# *SARA: A College Receptionist System*

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***Abstract*— Socially adept virtual assistants can help people with many of their daily tasks. One such application where appearance and social skills are crucial is a college virtual receptionist. One frequently has no idea where to look or who to ask for information while visiting a college for the first time. When someone isn't a student or an employee there, getting information for them gets challenging. The answer to these problems is a college inquiry virtual receptionist, a quick informative system to improve the college experience and give the user useful information. The virtual receptionist provides 24/7 support and can manage visitors even when staff would be unavailable, they offer helpful assistance and respond to questions about the examination cell, admissions, navigation, future college events, and other tasks like recording staff attendance, visitor notification, etc. Additionally, we can use this system in other industries like hotels and hospitals. All fields will benefit from it because we can quickly and easily tailor it to our needs.**

***Index Terms—virtual assistant, face recognition, attendance system***

## I. INTRODUCTION

Artificial intelligence plays important roles in a variety of settings, including the home, business, store, museum, and hospital, all of which differ from workplaces. In many fields, human-robot interaction is becoming increasingly crucial for service robots. Any industry has relied heavily on receptionists. They are frequently found at the "front desk," where they serve as the staff members' first point of contact and administrative support. Typical tasks performed by a receptionist include taking phone calls, scheduling appointments, maintaining files and records, and checking visitors and guests in.

Recent developments in artificial intelligence (AI), particularly in the field of machine learning (ML), provide the possibility of fully automating or speeding up the performance of certain tasks. A robot receptionist can be considered as a Socially Assistive Robot (SAR), since its objective is to assist human users through human interaction [1]. The implementation of an intelligent system with useful social interaction capabilities is one of the main objectives of social robotics. There is a lot of research being done in this area, and Sophia [2] and other highly developed humanoid robotic systems can be considered the cutting edge. AI requires sensitive attention and polite interactions with visitors on a regular basis. It should be able to recognise approaching visitors, communicate with them, hear their voice, understand their questions, and then appropriately answer them. Additionally, it could be able to pick up some information for itself from interactions with visitors.

In this article, we describe a Virtual Receptionist that uses voice recognition, text-to-speech (TTS), and a question-answer knowledge library to identify nearby guests, understand their queries and reply back to them. A virtual receptionist at a college is one such application where looks and interpersonal abilities are essential. When visiting a college for the first time, one typically has no idea where to search or who to ask for information. It becomes difficult to obtain information for someone who isn't a student or employee there. A rapid, informative system that enhances the college experience and provides the user with important information is the solution to these issues: a virtual receptionist for college inquiries. The virtual receptionist offers assistance around-the-clock and can handle visitors even when staff aren't available. They can answer questions about the examination cell, admissions, navigation, upcoming college events, and other tasks like keeping track of staff attendance and notifying visitors. With a few little adjustments


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and modifications, our receptionist system can easily be adapted to any industry.

## II. RELATED WORK

This paper introduces an open-source human-robot interface (HRI) system named DEVI [3], which is designed to enable effective communication between humans and robots in the context of interactive receptionist systems. The DEVI system consists of two main components: a robot agent and a user interface. The robot agent is equipped with a microphone, a speaker, a camera, and a display screen, while the user interface is designed to provide users with an intuitive and easy-to-use platform for interacting with the robot agent. This paper presents the technical details of the DEVI system, including the hardware and software components, as well as the communication protocols used between the robot agent and the user interface. The system is based on a modular architecture, which makes it easy to extend and customize for specific applications. The authors also describe the results of a usability study conducted with the DEVI system. The study involved 10 participants who interacted with the system in a simulated receptionist scenario. The results showed that the participants found the system to be easy to use and effective in facilitating communication with the robot agent. Overall, the DEVI system represents an important contribution to the development of open-source HRI systems for interactive receptionist applications. The system is modular, extensible, and easy to use, making it a valuable tool for researchers and developers working in the field of robotics and human-robot interaction.

This paper describes the development of an intelligent digital receptionist system [4] for use in public places such as hotels, hospitals, and other service-based environments. The system was designed to improve customer experience by providing quick and efficient assistance to customers, without the need for human intervention. The e-Receptionist system is built using a combination of hardware and software components. The hardware component includes a smart kiosk equipped with a touch screen display, camera, and microphone, while the software component includes natural language processing (NLP) algorithms that enable the system to interpret and respond to customer queries. They also describe the different modules of the system, including the speech recognition module, the language understanding module, and the knowledge management module. The system was able to accurately recognize and respond to customer queries, and users found the system to be easy to use and efficient. Overall, the e-Receptionist system represents an innovative approach to enhancing customer service in public places.

