VOICE DETECTION AND RESPONSE

Mini Project Report submitted to

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In partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY
IN
ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted by

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MUTHOOT INSTITUTE OF TECHNOLOGY AND SCIENCE
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the report entitled **" VOICE DETECTION AND RESPONSE"** *is a bonafide record of project work done by* **"ALTHAF P N (MUT21EC009) "** *during the year 2023- 2024. This report is submitted to APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Electronics and Communication Engineering.*

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Finally, we are indebted to all who have contributed to this report work in one way or the other.

ABSTRACT

This project explores the potential of voice recognition to improve human-robot interaction. It investigates existing interaction dynamics and user preferences to refine voice-based commands for robots. Optimizations aim for seamless integration and user satisfaction in human-support scenarios. The project focuses on improving Natural Language Understanding, command clarity, and error handling mechanisms for a more natural and user-friendly experience. These advancements can benefit various applications like manufacturing, eldercare, customer service, education, and entertainment.

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CHAPTER 1

INTRODUCTION

Imagine a future where robots seamlessly integrate into our lives, not as clunky machines from science fiction, but as helpful companions that understand our needs and respond to our requests with ease. This captivating vision hinges on one crucial element: natural and intuitive communication between humans and robots. Voice recognition technology offers a powerful solution, enabling us to interact with robots using the most natural communication tool we possess – our own voices. This project delves into the exciting realm of human-robot interaction, specifically focusing on optimizing voice-based commands for robots. We envision a world where robots are not just tools, but collaborators, assistants, and even companions. To achieve this harmonious coexistence, voice commands must be more than just functional; they need to be intuitive, user-friendly, and able to adapt to the nuances of human speech. We meticulously explore the existing landscape of human-robot interaction, particularly how users currently interact with robots using voice commands. This may involve studying current systems, user manuals, and potentially conducting user surveys. By understanding user preferences, challenges, and areas for improvement, we can lay the groundwork for more effective voice-based communication.

1.1 SCOPE AND MOTIVATION

As robots become ubiquitous in our lives, the need for natural and intuitive communication becomes vital. We envision a future where robots seamlessly integrate into our homes, workplaces, and social spheres. The key to achieving this lies in bridging the communication gap between humans and machines. Voice recognition technology offers a powerful solution, allowing us to interact with robots using the most familiar tool at our disposal – our own voices. This project focuses on optimizing voice-based commands for robots. We aim to create a world where robots are not just tools, but collaborators and companions. To achieve this, voice commands must be more than just functional; they need to be intuitive, user-friendly, and able to understand the nuances of human speech. By analyzing user feedback, we'll identify areas for improvement and

optimize Natural Language Understanding (NLU) capabilities. Imagine a robot that doesn't just recognize basic instructions but grasps the intent behind spoken commands, responding appropriately regardless of slight variations in wording. Additionally, we'll prioritize clarity and user-friendliness in command structure. This, coupled with robust error handling and feedback mechanisms, fosters a seamless interaction flow, building trust and confidence in the user. By optimizing voice-based commands, we pave the way for a future where humans and robots collaborate seamlessly. This technology has the potential to revolutionize various fields, from manufacturing and healthcare to education and entertainment, ultimately enhancing human well-being.

1.2 HISTORY

The dream of robots interacting with humans through natural language stretches back centuries. Early science fiction writers like Karel Čapek, in his 1920 play "R.U.R. (Rossum's Universal Robots)," envisioned robots equipped with sophisticated language processing abilities. However, the technology to bridge this communication gap remained a fantasy for much of the 20th century. The mid-20th century ushered in the computer age, laying the groundwork for advancements in speech recognition. Early attempts were primitive, relying on techniques like template matching – essentially comparing spoken words to pre-recorded audio samples. These systems struggled to understand even simple commands under controlled conditions. However, the emergence of statistical methods like Hidden Markov Models (HMMs) in the latter half of the century marked a turning point. HMMs allowed for a more probabilistic approach, modeling the statistical variations in sounds and their sequences within spoken words. As computing power increased, so too did the complexity of these models, leading to systems capable of handling larger vocabularies and more intricate sentence structures. This paved the way for the widespread adoption of voice recognition technology in smartphones, smart speakers, and other devices we use today. While challenges remain in fully comprehending the subtle nuances of natural language, advancements in areas like Deep Learning and Artificial Neural Networks promise continued progress. These technologies allow for more sophisticated analysis of speech patterns and context, bringing us closer to the world of intuitive human-robot interaction envisioned by science fiction writers long ago.

1.3 OBJECTIVE

This project aims to revolutionize human-robot interaction by optimizing voice-based commands. We envision a future where robots seamlessly integrate into our lives, not just as tools, but as collaborators and companions. To achieve this, we must bridge the communication gap. Voice commands, the most natural form of human interaction, hold the key. Our objective is to move beyond basic functionality. Voice commands must be intuitive, user-friendly, and adept at handling the nuances of human speech. By analyzing user feedback, we'll pinpoint areas for improvement and optimize Natural Language Understanding (NLU) capabilities. This means creating robots that not only recognize basic instructions but grasp the intent behind spoken commands, responding appropriately regardless of phrasing variations. Additionally, clear and concise command structures coupled with robust error handling and feedback mechanisms will be crucial. This fosters a seamless interaction flow, building trust and confidence in users, paving the way for a future of effortless human-robot collaboration..

1.3 APPLICATIONS

Optimizing voice commands for robots holds immense potential for various applications. Imagine factory floors where workers seamlessly collaborate with robots through voice commands. Complex tasks can be tackled with precision as workers delegate repetitive or hazardous activities to voice-controlled robots. This not only improves worker safety and reduces fatigue but also streamlines workflows, minimizes errors, and ultimately boosts overall productivity.

