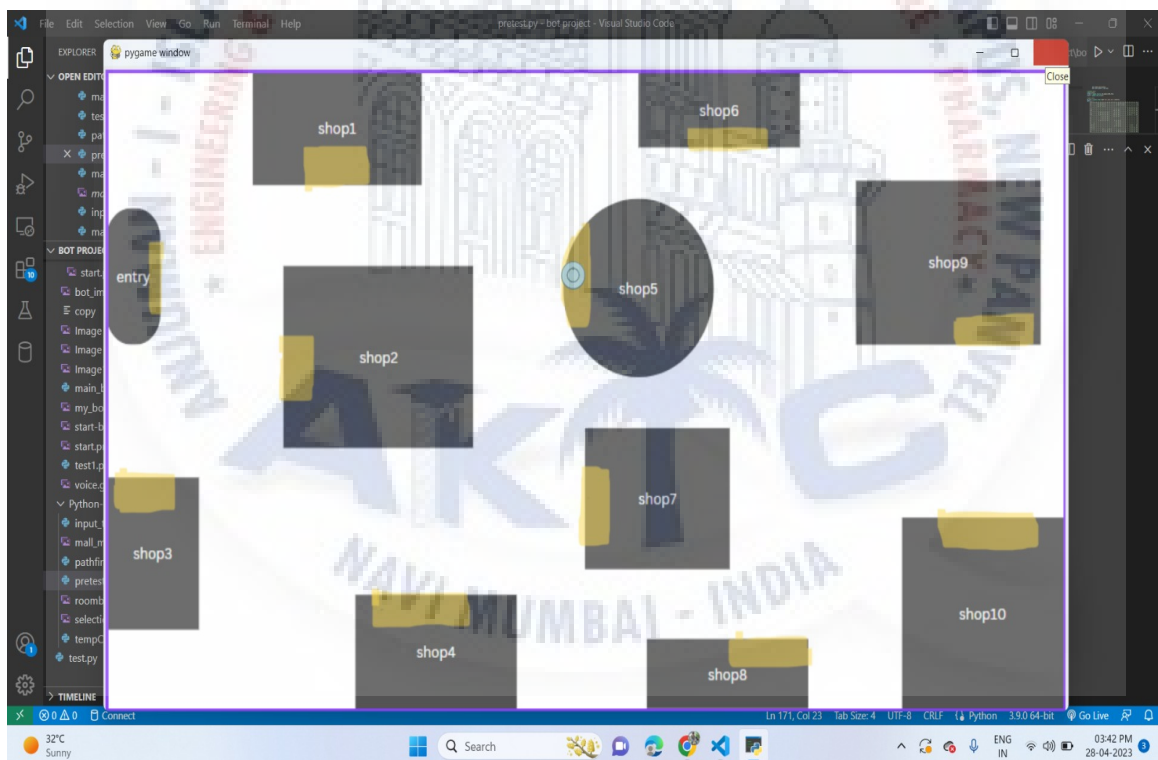


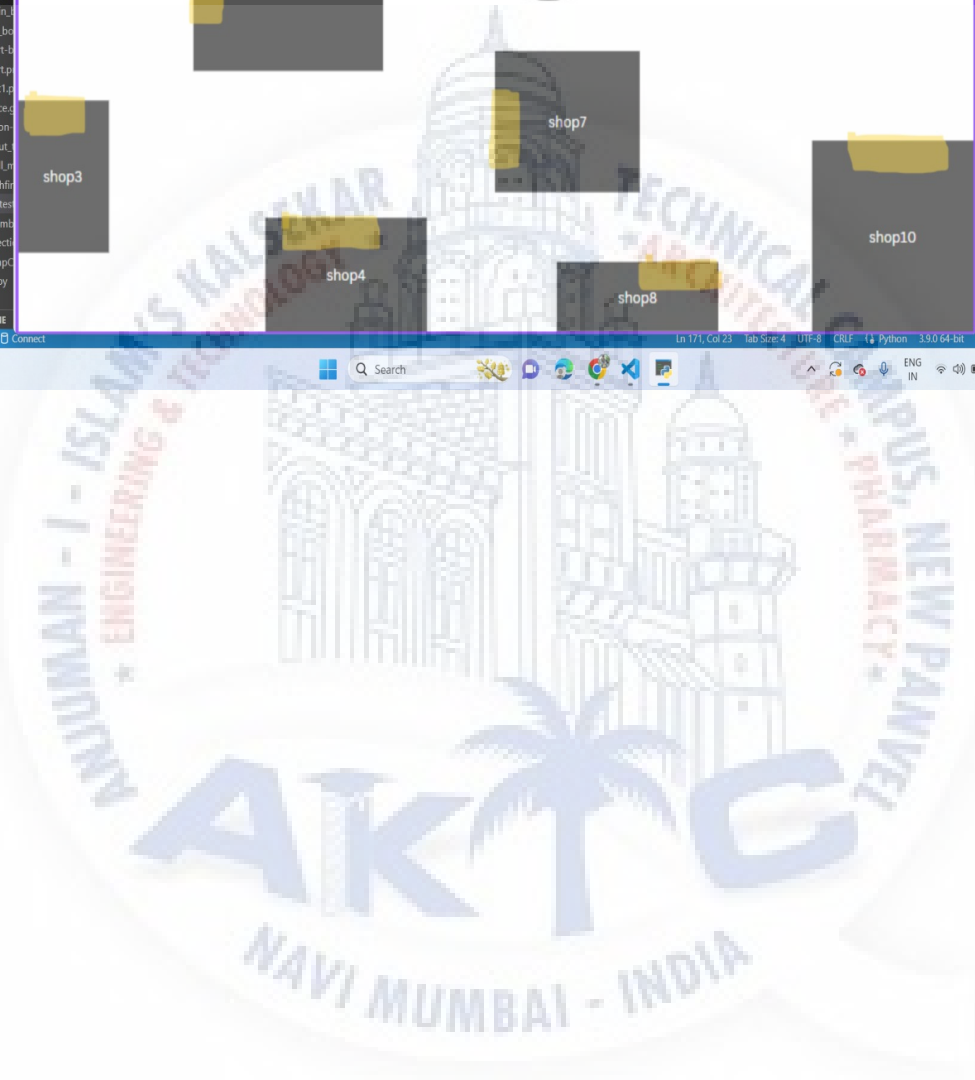
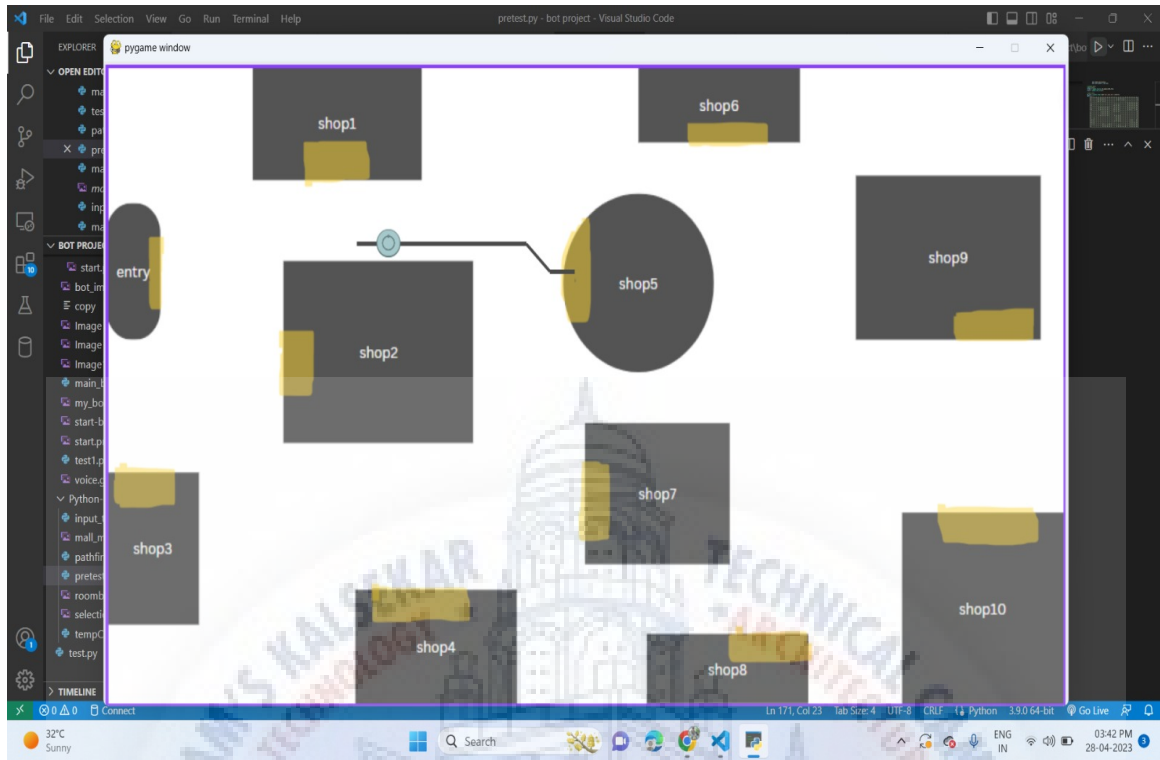
```
94         if x in Fashion:
95             speak("which store do you want to visit ")
96             speak(Store1)
97
98             shopname=takecommand().lower()
99             mytuple=(token(shopname))
100             all_words = mytuple
101             for word in all_words:
102                 if word in Store:
103                     find=word.lower()
104
105             if x in Accessories:
106                 speak("which store do you want to visit ")
107                 speak(Electronics)
108
109             shopname=takecommand().lower()
110             mytuple=(token(shopname))
111             all_words = mytuple
112             for word in all_words:
113                 if word in Electronics:
114                     find=word.lower()
115
116             if x in game:
117                 speak("which game you wish to play ")
118                 speak(games)
119                 shopname=takecommand().lower()
120                 mytuple=(token(shopname))
121                 all_words = mytuple
122                 for word in all_words:
123                     if word in games:
124                         find=word.lower()
125
126                 # print("i want to play games")
127             if x in Eat:
```