Here this paper proposes a visitor guidance system [5] that uses a touch screen panel and smart technologies to provide a better visitor experience. The system aims to replace traditional receptionists and make the process of visitor management more efficient and convenient. The proposed system has several features including an interactive touch screen panel that displays information about the organization, the ability to scan visitor IDs and print badges, and the option to notify the host of the visitor's arrival. Additionally, the system can store visitor data for future reference and analysis. The system reduced the workload of the receptionist and improved the overall visitor experience. The Smart-Receptionist system is a promising solution for organizations looking to improve their visitor management processes. The system's use of touch screen technology and smart features provides a convenient and efficient experience for visitors, while also reducing the workload of traditional receptionists.

Here proposes the development of a college chatbot system [6] that utilizes artificial intelligence (AI) and natural language processing (NLP) techniques to provide users with automated conversational interfaces. The system is designed to understand and respond to user queries in a conversational manner, using machine learning algorithms and language models to improve its responses over time. The college student and employees can freely upload their queries. The chat bot provides fast and efficient search for answers to the queries and gets the relevant links to their question. This paper also describes the various components of the chatbot system, including its architecture, data storage and retrieval mechanisms, and the NLP techniques used to analyze user inputs and generate appropriate responses. The chatbot system is evaluated through user testing and is found to provide accurate and relevant responses to user queries, demonstrating the effectiveness of the AI and NLP techniques used in its development.

This paper [7] describes the development of a system that uses face recognition technology to automate attendance management in educational institutions or organizations. The system aims to improve the accuracy and efficiency of traditional attendance management methods by eliminating the need for manual record-keeping and reducing the possibility of errors. The authors explain the working of the proposed system, which involves capturing images of students/employees and comparing them with a pre-existing database to mark their attendance automatically. The system comprises hardware components such as cameras, microcontrollers, and a computer system, as well as software components such as an image processing algorithm and a database management system. The authors describe the various stages of the image processing algorithm, including face detection, face alignment, feature extraction, and recognition. The authors then present the results of their experiments, which involved testing the system on a group of students. The results showed that the system was able to accurately recognize and mark the attendance of the students with a high degree of precision. In conclusion, the paper emphasizes the potential benefits of using face recognition technology in attendance management systems.

## III. PROPOSED SYSTEM

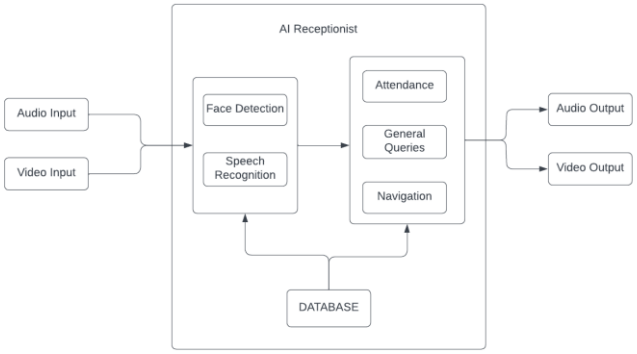


Fig. 1. Block Diagram

This project aims to automate a receptionist that can autonomously greet guests, answer questions, and direct them to the appropriate person or department. The receptionist should be able to handle common requests such as directions, alert the staff about the visitors, and provide general information about the company. In addition, the receptionist would be able to autonomously handle unexpected requests or questions. It will help to free up their time so that they can focus on providing a great experience for visitors.

Face recognition using KNN (K-Nearest Neighbors) [8] is an algorithm that uses a database of known faces to identify an unknown face in an image. It works by measuring the similarity between the unknown face and each face in the database, and then selecting the closest match. The algorithm is capable of recognizing a person even when their facial features have changed slightly over time. KNN is a fairly simple and intuitive algorithm, making it a popular choice for face recognition applications. It is also computationally efficient, requiring only a few calculations to identify a face. Additionally, the algorithm can be used in real-time applications, as it only needs to compare the unknown face to a Fig. 1. Block Diagram database of known faces and not the entire image. This makes KNN a powerful tool in face recognition applications, as it is accurate and fast.

