

Voice assistant integrated with augmented reality



¹Varun Das G
Computer Science Department,
Sathyabama Institute of Science and
Technology, India
varundas110901@gmail.com

²Srivarsh S
Computer Science Department,
Sathyabama Institute of Science and
Technology, India
srimail4306@gmail.com

³Dr. Murali E
Computer Science Department,
Sathyabama Institute of Science and
Technology, India
emurali88@gmail.com

Abstract— Augmented Reality is a new-age technology that offers a wide range of advantages that can enhance an individual's experience, improve productivity, reduce costs, and has the capability to disrupt various industries quickly. The growth of AR has been especially significant over the past few years and is projected to continue its growth in the future. Grand View Research reported that the market size was USD 4.48 billion in 2020, and it is expected to have a compound annual growth rate of 43.8% from 2021 to 2028.

This research paper explores the exciting concept of Augmented Reality and the already existing technology of Voice Assistant, which integrates the functionalities of an intelligent chatbot with the immersive experience of augmented reality. AR technology is continuously evolving, with the development of more powerful processors, sensors, and cameras. The introduction of 5G technology is also expected to enhance the capabilities of AR.

KEYWORDS— AUGMENTED REALITY (AR), INTELLIGENT CHATBOT, USER EXPERIENCE, IMMERSIVE, BENEFITS, CHALLENGES, APPLICATION, E-COMMERCE, EDUCATION, HEALTHCARE.

I. INTRODUCTION

Augmented Reality (AR) aims to enhance our perception and understanding of the world around us by blending digital content with the physical world in real time. AR technology provides an interactive and immersive experience by overlaying relevant digital information in our view of the real world. haptic feedback over the user's view of the physical world. The technology works by tracking the user's location and movements, recognizing objects or surfaces in the environment, and overlaying relevant information or visual effects in real time.

AR technology can provide new ways of learning, working, communicating, and interacting with other individuals and the world around us. It has numerous applications in various fields, such as healthcare, education, manufacturing, entertainment, and marketing.

A Voice Assistant is a digital assistant that uses voice recognition technology to understand and respond to spoken commands or questions from users. These assistants are

typically accessed through a device such as a smartphone, smart speaker, or another internet-connected device, and can perform a variety of tasks such as setting reminders, making phone calls, playing music, answering questions, providing weather updates, controlling smart home devices, and more.

II. LITERATURE REVIEW

Augmented Reality (AR) is a rapidly growing field, and there has been significant research and literature published on its applications, development, and impact. Here is a brief literature review of some key studies and findings in the field of AR.

- **AR in Education:** Several studies have explored the exciting potential of AR when it comes to education, highlighting its ability to improve in fields such as student engagement, motivation, and learning outcomes. A study by Bacca et al. (2014) found that AR helped enhance the understanding of intricate concepts in physics and improved overall student test scores. Another study by Radu et al. (2014) found that AR improved students' mental motivation and engagement in the education of history.
- **AR in Healthcare:** AR has been of special use in the field of medical applications, such as surgical planning, training, and patient education. A study by Sielhorst et al. (2014) demonstrated the potential of AR in minimally invasive surgery, improving the accuracy and efficiency of the overall procedure compared to humans. Another study by Jang et al. (2018) showed that AR improved patient understanding and compliance with medication regimens and processes.
- **AR in Marketing:** AR has been used for innovative and interactive marketing campaigns, providing customers with personalized and immersive experiences. Many billion-dollar companies have

built a business on ads AR is becoming an important player in this field as well. A study by Liu et al. (2020) found that AR-enhanced brand recognition and recall in advertising led to higher purchase intentions. Another study by Yu et al. (2019) demonstrated the effectiveness of AR in product visualization and customization.

- **AR Development and Challenges:** There have been numerous studies on AR development, including the design of AR interfaces, and the development of AR software and hardware. The challenges of AR implementation include A study by Billinghurst and Kato (2002) proposed a framework for AR development, including tracking, registration, visualization, and interaction. Another study by Azuma (1997) identified the challenges of AR implementation, such as real-time processing, accurate tracking, and occlusion management.

