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Integrating AR into E-Commerce Platform for Cloth Shopping

Kirti Pawar[1], Abhishek Gaund[2], Sarvesh Chate[3], Hemakshi Rathod[4], Rajdeep Gaikwad[5]
[1, 2, 3, 4, 5]*Department of Information Technology, Saraswati College of Engineering, Navi Mumbai, Maharashtra, India*

Abstract: Online shopping for clothing has grown rapidly, but customers often face difficulty in deciding whether a particular outfit will suit them, as they cannot physically try it before purchase. This project focuses on enhancing the online shopping experience by integrating Augmented Reality (AR) into an e-commerce platform for clothing recommendations. The proposed system allows users to virtually try on clothes using their mobile device camera, providing a real-time visualization of how garments appear on their body.
The system also incorporates an AI-based recommendation module that suggests clothing items based on user preferences, body type, and browsing history. By combining AR visualization with intelligent recommendations, the platform helps users make more confident purchasing decisions. The proposed solution reduces uncertainty, minimizes product returns, and improves overall customer satisfaction.
Additionally, the system provides an interactive and user-friendly interface that enables seamless browsing, selection, and virtual try-on of clothing items. The integration of AR technology bridges the gap between physical and online shopping by offering a more realistic and personalized experience. This project benefits both customers and retailers by improving engagement, increasing conversion rates, and creating a smart, technology-driven shopping environment.

I. INTRODUCTION

Online shopping has become an important part of everyday life. Many customers prefer buying clothes online because it saves time, offers a wide variety of options, and provides easy price comparison.

However, online clothing shopping still has several challenges. The biggest problem is that customers cannot try clothes before purchasing them. This makes it difficult to understand how the outfit will look, whether it will fit properly, or if it matches the user's style. Because of this uncertainty, customers often hesitate to buy clothes online, and many products are returned due to size or appearance mismatch.

To solve this issue, Augmented Reality (AR) technology can be used to improve the online shopping experience. AR allows digital objects to be placed in the real-world environment using a mobile device camera. In this project, AR is used to create a virtual try-on system where users can see how clothes will look on them in real time. This feature helps users visualize outfits more clearly and make better purchasing decisions.

The proposed system integrates AR into an e-commerce platform for clothing recommendations. Users can browse different clothing items and use the AR feature to virtually try them on. The system overlays selected outfits onto the user's live camera view, giving a realistic experience similar to trying clothes in a physical store. This reduces confusion about appearance and fitting.

In addition to AR-based virtual try-on, the system also includes a recommendation module that suggests clothing items based on user preferences and interactions. This helps users quickly find suitable clothes and improves overall usability. The platform is designed with a simple and responsive user interface so that users can easily navigate through products, select items, and use the AR feature without difficulty.

The main objective of this project is to enhance customer satisfaction and reduce product return rates by providing a more interactive and realistic shopping experience. By integrating AR technology into online clothing shopping, the system bridges the gap between offline and online shopping. It benefits both customers and retailers by improving engagement, increasing confidence in purchases, and creating a modern shopping environment.

Overall, this project demonstrates how Augmented Reality can transform traditional online clothing shopping into a more efficient, personalized, and user-friendly experience. It highlights the potential of AR technology in improving decision-making and making online fashion shopping more reliable and convenient.

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II. LITERATURE REVIEW

With the rapid growth of online shopping, researchers have focused on improving user experience in fashion e-commerce using emerging technologies. One major limitation identified in traditional e-commerce systems is the inability of customers to physically try clothes before purchasing. This leads to uncertainty regarding size, fitting, and overall appearance. To address this issue, several studies have proposed the use of Augmented Reality (AR) for virtual try-on systems. These systems allow users to visualize clothing items on their own body using a mobile device camera. Researchers observed that AR-based visualization helps customers better understand how clothes will look, thereby increasing confidence in purchase decisions and reducing product return rates.

Many research works also emphasize the integration of Artificial Intelligence (AI) with AR technology. AI-based recommendation systems analyze user behavior, preferences, and browsing history to suggest suitable clothing items. These personalized recommendations help users quickly identify products that match their style. Studies show that combining AR with recommendation systems improves engagement and enhances the overall shopping experience. This approach not only benefits customers but also helps retailers increase sales and customer retention.