Natural Language Processing (NLP) is a field of artificial intelligence (AI) which focuses on understanding human language[9]. It involves using computers to process and analyze natural language text, such as the written or spoken words of a person. The goal of NLP is to enable computers to understand and interact with humans in their own language. To achieve this, NLP algorithms use a combination of natural language understanding (NLU) and natural language generation (NLG) techniques. NLU techniques allow computers to understand the meaning of text, while NLG techniques allow computers to generate natural-sounding responses. NLP is used for a variety of applications, such as text classification, document summarization, sentiment analysis, and machine translation. By understanding the structure and meaning of human language, NLP is able to

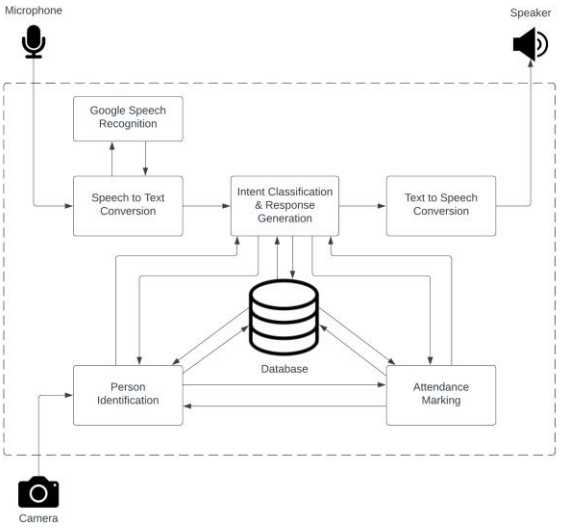


Fig. 2. System Architecture

improve the accuracy of AI systems and enable them to better understand user intent.

Speech recognition[10] is the process of converting spoken language into text. It is a branch of artificial intelligence which uses machine learning algorithms to understand spoken language, and is becoming increasingly important in both consumer and enterprise applications. Speech recognition involves converting audio into text, and can be used for a variety of tasks such as voice commands, dictation, and voice search. Speech recognition technology works by taking in audio input, analyzing it, and then converting it into text. To do this, the algorithm needs to understand the language, the context of the conversation, and the user's intonation and pronunciation. Speech recognition algorithms are becoming increasingly accurate, and can now understand natural language with a high degree of accuracy.

Figure 2 shows the system architecture. This system has 5 modules. The speech recognition module converts the audio from the user into text format by using the Google Speech recognition API. The text is then processed to identify the intent of the user input. This processing is done by the Intent Classification module.

The Intent Classification and Response generation module uses the text data generated by the speech recognition module and classifies what the user wants. The module maps the query with the intents and executes the appropriate action. The system then generates an appropriate response and provides it to the user in the form of audio and visual.

The Face Recognition module uses a trained model to identify the employees. When a new employee registers, the admin collects photos of the employee and adds them to the database. This database is later used to train the face recognition model. The training algorithm uses KNN classifier algorithm to identify different persons. If the visitor is not a

registered employee, the system will only greet them as it failed to identify the person; else the system will greet them with their name. The intent classification module can call the face recognition module whenever it is necessary for the system to identify the user. The module captures image frames from the webcam using the OpenCV package in python and processes the image using the trained model to identify the person. KNN classification algorithm is one of the best algorithms for facial recognition. The algorithm shows high accuracy in facial recognition. Some of the advantages of KNN classifier for facial recognition is that it can be trained with small datasets but still can produce high accuracy. It can also identify persons with partially covered faces to an extent.

The Attendance module is used to mark the daily attendance of the registered employee. On classifying the intent of the user as to mark the attendance, the system will call the attendance marking module. By using the facial recognition module, the system recognises the employee who asked to mark the attendance. The attendance marking module uses then person ID to mark their attendance on the database. This system can record the sign-in and sign-out time of the employee in the database. The admin can export the attendance report at the end of the day in the form of an Excel sheet.

The admin has the actions to Add and Delete an employee.it updates the database with the employee details. Updating the details of upcoming events, updating navigation and other general queries are done by the admin. After adding each employee the admin has to run the face recognition model training so the system can recognise the person successfully.

## IV. RESULT AND DISCUSSION

### *A. Answering general queries*

This receptionist system was able to answer general queries accurately, providing responses to questions related to navigation of college campus. This system uses mappings method to understand and interpret the intent of the queries, providing relevant responses to the users.

### *B. Face Recognition*

The system successfully recognised the registered employees. This system uses KNN algorithm for facial recognition. This system recognised the registered employees and greeted them with their name. It also helps the employees to mark their attendance easily with voice commands.

### *C. Marking attendace of the Employees*

This receptionist system was able to mark attendance of staff using facial recognition accurately. The system stored the daily attendance list in the database and the admin generated the attendance report at the end of the day. This system can streamline the attendance-taking process, saving time for both employees and administrators.

### *D. Visitor notification*

This system was able to inform the staff whom the user needed to visit through an email. The email is send through SMTP package. This system notified the appropriate staff member about the visitor's presence. This functionality can help to ensure that visitors are properly attended to and can help staff to manage their time effectively.

