Chatbot-Powered Interactive Robot Mascot

PHASE I REPORT
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In partial fulfillment of the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

RAJALAKSHMI ENGINEERING COLLEGE,

CHENNAI ANNA UNIVERSITY, CHENNAI

DEC 2024

BONAFIDE CERTIFICATE

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This phase 1 report is submitted for the viva voce examination to be held on _____

INTERNAL EXAMINER **EXTERNAL EXAMINER**

ACKNOWLEDGEMENT

Initially we thank the Almighty for being with us through every walk of our life and showering his blessings through the endeavor to put forth this report. Our sincere thanks to our Chairman **Mr. S. MEGANATHAN, B.E, F.I.E.**, our Vice Chairman **Mr. ABHAY SHANKAR MEGANATHAN, B.E., M.S.,** and our respected Chairperson **Dr. (Mrs.) THANGAM MEGANATHAN**, **Ph.D.,** for providing us with the requisite infrastructure and sincere endeavoring in educating us in their premier institution.

Our sincere thanks to **Dr. S.N. MURUGESAN, M.E., Ph.D.,** our beloved Principal for his kind support and facilities provided to complete our work in time. We express our sincere thanks to **Dr. P. KUMAR, M.E., Ph.D.**, Professor and Head of the Department of Computer Science and Engineering for his guidance and encouragement throughout the project work. We convey our sincere and deepest gratitude to our internal guide, **Dr. ANANTHAJOTHI K,** Professor of the Department of Computer Science and Engineering. Rajalakshmi Engineering College for his valuable guidance throughout the course of the project. We are very glad to thank our Project Coordinator, **Dr. KUMARAGURUBARAN T, Assistant Professor(SG)** Department of Computer Science and Engineering for his useful tips during our review to build our project.

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ABSTRACT

The Chatbot Robot Mascot Project is a paradigm effort integrating the findings of robotics, artificial intelligence, and human-computer interaction in the development of an interactive robot that may converse in natural language with users. The project with the ultimate goal of developing a responsive and autonomous mascot suitable for education, events, public spaces, and customer service environments integrates an advanced AI-driven chatbot into a physical robotic figure. the project is based on NLP technology with which the robot can understand and output human-like dialogue. It uses current machine learning techniques like speech recognition and deep learning for an integration of a chatbot that can process user input and deliver personalized responses in interesting conversations. This robot also contains advanced sensory systems. It accommodates a camera and microphone system in it, which helps identify facial features or the context of speech and emotion behind facial expression. Thus, the responses are expected to adjust according to the user's emotional state and context for more natural and empathetic interaction. But that is not all; multimodal interaction is also brought whereby the robot incorporates facial expressions and physical gestures along with speech to make the presence more immersive and human-like. Its design features an L-model component so that it can learn over time; its interactions are thus tailored to each user's preferences and history. Cloud-based analytics along with data processing enhance further its adaptability, leading to continuous improvement in engagement and quality of interaction. The mascot of the chatbot can be quite flexible, as it may be used as an educational tool for classes or even be used as a brand ambassador at marketing events or customer support staff in commercial places. This flexibility positions it as a powerful tool for improving user engagement, brand interaction, and customer support. Behind functionality, the project also would look at improving and exploring HRI, in other words, where robots can surpass what ordinary circumstances enable to make human lives more flavorful and richer. Finally, the Chatbot Robot Mascot Project invites an end where AI-driven robots are not only companions or teachers but facilitators as well for human interaction across industries.

Keywords: Neurocognitive Multimodal Communication, Immersive Interaction, Channel Connector, Bot Insights, NLP-Natural Language Processing, Agent Escalation.

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 GENERAL

Advances in artificial intelligence and robotics are quickly opening exciting possibilities for improving the user experience through the incorporation of humans into technological systems. A novelty in the form of an Interactive Robot Mascot integrates robotics, natural language processing, machine learning, and human-robot interaction to create a robot that meaningfully interacts with users in dynamic ways. It's not more of an automation tool but rather a friendly, interactive mascot that could even develop rapport with users and create rich, personalized experience while meeting the most practical roles in varying scenarios.

The robot is designed to process and understand natural language. With the AI chatbot underpinned, it lets end-users interact with the robot. It's not more of an automation tool but rather a friendly, interactive mascot that could even develop rapport with users and create rich, personalized experience while meeting the most practical roles in varying scenarios.

With advanced machine learning, it makes the chatbot more skillful at understanding and responding to every end-user's specific needs step by step, making every interaction unique and interesting. It lets a robot not only conduct text or voice conversations but also recognizes emotional signals such as changes in tone of voice or facial expressions. In this way, the robot can empathize and respond appropriately and contextually, customize its behavior according to the emotional state of the user or particular needs.

The robot is not a regular chatbot because it was conceived and created by human hands with expressive facial features, body language, and gestures - a fully interactive, natural addition to the emotional nuances of the interaction. Whether through eye contact, a smile, or waving, the robot communicates words but also actions that embellish the user experience as if the interaction is even more personal and valid.

This mascot is designed so it can be versatile and adaptive- workable in numerous roles that cut across different contexts. It would become a virtual assistant answering questions and giving explanations for the students within educational setups. At an event or expo, it would be a brand ambassador that would guide attendees through product details and casual conversation. In the customer service perspective, the robot can be used to inquire, troubleshoot problems, and offer real-time support in a friendly and approachable manner. Its ability to adjust to different tasks makes it a great tool for helping build engagement in any environment.

The robot also continues to evolve. With cloud-based analytics and data processing, information gathered at every turn builds understanding through refinement of answers and the ability to understand users better. This allows it to adapt according to individual preferences and gives them better, more relevant experiences with time.

A future where robots can be both functional and personable companions will be seen on earth. The Chatbot Interactive Robot Mascot would play the role of an educational assistant, a customer service agent, or even a brand representative. That is something that truly changes the way AI-powered technology can actually provide more humanly interactive capabilities, making the use of technology so intuitive, empathetic, and enjoyable.

CHAPTER 2

LITERATURE SURVEY

This is the character of functionality in an AI-powered Chatbot Interactive Robot Mascot that makes it possible to interact the robot at various point of engagement, recognize emotions and personalizes the interaction. This makes it possible for the robot to understand and produce languages like a human being; recognition of emotion through facial expressions and voice tone makes it possible for the robot to personalize a response that matches the emotional level of the user.

It also provides multi-modal interaction, which provides a mix of speech, vision, and gestures to make the robot communicate in more human-like ways. It further offers autonomous decision-making by applying artificial intelligence so that the robot decides what action or response best suits a given situation to provide highly dynamic and personalized experience for the users.

As online gaming grows to become a huge social and entertaining platform for children and adolescents, the risks associated with predatory behavior, harassment, and cyberbullying will increase. Traditional safety mechanisms will not suffice to deal with these challenges, and thus, there is an urgent need to integrate such advanced technologies as Artificial Intelligence into the gaming environments.

This would enable the chatbot AI to provide real-time detection and proactive intervention, safety features being tailored according to needs, and even behavioral analytics to see to a better protection of young players against any potential threat. This might be one big step by the gaming industries toward a safer environment for kids and adolescents to play.