Chapter 7

System Testing

7.1 Test Cases and Test Results





7.2 Sample of a Test Case

```
welcome to pheonix mall

how may i assist you
Listening...
Recognizing..
result2:
{ 'alternative': [ { 'confidence': 0.92995495,
                    'transcript': 'I wish to go in Subway'},
                  { 'transcript': 'I wished to go in Subway'},
                  { 'transcript': 'I wish to go in some way'},
                  { 'transcript': 'I was to go in Subway'},
                  { 'transcript': 'I wish to go ine Subway'}],
  'final': True}
You said:I wish to go in Subway
```



7.2.1 Software Quality Attributes

When it comes to building a voice bot for a mall, there are several software quality attributes that should be considered to ensure that the bot provides a high-quality experience for customers. Here are some of the key quality attributes to keep in mind:

Usability: The voice bot should be easy to use and understand. Customers should be able to interact with the bot in a natural and intuitive way, without needing to learn complex commands or workflows.

Reliability: The voice bot should be reliable and available whenever customers need it. It should be able to handle high volumes of traffic without crashing or becoming unresponsive.

Performance: The voice bot should respond quickly to customer requests and queries. Customers should not have to wait a long time for the bot to process their inputs or retrieve information.

Security: The voice bot should be designed with security in mind, to prevent unauthorized access or misuse of customer data. It should also be able to protect sensitive data such as payment information or personal details.

Maintainability: The voice bot should be easy to maintain and update over time. This includes being able to fix bugs, add new features, and make changes to the conversation flow or backend systems as needed.

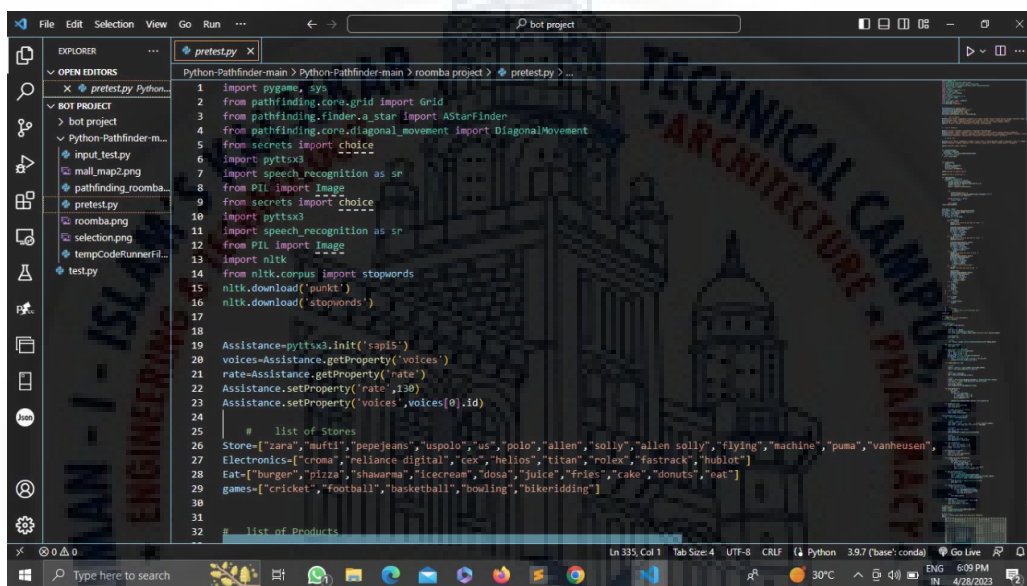
Scalability: The voice bot should be able to scale to handle increased traffic and demand as the mall grows and attracts more customers.