Some researchers have focused on improving the accuracy and realism of AR-based try-on systems. Techniques such as body detection, pose estimation, and image tracking are used to properly align virtual clothing with the user's body. These technologies ensure that clothes appear natural and realistic in real-time. However, certain challenges remain, such as variations in lighting conditions, body shapes, and camera quality. Recent advancements in mobile computing and AR frameworks have significantly improved performance and reduced these limitations.

Other studies highlight the importance of user interface design in AR-based applications. A responsive and easy-to-use interface allows users to browse products, select items, and use virtual try-on features without difficulty. Researchers found that a well-designed interface improves usability and encourages users to spend more time on the platform. Additionally, providing filtering options, category selection, and smooth navigation enhances the overall user experience.

Furthermore, literature also discusses the impact of AR technology on business outcomes. AR-enabled shopping platforms increase customer engagement, reduce uncertainty, and lower return rates. Retailers benefit from improved customer satisfaction and higher conversion rates. The interactive nature of AR bridges the gap between offline and online shopping by providing a more realistic experience. Based on these studies, it is clear that AR-based virtual try-on systems play an important role in modernizing fashion e-commerce.

Overall, the reviewed literature demonstrates that Augmented Reality combined with intelligent recommendation techniques can significantly improve online clothing shopping. These findings support the development of an AR-based e-commerce platform that offers virtual try-on, personalized recommendations, and an interactive shopping experience. The proposed system builds upon these research contributions to provide a more efficient and user-friendly solution.

III. RESEARCH METHODOLOGY

The proposed system follows a structured methodology to develop an Augmented Reality (AR) based e-commerce platform for clothing try-on and recommendation. The methodology explains the overall workflow of the system, starting from user interaction to final output. The aim is to provide a smooth, interactive, and personalized shopping experience using AR technology.

The first step in the methodology is user registration and login. Users create an account by entering basic details such as name, email, and password. This step helps the system identify users and store their preferences. A secure login mechanism ensures data privacy and allows the system to track user activity for personalized recommendations. Returning users can log in using their credentials and access their previous selections.

After successful login, users can browse through various clothing categories available on the platform. The system displays products with images, descriptions, and other necessary details. Users can explore different categories such as shirts, pants, dresses, and other apparel. Filtering and sorting options help users quickly find products based on preferences such as size, color, or style. This stage helps users explore multiple clothing items before making a selection.

Once a user selects a clothing item, the Augmented Reality (AR) module is activated. The system accesses the device camera and detects the user's body position. The selected clothing item is then overlaid onto the user's real-time image. This virtual try-on feature allows users to visualize how the clothing will appear on them. The AR system adjusts the clothing based on body alignment to provide a realistic view. Users can move, rotate, or change items to compare different outfits. This interactive feature improves decision-making and reduces uncertainty.

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In addition to the AR try-on feature, the system includes an AI-based recommendation module. This module analyzes user preferences, browsing history, and selected items. Based on this data, the system suggests clothing items that match the user's style. The recommendation algorithm helps users discover relevant products and reduces search time. Personalized suggestions improve user engagement and enhance the shopping experience.

After selecting suitable clothing items, users can add products to the shopping cart. The cart allows users to review selected items and make necessary changes. Users can remove items, update quantities, or continue shopping. Once satisfied, users proceed to the checkout process. The system records order details and updates user history. This data is later used to improve recommendation accuracy.

Finally, the system is evaluated based on performance, usability, and user satisfaction. The accuracy of AR visualization, response time, and ease of use are tested. User feedback is collected to identify improvements. The evaluation ensures that the system functions efficiently and provides a reliable shopping experience.

IV. BLOCK DIAGRAM

The Fig.1. flowchart shows the step-by-step working of the Augmented Reality based clothing system. The process starts with user registration or login. The user then browses clothing products and selects an item. After selection, the system displays the clothing on a virtual model using the AR module. The AI recommendation module suggests related items. The user decides whether to add the product to the cart. If yes, the user proceeds to checkout and completes payment. If not, the user continues browsing more products. Finally, the system stores user data and order history, and the process ends.

The Fig.2. block diagram represents the overall architecture of the system. The user interacts with the system through the user interface. The interface connects to three main modules: AR virtual try-on module, AI recommendation system, and product database. The AR module displays clothes on the user, the AI module provides personalized suggestions, and the product database stores item details. These modules send information to the cart and checkout section. After that, the payment gateway processes the transaction and the system generates the final output in the form of order confirmation.