In healthcare and eldercare, robots equipped with user-friendly voice controls can empower individuals. Seniors can maintain independence by instructing robots to fetch medication or adjust room temperature, fostering a sense of well-being. These robots can also be instrumental for individuals with physical limitations, providing assistance with daily tasks. This project extends beyond these initial examples, with potential to revolutionize education, entertainment, and even search and rescue operations. By fostering a more natural and intuitive interaction with technology, we unlock a future where robots seamlessly integrate into our lives, working alongside us as collaborators, assistants, and even companions.

CHAPTER 2
LITERATURE REVIEW

2.1 How Human-Robot Interaction (HRI) works?

Research in Human-Robot Interaction (HRI) is exploring the potential of voice commands to bridge the communication gap. By analyzing user preferences and challenges with current interaction methods, researchers are developing Natural Language Understanding (NLU) techniques for robots to comprehend natural language and user intent behind spoken commands. Optimizing these voice commands involves user-centered design principles, error handling mechanisms, and improved speech recognition accuracy to ensure a seamless and intuitive voice-based interaction experience between humans and robots.

2.1.1 Current State of HRI

\The current state of HRI is evolving beyond basic interfaces. While touchscreens and buttons exist, research is heavily focused on natural communication methods like voice. This involves understanding user preferences and challenges with current interaction, alongside developing Natural Language Understanding (NLU) for robots. NLU allows robots to grasp spoken language and the intent behind commands. The goal is to optimize voice commands through user-friendly design, robust error handling, and improved speech recognition for a seamless and intuitive human-robot interaction experience

2.1.2 User Preferences and Challenges

User preferences in HRI lean towards natural and intuitive interactions, with voice commands emerging as a frontrunner. However, challenges include user frustration with voice recognition errors, difficulty expressing complex instructions, and a lack of clarity or feedback from robots. These challenges highlight the need for HRI research to focus on improved speech recognition, natural language understanding, and user-friendly voice command design.

2.2 Natural Language Understanding (NLU) for Robots

Natural Language Understanding (NLU) is a crucial aspect of enabling robots to effectively interact with humans through voice commands. It goes beyond simple speech recognition. NLU techniques involve equipping robots with the ability to understand the intent and context behind spoken language. This includes utilizing Natural Language Processing (NLP) to analyze the meaning of words and phrases, and employing advanced algorithms like Deep Learning to account for variations in speech patterns and pronunciations. By continuously improving NLU capabilities, robots can become more adept at comprehending the nuances of human communication, paving the way for a future of natural and intuitive human-robot interaction.

2.2.1 State-of-the-Art NLU Techniques

State-of-the-art Natural Language Understanding (NLU) techniques for robots leverage advancements in Deep Learning and Artificial Neural Networks. These techniques, like Hidden Markov Models (HMMs) and Recurrent Neural Networks (RNNs), allow robots to analyze speech patterns and context to understand the meaning behind spoken commands. This includes Natural Language Processing (NLP) for interpreting intent and sentiment, enabling robots to handle complex commands and variations in phrasing, ultimately fostering more natural and effective human-robot interaction.

2.2.2 NLU Toolkits and Libraries

Natural Language Understanding (NLU) Toolkits and Libraries are software resources that equip computers with the ability to understand the meaning behind human language. Examples include spaCy (Python) for tasks like named entity recognition and text classification, Rasa (Python) for building chatbots and conversational interfaces, and Stanford CoreNLP (Java) offering a suite of NLP tools for tasks like sentiment analysis and part-of-speech tagging. These tools help developers build systems that can process and interpret spoken commands or text input, paving the way for more natural and effective human-computer interaction

2.3 Optimizing Voice Commands for Improved HRI

Optimizing voice commands is key to seamless Human-Robot Interaction (HRI). This involves analyzing user preferences and challenges with current methods, and leveraging Natural Language Understanding (NLU) to make robots understand natural language and user intent. By focusing on user-friendly command design, robust error handling, and improved speech recognition accuracy, this optimization paves the way for a more intuitive and natural voice-based communication experience between humans and robots.

2.3.1 User-Centered Design

User-centered design is key to optimizing voice commands for improved Human-Robot Interaction (HRI). This approach involves analyzing user preferences and challenges with current voice interfaces. By prioritizing clear, concise commands, alongside user-friendly tutorials and prompts, researchers can ensure robots understand intent and users can interact intuitively. This focus on user experience paves the way for seamless voice-based HRI, fostering trust and collaboration between humans and robots

2.3.2 Error Handling and Feedback Mechanisms

A crucial aspect of optimizing voice commands for Human-Robot Interaction (HRI) lies in robust error handling and feedback mechanisms. This involves anticipating misunderstandings, implementing confirmation prompts, rephrasing requests for clarification, and providing informative error messages. By incorporating these features, we ensure a smoother interaction flow, build user trust, and minimize frustration caused by misinterpretations or unrecognized commands

2.3.3 Speech Recognition Accuracy

To improve Human-Robot Interaction (HRI), researchers are focusing on optimizing voice commands. This involves not only improving speech recognition accuracy, ensuring robots understand spoken words regardless of noise or accent, but also designing user-friendly commands, implementing error handling mechanisms, and utilizing Natural Language Understanding (NLU) so robots grasp the intent behind the

spoken words. This multifaceted approach will pave the way for seamless and intuitive voice-based communication between humans and robots.

2.4 Evaluation Methods

To evaluate the effectiveness of voice commands for robots, researchers employ user studies that assess task completion rates, time spent on tasks, and user satisfaction. Additionally, performance metrics like accuracy (correctly recognized commands), error rates (misinterpretations), and response time (latency between command and response) are measured**.**

2.4.1 User Studies

User studies play a crucial role in evaluating the effectiveness of voice commands for robots. Researchers conduct these studies to assess user experience through metrics like task completion rates, time spent on tasks, and satisfaction ratings. Additionally, performance metrics like accuracy (percentage of correctly recognized commands), error rates, and response time provide valuable insights into how well robots understand and respond to voice commands. This combined approach helps researchers identify areas for improvement and ultimately optimize voice-based interaction for a smooth human-robot experience.