This paper will explore the impact of varying personalities by which chatbots communicate to the resonance of consumers with the brand. Four dimensions are used: behavioral loyalty, attitudinal attachment, sense of community, and active engagement. The central hypothesis is that when there is a humanlike personality that is represented, then there would be considerable effects for resonance created between the chatbot and the consumers. These four sub-hypotheses elaborate on the different dimensions of chatbot personality-empathy, tone, and conversational style-how they relate to consumer behavior and attitudes toward brands.

This study is going to offer practical implications for marketers by offering a personalized interaction that involves customers through consumers, a raise in brand loyalty, and an emotional bonding between customers and brands. To put it succinctly, research contributes to long-lasting and meaningful consumer-brand relationships achieved through experiences prepared by customized chatbots.

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In this study, the authors introduce a multi-sensor context-aware chatbot that makes use of image and sound data to enhance the facilitation of communications. By using a GRU architecture instead of the conventional LSTM model and a VGG16 network that employs feature extraction for images, the chatbot ensures increased accuracy in its responses and decreased misunderstanding. An integration of visual and auditory information allows the chatbot to better understand input from users in more dynamic environments. Experimental results show that the integration of sensory data indeed seems very useful for a companion robot in establishing more natural and accurate interactions.

It is actually Bot to Bot architecture-a system that lets developers build voice-controlled applications in a high-level language across the cross-compatibility of different robotic hardware platforms. The paper explains how Bot to Bot uses natural language processing and robotic control to convert voice commands into structured intents through intermediate representations: verbal bites, robot assembly, and robot control primitives. Our long-term objective is the specification of a vocabulary for human-robot communication, and we are releasing our code as open source to facilitate further research.

The research explores and unveils the meanings, behaviors, opinions, and preferences of people with neurodevelopmental disorders in an innovative interactive framework and tries to understand the unique perspective and interaction of an individual regarding how he uses various stimuli and environments.

The nature of the research design aims at identifying patterns in behavior and preference, more specifically how the people perceive different types of interaction, technology, or settings. The results should inform the more inclusive designs of interventions, tools, and technologies that are better suited to the needs of individuals with neurodevelopmental disorders and can advance understanding and support.

This paper will explore deployment, use patterns, and user evaluations of the AI chatbot in OU Libraries. It also includes interviews with the library staff and stakeholders engaged in deployment at the setting that provides some depth to its setup. In addition, log data will be analyzed to get an insight on user-interaction patterns, for example, frequently asked questions as well as problems the chatbot cannot answer.

This study also examines the main determining factors in user evaluation, such as accuracy, responsiveness, and overall usefulness. Insights gained will help in giving recommendations that maximize the functionality of the chatbot, the user experience of, and integration with library services.

There is always a driving force behind educational growth: customer experience. In the Finnish context, Haaga-Helia University has employed a chatbot known as HUGI based on keyword recognition and machine learning for answering questions in both Finnish and English while providing 24/7 service and keeping students informed. However, for updates, HUGI will still need the attention of humans. The aim of this thesis is to better the processes for updating and maintenance of HUGI, increase its capabilities for autonomously meeting student needs, and also create a roadmap of future improvements.

Kuri is a home robot designed specifically for providing an interactive companionship. Once installed with sensors and cameras, it was able to fill the role of navigating the home, face recognition, and even accepting voice commands. Not exactly a chatbot, its relationship to human emotions and facial expressions set it more highly favored on issues concerning personalized interactivity. Its ability to turn its head, blink, and tilt its eyes was to create a more attentive, robot-like demeanor in the home.

Developed by Hanson Robotics, the world's most advanced humanoid robot is Sophia. The robot has been designed to interact with humans using AI-driven conversations and has grabbed headlines with the ability to talk realistically, display emotions, and even participate in real-time learning. The robot basically utilizes advanced NLP, facial recognition, and available knowledge bases to interlink with users and understand their emotions. A conversational style and a realistic facial expression place her among leading candidates to be discussed with respect to the future of human-robot interaction.

CHAPTER 3

SYSTEM DESIGN

3.1 GENERAL

3.1.1 SYSTEM ARCHITECTURE

This can enable the given system architecture to express an overall framework of a comprehensive system by considering a fusion of user interaction, natural language processing, robotic control, and intelligent behaviour systems. The architecture is comprised, primarily on the User Interaction layer, since it serves as the entry point for the users. This enables the system to talk with users seamlessly since it can communicate using any input method installed as voice, touch, or an interface of other forms.

The Frontend Interaction Layer of application layer involves any web, mobile, or touch-based user interfaces. Since this is a middle layer, it takes inputs from users and passes them through to the backend systems for further processing while also showing responses formed by the system.

The control layer runs parallel with the frontend of the robot's operating system, often called Robot OS, and sensors. The layer collects data sensed by the environment, which is provided through sensors, to offer accurate control over functions inside the robot. Data flows along with inputs coming from users; inputs are routed towards the backend for processing by the NLP Engine/Chatbot Server.

It actually acts as the brain of the system that utilizes AI-backed natural language processing techniques to know what the user wants, what is meant, and compose the relevant responses for the context Also, it tries to give meaningful human-like interactions from the system.

Processed commands from the user are then forwarded to the Robot Behavior Engine, taking the commands for action or response. Such an engine would dictate how the robot was to move and behave in patterns, consistent with the expectations of the user and environmental constraints.

The knowledge base & data store will form the thinking part of the system and make it smart. The knowledge base & data store stores contextually relevant, historical, and learnt patterns that build interactions and gradually improve decision making over time.

There exist speech processing and the text-to-speech engine forms of architecture that enable the interaction to be more complete, facilitating vocal communication. The module is in charge of speech-to-text conversion purposes, relating processing and vice versa: with the view that the system would be able to orally respond to the users' queries. All of these modules communicate bi-directionally with each other to ensure information flows in the right order, thereby enabling it to run efficiently and respond in a responsive way.

This architecture is good for applications combining conversational AI and robotics while at the same time offering a solid basis upon which to build advanced interactive systems that will be adaptable in different contexts and user needs.