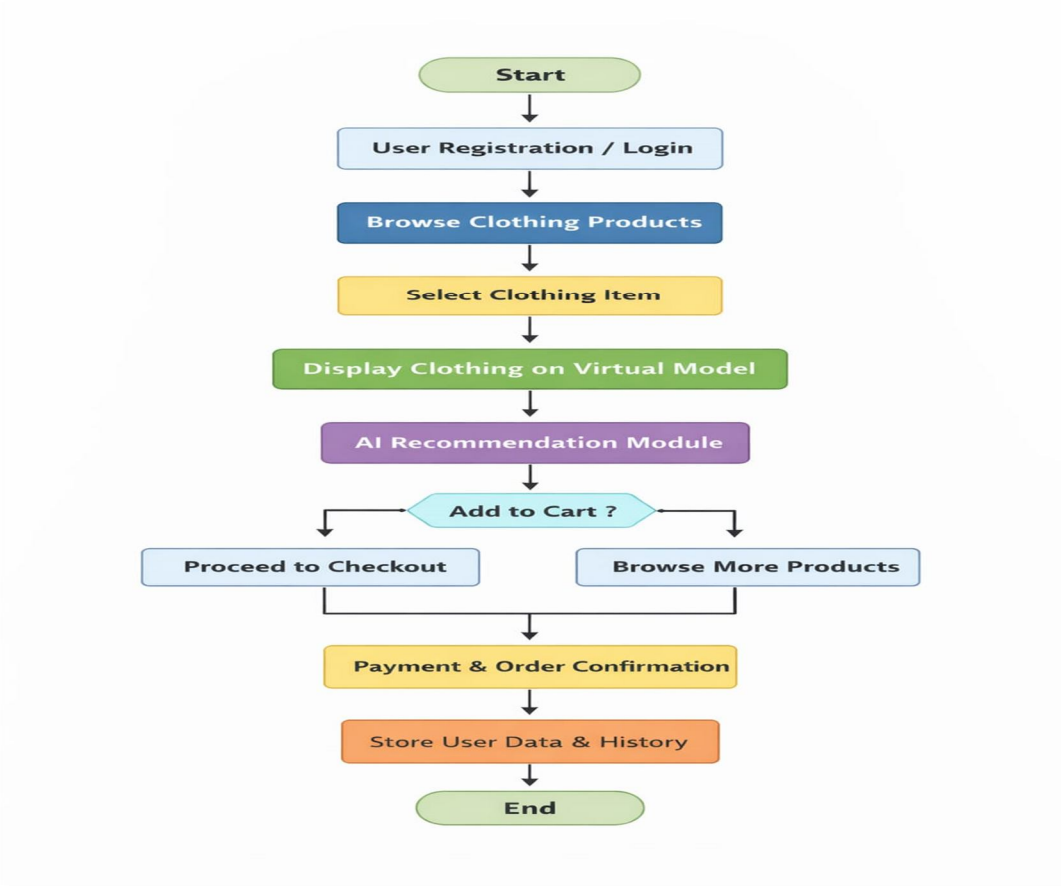


Fig. 1: System Flowchart

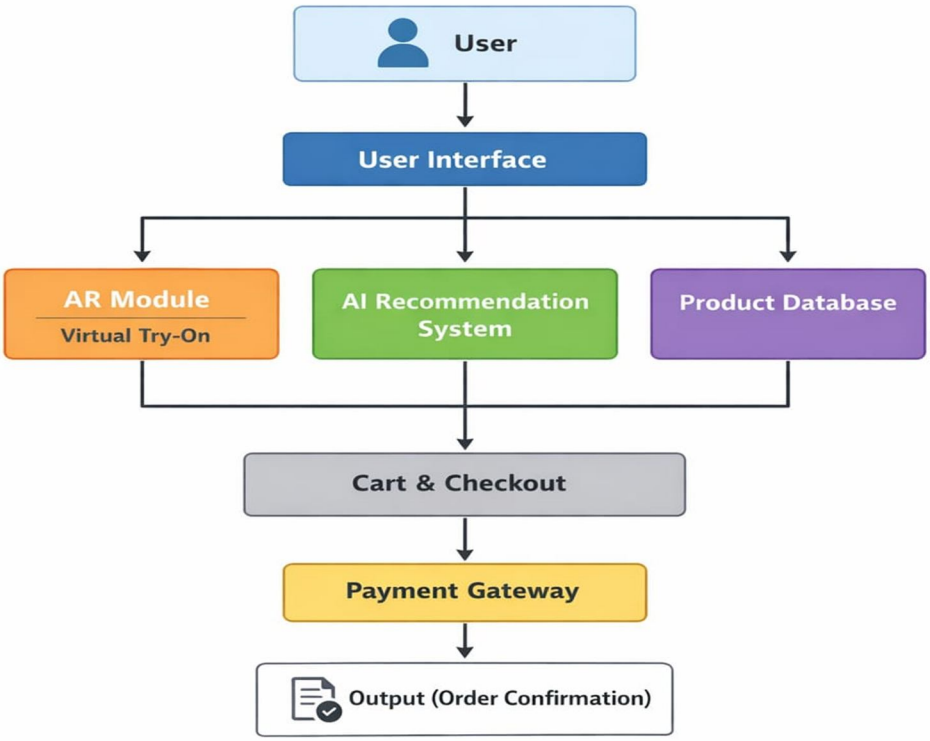


Fig. 1: Block Diagram

V. RESULTS AND DISCUSSION

The Augmented Reality based virtual try-on system was successfully designed and implemented. The system allows users to browse clothing products and visualize selected items using the AR module. During testing, the system worked smoothly and displayed clothing on the virtual model in real time. Users were able to interact with the interface easily and navigate through different options without confusion. This shows that the developed system is user-friendly and suitable for online clothing shopping applications.

The AR module produced satisfactory results by overlaying clothing items on the virtual model. In most cases, the alignment of clothes appeared accurate and helped users understand how the selected item would look. This feature reduces the uncertainty that usually occurs in traditional online shopping. The system also worked well under normal lighting conditions and provided a clear display of clothing textures and colors. However, minor issues such as slight misalignment were observed when users moved quickly or when lighting conditions were poor. The AI recommendation module also contributed to improving user experience. Based on user selection and browsing behavior, the system suggested similar or related clothing items. These recommendations helped users explore more options quickly and reduced the time required to search for products manually. This improves decision making and increases the chances of selecting suitable items. The recommendation system also enhanced personalization in the shopping process. The integration of cart and checkout modules ensured smooth completion of the purchasing process. After selecting items, users were able to add them to the cart and proceed to checkout without any interruption. The payment process was simulated successfully, and order confirmation was generated at the end. The system also stored user data and order history, which can be used for future recommendations and analysis.