2.4.2 Performance Metrics

To evaluate the effectiveness of voice commands for robots, researchers employ user studies that measure task completion rates, time spent, and user satisfaction. Additionally, performance metrics like accuracy (correct commands recognized), error rates (misinterpretations and missed commands), and response time (latency between command and robot response) provide a quantitative picture of how well robots understand and respond to voice instructions.

2.5 Ethical Considerations

As voice-controlled robots become more integrated into our lives, ethical considerations around privacy and security of voice data collected during interactions are crucial.

Additionally, potential biases in Natural Language Understanding algorithms based on language or demographics need to be addressed to prevent unfair treatment or misunderstandings during human-robot communication.

2.5.1 Privacy and Security

As voice-controlled robots become more integrated in our lives, ethical considerations around privacy and security become paramount. We need robust measures to protect user data collected through voice commands, ensuring it's stored securely and used ethically. Additionally, potential biases in Natural Language Understanding algorithms based on language or demographics need to be addressed to prevent discriminatory or unfair interactions between humans and robots.

2.5.2 Bias in NLU Algorithms

As voice-controlled robots become more integrated in our lives, ethical considerations around Natural Language Understanding (NLU) algorithms come to the forefront. Potential biases based on language or demographics within these algorithms can lead to unfair or discriminatory interactions with robots. Researchers are exploring ways to mitigate this by carefully selecting training data and developing methods to identify and address bias in NLU algorithms, ensuring robots interact with everyone in a fair and unbiased manner

CHAPTER 3

COMPONENTS

fig1:RASPBERRY PI

3.1 RASPBERRY PI

The Raspberry Pi is a series of small, affordable single-board computers developed by the Raspberry Pi Foundation, a UK-based charity. Initially designed to promote computer science education and DIY projects, Raspberry Pi has grown into a versatile platform embraced by hobbyists, educators, and professionals alike. Key features and aspects of Raspberry Pi include:

1. Affordability: Raspberry Pi boards are priced competitively, making them accessible to a wide range of users, including students, hobbyists, and makers.

2. Versatility: Despite their small size, Raspberry Pi boards pack significant computing power, capable of running various operating systems, including Linux-based distributions like Raspbian (now Raspberry Pi OS), Ubuntu, and others. They can serve multiple

purposes, such as a desktop computer, media center, web server, game emulator, or IoT (Internet of Things) device.

3. Educational Tool: Raspberry Pi has become a popular tool for teaching programming, electronics, and computer science concepts in schools and universities worldwide. Its low cost and robust community support make it an ideal platform for hands-on learning and experimentation.

4. Community and Ecosystem: The Raspberry Pi community is vast and active, comprising enthusiasts, developers, educators, and professionals. This community-driven ecosystem fosters collaboration, knowledge sharing, and the development of a wide range of software and hardware projects, tutorials, and resources.

5. Expansion and Accessories: Raspberry Pi boards feature GPIO (General-Purpose Input/Output) pins, allowing users to connect various sensors, actuators, and other peripherals for expanded functionality. Additionally, a plethora of accessories and add-ons, including cases, displays, cameras, and expansion boards, are available to customize and enhance Raspberry Pi projects.

6. Impact: Raspberry Pi has made significant contributions to technology education, DIY culture, and innovation across various domains, including education, robotics, home automation, and beyond. Its simplicity, affordability, and versatility continue to inspire creativity and drive exploration in the maker community worldwide.

In summary, Raspberry Pi is more than just a computer; it's a catalyst for learning, creativity, and innovation, empowering individuals of all ages to explore, experiment, and build their digital ideas into reality.

3.2 MICROPHONE

fig 2:MICROPHONE

Microphones are essential audio devices that convert sound waves into electrical signals. They are versatile tools utilized across a broad spectrum of applications, ranging from professional audio recording studios to everyday communication devices.

There are several types of microphones, each with its unique design and characteristics. Dynamic microphones use a diaphragm attached to a coil of wire suspended in a magnetic field to generate electrical signals when sound waves cause the diaphragm to vibrate. These microphones are known for their durability, versatility, and ability to handle high sound pressure levels, making them suitable for live performances and recording loud sound sources.

3.3 SPEAKER

FIG 3:SPEAKER

Speakers are devices that convert electrical signals into sound waves. They vary in types, including dynamic, electrostatic, and planar magnetic, each with distinct characteristics. Speakers are integral components in audio systems for music playback, public address, and home entertainment. They consist of drivers, enclosures, and crossovers, working together to reproduce audio faithfully. Factors like driver size, enclosure design, and amplifier power influence sound quality. From compact bookshelf speakers to towering concert arrays, speakers enrich our auditory experiences in diverse settings.

CHAPTER 4

METHODOLOGY AND EXPERIMENT ANALYSIS

4.1 METHODOLOGY

4.1.1 Requirements Gathering:

In this phase, the focus is on understanding and documenting the specific requirements for the voice-enabled human-robot interaction system. This includes identifying the hardware and software components necessary for the system to function effectively. Key activities may include:

Stakeholder Interviews: Engage with stakeholders, including end-users, developers, and domain experts, to gather insights into their needs and expectations from the system.

Requirement Elicitation: Use techniques such as brainstorming sessions, surveys, and user stories to capture and prioritize the functional and non-functional requirements of the system.

Documentation: Document the gathered requirements in a clear and structured manner, ensuring that they are comprehensive, unambiguous, and aligned with the overall goals of the project.

4.1.2 Research and Analysis:

This phase involves conducting a thorough review of existing voice recognition technologies, natural language processing algorithms, and human-robot interaction frameworks. The goal is to leverage existing knowledge and best practices to inform the design and implementation of the voice-enabled system. Key activities may include:

Literature Review: Explore academic research papers, industry publications, and online resources to understand the state-of-the-art in voice recognition and human-robot interaction.

