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Implementation of Infobot

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ABSTRACT

Artificial intelligence is used in infobot implementation to allow robots to carry out tasks on their own. A state-of-the-art robotics project called artificial intelligence uses Python programming and the capabilities of a Raspberry Pi to build an intelligent robot that can respond to questions. These artificial intelligence (AI) systems are able to perform tasks like speech recognition, navigation, and decision-making because they use sensors, algorithms, and machine learning to observe and interact with their surroundings. They are used in a number of industries, such as exploration, manufacturing, and healthcare. This paper integrates Google's extensive knowledge base and Wi-Fi connectivity into a flexible and interactive robotic platform, with the goal of bridging the gap between artificial intelligence, robotics, and ordinary information retrieval, include voice recognition for user input, spoken response for output, autonomous mobility to explore its surroundings, and real-time information retrieval. Overall, the implementation of an infobot amalgamates Natural Language Processing, knowledge representation, and user interface design to deliver an intelligent system capable of providing assistance and information across a diverse array of topics.
Keywords : Artificial Intelligence, Natural Language Processing, Automatic Speech Recognition, Virtual Personal Assistant

I. INTRODUCTION

Implementing an infobot for versatile applications such as education, tour guiding, voice assistance, customer support, and medical information involves a meticulous integration of hardware components to facilitate seamless interactions with users. The foundation of this system lies in the Raspberry Pi 3B+, a powerful computing platform capable of managing various tasks and processing user input effectively. Augmented by a microphone and speaker setup, the infobot can engage users in natural language interactions, making it suitable for applications like voice assistance and customer support, where verbal communication is paramount. Furthermore, the inclusion of a display enriches the user experience, providing visual feedback and enhancing information presentation.

To enable physical movement and navigation in applications like tour guiding, the integration of a motor driver, Arduino, and gear motor is essential. These components empower the infobot to traverse environments and deliver location-based information to users. In educational settings, the infobot can serve as an interactive guide, offering students access to educational materials, answering queries, and facilitating learning experiences through dynamic interactions. Similarly, in healthcare contexts, it can provide patients with medical information, assist in managing health conditions, and offer support in accessing relevant resources.

The versatility of this infobot implementation extends to its adaptability across diverse domains, offering tailored solutions to meet specific needs. For instance, in a tour guide application, the infobot can provide historical insights, point out landmarks, and offer contextual information based on user preferences. In customer support scenarios, it can handle inquiries, troubleshoot issues, and provide assistance in real-time, enhancing customer satisfaction and efficiency. Meanwhile, in medical information dissemination, it can deliver accurate and up-to-date information on health conditions, treatment options, and preventive measures, empowering users to make informed decisions about their health.

By harnessing the capabilities of hardware components like the microphone, power supply, Raspberry Pi 3B+, motor driver, Arduino, gear motor, display, and speaker, this infobot implementation opens up a multitude of possibilities for enhancing user experiences and delivering valuable services across education, tourism, healthcare, and beyond. Through seamless integration and intelligent design, it offers a comprehensive solution to cater to the diverse needs of users in various contexts, ultimately enriching interactions and driving innovation in the field of human-computer interaction.

The organizational framework of this study divides the research work in the different sections. The Literature survey is presented in section 2. In section 3 and 4 discussed about Existing and proposed system methodologies. Further, in section 5 shown Simulation Results is discussed and Conclusion and future work are presented by last sections 6.

II. LITERATURE SURVEY

In 2015, **Anurag Mishra**, Pooja Makula , Akshay Kumar, Krit Karan and V. K. Mittal.This paper describes an easy and simple hardware for implementation of Face, Object and speech detection and recognition. Using an online cloud server. The speech signal commands converted to text form are communicated to the robot over a Bluetooth network [1].

In 2012, **Xianghua Fan**, Fuyou Zhang, Haixia Wang and Xiao Lu.Face detection technology has widely attracted attention due to its enormous application value and market potential, such as face recognition and video surveillance system. Real time face detection not only is one part of the automatic face recognition system but also is developing an independent research subject. So, there are many approaches to solve face detection. Here the modified AdaBoost algorithm based on OpenCV is presented, and experiments of real-time face detecting are also given through two methods of timer and dual thread. The result shows that the method of face detection with dual-thread is simpler, smoother and more precise [2].