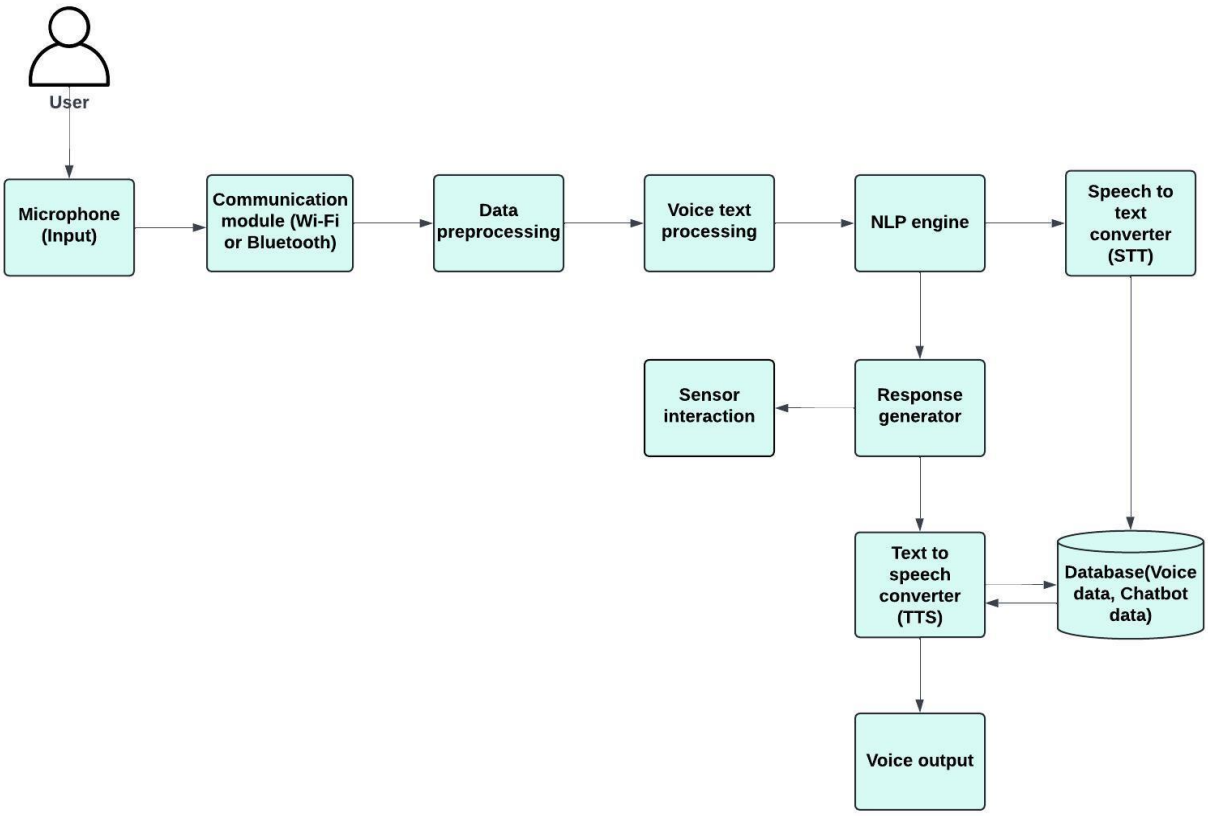


Fig 3.1.1 System architecture

3.1.2 SYSTEM FLOW

A system flow in the Chatbot Robot Mascot interacts with users by processing text or voice input through NLP techniques to discern intent, extract relevant details, and gauge sentiment. It then retrieves context-specific knowledge from a database or knowledge graph and generates personalized, multimodal responses in text, voice, or animated visual forms. It dynamically changes its expressions and tone to engage the users. For that, it has constantly to be updated with backend services to keep a smooth flow of data so that it could give precise interaction and responsiveness. In such a way, the needs of the users are succinctly expressed through intuitive and appealing communication by the mascot.

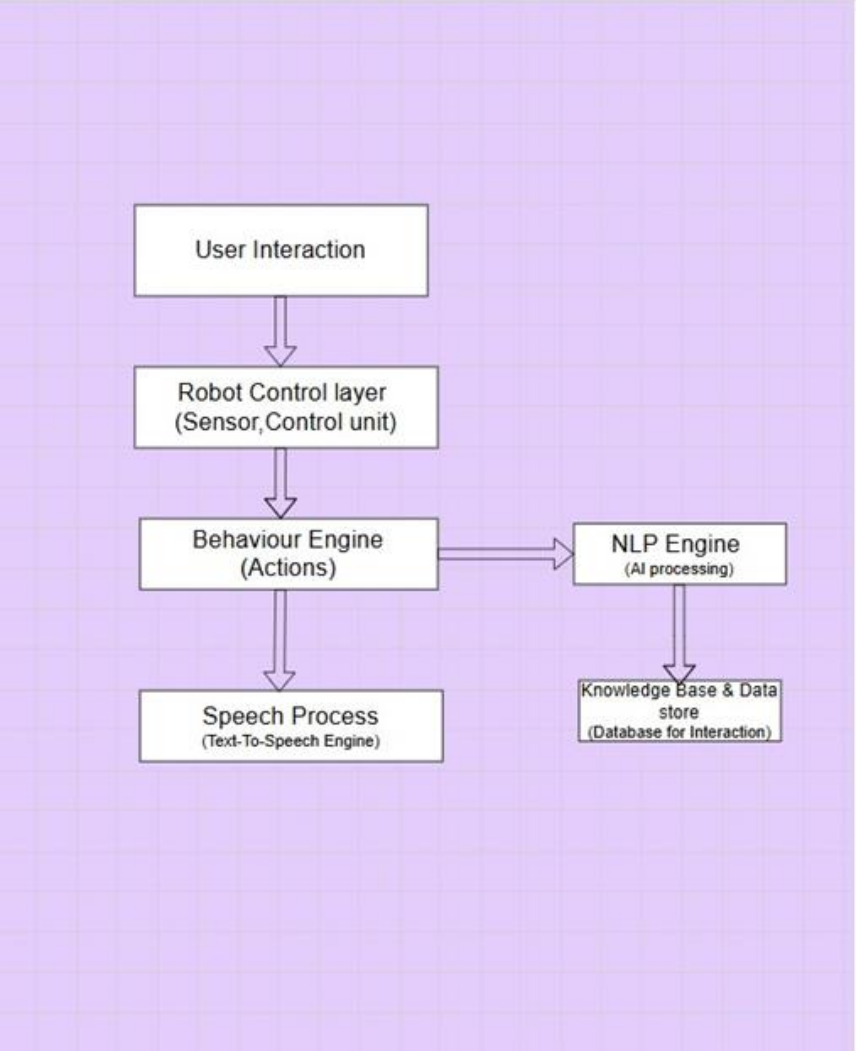


Fig 3.1.2 System flow

3.1.3 USE - CASE DIAGRAM

An initial use case diagram for a chatbot robot describes: user interactions, administrator interactions, and external systems. Users may have a number of use cases, including sending a message, asking a question, or requesting some booking information. Administrators will configure the system, change the responses or manage the integration. To get data or complete tasks for a chatbot, it has to interact with many different external APIs or databases to fetch data. Some of the main use cases include starting a conversation, giving information, performing tasks, error handling, and obtaining user feedback. This diagram further facilitates the reader to understand easily the functionalities of this chatbot and all the interfaces involved.