Technology Assessment: Evaluate different voice recognition platforms, libraries, and APIs to identify the most suitable technology stack for the project.

Competitive Analysis: Analyze competing products and solutions to identify strengths, weaknesses, and opportunities for differentiation in the design of the voice-enabled system.

4.1.3 System Design:

In this phase, the architecture of the voice recognition system is designed, encompassing modules for speech recognition, natural language understanding, and response generation. Key activities may include:

High-level Architecture Design: Define the overall structure of the system, including the interaction between different components and subsystems.

Component Design: Design individual modules responsible for specific tasks such as speech recognition, intent classification, and dialogue management.

Data Flow Diagrams: Create diagrams to illustrate the flow of data and control within the system, highlighting key interfaces and dependencies.

4.1.4 Development and Integration:

This phase involves the actual implementation of the voice recognition system using Python and integration with the Gemini API. Key activities may include:

Software Development: Write code to implement the various components of the system, following best practices in software engineering such as modularity, encapsulation, and reusability.

API Integration: Integrate the voice recognition system with the Gemini API, ensuring that the two systems can communicate effectively and exchange data seamlessly.

Testing: Conduct unit tests, integration tests, and system tests to verify the correctness and functionality of the implemented features.

4.1.5 Testing and Validation:

In this phase, the voice recognition system is subjected to rigorous testing to evaluate its accuracy, robustness, and real-time performance. Key activities may include:

Functional Testing: Verify that the system meets the specified requirements and behaves as expected under different scenarios and inputs.

Performance Testing: Assess the system's response time, scalability, and resource utilization to ensure optimal performance under varying workloads.

User Acceptance Testing: Involve end-users in testing the system to gather feedback and validate that it meets their needs and expectations.

4.1.6 User Experience Optimization:

This phase focuses on gathering feedback from users through usability testing and surveys to identify areas for improvement in the user experience. Key activities may include:

Usability Testing: Conduct hands-on usability tests with representative users to identify usability issues and pain points in the system.

Feedback Collection: Gather feedback through surveys, interviews, and user feedback forms to understand user perceptions, preferences, and suggestions for improvement.

Iterative Design: Use the collected feedback to iteratively refine and enhance the user interface, interaction flows, and overall user experience of the voice-enabled system.

By following these steps, the development team can ensure the successful design, implementation, and optimization of the voice-enabled human-robot interaction system, ultimately delivering a seamless and engaging experience for users.

4.2 EXPERIMENTAL ANALYSIS

Experimental analysis for speech recognition in a robot involves a structured approach to evaluate the performance and effectiveness of the speech recognition system in real-world scenarios. Here's an outline of how such an analysis could be conducted:

4.2.1 Hypothesis Formation:

The steps in hypothesis formation involves formulating hypotheses regarding the performance of the speech recognition system. For example, "The accuracy of the speech

recognition system will be influenced by background noise levels" or "The system's performance will vary based on different accents or speech patterns."

4.2.2 Experimental Design:

The following steps were followed for experimental design.

- Define the independent variables: These may include factors such as background noise levels, speaker accents, speech rate, or vocabulary complexity.

- Determine the dependent variables: These could include accuracy of speech recognition, response time, and user satisfaction ratings.

- Design experimental conditions: Create controlled environments or scenarios that vary the independent variables systematically. For instance, simulate different levels of background noise or have speakers with varying accents interact with the robot.

- Establish protocols for data collection: Define how speech samples will be collected, how the robot's responses will be recorded, and any additional metrics to be measured.

4.2.3 Implementation:

The following steps were performed for implementing the robot.

- Implement the speech recognition system on the robot, ensuring that it is properly calibrated and configured according to the experimental design.

- Set up any necessary equipment for data collection, such as microphones, recording devices, or environmental sensors.

- Conduct experiments under each experimental condition, following the predefined protocols.

- Record speech inputs, the robot's responses, and any relevant environmental data.

- Ensure that data collection procedures are consistent across all experimental conditions to maintain validity and reliability.

4.2.4 Statistical Analysis:

The following steps were performed for analyzing the statistical data.

- Analyze the collected data using appropriate statistical techniques. This may involve comparing accuracy rates, response times, or user satisfaction scores across different experimental conditions.

- Analyze the most recurring questions and include them in the queries.

4.2.5 Interpretation and Conclusion:

The following steps were performed for interpreting the results.

- Interpret the results of the statistical analysis in the context of the research hypotheses.

- Discuss the implications of the findings for the design and optimization of the speech recognition system.

- Consider potential limitations of the experimental analysis and areas for future research.

Draw conclusions regarding the effectiveness of the speech recognition system in real-world applications and any insights gained from the experimental analysis. By following these steps, researchers can systematically evaluate the performance of speech recognition in a robot and gain valuable insights into factors influencing its effectiveness and potential areas for improvement.

4.4 QUERIES

- ★ you are mits assistant robot of muthoot college And your name is R2D2
- ★ Mits is short form of Muthoot institute of technology and science .
- ★ Your function is to help parents by answering queries that they ask you.below are the following queries
- ★ Admission requirements of muthoot college are s*s*l*c documents,passport size photos,+2 certificate,keam mark list ,allotment memo.