Overall, the results indicate that the AR-based clothing system improves online shopping experience by providing visualization, personalization, and ease of use. The system increases user engagement and helps users make better purchase decisions. Although some limitations were observed, such as dependency on camera quality and minor alignment issues, the performance of the system was satisfactory. The proposed system demonstrates that Augmented Reality can enhance e-commerce platforms by making shopping more interactive, efficient, and reliable.

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VI. CONCLUSION

The Augmented Reality based virtual try-on system for clothing was successfully designed, developed, and tested. The main objective of the project was to provide users with an interactive and realistic shopping experience, and this objective was achieved. The system allows users to browse clothing items and visualize them using AR technology before making a purchase. This helps users understand how the clothing will look, which reduces uncertainty and improves confidence in selecting products.

The integration of different modules such as the user interface, AR virtual try-on module, AI recommendation system, product database, and checkout process worked effectively. The AR module displayed clothing items on the virtual model in real time, while the AI recommendation module suggested relevant items based on user preferences. This combination improved user engagement and made the shopping experience more personalized. The system also allowed users to add items to the cart and complete the purchase smoothly, ensuring an end-to-end workflow.

The results showed that the developed system can enhance online shopping by providing better visualization of products. Users can make informed decisions without physically trying the clothes. This reduces the chances of wrong selection and helps minimize product returns. Additionally, the system improves convenience as users can explore multiple clothing options quickly and easily. The storage of user data and history also helps in providing improved recommendations for future use.

However, some limitations were observed during testing. The performance of the AR module depends on camera quality and lighting conditions. In certain situations, minor misalignment of clothing was noticed when the user moved quickly. These limitations can be addressed in future work by improving tracking algorithms, using advanced AR frameworks, and optimizing system performance. Adding more features such as size detection, body measurement, and real-time adjustments can further enhance the system.