Accessibility: The voice bot should be designed to be accessible to all customers, including those with disabilities or language barriers. This may involve providing support for different languages, accents, or speech patterns, as well as providing text-based alternatives for customers who cannot use voice commands.

By prioritizing these software quality attributes, you can build a voice bot that provides a high-quality experience for customers and helps to enhance their shopping experience in the mall.

Chapter 8

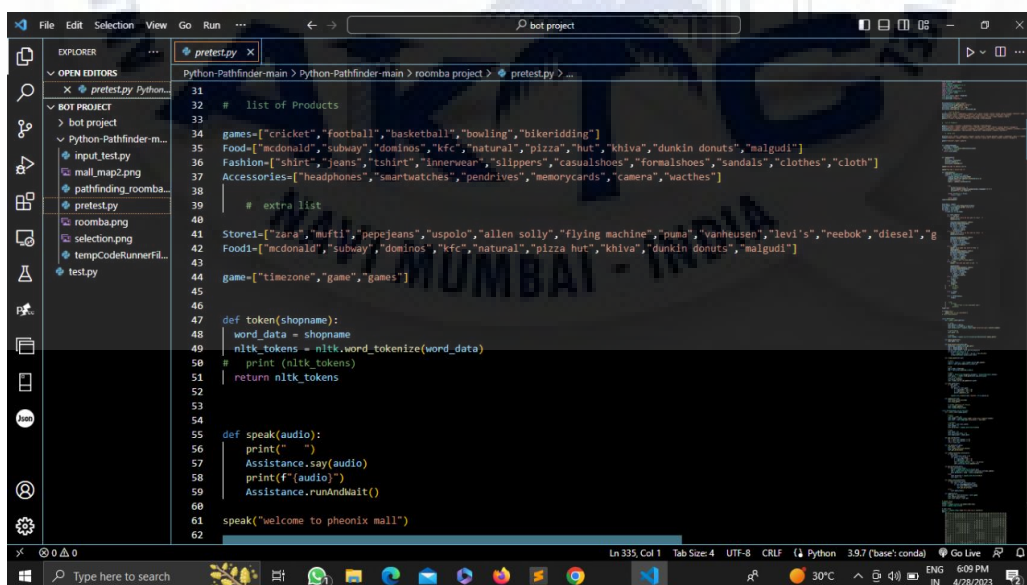
Screenshots of Project



```

1 import pygame, sys
2 from pathfinding.core.grid import Grid
3 from pathfinding.finder.a_star import AStarFinder
4 from pathfinding.core.diagonal_movement import DiagonalMovement
5 from secrets import choice
6 import pyttsx3
7 import speech_recognition as sr
8 from PIL import Image
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11 import speech_recognition as sr
12 from PIL import Image
13 import nltk
14 from nltk.corpus import stopwords
15 nltk.download('punkt')
16 nltk.download('stopwords')
17
18 Assistance=pyttsx3.init('sapi5')
19 voices=Assistance.getProperty('voices')
20 rate=Assistance.getProperty('rate')
21 Assistance.setProperty('rate',130)
22 Assistance.setProperty('voices',voices[0].id)
23
24 # list of Stores
25 Stores=["zara","mufti","pepejeans","uspolo","us","polo","allen","solly","allen solly","flying","machine","puma","vanheusen"]
26 Electronics=["cnoma","reliance digital","cecx","helios","titan","rolex","fastrack","hublot"]
27 Food=["mcdonald","subway","dominos","kfc","natural","pizza","hut","khiva","dunkin donuts","malgudi"]
28 Fashion=["shirt","jeans","tshirt","innerwear","slippers","casualshoes","formalshoes","sandals","clothes","cloth"]
29 Eat=["burger","pizza","shawarma","icecream","dosa","juice","fries","cake","donuts","eat"]
30 games=["cricket","football","basketball","bowling","bikeridding"]
31
32 # list of Products