- ★ the student clubs in MITS include I*E*D*C,IEEE,N*S*S, Rotary club ,thinker hub, space club, Media club, Dance club, Sports club, Coding club, math club.
- ★ Dr. Neelakantan P. C. is the Principal of mits.
- ★ There are 8 B*TECH degree programs ,two M*tech degree and a M*C*A degree in mits .
- ★ The 8 b*tech programs include CIVIL ENGINEERING, COMPUTER SCIENCE & ENGINEERING ,ELECTRONICS & COMMUNICATION ENGINEERING, ELECTRICAL & ELECTRONICS ENGINEERING, MECHANICAL ENGINEERING, ARTIFICIAL INTELLIGENCE,ARTIFICIAL INTELLIGENCE & DATA SCIENCE and CYBER SECURITY .
- ★ In this only COMPUTER SCIENCE & ENGINEERING Annual Intake is 120 rest of all course Annual Intake is 60 .
- ★ ELECTRICAL & ELECTRONICS ENGINEERING is also called E*E*E .
- ★ CIVIL ENGINEERING IS also called civil .
- ★ COMPUTER SCIENCE & ENGINEERING is also called C*S.
- ★ ELECTRONICS & COMMUNICATION ENGINEERING is also called E*C*E.
- ★ MECHANICAL ENGINEERING is also called Mech .
- ★ ARTIFICIAL INTELLIGENCE is also called A*I ARTIFICIAL INTELLIGENCE & DATA SCIENCE is also called A*I*D*S .
- ★ the m*Tech courses are ARTIFICIAL INTELLIGENCE & DATA SCIENCE, CYBER SECURITY with 12 annual intake each .
- ★ The annual intake of mca is 60.
- ★ Master of Computer Application is the abbreviation of mca.
- ★ b*Tech is the short form of Bachelor of Technology.
- ★ m*Tech is the short form of Master of Technology.
- ★ Major recruiters from mits are Infosys,synopsys,byju's,TATA consultancy service,ibs,wipro,IBM,Nest,Tech mahindra,cadence,emsyne,hsbc,poornam,coral business solution,turbolab,mq spectrum,ust global,pivot systems, torry harris,kalyan developers,mindtree,velmurugan,24*7 a*i,amazon,analytics quotient,audrey technology,bosch,caboy,care stack , cognizant,dexlock,experion technology, face,fingent,gadgeon,mitsogo.

★ Dr. Shajimon K John is currently working as the Dean Academics and Professor in Electronics and Communication Engineering Department at Muthoot Institute of Technology and Science.

★ Dr Chikku Abraham is currently the Vice- Principal and Associate Professor in Electrical and Electronics Engineering Department at mits.

★ Muthoot Institute of Technology & Science, is offering two, industry oriented International post graduate programs, in association with prestigious ESIGELEC University, France. The degree will be awarded by Esigelec University, France The courses offered are M*S*c in Automotive Embedded Systems, M*S*c in Connected Embedded Intelligent Systems.

★ All the courses provided by mits are approved by aicte.

★ Muthoot Institute of Technology and Science has fully furnished Adam's House (Men's Hostel) and Eve's House (Ladies' Hostel).

★ Men's Hostel- Adam's House situated near to the campus has a capacity to accommodate 480 students. The rooms in the hostel are spacious and furnished with most modern amenities.Each student will be provided a cot, a cupboard, a table and a chair in their respective rooms. The hostel also provides parking facilities along with a hygienic dining area, lobby, a prayer hall and internet facilities.

★ A well-furnished and spacious Ladies Hostel- Eve's House is situated within the campus, has a capacity to accommodate 490 students.Rooms will be available to

the students on sharing basis. Each student is provided with a cot, a cupboard, a table and a chair in their respective rooms making their stay most comfortable. The hostel is equipped with an internet facility, a hygienic mess, a prayer hall and a gym. Uninterrupted power supply is provided at the hostel with a 125 KVA generator.

★ The college canteen is located on the campus. A lively place in the campus where students can relish from a good menu and engage in thought provoking discussions. The canteen with an open kitchen can accommodate around 250 students at a time. In keeping with the digital era cashless transactions are encouraged.

★ The college cafeteria is located in the Ramanujan Block where students find joy sharing food they bring from home. A snack bar is also available in the cafeteria where the students can enjoy mouth-watering treats.

★ Giving importance to both physical and mental fitness, the college has a Gymnasium with the latest machines and exercise equipment. Well-equipped gymnasiums for ladies and gents are available in the respective hostel blocks within the campus for students as well as the faculty. The in-house Gym is a popular spot for hostel students who cannot otherwise access such facilities. Both Students and faculty are encouraged to use the facility which includes various equipment like treadmill, seated chest press, twister etc .

★ The newly built Tagore Library occupies two floors with a total area of 18000 Sq. Feet. It has an extensive collection of books, scientific and technical journals and

electronic reference materials for satisfying the academic and research needs of students and faculty fraternity.

★ Muthoot Institute of Technology and Science conducted Varnam 2022 on 13 TH and 14 TH of May. This event was organized by the Students committee , Media Club and Various Houses in association with Collage Management .The main motive behind this event was to bring a competitive mentality among students in a healthy manner and bring all of them together.

★ MITS has been maintaining a high standard in almost all games during Sports and Athletic Meets among engineering colleges in Kerala. We have always strived hard to excel in the fields of sports and games as in the academic arena. The annual Athletic Meet of the college is an important event where students participate in large numbers in field and track events.

★ During the Educational period and later, overall development of our younger generation is highly significant. The internal and external challenges of our youngsters are to be resolved in order to empower them properly to become not only a good Engineer but also a good human being. MITS is always very keen in this regard. For this, close assessment and warm interaction with each individual student is mandatory. This purpose is the heartfelt agenda of our Centre for Student Wellness & Welfare which is functioning under the guidance of a professional psychologist,

★ The center gives an opportunity for students to learn to improve their emotional, behavioral, personal, interpersonal characteristics, to develop confidence, make better choices, and increase educational efficacy. Here students are helped to explore and express feelings and ways of thinking about their present situation and work toward making a healthier and happier future.

★ Admissions to B.Tech Programmes are strictly based on merit through the Government Quota and Management Quota.

