

VR Shopping, Fitting, and Recommendation Service Based on Interactive Interface

Li Jar and Sook Youn Kwon

Department of international Cooperation and Technology, Jeonju Vision College

Department of Computer Science, Jeonju Vision College

Jeonju, South Korea

[e-mail: davidbeljar@gmail.com, sookyou73@naver.com]

*Corresponding author: Sook Youn Kwon

Abstract

In the fashion industry, there has been an active adoption of digital and virtual technology-based services to capture customer attention and interest. Virtual reality(VR) shopping malls offer marketing advantages and shopping opportunities by showcasing various products from each brand, while also allowing for the realistic creation of store environments without the need for physical resources, promoting a more positive environmental impact. This study proposes an interactive interface-based VR shopping mall that includes three key technologies.

First, it supports an interactive interface linked to generative AI technology, enabling people with physical limitations to shop freely using only voice commands. Second, by utilizing an Open API, the system automatically generates a virtual avatar similar to the user's face and body size, allowing users to try on desired clothing in a virtual fitting service. Lastly, the proposed system includes an intelligent recommendation service that suggests suitable clothing based on the user's context, using detailed information (brand, style, color, material, appropriate weather, etc.) of the purchased items.

Keywords: VR Shopping mall, Generative AI, Gemini, Ghat GPT, Cloth Recommendation, Fitting

1. Introduction

The expansion of smartphone usage and factors such as COVID-19 have led to continuous growth in the online shopping market. In particular, the advancement and integration of metaverse technologies like artificial intelligence (AI), VR, and AR are providing consumers with a new paradigm, serving as a catalyst to further activate and develop online shopping [1] [2] [3]. VR shopping malls allow for the creation of immersive store environments without the use of

physical resources, promoting environmental sustainability. They offer the advantage of allowing users to participate and immerse themselves in desired experiences anytime and anywhere, overcoming time and space limitations, which is why they are actively utilized in the fashion industry[4]. In addition, online shopping malls that use artificial intelligence technology offer consumers quick and accurate access to suitable clothing through personalized recommendation algorithms and virtual styling services. Companies, in turn, utilize this technology to analyze consumer purchasing and browsing patterns, helping them improve their marketing strategies. Furthermore,

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consumer reviews and style sharing through social media platforms provide richer information about products and promote interaction among consumers, leading to increased purchase satisfaction and higher consumption [2].

Among artificial intelligence technologies, speech recognition is known as one of the most efficient means for facilitating communication between machines and humans. Both domestic and international retail companies are incorporating speech recognition technology into their businesses to offer consumers a more convenient shopping experience [5].

Recently, there have been new and exciting attempts to integrate conversational AI models such as Google Gemini and ChatGPT into metaverse platforms in order to develop various tools. The metaverse promotes user interaction, enables experience sharing, while generative AI has the advantage of providing personalized services tailored to user needs through conversations.[6] However, there are still few real-world examples of integrating these two technologies to build online clothing shopping platforms.

This paper proposes a conversational interface-based VR shopping mall where users can communicate with an AI agent via voice and receive clothing recommendations tailored to their situation, using the conversational AI model Gemini (1.5-flash). The proposed system not only includes the AI-based clothing recommendation function but also allows users to create their own avatars, shop freely, and try on clothes. To focus on the integration of generative AI and metaverse platforms, the study excludes functionalities such as collecting and extracting features from users' faces and body types through cameras to generate similar avatars, as well as creating and applying objects like the colors and textures of real clothing through 3D scanners.

2. System Design and Implementation

2.1 System Design

The proposed system consists of a Unity engine

and a generative AI model operating on a RAG application server, as shown in **Fig. 1**. RAG (Retrieval Augmented Generation) is a technique that expands the knowledge of LLMs (Large Language Models) with additional data, helping the model generate more accurate and specific answers.

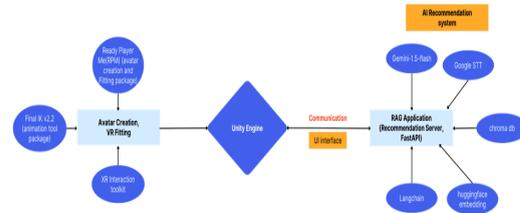


Fig. 1. System Configuration

Fig. 2 illustrates the processing flow of the proposed system. The system is implemented using RPM (Ready Player Me) and the Final IK package to enable avatar creation and clothing fitting within the VR environment. Additionally, when the user sends a voice command through a microphone requesting clothing recommendations, the AI server (RAG) converts the voice input into text via Google's STT API, then transmits it to the server (load). The text is subsequently split by a text splitter (split) and embedded into a numerical vector format (embed) (e.g., [01, 0.8, 1.1, ...]) and stored (store). Based on the embedded user request data, the AI server retrieves relevant split data from the vector database (chroma DB) and then generates an answer by using the user request and clothing ID as a prompt for the LLM. The clothing ID included in the generated answer is used to search for the 3D clothing objects in the user's virtual wardrobe, and the answer is provided to the user in both voice and text formats. **Fig. 3** schematically illustrates the process by which the AI model generates a response message to a user request.

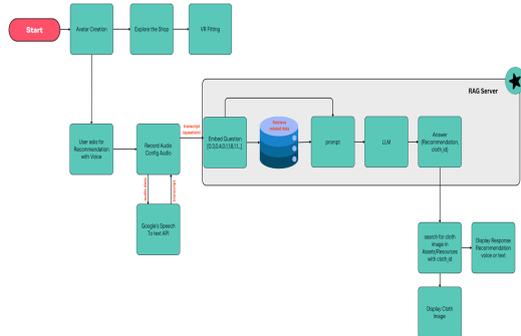


Fig. 2. System Process

2.1 System Implementation

The following Fig. 3 shows the prototype execution screen of the proposed system. The top-left and top-right screens display the results of the avatar creation and clothing fitting services, while the bottom screen shows the conversational AI model, Gemini, selecting appropriate clothing based on the user's request. It provides the clothing recommendations along with the 3D objects and displays the results in both text and voice formats.

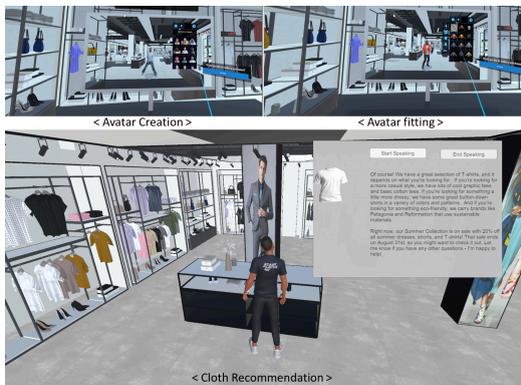


Fig. 3. System Execution Screen
 (Avatar Creation, Fitting, Recommendation)

3. Conclusion and Future Research Directions

This study implemented a conversational interface-based virtual shopping mall by integrating the conversational AI model, Google Gemini, with a VR environment. The system's key features include automatic avatar creation

and clothing fitting functionality using various libraries, as well as personalized clothing recommendation services based on the conversational AI model. Through this research, it was demonstrated that the integration of metaverse platforms and generative AI provides a sense of familiarity and comfort for users, while also enhancing shopping satisfaction through personalized services.

In the future, we plan to create characters that closely resemble the actual customer's face and body size, and implement detailed size matching features. Additionally, a push notification feature will be developed to suggest clothing that matches items already stored in the user's virtual wardrobe when new products arrive, making it easier for users to make a purchase.

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