```



```

31 # list of Products
32 games=["cricket","football","basketball","bowling","bikeridding"]
33
34 Food=["mcdonald","subway","dominos","kfc","natural","pizza","hut","khiva","dunkin donuts","malgudi"]
35 Fashion=["shirt","jeans","tshirt","innerwear","slippers","casualshoes","formalshoes","sandals","clothes","cloth"]
36 Accessories=["headphones","smartwatches","pendrives","memorycards","camera","watches"]
37
38 # extra list
39
40 Stores=["zara","mufti","pepejeans","uspolo","allen solly","flying machine","puma","vanheusen","levi's","reebok","diesel","g
41 Food=["mcdonald","subway","dominos","kfc","natural","pizza hut","khiva","dunkin donuts","malgudi"]
42
43 game=["timezone","game","games"]
44
45
46
47 def token(shopname):
48     word_data = shopname
49     nltk_tokens = nltk.word_tokenize(word_data)
50     # print(nltk_tokens)
51     return nltk_tokens
52
53
54
55 def speak(audio):
56     print(" ")
57     Assistance.say(audio)
58     print(f"audio")
59     Assistance.runAndWait()
60
61 speak("welcome to phonix mall")
62

```

```

Python-Pathfinder-main > Python-Pathfinder-main > roomba project > pretest.py > ...
63 speak("how may i assist you ")
64
65 def takecommand():
66     command=sr.Recognizer()
67     with sr.Microphone() as source:
68         command.energy_threshold=10000
69         command.adjust_for_ambient_noise(source,1.2)
70         print("Listening...")
71         audio = command.listen(source)
72
73         try:
74             print("Recognizing..")
75             query=command.recognize_google(audio,language='en-in')
76             print(f'You said:{query}')
77
78         except Exception as Error:
79             return "none"
80
81     return query
82
83 inputs=takecommand()
84
85
86 word_data = inputs
87 nltk_tokens = nltk.word_tokenize(word_data)
88 en_stops = set(stopwords.words('english'))
89 all_words = nltk_tokens
90 for word in all_words:
91     if word not in en_stops:
92         x = word.lower()
93
94
    
```

```

Python-Pathfinder-main > Python-Pathfinder-main > roomba project > pretest.py > ...
94
95     if x in Fashion:
96         speak('which store do you want to visit ')
97         speak(Store1)
98         shoppname=takecommand().lower()
99         mytuple=(token(shoppname))
100         all_words = mytuple
101         for word in all_words:
102             if word in Store:
103                 find=word.lower()
104
105     if x in Accessories:
106         speak('which store do you want to visit ')
107         speak(Electronics)
108         shoppname=takecommand().lower()
109         mytuple=(token(shoppname))
110         all_words = mytuple
111         for word in all_words:
112             if word in Electronics:
113                 find=word.lower()
114
115     if x in game:
116         speak('which game you wish to Play ')
117         speak(games)
118         shoppname=takecommand().lower()
119         mytuple=(token(shoppname))
120         all_words = mytuple
121         for word in all_words:
122             if word in games:
123                 find=word.lower()
124         # print("i want to play games")
125     if x in Eat:
126         speak('from were you want to eat ')
    
```

```

Python-Pathfinder-main > Python-Pathfinder-main > roomba project > pretest.py > ...
125
126         speak('From were you want to eat ')
127         speak(Food1)
128         shoppname=takecommand().lower()
129         mytuple=(token(shoppname))
130         all_words = mytuple
131         for word in all_words:
132             if word in Food:
133                 find=word.lower()
134
135     if x in Store:
136         # print(x)
137         find=x
138     if x in Eat:
139         print(x)
140         find=x
141     # if x in Eat:
142     #     print(x)
143     #     find=x
144
145     if x in Food:
146         find=x
147
148     if x in Electronics:
149         find=x
150
151     # else:
152     #     # break
153     #     speak("this is not available now")
154     #     print(x)
155     find="XXX"
156
    
```



```

Python-Pathfinder-main > Python-Pathfinder-main > roomba project > pretest.py > ...
157 if find=="xxx":
158     | speak("this is not available")
159     # input-takecommand()
160
161
162 class Pathfinder:
163     def __init__(self,matrix):
164
165         # setup
166         self.matrix = matrix
167         self.grid = Grid(matrix + matrix)
168         self.select_surf = pygame.image.load('selection.png').convert_alpha()
169
170         # pathfinding
171         self.path = []
172
173         # Roomba
174         self.roomba = pygame.sprite.GroupSingle(Roomba(self.empty_path))
175
176     def empty_path(self):
177         self.path = []
178
179     def draw_active_cell(self,ha):
180         mouse_pos = pygame.mouse.get_pos()
181         row = mouse_pos[1] // 32
182         col = mouse_pos[0] // 32
183         current_cell_value = self.matrix[row][col]
184         if current_cell_value == 1:
185             rect = pygame.Rect((col * 32,row * 32),(32,32))
186             screen.blit(self.select_surf,rect)
187
188     def create_path(self,ha):