In 2018, **Dyah Ayu Anggreini Tuasikal**, Hanif Fakhrurroja, Carmadi Machbub.This paper describes Voice activation speaker recognition to regulate the Bioloid GP automaton by MFCC and DTW strategies is enforced well in automaton robots. The first step in the speech recognition process is feature extraction. In this paper use Mel Frequency Cepstrum Coefficient (MFCC) on characteristic extraction process and Dynamic Time Warping (DTW) used as feature matching technique [3].

In 2017, **U Bharath Sai**, K Sivanagamani, B Satish,UG Students.Today's most advanced industrial robots will soon become "dinosaurs." Robots are in the infancy stage of their evolution. As robots evolve, they will become more versatile, emulating the human capacity and ability to switch job tasks easily. While the personal computer has made an indelible mark on society, the personal robot hasn't made an appearance. Obviously, there's more to a personal robot than a personal computer. Robots are indispensable in many manufacturing industries. The reason is that the cost per hour to operate a robot is a fraction of the cost of the human labour needed to perform the same function. More than this, once programmed, robots repeatedly perform functions with a high accuracy that surpasses that of the most experienced human operator. Human operators are, however, far more versatile. Humans can switch job tasks easily. Robots are built and programmed to be job specific. You wouldn't be able to program a welding robot to start counting parts in a bin [4].

The paper titled "Supervised machine learning in intelligent character recognition of handwritten and printed nameplate" authored by **Renuka Kajale**, Soubhik Das, and Paritosh Medhekar was presented at the 2017 International Conference on Advances in Computing, Communication and Control (ICAC3). The paper focuses on the application of supervised machine learning techniques in the domain of intelligent character recognition (ICR), specifically targeting handwritten and printed nameplates. The authors introduce the problem of character recognition within nameplates, which is a significant task in various domains such as logistics, inventory management, and document processing. They emphasize the challenge posed by variations in handwriting styles and printing quality, making traditional recognition methods less effective [5].

The paper titled "A Time-Effect Cascade for Real-Time Object Detection: With applications for the visually impaired," authored by **X. Chen** and A. L. Yuille, was presented at the 1st International Workshop on Computer Vision Applications for the Visually Impaired (CVACVI) on June 20, 2005. The paper addresses the challenge of real-time object detection, particularly focusing on its applications for assisting the visually impaired.The authors introduce a novel approach called the "Time-Effect Cascade" for efficient and rapid object detection in real-time scenarios. They propose a cascade architecture that exploits temporal information to enhance the speed and accuracy of object detection systems, making it particularly suitable for applications where timely responses are critical, such as aiding visually impaired individuals in navigating their surroundings [6].

The paper titled "Robust Real-Time Face Detection" authored by P. Viola and M. Jones was published in the International Journal of Computer Vision in 2004. The paper presents a pioneering approach to real-time face detection, which has become a fundamental technique in computer vision applications, such as facial recognition, surveillance, and human-computer interaction. The authors introduce a novel algorithm for face detection that achieves robust performance in real-time scenarios, even under challenging conditions such as varying lighting conditions, pose variations, and occlusions. The methodology proposed by Viola and Jones is based on the concept of integral images and AdaBoost learning, which enables efficient feature evaluation and selection [7].

The paper titled "Firefox Voice: An Open and Extensible Voice Assistant Built Upon the Web" authored by **Cambre, Julia**, Alex C. Williams, Afsaneh Razi, Ian Bicking, Abraham Wallin, Janice Tsai, Chinmay Kulkarni, and Jofish Kaye, was presented at the 2021 CHI Conference on Human Factors in Computing Systems. The paper introduces Firefox Voice, a novel voice assistant designed to be open and extensible, built upon web technologies. The authors address the growing demand for voice assistants while emphasizing the importance of privacy, user control, and interoperability. They propose Firefox Voice as a solution that leverages web-based technologies to provide users with a voice assistant experience that respects their privacy and offers flexibility in customization and integration with existing web services [8].