In conclusion, the proposed AR-based clothing try-on system successfully demonstrates the use of Augmented Reality in e-commerce applications. The system improves user interaction, enhances visualization, and provides personalized recommendations. It helps users make better purchase decisions and increases overall customer satisfaction. Therefore, the implementation of Augmented Reality in online clothing platforms has strong potential to transform the shopping experience and represents an important step toward the future of digital retail.

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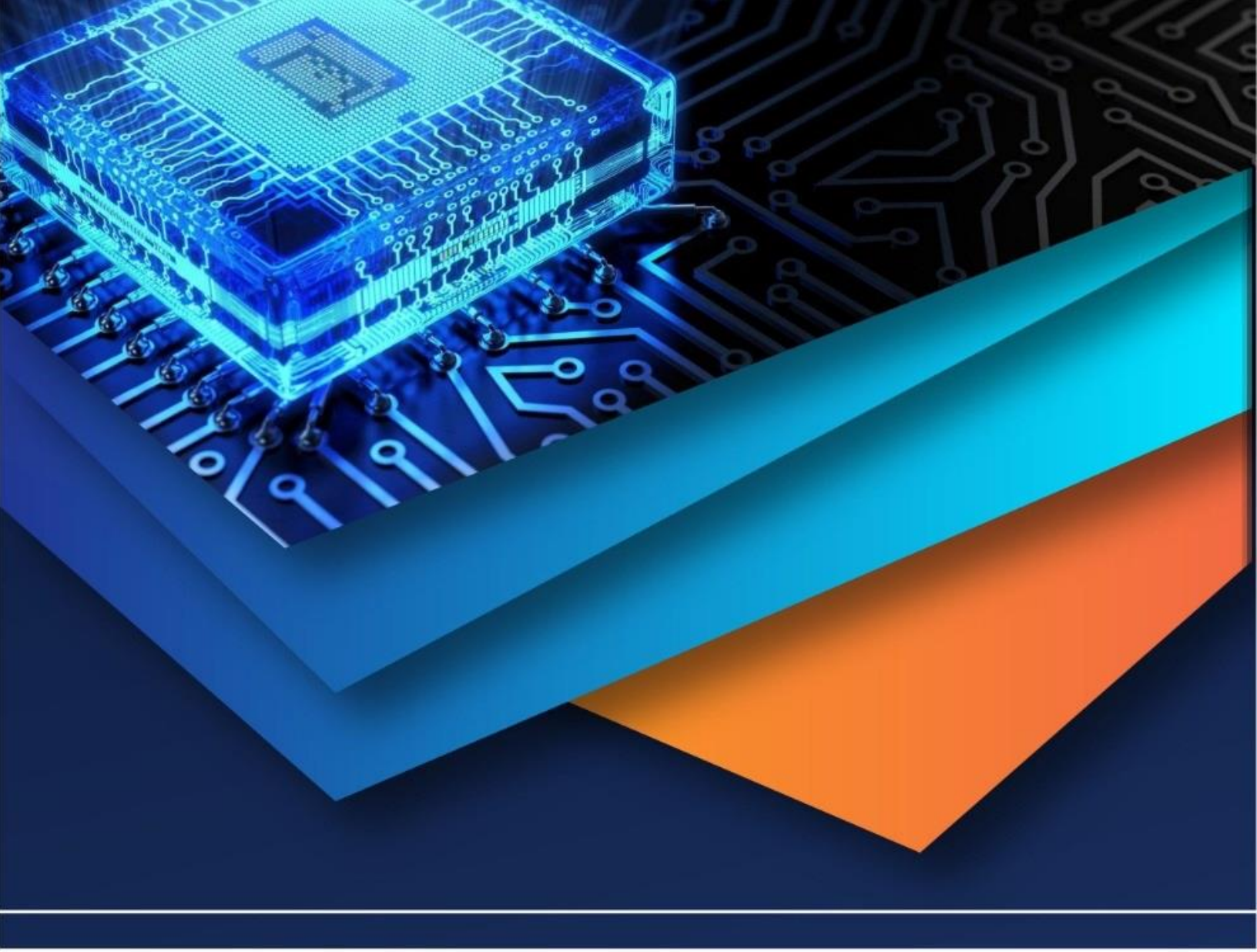
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