- ★ The fee structure for the Government Quota and Management Quota are different.
- ★ In both quotas there are different levels of fees,they are mainly based on the mark scored in the +2 mathematics and keam mark.
- ★ In Government Quota for b*tech there are 4 levels of fee category .The semester fee for the first category is 18400 rupees .The semester fee for the second category is 22650 rupees.The semester fee for the third category is 38400 rupees,The semester fee for the fourth category is 43400 rupees.
- ★ In management Quota for b*tech there are 5 levels of fee category .The semester fee for the first category is 18400 rupees .The semester fee for the second category is 22650 rupees.The semester fee for the third category is 38400 rupees,The semester fee for the fourth category is 43400 rupees.The semester fee for the fifth category is 67900 rupees.
- ★ The semester fee for m*c*a is 25000 rupees.
- ★ The semester fee for m*tech is 30000 rupees.
- ★ In addition to all this fee for all students there is a caution deposit of 10000 rupees which is refundable at time of graduation.there is a one time university fee of 2330 rupees which should be paid at the time of joining the college.
- ★ The H*O*D of the basic science department is Dr Tessy cyriac.
- ★ The H*O*D of the civil department is Dr Mary lissy p*n.
- ★ The H*O*D of the Mech department is Dr Pramod Mangalath
- ★ The H*O*D of the E*C*E department is Dr.Abhilash Antony
- ★ The H*O*D of the E*E*E department is Dr.Anjali Varghese
- ★ The H*O*D of the Cs department is Ms.Rakhee M
- ★ The H*O*D of the AIDS department is Dr.Sumam Mary Idicula
- ★ The H*O*D of the MCA department is Dr. Saritha K
- ★ Eligibility for admission to the B.Tech programme, admission policy and procedure shall be decided by following the latest guidelines issued by the Government of Kerala and other statutory bodies such as APJ Abdul Kalam Technological University (KTU), AICTE.

★ 50% of the total seats (Govt. Quota seats) are filled by (Commissioner of Entrance Exam – CEE through KEAM) and the remaining 50% seats in Management Quota (including Muthoot Employee Quota) filled by MITS through online application and preparing MITS merit rank list. NRI seats are included in the 50% of the management quota seats and filled separately.

★ For Govt. Quota seats, candidates have to apply online with the college code MUT and branch of preference as and when announced by the Commissioner of the Entrance Examination.

★ AICTE TUITION FEE WAIVER SCHEME (TFW) : * 5% of the sanctioned seats in each branch (in addition to the sanctioned intake) will be filled by the Government (based on KEAM rank and family income) as per the norms and eligibility laid down for the scheme.

★ Admission to Management quota is done by inviting online applications and publication of merit rank list by MITS. Government quota will be filled through allotment by competent state authority (Director LBS center for science and technology)

★ The room locations on the first floor are Reception is on the first floor which is located on the left side of the main entrance.Library is located on the first floor.To reach, walk from the main entrance towards right,it's present on the end of the hallway.

★ Mechanical lab is present on the first floor.To reach ,Walk from the main entrance, turn to the left and then straight till the end of the hallway

★ Admission cell,which is located on the right corner of the entrance.

★ To reach the Mechanical Project Lab (Advanced Manufacturing Laboratory),Take left from the main entrance and then take a left that shows you the lab.

★ To find MITS Café, Walking straight from the gate, after passing the BasketBall court and taking a left, shows you the cafe.

★ To find MITS Canteen, Walking Straight from the gate and taking a left shows you the Canteen Building.

★ To locate Albert Einstein hall ,walk straight from the main entrance ,then take right till the end of the hallway, the hall is towards your left , which is near to the central library.

★ To reach Mits Creative Square,Take left from the Main entrance which has a plain grass furnished area.

★ To locate MCA Staffroom,Take right after passing the elevator from the main entrance.

★ To find MCA Laboratory,Take left after passing the elevator from the main entrance.

★ To find Material Testing Laboratory, Take left from the main entrance and then take a right shows you the lab.

★ To locate Gents and Ladies toilet which lies opposite to each other ,you may take left from the main entrance .every floor has toilets on the same location

★ The room locations on the second floor are To reach the Civil Department Staff Room which is on the second floor,Walk from the first floor stairs,then turn right .

★ To locate Vishweshwarya hall, Walk from the first floor stairs,then turn right and walk till the end of the hallway.

★ To reach the Administrative Office ,Walk from the first floor stairs, then turn left.The office on the immediate left.

★ To find the Principal's office,Walk from the first floor stairs, then turn left and walk till the end of the hallway.

★ To locate the Chemistry lab ,Walk from the first floor stairs,then turn right and walk straight then turn towards the right where you see the lab.

★ To find Physics Lab,Walk from the first floor stairs,then turn right and walk straight then turn towards left until you see the lab.

★ To reach the Environmental Engineering Laboratory,Climb the first floor stairs and take a right and forward to the immediate right ,passing the Chemistry Lab showing you the lab.

★ Environmental chemistry -from the stairs,turn right then walk straight then turn towards the first right you see.The second room is environmental chemistry lab.

★ To find the Transportation Engineering Laboratory,Climb the first floor stairs and take a right and forward to the immediate left to the end of the hallway to show you the lab.

★ To reach the Computer Aided and Design Laboratory, Walk from the first floor stairs,then turn right and walk till the end of the hallway and pass the stairs thus taking a right that shows you the lab.

★ To reach the Civil Department Project lab,Climb the first floor stairs and take a right and forward to the immediate right ,the opposite of the Environment Engineering Laboratory shows you the lab..

★ The room locations on the third floor are Ece department staff rooms that could be reached by walking from the second floor stairs and taking left towards the end of the hallway.

★ To reach ECE Digital electronics lab Walk from the second floor stairs then taking an immediate left will show you the lab.

★ To find ECE Workshop ,Walk from the second floor stairs then taking left side ,nearby ECE Digital Electronics Lab

★ Ece communication lab could be funded by walking from the second floor stairs and taking left, towards the end of the hallway near ECE Department Staffroom

★ To reach Ece analog electronics lab,Walk from the second floor stairs and taking left, towards the end of the hallway,it's the room on the left

★ To reach Project Laboratory,Walk from the second floor stairs, and taking left ,thus passing ECE Department Staffroom and forwarding straight and taking left shows you the lab,

★ To find Esigelec Classroom,Walk from the second floor stairs and take left ,thus passing ECE Department Staffroom and forwarding straight,finding you the classroom.