III. EXISTING METHOD

The block diagram of existing method is shown in figure 1.

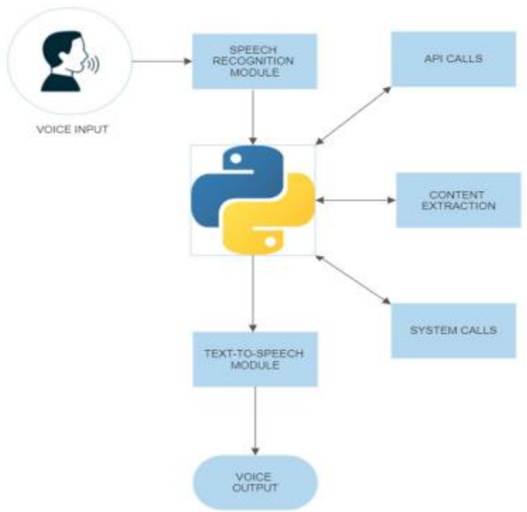

Figure 1. Block diagram of existing method

In existing method, this robot bridges the gap between human commands and machine actions. Here's how it works:

Understanding Your Voice: A speech recognition module, likely written in Python, listens to your voice commands through a microphone. This module converts the audio into text, essentially transcribing your speech.

Python Powerhouse: The Python backend acts as the robot's brain. It receives the transcribed text and utilizes natural language processing techniques to understand the intent behind your words. Imagine it like a translator, taking your everyday language and converting it into instructions the robot can comprehend.

Responding Clearly: Once the Python backend understands your request, it utilizes a text-to-speech module to craft a response. This module transforms the generated text back into audio, allowing the robot to speak and answer your questions or confirm actions.

Reaching Out for Information: For complex requests or tasks requiring external data, the robot may make API calls. Think of APIs as doorways to information on the internet. These calls allow the robot to access weather updates, news headlines, or even control smart home devices through their respective APIs.

Extracting the Essence: If the retrieved information is lengthy, the robot might employ content extraction techniques. Imagine it skimming through a webpage and extracting only the relevant details, like the answer to your question, to deliver a concise response.

Communicating with the System: The Python backend may also utilize system calls to interact with the robot's operating system. These calls allow the robot to perform actions like controlling its display for visual feedback or managing its hardware components for optimal functioning.

In essence, this robot acts as a middleman, translating your spoken commands into machine-readable instructions, processing information, and delivering responses or completing tasks through a combination of Python programming, external calls, and system interactions. Overall, by seamlessly integrating speech recognition, text-to-speech conversion, API calls, content extraction, and system commands, the robot creates an interactive and versatile user experience, capable of understanding and fulfilling user requests through natural language interaction.

IV. PROPOSED METHOD

By using voice recognition technology, the infobot will respond to inquiries and provide a visual representation. It is movable and can be moved using a voice assistant mobile app on a smartphone. It is particularly useful for new students since it provides information on block numbers and other details. The block diagram is explained with the following steps.

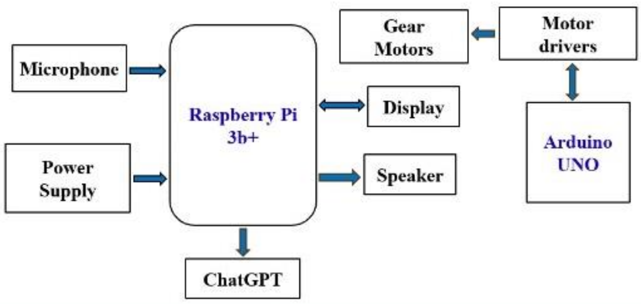

Figure 2. Block diagram of proposed method

Microphone: The microphone serves as the primary input device for the robot, allowing it to listen and interpret voice commands or interactions from users. It captures audio signals from the environment and converts them into electrical signals that can be processed by the robot's electronic components.