Voice assistants are a rapidly growing technology that allows users to interact with devices through voice commands. Here is a brief literature review of some key studies and findings in the field of voice assistants:

- **User Acceptance:** Several studies have explored user acceptance of voice assistants, highlighting the importance of ease of use, usefulness, and trust. A study by Zhou and Lu (2018) found that users preferred voice assistants for simple and quick tasks, such as weather updates or music playback. Another study by Balasubramanian et al. (2018) found that users valued voice assistants for their convenience and efficiency and not necessarily for larger tasks.
- **Privacy and Security:** Voice assistants have always raised concerns when it comes to privacy and security, as they collect and store user data. A study by Polonetsky and Tene (2018) emphasized the need for transparency and user control over data collection and usage. Another study by Ganapathy et al. (2020) proposed a framework for secure voice assistant design, including privacy-preserving techniques and secure authentication.
- **Accessibility:** Voice assistants have the potential to enhance accessibility for individuals with disabilities, such as visual or motor impairments. A study by Adams et al. (2019) demonstrated the potential of voice assistants in improving the daily lives of visually impaired individuals. Another study by Li and Trewin (2018) explored the challenges and opportunities of voice assistant design for individuals with motor impairments.
- **Development and Challenges:** There have been numerous studies on voice assistant development, including natural language processing, machine learning, and user interface design. A study by

Serban et al. (2018) proposed a deep learning framework for voice assistant dialogue management. Another study by Singh et al. (2018) identified the challenges of voice assistant design, such as handling ambiguity and providing personalized experiences.

III. EXISTING SYSTEM

There are several existing voice assistants available today, including:

- **Amazon Alexa:** Developed for echo devices, Alexa is a cloud-based voice assistant that can perform a wide range of tasks, such as playing music, setting alarms, controlling smart home devices, and providing weather updates. It is available on Amazon devices and can also be accessed through the Alexa app.
- **Google Assistant:** Developed by Google, Google Assistant is a voice assistant that can perform tasks such as scheduling appointments, sending messages, and controlling smart home devices. It is available on Android devices and can also be accessed through the Google Home smart speaker and other smart devices.
- **Apple Siri:** Developed by Apple, Siri is a voice assistant that can perform tasks such as sending messages, making phone calls, and providing directions. It is available on Apple devices such as iPhones, iPads, and the Home Pod smart speaker.
- **Microsoft Cortana:** Now defunct on mobile devices because of the Windows phone failure, Cortana is a voice assistant that can perform tasks such as scheduling appointments, sending emails, and providing weather updates.
- **Samsung Bixby:** Developed by Samsung, Bixby is a voice assistant that can perform tasks such as setting reminders, controlling smart home devices, and sending messages. It is available on Samsung devices such as the Galaxy smartphone and smart home appliances.

IV. POTENTIAL APPLICATIONS OF AR & VOICE ASSISTANTS

Integrating voice assistants with augmented reality (AR) can offer several benefits, including enhancing user interaction and providing more immersive experiences. Here are some examples of voice assistant integration with AR that are in use as of today:

- **Smart Glasses:** Smart glasses, such as Google Glass or Vuzix, can incorporate both AR and voice assistants to provide users with hands-free access to information and tasks. For example, users can use

voice commands to take photos or videos, navigate through menus, or receive notifications through the glasses.

- **AR Shopping:** Voice assistants can also be integrated with AR shopping experiences, allowing users to interact with products and make purchases through voice commands. For example, a user could use their voice assistant to add items to their virtual shopping cart, adjust product specifications, or receiving personalized recommendations.
- **Navigation and Wayfinding:** Voice assistants can also be integrated with AR navigation and wayfinding applications, providing users with real-time directions and information. Mercedes-Benz has been at the forefront of implementing this technology into the latest S-Class and EQS passenger vehicles.
- **Gaming and Entertainment:** Voice assistants can also enhance gaming and entertainment experiences with the help of AR. For example, a user could use their voice assistant to control characters in a game or receive narration or guidance throughout the experience.