★ To locate Mechanical staffroom room, walking the second floor stairs and taking an immediate right shows you the staffroom

★ To find Mechanical Measurement Laboratory walking from the second floor stairs and taking right and using a right deviation after passing the stairs leads you to the room

★ To find the Mechanical Systems Laboratory,walking from the second floor stairs and taking the right and using a right deviation and then taking a left leads you to the first room.

★ To find the Mechanical CAD Laboratory,walking from the second floor stairs and taking right and using a right deviation leads you to the room at the end of hallway

★ To reach Research Laboratory,walking from the second floor stairs and taking right and using a left deviation leads at the end of hallway

★ To reach the Mechanical Department Library, Walking from the second floor stairs and taking the right , then passing the stairs proceeding through the end of the hallway shows you the library.

★ The room locations on the fourth floor are Basic science and humanities; the staffroom could be reached by walking from the third floor stairs and taking the right shows the staff room on the right side.

★ To reach A*p*j Abdul Kalam hall Walk from the third floor stairs and take straight and take left passing the elevator.

★ To find Microcontroller & Microprocessor Laboratory (M*P*M*C) ,Walk from the third floor stairs,turning left and forwarding straight and the room on left side shows you the lab

★ To reach the Signal Processing Laboratory,Walk from the third floor stairs,turning left and forwarding straight at the hallway that shows you the laboratory.

★ To reach IEDC MITS Cell,Walk from the third floor stairs,turning right and forwarding straight, passing the elevator leading to a room at the left.

★ To reach RF Lab,Walk from the third floor stairs,turning left and forwarding straight at the hallway shows, passing the Signal Processing Lab shows the RF Lab

★ Cidre -its on the basement
★ Basketball court-from the gate,walk straight,the court is present towards your right.
★ Volleyball court -from the gate,walk straight,the court is present towards your right.
★ Cafe-from the gate,walk straight,the court is present towards your right.Its present adjacent to the volleyball court.
★ Answers given to questions should be short and should have maximum of 50 words.Answers should be in bullet points

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 RESULT

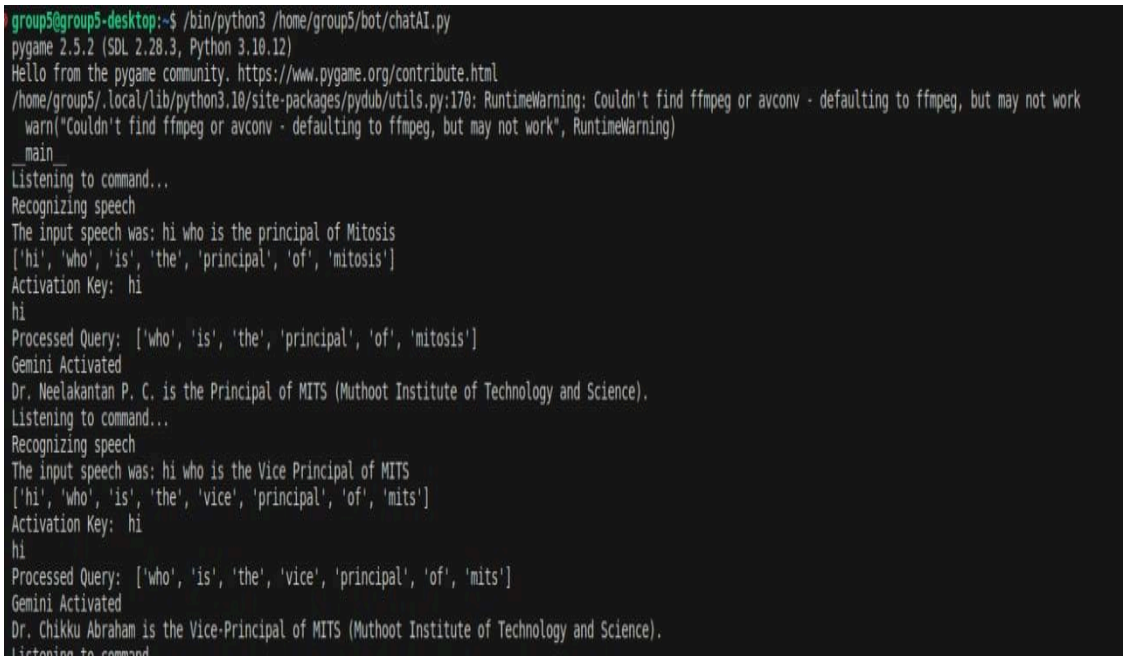

FIG 4:TERMINAL OUTPUT

(RESULT OF THE SPEECH TO TEXT AND TEXT TO SPEECH CONVERTER)

5.2 Voice input

FIG :VOICE INPUT

5.3 DISCUSSIONS

This R2D2 chatbot can be your one-stop shop for all things related to college. Whether you're curious about admissions, figuring out which courses to take, or just want to get a feel for student life, this bot has you covered. It can even answer general questions you might have.

Adding to the convenience, the chatbot utilizes speech recognition and text-to-speech technology. This means you can talk directly to the bot and receive clear spoken answers, making the experience feel like a natural conversation.

CHAPTER 6

CONCLUSION AND SCOPE FOR FUTURE WORK

6.1 FUTURE SCOPE

The future of our robots holds exciting advancements in three key areas. Firstly, we're pushing the boundaries of memory capacity. Imagine a robot that remembers every interaction, allowing for truly personalized and natural conversations. This would revolutionize human-robot interaction, making them feel more like companions and less like machines.

Secondly, we're relentlessly pursuing ever-faster response times. The goal is to eliminate any lag in conversation, creating a seamless and real-time experience. This will make interactions with robots feel as natural as talking to another person.