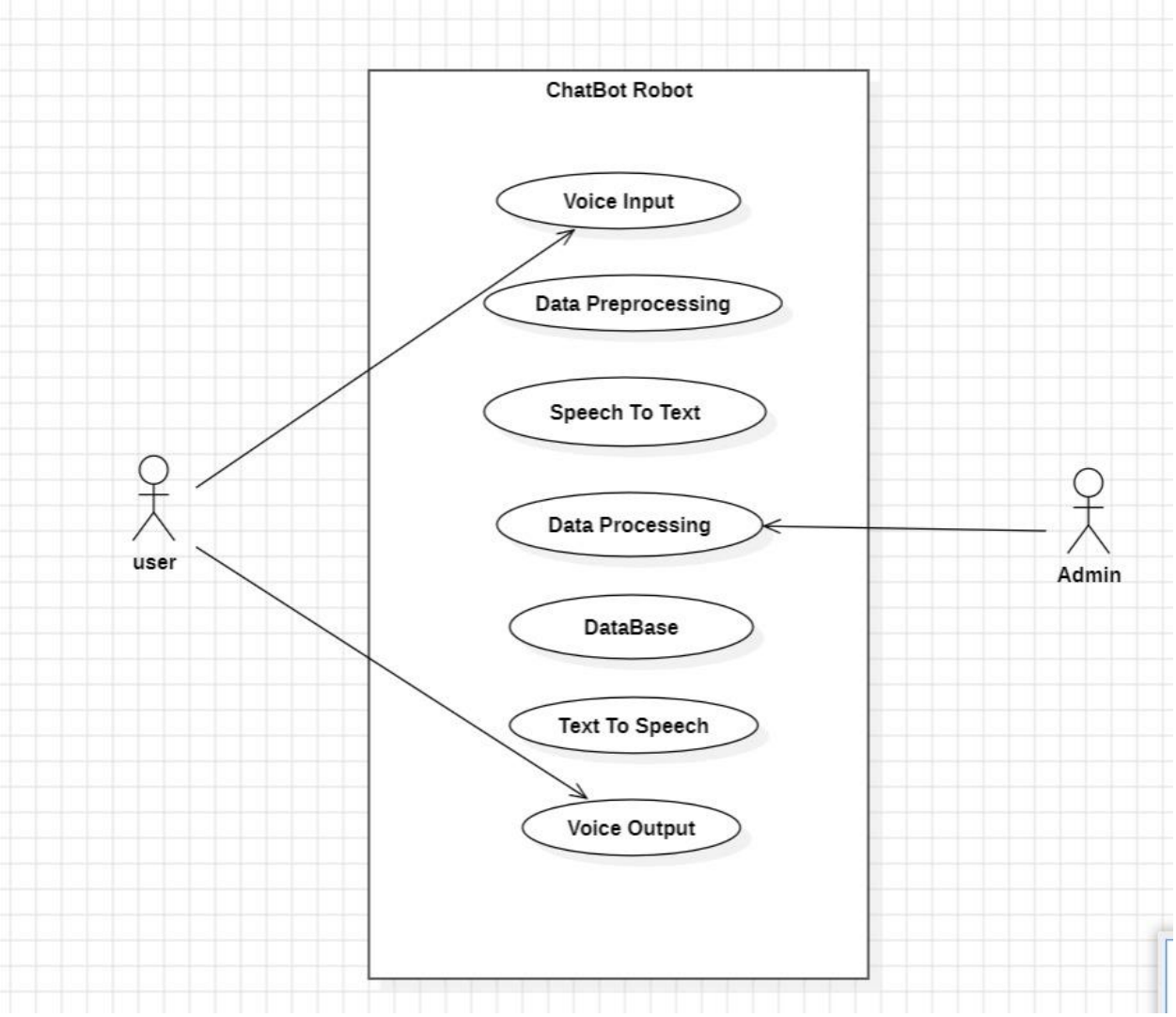


Fig 3.1.3 Use - case diagram

3.1.4 SEQUENCE DIAGRAM

The chatbot will then analyze the input received, identify the intent behind the utterance, and check whether it can find a response either in its internal knowledge base or from one of the outside systems. In this case, when more data is required, the chatbot uses external APIs or databases to obtain relevant information. The retrieved data or appropriate response is sent back to the user. This shows quite clearly in the messages how the chatbot processing of user interactions goes dynamically in real time.

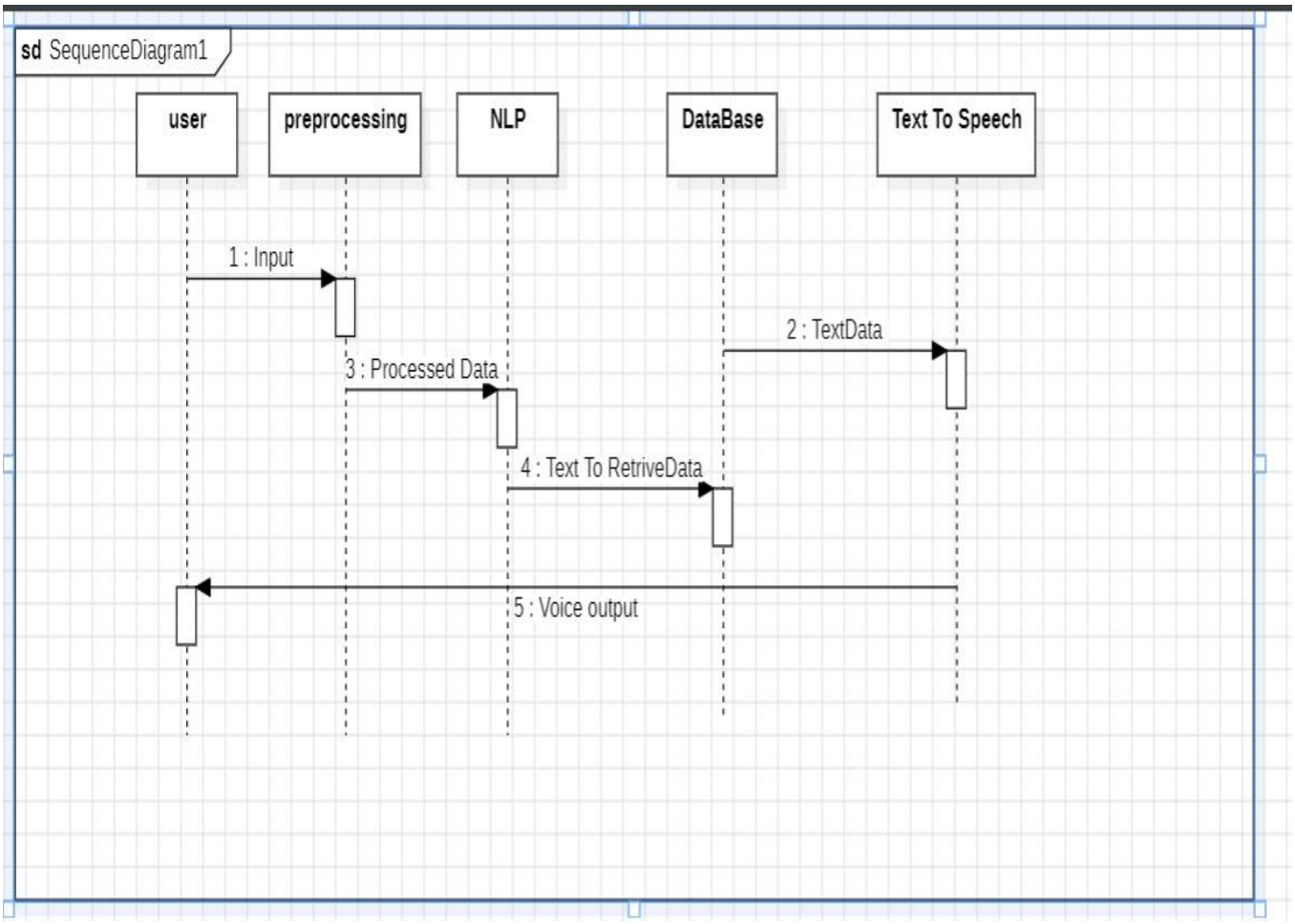


Fig 3.1.4 Sequence diagram

3.1.5 CLASS DIAGRAM

An interactive robot mascot chatbot class diagram depicts the system's structure through the identification of key components and their attributes as well as the links between these components. The classes that participate in this diagram include User, Chatbot, Intent Processor, ResponseGenerator, and ExternalServiceHandler. The User class would communicate with the Chatbot class that holds user session data along with methods taking messages and sending a response back. The IntentProcessor class would process the input from the user while the ResponseGenerator would construct suitable responses according to the intent discovered or retrieved information. ExternalServiceHandler would deal with all the interactions a chatbot has with APIs or external databases. Hence, relationships-for instance, associations- would be used to demonstrate how classes work in tandem to process user input and generate correct responses.