Overall, integrating voice assistants with AR can offer a range of benefits, including enhancing usability, accessibility, and immersion. As AR and voice assistant technologies continue to advance, we can expect to see more innovative and creative integrations in various domains.

```
Listening...
you said:who is the president of India
Draupadi Murmu (from 25/07/2022 to present)
Listening...
you said:what is the weather in Chennai
temperature | 30 °C (heat index: 36 °C)
conditions | few clouds
relative humidity | 75% (dew point: 25 °C)
wind speed | 1 m/s
(37 minutes ago)
```

Fig 1: Voice Assistant Technology

Overall, Voice assistants are AI-powered digital assistants that use natural language processing (NLP) to interpret and respond to human voice commands. They are typically accessed through smart speakers or mobile devices and can perform a wide range of tasks, from setting reminders and playing music to controlling smart home devices and providing information.

Voice assistant technology has become an increasingly popular way for people to interact with their devices and accomplish tasks. From setting reminders to controlling smart home devices, voice assistants have revolutionized the way we interact with technology.

Voice assistant technology is powered by artificial intelligence (AI) and natural language processing (NLP) algorithms. These algorithms allow the devices to understand spoken language and interpret the meaning behind the words. By using voice commands, users can interact with their devices without having to use their hands.

There are several popular voice assistants available on the market, including Amazon's Alexa, Apple's Siri, and Google Assistant. These devices are typically accessed through smart speakers or mobile devices and can perform a wide range of tasks.

One of the most significant benefits of voice assistant technology is the convenience it provides. Users can access information or perform tasks with just a few words, without having to navigate menus or type on a keyboard. This can be especially useful for people who have difficulty with mobility or vision.

Voice assistants can also integrate with other devices and services, such as smart home devices and music streaming services, to provide a seamless user experience. For example, users can use their voice assistant to turn on the lights or adjust the thermostat in their homes.

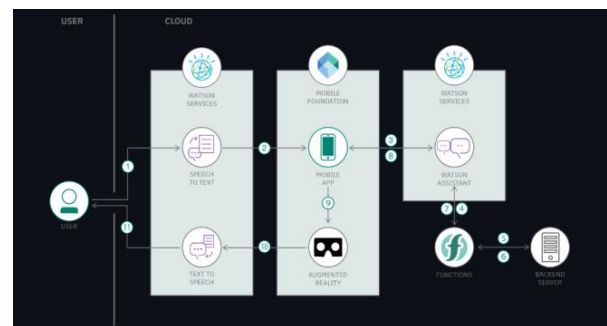


Fig 2: Workflow Diagram

V. PLAUSIBLE METHODOLOGY ON A LARGE SCALE

We have decided to approach this project to demonstrate the wide personal applications possible when it comes to integrating these two technologies.

Voice assistants can provide personalized experiences in AR environments, such as providing recommendations based on user preferences or history. For example, a user could use their voice assistant to receive personalized product recommendations while shopping in an AR environment.

Integrating augmented reality (AR) and voice assistant technologies can be achieved through a variety of methods and tools, depending on the application and use case. Here are some general steps and considerations for integrating AR and voice assistants:

Identify the Use Case: Identify the specific application or use case for the integration of AR and voice assistants. This could be anything from a shopping experience to navigation or entertainment.

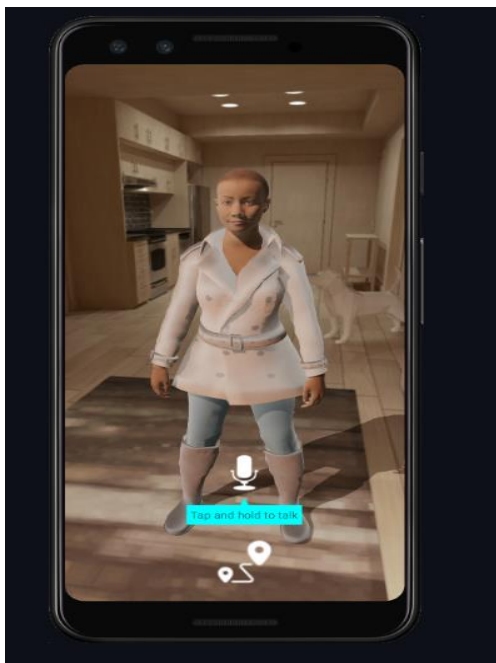
Choose the AR Platform: Choose an AR platform that is suitable for the application and compatible with voice assistant integration. Popular AR platforms include ARKit, ARCore, and Vuforia.