Figure 3. Block diagram of microphone

Power Supply: A reliable power supply is crucial to ensure uninterrupted operation of the robot. It provides electrical power to all components, including the Raspberry Pi, Arduino, motor driver, display, speaker, and any other peripherals. The power supply must be able to deliver sufficient current and voltage to meet the requirements of all components.

Raspberry Pi 3B+: The Raspberry Pi 3B+ serves as the central processing unit (CPU) of the robot. It runs the robot's software, processes input from the microphone, controls the motor driver and display, and generates output for the speaker. The Raspberry Pi is a versatile and powerful single-board computer that is commonly used in robotics and other embedded applications.

Figure 4.Raspberry pi 3b+

Motor Driver and Gear Motor: The motor driver and gear motor assembly enable the robot's mobility. The motor driver acts as an interface between the Raspberry Pi and the gear motor, controlling its speed and direction. The gear motor provides the mechanical power to drive the robot's wheels, allowing it to move in different directions and navigate its environment.

Figure 5. L298N motor driver

Figure 6. Gear Motor

Arduino: The Arduino microcontroller serves as a secondary processing unit in the robot. It works in conjunction with the Raspberry Pi to control and coordinate the movements of the motors. The Arduino receives commands from the Raspberry Pi and translates them into precise motor control signals, ensuring smooth and accurate movement of the robot.

Figure 7.Arduino Uno

Display: The display provides visual feedback to the user, enhancing the robot's interaction capabilities. It can be used to display text-based messages, graphical interfaces, or navigation instructions. The Raspberry Pi controls the display and sends relevant information to be displayed based on user inputs or system status.

Figure 8.Dotmatrix display

Speaker: The speaker enables the robot to communicate verbally with the user. It produces sound output for responding to voice commands, providing feedback, or delivering notifications. The Raspberry Pi generates text-to-speech (TTS) signals, which are converted into audible speech by the speaker, allowing the robot to speak and interact with users in a natural and intuitive manner.

Figure 9.Watts speaker

Each of these components plays a crucial role in the operation and functionality of the Personal Assistant Robot, enabling it to listen, process, and respond to user commands, move and navigate its environment, display information, and communicate effectively through both audio and visual channels

FLOW DIAGRAM

This flowchart illustrates the basic sequence of events when a user interacts with the Robot. It starts with the user speaking a command, which is captured by the microphone and processed by the Raspberry Pi. Depending on the recognized command, the Raspberry Pi determines the appropriate action, which may involve movement, display of information, speech output, or interaction with external APIs. Finally, the flowchart handles scenarios where the command is not recognized, providing error feedback or prompting the user to repeat their command.

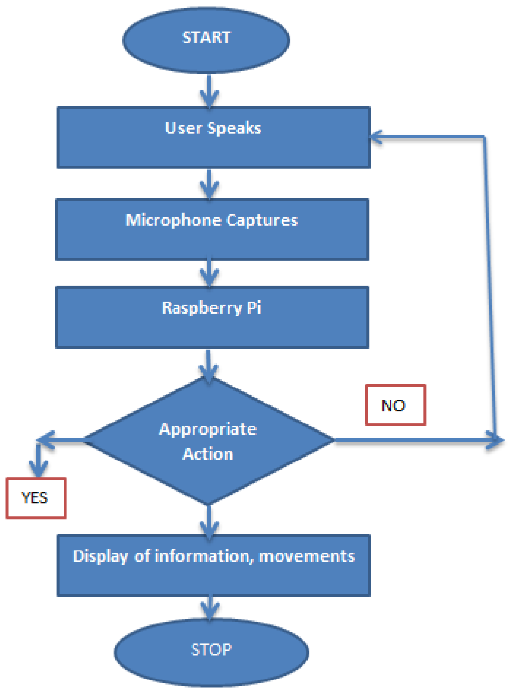

Figure 9. Flow Diagram

V. RESULTS AND DISCUSSIONS

This system can work on minimum power supply of 5V that is need for the working of the raspberry pi system the raspberry pi board is the main circuit board of the system it controls all the divides, as well as the hardware that is attached to the system the mic works as the input source through which the input is passed to the system and through the raspberry pi the output, are been passed but the speaker as well as with the motor driver for the movement of the mower as per the direction that is commanded by the user. The below figure 10 display the developed robot.