```

```

Python-Pathfinder-main > Python-Pathfinder-main > roomba project > pretest.py > ...
188     def create_path(self,ha):
189
190         # start
191         start_x, start_y = self.roomba.sprite.get_coord()
192         start = self.grid.node(start_x,start_y)
193
194         # end
195         end_x,end_y =ha[find]
196         end = self.grid.node(end_x,end_y)
197
198         # path
199         finder = AStarFinder(diagonal_movement = DiagonalMovement.always)
200         self.path, _ = finder.find_path(start,end,self.grid)
201         # print(self.path)
202         self.grid.cleanup()
203         self.roomba.sprite.set_path(self.path)
204
205     def draw_path(self):
206         if self.path:
207             points = []
208             for point in self.path:
209                 x = (point[0] * 32) + 16
210                 y = (point[1] * 32) + 16
211                 points.append((x,y))
212
213             pygame.draw.lines(screen,"#4a4a4a",False,points,5)
214
215     def update(self,ha):
216         self.draw_active_cell(ha)
217         self.draw_path()
218
219     # roomba updating and drawing

```

```

Python-Pathfinder-main > Python-Pathfinder-main > roomba project > pretest.py > ...
220         self.roomba.update()
221         self.roomba.draw(screen)
222
223 class Roomba(pygame.sprite.Sprite):
224     def __init__(self,empty_path):
225
226         # basic
227         super().__init__()
228         self.image = pygame.image.load('roomba.png').convert_alpha()
229         self.rect = self.image.get_rect(center = (85,240))
230
231         # movement
232         self.pos = self.rect.center
233         self.speed = 3
234         self.direction = pygame.math.Vector2(0,0)
235
236         # path
237         self.path = []
238         self.collission_rects = []
239         self.empty_path = empty_path
240
241     def get_coord(self):
242         col = self.rect.centerx // 32
243         row = self.rect.centery // 32
244         return (col,row)
245
246     def set_path(self,path):
247         self.path = path
248         self.create_collission_rects()
249         self.get_direction()
250
251     def create_collission_rects(self):