Design the User Interface: Design the user interface for the AR and voice assistant integration, considering the specific use case and user experience. This could involve designing voice commands, creating virtual objects, or designing the visual interface for the AR environment.

Integrate the Technologies: Integrate the AR and voice assistant technologies using appropriate software development tools and frameworks. This could involve using a software development kit (SDK) or application programming interface (API) to connect the technologies.

Test and Refine: Test the integration in a real-world setting, gather user feedback, and refine the implementation based on user needs and preferences.

Overall, integrating AR and voice assistant technologies requires careful planning, design, and implementation, as well as ongoing testing and refinement. With the right tools and expertise, AR and voice assistant integration can create exciting new opportunities for user interaction and engagement.



VI. CONCLUSION

This idea was developed and tested as an assistive AR application that may have a variety of uses for entertainment, personal, and recreational uses.

Overall, an AR-enabled voice assistant could provide a more intuitive, immersive, and personalized user experience, which could be especially useful in situations where hands-free or visual interaction is preferred.

REFERENCES

- [1] D. Yu and L. Deng, Automatic Speech Recognition: A Deep Learning Approach. London: Springer, 2015.
- [2] A. Graves and N. Jaitly, "Towards end-to-end speech recognition with recurrent neural networks," in International Conference on Machine Learning, pp. 1764–1772, 2014.
- [3] J. Li, L. Deng, Y. Gong, and R. Haeb-Umbach, "An overview of noise-robust automatic speech recognition," IEEE/ACM Transactions on Audio, Speech, and Language Processing, vol. 22, no. 4, pp. 745–777, 2014.
- [4] J. D. Van Krevelen and R. Poelman, "A survey of augmented reality technologies, applications and limitations," International journal of virtual reality, vol. 9, no. 2, pp. 1–20, 2010.
- [5] T. P. Caudell and D. W. Mizell, "Augmented reality: An application of heads-up display technology to manual manufacturing processes," in System Sciences, 1992. Proceedings of the Twenty-Fifth Hawaii International Conference on, vol. 2, pp. 659–669, IEEE, 1992.
- [6] D. Schmalstieg and T. Hollerer, Augmented reality: principles and practice. Boston: Addison-Wesley Professional, 2016. [25] J. Lukkarila, "Developing a conversation assistant for the hearing impaired using automatic speech recognition," MSc Thesis, Aalto University, 2017.
- [7] J. Carmigniani, B. Furht, M. Anisetti, P. Ceravolo, E. Damiani, and M. Ivkovic, "Augmented reality technologies, systems and applications," Multimedia Tools and Applications, vol. 51, pp. 341–377, Jan 2011.
- [8] F. Zhou, H. B.-L. Duh, and M. Billinghurst, "Trends in augmented reality tracking, interaction and display: A review of ten years of ismar," in Proceedings of the 7th IEEE/ACM International Symposium on Mixed and Augmented Reality, pp. 193–202, IEEE Computer Society, 2008.
- [9] O. Bimber and R. Raskar, "Modern approaches to augmented reality," in ACM SIGGRAPH 2006 Courses, SIGGRAPH '06, (New York, NY, USA), ACM, 2006.
- [10] M. Tatzgern, V. Orso, D. Kalkofen, G. Jacucci, L. Gamberini, and D. Schmalstieg, "Adaptive information density for augmented reality displays," in 2016 IEEE Virtual Reality (VR), vol. 00, pp. 83–92, 2016. [21] R. R. Hainich, The End of hardware: augmented reality and beyond. BookSurge, 2009.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