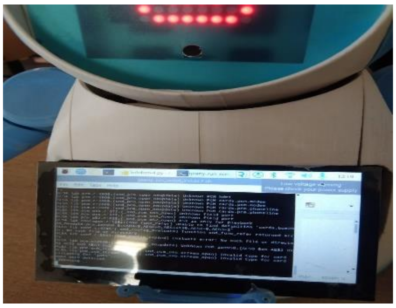

Figure 10. Front view of robot

The figure 11 displays the information of robot listening the commands from the voice.

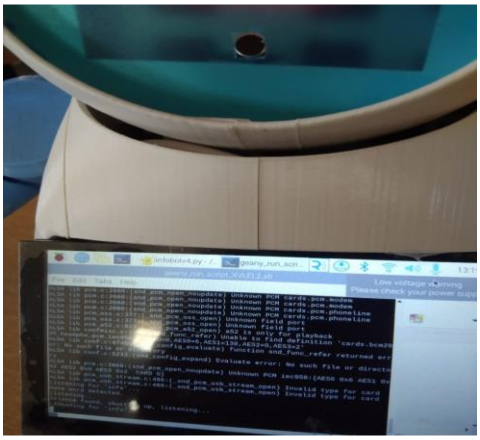

Figure 11. Display of voice listening

The figure 12 shows interaction of robot displaying how I can help you.

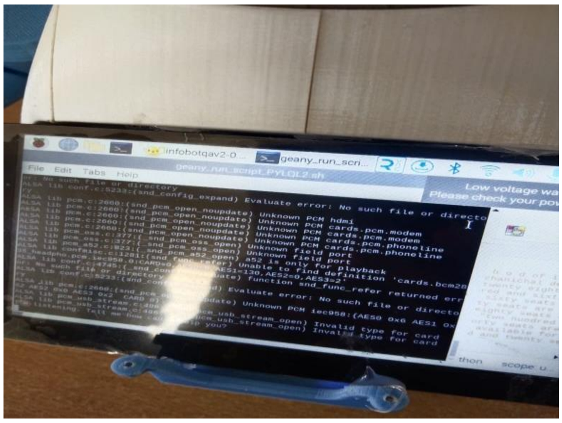

Figure 12. Interaction of robot by displaying how can help you

The figure 13 shows the complete picture of robot along with team members.

Figure 13. Complete picture of Robot

The figure 14 and 15 shows the working screenshots while functioning of the robot and responding to their commands.

Figure 14. Working of robot with commands

Figure 15. Display based on commands

VI. CONCLUSION AND FUTURE SCOPE

In conclusion, the implementation of an infobot utilizing a combination of hardware components such as a microphone, power supply, Raspberry Pi 3B+, motor driver, Arduino, gear motor, display, and speaker presents a versatile and powerful platform for diverse applications. By harnessing these components, we create a system capable of understanding user input, processing information, and delivering meaningful responses in real-time. The integration of the Raspberry Pi 3B+ as the central processing unit provides the computational power necessary for running algorithms and managing interactions efficiently. Coupled with a microphone and speaker setup, the infobot can engage users in natural language interactions, making it suitable for applications such as voice assistance, customer support, and educational guidance. Furthermore, the inclusion of a display enhances the user experience by providing visual feedback and information display, facilitating interactions in various contexts. The motor driver, Arduino, and gear motor enable physical movement, allowing the infobot to navigate environments and manipulate objects as needed, making it ideal for applications like tour guiding and interactive exhibits. Overall, the implementation of an infobot using these hardware components offers a scalable and adaptable solution for a wide range of applications, from education and tourism to customer support and beyond. By leveraging the capabilities of each component, organizations and individuals can create intelligent systems that enhance user experiences, streamline processes, and provide valuable services in diverse domains. As technology continues to evolve, the potential for infobots to revolutionize human-computer interaction and support various aspects of daily life remains promising.