Overall, this virtual assistant was successful in achieving its objectives, providing an efficient solution for answering general queries, navigating the user to appropriate places in the college campus, notifying visitor, and marking attendance of staff. It is challenging for the speech-to-text converter to translate the audio question to text in a noisy environment. This problem can be reduced by using enhanced noise cancellation algorithms or specific noise cancelling hardware for audio processing. Other than that this virtual assistant enhanced the overall user experience by reducing the need for human intervention and operational efficiency.

TABLE I. RESULTS OF SPEECH RECOGNITION

| Condition | Accuracy | Comments |
|---|---|---|
| Responses to various intents | 90% | Queries |
| Responses of the system in a noisy environment | 50%-90% | Accuracy varies depending on the noise |
| Google Speech Recognition | < 2s | Depends on network speed |
| Text to Speech | < 2s | Depends on network speed |

## V. CONCLUSION

In our analysis, we found that the virtual receptionist has the potential to significantly improve customer satisfaction, reduce waiting times, and increase staff productivity. With its ability to handle routine inquiries and tasks, such as answering frequently asked questions, navigating visitors and notifying visitors arrival, the virtual receptionist can free up human staff to focus on more complex tasks and provide higher-level customer service. We have successfully developed a virtual receptionist system that can interact with the visitors, asking and understanding their intents and response accordingly. Our system can perform actions like navigating the visitors to their destination, giving them the information regarding their queries. We have also integrated an attendance system for the employees of the institution using facial recognition system. However, it's important to note that the virtual receptionist is not a complete replacement for human staff. In situations where a personal touch or complex problem-solving is required, human staff will still be needed to provide assistance. Additionally, the implementation of a receptionist

system will require careful planning and consideration to ensure a smooth transition and integration with existing systems. This system can be improved by providing additional features like payment options, scheduling meetings, answering calls, booking cabs, and also integrating a face recognition system with a data analytic system can help with checking availability of faculties at the premises, last arrival details etc. Using an improved noise-cancelling mechanism can improve the overall efficiency. With a few little adjustments and modifications, our receptionist system can easily be adapted to any industry. Overall, the virtual receptionist is a promising technology that has the potential to revolutionize the way businesses handle customer service and front desk operations.

## *References*

[1] D. Feil-Seifer and M. J. Mataric, “Defining socially assistive robotics,” in 9th International Conference on Rehabilitation Robotics, 2005. ICORR 2005. IEEE, 2005, pp. 465–468.

[2] C. Weller, “Meet the first-ever robot citizen a humanoid named sophia that once said it would destroy humans,” Business Insider Nordic. Haettu, vol. 30, p. 2018, 2017.

[3] R. Karunasena, P. Sandarenu, M. Pinto, A. Athukorala, R. Rodrigo and P. Jayasekara, ”DEVI: Open-source Human-Robot Interface for Interactive Receptionist Systems,” 2019 IEEE 4th International Conference on Advanced Robotics and Mechatronics (ICARM), Toyonaka, Japan, 2019, pp. 378-383, doi: 10.1109/ICARM.2019.8834299.

[4] Y. Yang and L. Li, ”The Design and Implementation of a Smart e-Receptionist,” in IEEE Potentials, vol. 32, no. 4, pp. 22-27, July-Aug. 2013, doi: 10.1109/MPOT.2012.2213851.

[5] M. Sandhya and R. Mahalakshmi, ”Smart-Receptionist: A Visito Guidance Kit with Touch Screen Panel,” Vol.3, Issue 4, April 2014.

[6] Tarun Lalwani, Shashank Bhalotia, Ashish Pal, Shreya Bisen, Vasundhara Rathod, . (2018). “Implementation of a Chat Bot System using AI and NLP”. 10.21276/ijircst.

[7] Smitha, Pavithra S Hegde, Afshin,. (2020). ”Face Recognition based Attendance Management System”. International Journal of Engineering Research and. V9. 10.17577/IJERTV9IS050861.

[8] X. Guo, "A KNN Classifier for Face Recognition," 2021 International Conference on Communications, Information System and Computer Engineering (CISCE), Beijing, China, 2021, pp. 292-297, doi: 10.1109/CISCE52179.2021.9445908.

[9] M. Banane and A. Erraissi, "A comprehensive study of Natural Language processing techniques Based on Big Data," 2022 International Conference on Decision Aid Sciences and Applications (DASA), Chiangrai, Thailand, 2022, pp. 1492-1497, doi: 10.1109/DASA54658.2022.9765270.

[10] P. Sirikongtham and W. Paireekreng, "Improving speech recognition using dynamic multi-pipeline API," 2017 15th International Conference on ICT and Knowledge Engineering (ICT&KE), Bangkok, Thailand, 2017, pp. 1-6, doi: 10.1109/ICTKE.2017.8259624.