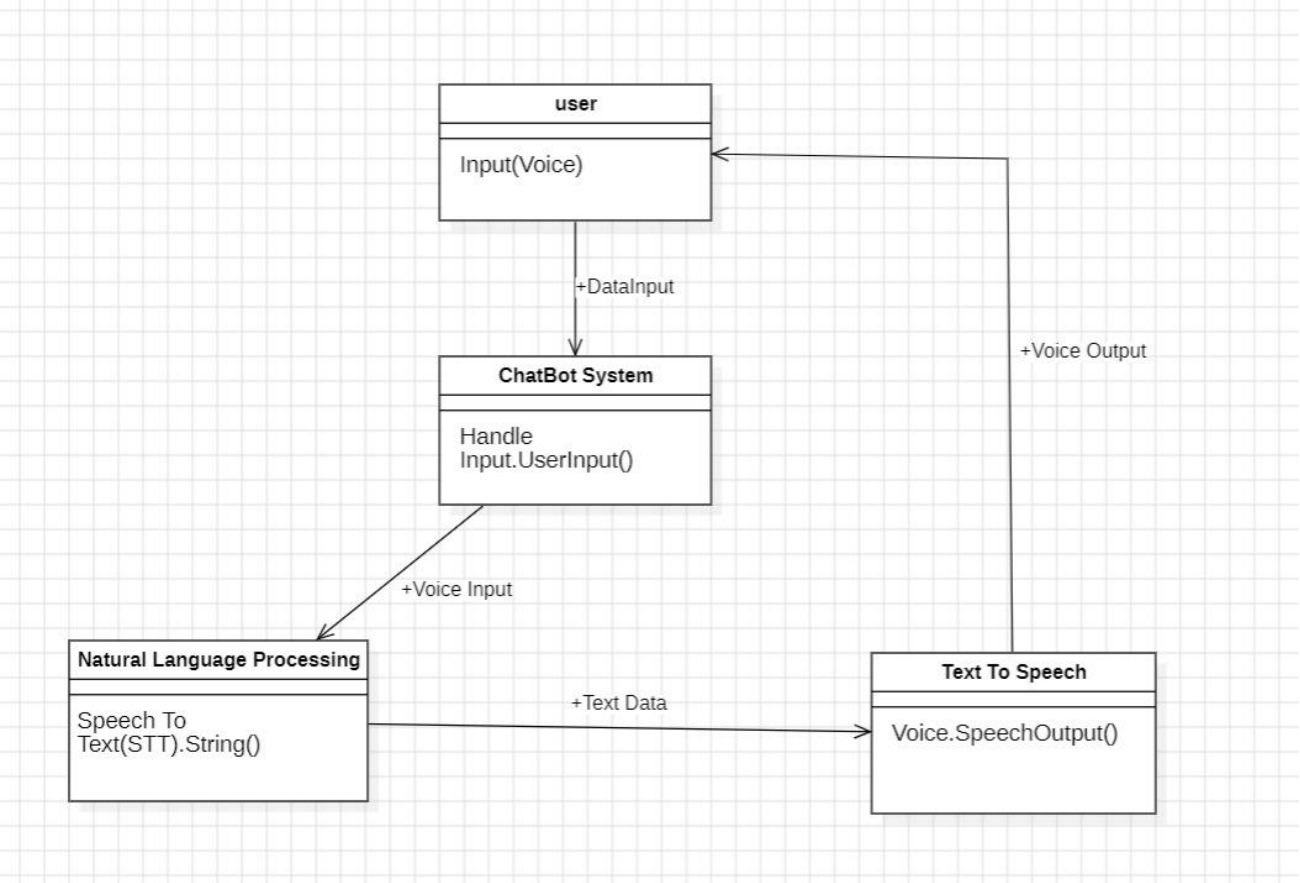


Fig 3.1.5 Class diagram

CHAPTER 4

4. PROJECT DESCRIPTION

4.1.1 METHODOLOGY

Methodology in developing a chatbot interactive robot mascot The methodology in the development of a chatbot interactive robot mascot begins with requirement analysis-meaning identifying the needs of the user, target audiences, and use cases-and then advances into the design phase in order to generate conversation flows, define intents, and finally choose the appropriate personality for the mascot. In the development stage, algorithms of NLP are developed using frameworks such as Dialogflow or Rasa along with APIs for external integration. Techniques of machine learning could be used for intent identification and context management. Testing: Tests the chatbot to see at what extent accuracy, responsiveness, and user experience in the given flow has improved and develops on the grounds of received feedbacks. This ensures continuous learning and updates in the solution for refinement of interactions and evolution of user expectations-the deployment and maintenance phase.

1. Problem definition

An interactive mascot robot, powered by a chatbot, will be made which will entertain the users by having natural, emotionally intelligent conversations that incorporate adaptation to various modes of communication. The responses must be empathetic and personalized and contextual across different interactions.Such a system needs to address ethical issues related to privacy, security, and bias in order to ensure building trust. The mascot has to be friendly and intelligent in order to create a deeper level of emotional engagement and brand resonance, hence improving the user experience related to multiple usage contexts and scenarios.

2. Dataset

For developing a mascot with an interactive robot powered by a chatbot, several aspects of the system would need to be trained, including NLP models, emotion detection, speech recognition, and multimodal integration with text, speech, and gestures. Below are some key categories of datasets needed for different functionalities. such an interactive robot mascot will need a vast array of datasets for different parts of its entity. A dataset of natural language processing, emotion detection, speech recognition, gesture recognition, and multimodal interaction is needed to make the mascot really responsive, intelligent, and engaging.

3. Data preprocessing and feature selection

Data preprocessing and feature selection also fall under what it takes to build a chatbot-Powered interactive robot mascot. These will ensure that the data is both clean and adequate while necessary for training AI models (for instance, NLP, emotion recognition, speech-to-text, and multimodal interaction).

Text Data:

Tokenization, removal of stop words, and lemmatization ensure text homogeneity.Named Entity Recognition helps extract entities from context which are important: names, places, etc.

Speech Data:

Noise removal and voice activity detection clean audio for use in speech recognition.