FUTURE SCOPE

Future infobot implementations could focus on enhancing user interaction through advancements in natural language processing (NLP) and machine learning. This could involve improving the infobot's ability to understand complex queries, detect user emotions, and engage in more natural and context-aware conversations.

Integrating additional sensory modalities such as gesture recognition, facial expression analysis, and haptic feedback could enrich the user experience and enable more intuitive interactions with infobots. This could be particularly beneficial for users with disabilities or in scenarios where voice-based interaction may not be feasible.

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REFERENCES

[1] Anurag Mishra, Pooja Makula , Akshay Kumar, Krit Karan and V. K. Mittal, “A voice-controlled personal assistant robot” Published in: 2015

International Conference on Industrial Instrumentation and Control (ICIC).

[2] Xianghua Fan, Fuyou Zhang, Haixia Wang and Xiao Lu,“ The system of face detection based on OpenCV” Published in: 2012 24th Chinese Control and Decision Conference (CCDC).

[3] Dyah Ayu Anggreini Tuasikal, Hanif Fakhrurroja, Carmadi Machbub “Voice Activation Using Speaker Recognition for Controlling Humanoid Robot” Published in: 2018 IEEE 8th International Conference on System Engineering and Technology (ICSET).

[4] U Bharath Sai, K Sivanagamani, B Satish,UG Students ”Voice controlled Humanoid Robot with artificial vision” Published in: 2017 International Conference on Trends in Electronics and Informatics (ICEI).

[5] Renuka Kajale, Soubhik Das and Paritosh Medhekar”Supervised machine learning in intelligent character recognition of handwritten and printed nameplate” Published in: 2017 International Conference on Advances in Computing, Communication and Control (ICAC3).

[6] X. Chen, A. L. Yuille, “A Time-Effect Cascade for Real Time Object Detection: With applications for the visually impaired,” 1st Intern. Workshop on Comp. Vision Applications for the visually CVACVI, June 20, 2005.

[7] P. Viola and M. Jones, “Robust Real-Time Face Detection”, International Journal of Computer Vision, Vol. 57(2), pp. 137– 154,2004.

[8] Cambre, Julia, Alex C. Williams, Afsaneh Razi, Ian Bicking, Abraham Wallin, Janice Tsai, Chinmay Kulkarni, and Jofish Kaye. "Firefox Voice: An Open and Extensible Voice Assistant Built Upon the Web." In Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems, pp. 1-18. 202.

[9] Liao, Song, Christin Wilson, Long Cheng, Hongxin Hu, and Huixing Deng. "Measuring the effectiveness of privacy policies for voice assistant applications." In Annual Computer Security Applications Conference, pp. 856-869. 2020.

[10] Pérez, Anxo, Paula Lopez-Otero, and Javier Parapar. "Designing an Open Source Virtual Assistant." Multidisciplinary Digital Publishing Institute Proceedings. Vol. 54. No. 1. 2020.

[11] Braun, Michael, Anja Mainz, Ronee Chadowitz, Bastian Pfleging, and Florian Alt. "At your service: Designing voice assistant personalities to improve automotive user interfaces." In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems, pp. 1-11. 2019.

[12] Zhang, Ying, Mohammad Pezeshki, Philémon Brakel, Saizheng Zhang, Cesar Laurent Yoshua Bengio, and Aaron Courville. "Towards end-to-end speech recognition with deep convolutional neural networks." arXiv preprint arXiv: 1701.02720 (2017).

[13] Shalini, Shradha, Trevor Levins, Erin L. Robinson, Kari Lane, Geunhye Park, and Marjorie Skubic. "Development and comparison of customised voice assistant systems for independent living older adults." In International Conference on Human-Computer Interaction, pp. 464-479. Springer, Cham, 20.

[14] Palanica, Adam, Anirudh Thommandram, Andrew Lee, Michael Li, and Yan Fossat. "Do you understand the words that are coming outta my mouth? Voice assistant comprehension of medication names." NPJ digital medicine 2, no. 1 (2019): 1-6.