```

```

Python-Pathfinder-main > Python-Pathfinder-main > roomba project > pretest.py > ...
pretest.py
def create_collision_rects(self):
    if self.path:
        self.collision_rects = []
        for point in self.path:
            x = (point[0] * 32) + 16
            y = (point[1] * 32) + 16
            rect = pygame.Rect((x - 2, y - 2), (4, 4))
            self.collision_rects.append(rect)

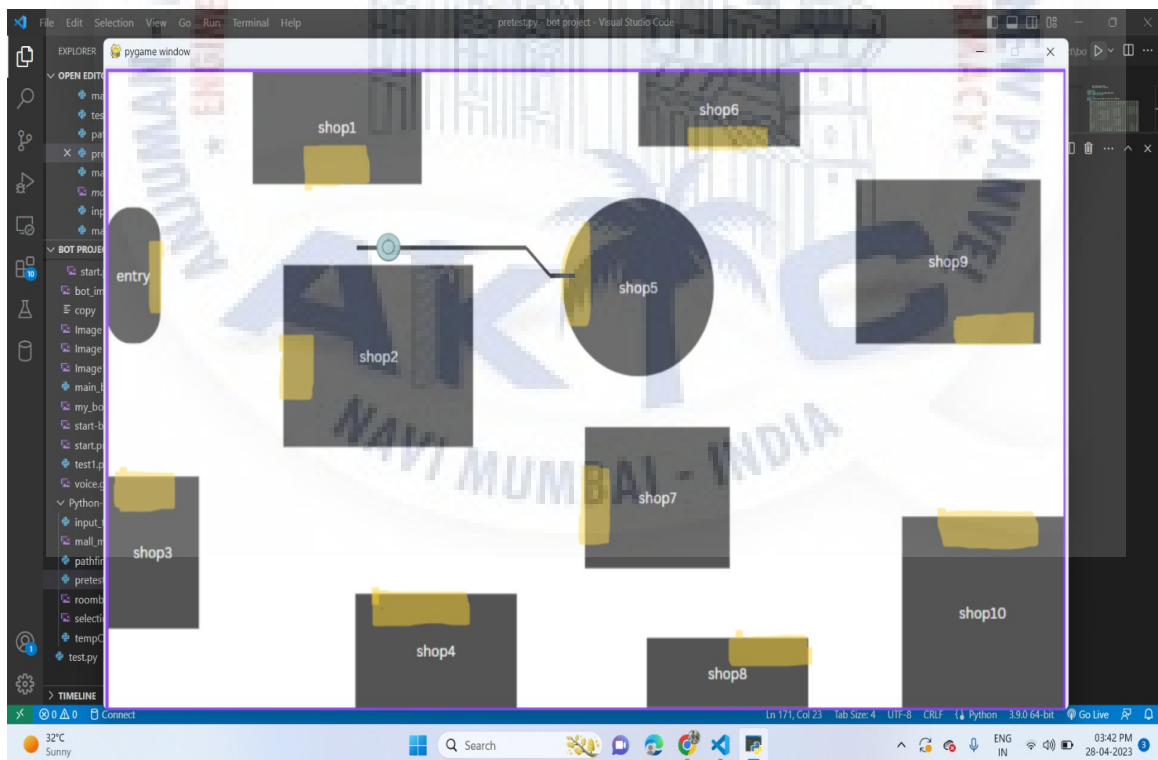
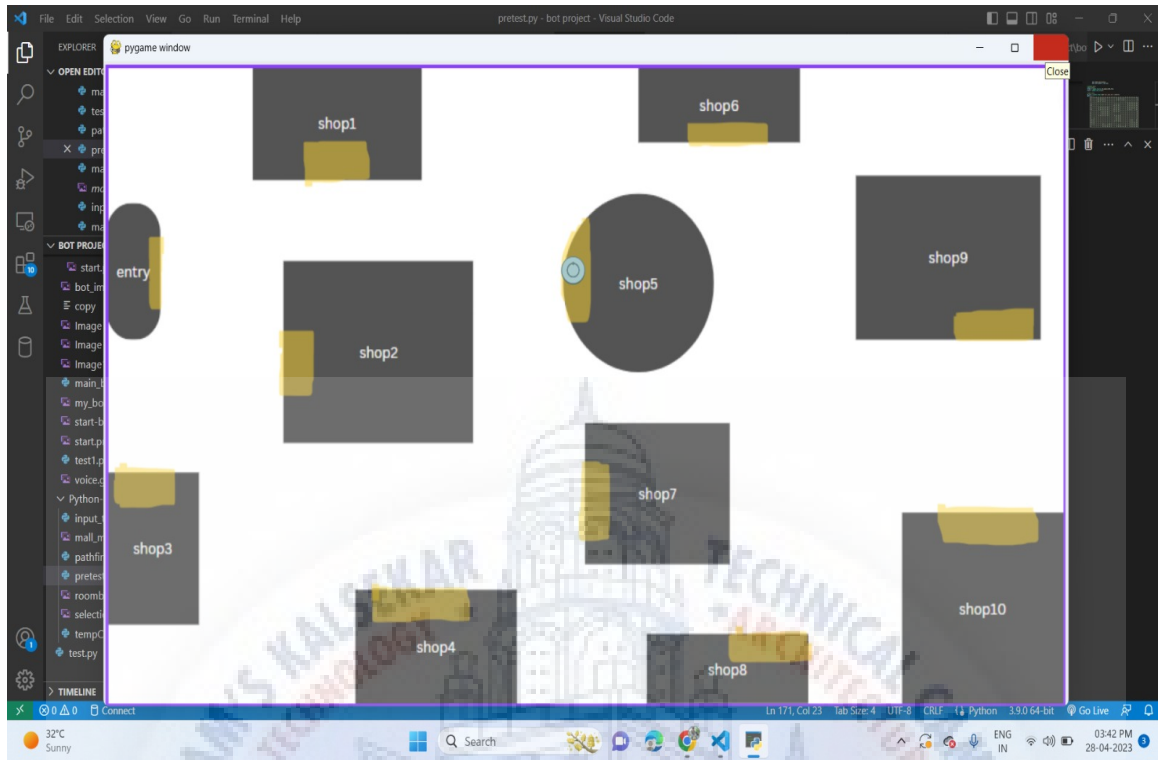
def get_direction(self):
    if self.collision_rects:
        start = pygame.math.Vector2(self.pos)
        end = pygame.math.Vector2(self.collision_rects[0].center)
        self.direction = (end - start).normalize()
    else:
        self.direction = pygame.math.Vector2(0, 0)
        self.path = []

def check_collisions(self):
    if self.collision_rects:
        for rect in self.collision_rects:
            if rect.collidepoint(self.pos):
                del self.collision_rects[0]
                self.get_direction()
        else:
            self.empty_path()

def update(self):
    self.pos += self.direction * self.speed
    self.check_collisions()
    self.rect.center = self.pos
  