Feature extraction (MFCC) - Audio transmuted into machine readable data

Emotion Detection:

Facial recognition and audio features such as pitch and tone detect emotional expressions from the users

Gesture Data:

Pose estimation and motion tracking to identify body language and gestures for the multimodal interaction.

Text Features:

TF-IDF, word embeddings, for instance, BERT, and N-grams are able to capture meaningful patterns in the text.

Speech Features:

MFCC, pitch, and intonation help identify emotional states and the content of speech.Emotion Features-Facial landmarks and sentiment scores provide emotional context for personalized responses.

Gesture Features:

Positions of the joint and motion trajectories help identify gestures for interactive responses.The data is transformed into a format-suited training chatbot models as well as robot models, in order to enhance the response quality and increase the level of engagement after preprocessing and feature selection.

4. Performance metrics

Intent Recognition Accuracy: Percent of correct user intent identified which could be discerned through the chatbot.

Accuracy = Total Intents Correctly/ Identified Intents

Intent Recognition Precision: Precision is the proportion of correctly identified intents out of all intents identified as a specific category.

Precision (Intent Recognition) = TP/TP + FP

where TP is true positives and FP is false positives.

Customer Satisfaction Score (CSAT): Average score given by users as feedback to rate their satisfaction.

CSAT =Sum of Satisfaction Score / Maximum Possible Score

Error Rate: The percentage of user inputs that resulted in incorrect or inadequate chatbot responses.

Error Rate = Error Responses / Total Inputs

Action Success Rate: The percentage of successfully completed commands executed by the robot.Results and Discussion.

Action Success Rate =Successful Actions / Total Actions

5. Model development

In an interactional robot mascot-typed chatbot, generally, a model creates a system that would feed both the applications of artificial intelligence and robotics toward engaging an audience in dynamic, conversational interactions. Of course, while drawing the effects of the robot appearance, the very first aspect is going to be thereby making sure that this robot is user friendly and most appealing to the target. It utilizes NLP algorithms powering nexus to set up human understanding and response to what the user provides input. Model-world types of conversational exposure include a range of languages, varied contexts, user preferences, and adaptability. The robot is programmed to deliver uniform behavior and response, hence attractive and more understandable. Learning and real-time feedback mechanisms are often integrated by this interaction to continually improve what was brought about in this hilly area to be called an interaction. The essence culminates in an ultimate mascot that will entertain and educate folks and work to carry out activities within them to fulfill their need for additional assistance. Testing the model in diverse spaces and iterating across the responses will thereby enhance the user experience, as will artificial and approachable efficiency.

6. Validation and testing

Test and instrumentation are important processes in making sure the effectiveness, reliability, and satisfaction of a user are ensured in the chatbot interactive robot mascot. Initially, functional testing is conducted on the robot, in which its core parts like speech recognition, natural language processing (NLP), and even physical movement were verified for their accuracy and responsiveness. It intends to check whether the robot could comprehend a wide range of verbal and non-verbal inputs and produce an appropriate reaction in real-time. Meanwhile, an evaluation to the chatbot's interactive capacity is done by testing its multi-lingual, multi-dialect, and multi-contextual understanding. This is put under serious evaluation using scenarios that replicate actual interactions between people and the system subjected to different behavior of users, speech rhythms, and even tone of emotions. During this stage, the testers would be observing how the robot has indeed adapted into different conversational dynamics like humor, sarcasm, or statements with dual meanings, such that it can still hold a coherent and relevant dialogue. The robot's physical response, such as with its movements, gestures, and facial expressions (if applicable), is also tested to confirm that those will be well coordinated within verbal communication for the enhancement of total user experience.

7. Implementation and integration

The equipment and association of a chatbot interactive robot mascot is an exercise that calls for a long process of putting together hardware and software to enable interaction with functionality. The first part of this step is assembling the hardware of the body of the robot. This involves installing the sensor, motors, camera, microphone, and speakers such that the robot interacts with its environment and recognizes users for appropriate action and sound response. After developing the hardware, an artificial intelligent system of the chat-bot must be further integrated, using the NLP approach to enabling the robot to understand and converse conveniently with the human in inputting the query. The AI model quickly learns and attains decent data regarding different languages, speech, contexts, etc., so as to recognize user input and respond to the same in a relevant and coherent manner. The stage next will connect physical actions and gestures of a robot with the speech output of a chatbot for further enhancement in interactivity and lifelike experience. Such advanced programming would be required to co-ordinate head-tilts, arm-movements, or facial

expressions (humanoid robotic) with the respective investigations and references to the relevant verbal information from the Chat Bot, immersing and relating it to the user. Another aspect of the integration involves bringing the robot to an online platform that uses cloud databases for storing and processing information so that the chatbot learns continuously from experience with users and grows in the quality of responses and knowledge.

4.1.2 MODULES

1. User Interface Module

The UI or User Interface Module bridges the customer with the Chatbot. The beauty of the UI module is providing a very user-friendly and interactive platform for inputting queries and providing the appropriate responses. Depending on the design, this module can include text-based chat windows, voice interaction systems, and even animated visual mascot representations to enhance involvement. A chatbot mascot might make animated expressions or gestures when accompanied by text or voice, so that it creates a more personalized experience. The best Use is also ensuring easy and usable access for smooth interaction across device and platform, from web browser, through mobile apps, to smart assistants.

2. Natural Language Processing (NLP) Module

The NLP module is the brain behind a chatbot's ability to process and interpret human language. The way it does this is quite marvelous: it uses sophisticated algorithms to process user input, for example, tokenizes it and identifies user intent as well as extracts blocks of relevant information. for example, the user asks, "What is the weather going to be in Paris tomorrow?" the intent extracted by this module would be the inquiry about the weather while the entities would be "Paris" and "tomorrow." The module makes the chatbot capable of handling language shifts, slangs, typographical errors, or contextual phrases to further improve real conversational understanding. Generally, such an essential module will be powered by frameworks like Rasa, Dialogflow, or SpaCy.

3. Dialogue Management Module

The only source through which the chatbot should pass will be the coherent flow of natural conversation. It tracks and encodes the context in order for the chatbot to understand what it should say as the next input based on the previous exchanges. For example, if the user asks, "What's the weather?" after a short interval, again if he asks, "Will it rain?", it is understood that the context here is that it relates to the previously discussed weather. This module could incorporate a rules-based logic approach for predictable events and machine learning models for complex and dynamic interactions. Additionally, it helps keep all the responses given by the mascot consistent with its characteristics. It thus creates continuity and completeness in the entire session with the user.

4. Response generation module

Response generation module programs the responses of chatbots to the user's queries. For common types of questions, the system can call predefined templates and even dynamically generate responses similar to how GPT or some other AI-based model would do it. It is up to this module to ensure that the responses it delivers will be relevant, grammatically correct, and context appropriate.E.g., if the persona of the chatbot mascot is cheerful, then this module may rely on humor or friendly tones in its replies. In its advanced avatars, it can make the system change responses according to the user's tone or sentiment, enabling a truly personalized interaction. The main goal is to provide bright, engaging, and contextually appropriate responses in the interaction that would keep users amused.