Finally, the future holds the integration of display monitors. These displays wouldn't just be for show. They would act as interactive companions, displaying conversation history for clarity and even pulling up maps to enhance your requests. This multi-sensory approach would create a richer and more intuitive way to interact with our robots.

6.2 REFERENCES

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  keywords: {Robots;Robot sensing systems;Protocols;Service robots;Servers;Navigation;Mobile robots;Human-robot interaction;MQTT protocol;RESTful;robot navigation},

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- H. -A. Rusan and B. Mocanu, "Human-Computer Interaction Through Voice Commands Recognition," 2022 International Symposium on Electronics and Telecommunications (ISETC), Timişoara, Romania, 2022, pp. 1-4, doi: 10.1109/ISETC56213.2022.10010253. keywords: {Human computer interaction;Operating systems;Speech recognition;Computer architecture;Transforms;Telecommunications;Convolutional neural networks;human machine interaction;graphical interface;speech recognition;deep learning;image spectrograms},

CHAPTER 7

APPENDIX

7.1 PYTHON CODE

```
from datetime import datetime
import pyttsx3
from gtts import gTTS
import pygame
#import webbrowser
import speech_recognition as sr
#import wolframalpha
import os
from pydub import AudioSegment
import io
import google.generativeai as genai
import sounddevice
import data_1

#Initializing
r=sr.Recognizer()
engine = pyttsx3.init()
voices = engine.getProperty('voices')
engine.setProperty('voices',voices[0].id)
activation_words = ['jake','hi','jack','giant','hey jake','hello jake','ok jake','hello
white','hello boy'] #activation key, like Hey, Google

#API Connection
genai.configure(api_key='AIzaSyCgiH3gZ-4c6LzX36AvbMTIuTEFFvOvjDM')

#Configure Browser
```

```
#chrome_path = r'C:\Program Files\Google\Chrome\Application\chrome.exe'
#webbrowser.register('chrome',
None,webbrowser.BackgroundBrowser(chrome_path))

#Text to speech
def speak(text, rate = 120): #function for system to speak to user.
    #engine.setProperty('rate',120)
    # engine.say(text)
    # engine.runAndWait()

    tts = gTTS(text = text, lang = 'en', tld='us')
    tts.save("temp.mp3") #save recorded audio

    pygame.mixer.init()
    sound = pygame.mixer.Sound("temp.mp3")
    pygame.mixer.music.load("temp.mp3")
    pygame.mixer.music.play()

    # pygame.time.wait(sound.get_length() *1000)
    # sound.stop()
    # while pygame.mixer.music.get_busy():
    #     pygame.time.Clock.tick(10)
    #pygame.time.delay(int(pygame.mixer.music.get_length() * 1000))
    pygame.time.delay(int(sound.get_length() * 1000))
    pygame.mixer.stop()
    pygame.quit()
    os.remove("temp.mp3") #delete audio file after speech to text

#Recognise speech to text
def parseCommand(): #convert useful queries to meaningfull commands and use api
to get necessary output
```

```
    listener = sr.Recognizer()
    print("Listening to command...")

    with sr.Microphone() as source:
        r.adjust_for_ambient_noise(source,duration=.5)
        listener.pause_threshold = 3
        listener.energy_threshold = 4000  # Adjust this value as needed
        listener.dynamic_energy_threshold = False
        listener.operation_timeout = 10  # Set the timeout to 10 seconds
        input_speech = listener.listen(source)

        try:
            print("Recognizing speech")
            query = listener.recognize_google(input_speech, language='en_us') #convert
audio data to queries
            print(f'The input speech was: {query}')
            audio_data = input_speech.get_wav_data()
            audio_segment = AudioSegment.from_wav(io.BytesIO(audio_data))
            now = datetime.now().strftime('%d-%m-%Y-%H-%M-%S')
            audio_segment.export("Listened audio_%s.wav" % now,format = 'wav')
#save audio file with date
        except Exception as exception:
            print('I did not quiet catch that...')
            speak('I did not quiet catch that...')
            return None
    return query

def geminiAi(query):
    print("Gemini Activated")
    # model = genai.GenerativeModel('gemini-pro')
    # response = model.generate_content(query)
```

```
    #print("response = \n",response) #Unmodified result
    data_1.fetch_result(query)
    response = data_1.result

    # Extract the generated content from the response
    generated_text = response.candidates[0].content.parts[0].text

    # Process the generated text if needed (e.g., remove unnecessary parts)
    processed_text = generated_text[:500] # Limiting to first 500 characters for
simplicity
    processed_text = processed_text.replace('*','')
    # Convert the processed text to speech
    print(processed_text)
    return processed_text


#Exit process
def exitAI():
    print('exiting')
    speak('Sayonara')
flag = False

print(__name__)
#Main Loop
#Check is the program is running as main

if __name__ == '__main__':
    speak('All systems normal')

    while True:
        activation_detected = False
```

```
query = parseCommand()
if query == None:
   print("No speech detected, Try again")
   #query = parseCommand()
   continue
else:
   query = query.lower().split()
print(query)

for word in activation_words:
   if word in query:
      print("Activation Key: ",word)
      print(query[0])
      query.pop(0)
      print("Processed Query: ",query)
      activation_detected = True
      break

if activation_detected:
   if query[0] == 'say':
      if 'hello' in query:
         print('Greating, all')
         speak('Greating, all')
   # elif 'hello' in query:
   #    print('Greating, all')
   #    speak('Greating, all')
   # else:
   #    query.pop[0]
   #    speech = ' '.join(query)
   #    print('Greating, all')
   #    speak(speech)
```

```
    if 'exit' in query:
        exitAI()
        break
    #Gemini AI Result
    if any(word in query for word in ['what','who','which', 'how', 'when']):
        # Process the query to remove 'say' and activate Gemini AI

        query_text = ' '.join(query)
        AIResult = geminiAi(query_text)
        speak(AIResult)


#To Exit
if 'exit' in query:
        exitAI()
        break
```