```

```

welcome to phoenix mall
how may i assist you
Listening...
Recognizing..
result2:
{ 'alternative': [ { 'confidence': 0.92995495,
                    'transcript': 'I wish to go in Subway'},
                  { 'transcript': 'I wished to go in Subway'},
                  { 'transcript': 'I wish to go in some way'},
                  { 'transcript': 'I was to go in Subway'},
                  { 'transcript': 'I wish to go ine Subway'}}],
  'final': True}
You said:I wish to go in Subway
  
```



Chapter 9

Conclusion and Future Scope

9.1 Conclusion

In our project we have implemented many things compared to other assistants. Now a days it is very useful in human life because it is a hands-free application. It is a very simple application. As well as it is used in a business field also for example in malls, the person want to find some store which he/she doesn't know, through voice assistant they can get any information so that their work becomes easy. Voice assistants are useful in many fields such as education, daily life application, home appliances etc. and voice assistant is also useful for the illiterate people they can get any information just by saying to the assistant, luxury is available for people, thanks to AI based voice assistants. Voice assistant is developing more and more in daily life. Many companies of voice assistant trying to improve interaction and more features to the next level and many of the youth started using voice assistant in daily life and from many sources the result showing very good feedback. Compared to last 2 years voice assistants have been developed more and more.

9.2 Future Scope

Store information and directions: The voice bot can provide visitors with information on store locations, hours, and products, as well as directions to specific stores within the mall.

Promotions and deals: The voice bot can inform visitors of current promotions and deals at different stores within the mall, and provide personalized recommendations based on their interests.

Event information: The voice bot can provide visitors with information on upcoming events at the mall, including concerts, workshops, and other activities.

Dining options: The voice bot can provide visitors with information on restaurants and food options within the mall, as well as personalized recommendations based on their dietary preferences.

Parking information: The voice bot can provide visitors with information on parking locations and availability within the mall, and provide directions to parking spots.

Feedback and ratings: The voice bot can allow visitors to provide feedback and ratings on stores and products within the mall, and provide this information to mall operators for analysis.

Personalized shopping experience: The voice bot can provide personalized recommendations and shopping experiences for visitors based on their interests, previous purchases, and other factors.

Virtual assistant: The voice bot can serve as a virtual assistant, allowing visitors to book appointments, make reservations, and perform other tasks within the mall.

Overall, the feature scope for a voice bot for a mall will depend on the specific needs and goals of the mall and its visitors. By focusing on providing visitors with personalized and convenient experiences, a voice bot can help enhance the overall shopping experience for mall visitors and increase customer satisfaction.

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