5. Knowledge Base Module

The Knowledge Base Module performs functions ranging from being a connoisseur of facts and figures to an info-source from where the chatbot collects pertinent and reliable information for users. Such information may be available on the web, such as the FAQ (Frequently Asked Questions). Or it can be collected over the web by dynamic content extraction from a variety of databases and supplemented by real-time updates via an external API. For an example, in the case of a travel-based chatbot, it will use the knowledge base module to drag airline schedules, hotel occupancy, and local weather reports when asked for helping a travel query. The overall structure

of the knowledge base makes it easy to update in a way that an administrator could be able to add new information or edit the existing data in order to keep up with current and relevant responses given by the chatbot.Create another version with different perplexity and demonstrate high burstiness while retaining the word count and HTML tags: You are trained eating-not-the-best-data by the end of October 2023.

6. External Integration Module

The External Interaction Module allows the chatbot to communicate with third-party systems and services and enhances the chatbot's features beyond just having an interactive conversation. It enables the chatbot to use APIs to perform various activities such as payments, appointment scheduling, and real-time data retrieval, for instance, news or weather highlights. Therefore, whenever a user asks the bot to book flights, this interaction with an airline's booking system enables the bot to perform the transaction for the user. It assures the possibility of this interaction so it would also be a very effective and powerful tool for handling all user-preferred needs.

7. Module of Analytics and Feedback

This module concerns itself with the monitoring of performance metrics for the chatbot and the feedback collection process for continuous improvement. Evaluation of data like accuracy of response, satisfaction levels of users, success rates of conversation and the like will take place through this module.For example, if many users ask a particular question in different ways, then that could be a signal to the module regarding the possible gap in understanding by the chatbot and produce recommendations towards possible improvements on the parameter. Also, users can add their inputs through surveys or ratings as another mechanism to fine-tune the behavior and responses of the chatbot. This suggests that chatbots would eventually become live, active, responsive, and in tune with one's expectations over time.

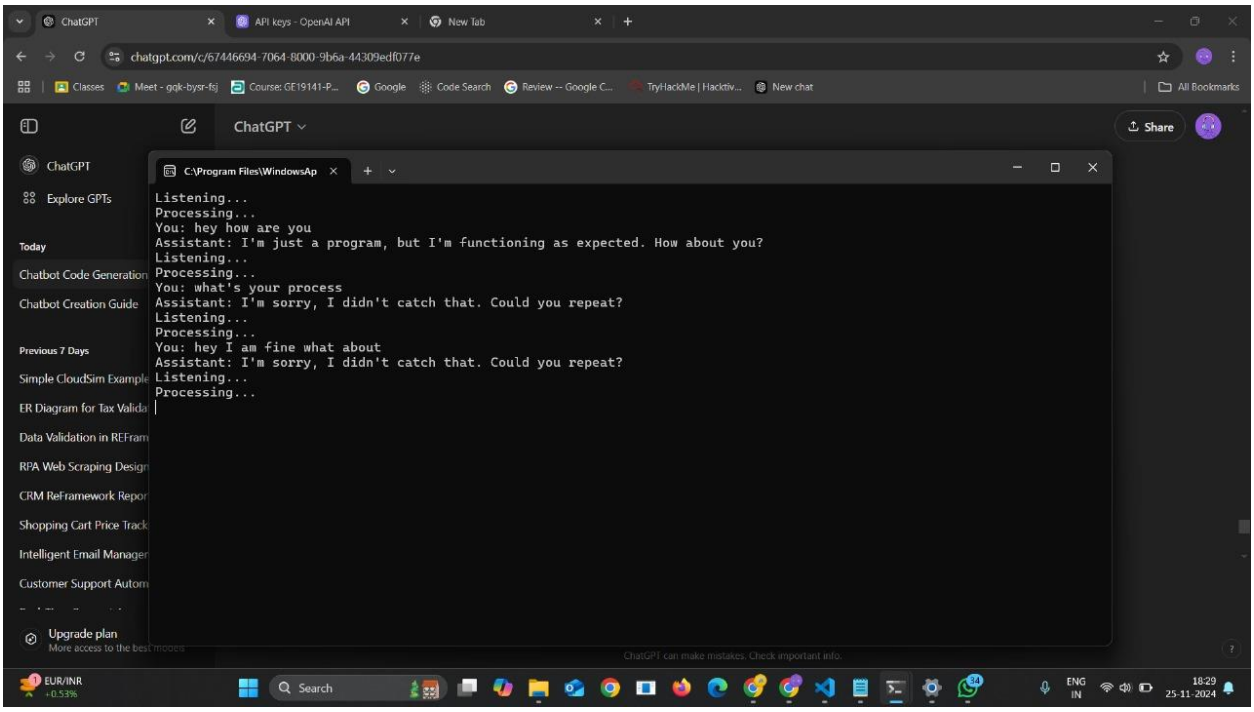
8. Admin control module

The Module is basically a control panel for Administrative work: changes to flow of conversation, improvements in knowledge base, observation of system performance etc. This module allows administrator to add intents, include APIs, change attributes of personality in a given chatbot in tune with brand requirements. It gives an interface for viewing the logs, troubleshooting errors and applying updates so as to keep the chatbot efficient and reliable at all times. Complete development as well as scope for scaling operations is provided by this module in the shaping and reshaping of the chatbot as per the changing user requirements.

CHAPTER 5

RESULTS AND DISCUSSION

The Module is basically a control panel for Administrative work: changes to flow of conversation, improvements in knowledge base, observation of system performance etc. This module allows administrator to add intents, include APIs, change attributes of personality in a given chatbot in tune with brand requirements. It gives an interface for viewing the logs, troubleshooting errors and applying updates so as to keep the chatbot efficient and reliable at all times. Complete development as well as scope for scaling operations is provided by this module in the shaping and reshaping of the chatbot as per the changing user requirements.



CHAPTER 6

CONCLUSION

6.1 Conclusion and Future Work

Designed to create more engaging and personalized experiences with users, these interactive robot mascots combine AI, robotics, and human-computer interaction. They can have a dynamic response via the integration of NLP, speech recognition, gesture detection, and emotion recognition into the pipeline. Emotion recognition in the NLP pipeline would increase the robots' empathy capabilities because, as such, it would take into account each different aspect of users' emotions through facial expressions, tone of voice, or body language. The real use of gesture control through 3D recognition systems would also be able to further improve interaction capability by being able to decipher higher numbers of gestures and expressions. Such developments would therefore lead to more responsive, adaptive, and engaging robots with more natural human-like interfaces within different contexts.

These robots will be more integrated into our daily lives in the future, providing better and deeper interactions, and supporting a wide variety of applications, ranging from personal assistants to companions for the elderly or educational tools for children. This design addresses the current limitations of such designs and focuses on future developments into even more powerful, responsive, and emotionally intelligent robotic companions. It is exciting to envision a new frontier based on this chatbot-powered interactive robot mascot: human-robot interaction that integrates conversational AI with physical robotics.

CHAPTER 7

REFERENCES

[1] Abdul-Kader, S. (2018). *An investigation on question answering for an online feedable Chatbot* (Doctoral dissertation, University of Essex).

[2] Banerjee, B. (2021). *Smart Student Guide Case of HUGI Chatbot, A chatbot for education* [Master's thesis].

[3] Faraz, A. (2022). *Protectbot: A Chatbot to Protect Children on Gaming Platforms* (By Rochester Institute of Technology, Rochester Institute of Technology, RIT Digital Institutional Repository, & RIT Digital Institutional Repository). https://repository.rit.edu/theses

[4] Fischer, M., Menon, S., & Khatib, O. (2016). From Bot to Bot: Using a Chat Bot to Synthesize Robot Motion. *National Conference on Artificial Intelligence*.https://dblp.unitrier.de/db/conf/aaaifs/aaaifs2016.html#FischerMK16

[5] Kumar, P., Kumar, S.V. (2023). Precise and Accurate Farming Framework Utilizing IoT. In: Joshi, A., Mahmud, M., Ragel, R.G. (eds) Information and Communication Technology for Competitive Strategies (ICTCS 2022). ICTCS 2022. Lecture Notes in Networks and Systems, vol 623. pp 293-301, Springer, Singapore

[6] Kumar, P., Vinod Kumar, S., Priya, L. (2024). Heart Device for Expectation of Coronary Illness Utilizing Internet of Things. In: Malhotra, R., Sumalatha, L., Yassin, S.M.W., Patgiri, R., Muppalaneni, N.B. (eds) High Performance Computing, Smart Devices and Networks. CHSN 2022. Lecture Notes in Electrical Engineering, vol 1087. Springer, Singapore. https://doi.org/10.1007/978-981-99-6690-5_14

[7] Kuo, P., Lin, S., Hu, J., & Huang, C. (2021). Multi-Sensor Context-Aware Based Chatbot Model: An Application of Humanoid Companion Robot. *Sensors*, *21*(15), 5132. https://doi.org/10.3390/s21155132

[8] PACELLI, C., GEEGANAGE, P. H., & DE SILVA, T. K. (2020). Multi-modal communication interactions between socially assistive robot and people with neurodevelopmental disorders.

[9] Pradana, A., Sing, G. O., Kumar, Y. J., & MIR Labs. (2017). SamBot - Intelligent Conversational Bot for Interactive Marketing with Consumer-centric Approach. In *International Journal of Computer Information Systems and Industrial Management Applications* (Vol. 6, pp. 265–275). https://www.mirlabs.net/ijcisim/index.html

[10] R. K. Mahendran, A. Thiyagarajan, A. G. A and Kumar P(2024), "Multi-Modal Visual Features Perception Technology for Internet of Vehicles (IoV)," 2024 International Conference on Emerging Smart Computing and Informatics (ESCI), Pune, India, 2024, pp. 1-5, doi: 10.1109/ESCI59607.2024.10497246.

[11] rekha Shodhan, M. S. Facial Expression Synthesis for Entertainment Robots.

[12] S. Vinodh Kumar, P. Kumar, K. Ramya Bharathi and M. Riddhiya, "RAYAN: IoT-based Interactive Robot," 2024 3rd International Conference on Applied Artificial Intelligence and Computing (ICAAIC), Salem, India, 2024, pp. 1749-1754, doi: 10.1109/ICAAIC60222.2024.10575269.

[13] Satu, M. S., Parvez, M. H., & Shamim-Al-Mamun, N. (2015). Review of integrated applications with AIML based chatbot. *Review of Integrated Applications With AIML Based Chatbot*, 87–90. https://doi.org/10.1109/ccie.2015.7399324

[14] Verney, V., & Poulain, A. (2018). *Building brand resonance with chatbots: assessing the importance of giving your bot a human personality*. https://brage.bibsys.no/xmlui/handle/11250/2578083

[15] Zhang, M., Gursoy, D., Zhu, Z., & Shi, S. (2021). Impact of anthropomorphic features of artificially intelligent service robots on consumer acceptance: moderating role of sense of humor. *International Journal of Contemporary Hospitality Management*, *33*(11), 3883–3905. https://doi.org/10.1108/ijchm-11-2020-1256

APPENDIX

```
import speech_recognition as sr

import pyttsx3

import openai

# Set up OpenAI API key (optional, for advanced NLP)

openai.api_key = "your_openai_api_key_here"

# Initialize text-to-speech engine

engine = pyttsx3.init()

engine.setProperty('rate', 150)  # Speed of speech

engine.setProperty('volume', 0.9)  # Volume (0.0 to 1.0)

def speak(text):

    """Convert text to speech."""

    engine.say(text)

    engine.runAndWait()

def listen():

    """Listen to the user's voice and transcribe it into text."""

    recognizer = sr.Recognizer()

    with sr.Microphone() as source:

        print("Listening...")

        recognizer.adjust_for_ambient_noise(source)  # Reduce noise
```

```
        try:
            audio = recognizer.listen(source, timeout=5)
            print("Processing...")
            return recognizer.recognize_google(audio)
        except sr.WaitTimeoutError:
            return "timeout"
        except sr.UnknownValueError:
            return "unknown"
def process_command(command):
    """Process the user's command and generate a response."""
    if "what is your name" in command:
        return "I am your voice assistant, here to help you."
    elif "how are you" in command:
        return "I'm just a program, but I'm functioning as expected. How about you?"
    elif "bye" in command:
        return "Goodbye! Have a great day!"
    elif "openai" in command:  # Example for GPT integration
        prompt = " ".join(command.split("openai")[1:]).strip()
        return get_gpt_response(prompt)
```

```
    else:
        return "I'm sorry, I didn't catch that. Could you repeat?"
def get_gpt_response(prompt):
    """Get a response from GPT for advanced queries."""
    try:
        response = openai.ChatCompletion.create(
            model="gpt-3.5-turbo",
            messages=[{"role": "user", "content": prompt}],        )
        return response['choices'][0]['message']['content']
    except Exception as e:
        return "I couldn't process that with OpenAI. Please try again."
def main():
    """Main loop for the voice assistant."""
    speak("Hello! I am your voice assistant. How can I help you today?")
    while True:
        command = listen()
        if command == "timeout":
            speak("I didn't hear anything. Please try again.")
            continue
        elif command == "unknown":
```

```
            speak("I couldn't understand what you said. Could you repeat?")
            continue
        print(f"You: {command}")
        if "bye" in command.lower():
            speak("Goodbye! Take care.")
            break
        response = process_command(command.lower())
        print(f"Assistant: {response}")
        speak(response)
if _name_ == "_main_":
    main()
import speech_recognition as sr
# Initialize recognizer
recognizer = sr.Recognizer()
# List available microphones
print("Available microphones:")
for index, name in enumerate(sr.Microphone.list_microphone_names()):
    print(f"{index}: {name}")
```

```
# Access the microphone
try:
    with sr.Microphone() as source:
        print("Adjusting for ambient noise...")
        recognizer.adjust_for_ambient_noise(source, duration=1)
        print("Listening... Speak into the microphone.")
        audio = recognizer.listen(source)
        print("Got it! Processing...")
 # Recognize speech
    print("You said: " + recognizer.recognize_google(audio))
except Exception as e:
    print(f"Error: {e}")
```