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VIRTUAL DRESSING ROOM USING AR

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ABSTRACT

The Virtual Dressing Room Using Augmented Reality (AR) project explores the application of AR technology to revolutionize the online shopping experience. Traditional online shopping often lacks the ability for users to try on clothes virtually, leading to uncertainty regarding fit, size, and overall appearance. This project aims to address this gap by providing a platform where users can visualize clothing items on their own digital avatars in real-time. Through the use of AR, customers can view how garments fit their body shape and size, helping them make more informed purchase decisions. The system Integrates AR with machine learning algorithms to create a seamless, interactive experience. It uses the camera on a user's device to scan and map their body dimensions, creating a 3D avatar that can be dressed in various clothing items. This virtual try-on experience ensures that users can experiment with different styles, colors, and fits without the need to physically try on the garments, ultimately reducing the return rates and improving customer satisfaction in e-commerce platforms. The project also highlights the challenges and innovations within the AR field, including accurate body tracking, realistic garment rendering, and real-time feedback. As AR technology evolves, the potential for this solution to transform industries like fashion and retail becomes more significant. By enabling personalized and interactive shopping, the virtual dressing room not only enhances the consumer experience but also offers businesses a competitive edge in the growing online retail market.

Keywords: Analysis, Investigation, Research.

I. INTRODUCTION

Virtual dressing rooms (VDR) are an innovative solution for the fashion retail industry, utilizing Augmented Reality (AR) to enable customers to try on clothes virtually. These systems simulate how garments will look on a person's body by overlaying digital clothing onto live images. By eliminating the need for physical try-ons, VDRs offer a more engaging and convenient shopping experience

1.1 Significance of the Project

The primary objective of this project is to enhance the online shopping process by creating an AR-based virtual dressing room. By integrating real-time body tracking and 3D garment rendering, users will be able to visualize clothing on their own bodies, thereby improving the accuracy of purchase decisions. This system addresses challenges like fit issues, inaccurate product representation, and high return rates, ultimately benefiting both customers and retailers.

II. LITERATURE REVIEW

2.1 Overview of Augmented Reality in Retail

AR is transforming retail by enabling interactive shopping experiences, especially in fashion. It allows customers to visualize clothing without physically trying it on, enhancing engagement and purchase decisions. Studies (Pantano et al., 2020) show that AR increases satisfaction, loyalty, and personalization in shopping.

2.2 Technological Foundations of Virtual Dressing Rooms

Virtual dressing rooms use computer vision, 3D modeling, and real-time rendering to create realistic try-on experiences. AI and machine learning refine fit and recommendations by analyzing user preferences (Gupta & Mishra, 2021) accuracy and interactivity.

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2.3 Consumer Behavior and User Experience

User satisfaction depends on intuitive design, accuracy, and realism (Liu et al., 2020). High-quality virtual try-ons boost consumer trust and purchasing decisions (Kim & Forsythe, 2017). Personalized recommendations enhance decision-making and increase purchase likelihood.

2.4 Challenges and Future Trends

Challenges include accurate body measurements and privacy concerns (Dong et al., 2019). Future advancements in AI and Mixed Reality (MR) aim to provide more immersive and personalized shopping experiences (Nash et al., 2021), further blurring the digital-physical divide.

III. METHODOLOGY

4.1 Project Overview

This project aims to develop a virtual dressing room prototype using AR, allowing users to try on clothes in a 3D simulated environment. The system will be tested for usability, fitting accuracy, and shopping experience enhancement through user testing and surveys.

4.2 System Architecture

User Interface (UI): Enables browsing, item selection, and AR try-on.

AR Engine: Uses ARKit/ARCore to overlay digital clothing.

Backend System: Cloud storage for clothing data and user profiles.

3D Model Renderer: Uses Unity to visualize clothing in real time.

Body Scanning Module: Captures user body measurements via AR sensors.

4.3 Data Collection and Analysis

Body Measurements: Captured via AR for accurate clothing fit.

User Feedback: Gathered through surveys and interviews.

Return Rates: Compared before and after virtual try-on implementation.

4.4 Evaluation Metrics

User Satisfaction: Measured through feedback.

Fit Accuracy: Analyzes virtual vs. real-world fitting.

Return Rate Reduction: Assesses impact on return rates due to sizing issues.

IV. MODELING AND ANALYSIS

1. Pose Estimation

Tracks body joints in real-time.

Models: OpenPose, MediaPipe Pose, DensePose, HRNet

2. Body Segmentation

Identifies body regions for clothing overlay.

Models: U-Net, DeepLab, Mask R-CNN

3. Garment Fitting & Warping

Aligns and animates clothes on the body.

Techniques: Thin Plate Spline (TPS), 3D mesh fitting, Physics-based simulation

4. Face & Gesture Recognition (Optional)

Enables interaction and personalization.

Models: CNNs, MediaPipe Hands

🛠 Tech Stack

Languages: Python, Swift, Java, C#

Libraries: TensorFlow, PyTorch, OpenCV

Engines: Unity3D, Unreal Engine

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AR SDKs: ARKit, ARCore, Vuforia

V. RESULTS AND DISCUSSION

As a result of implementing the Virtual Dressing Room using AR:

Users experience improved confidence in their purchase decisions.

There is a notable reduction in product return rates due to better fit visualization.

Customer engagement and satisfaction levels increase due to the interactive experience.

Retailers benefit from enhanced conversion rates, lower returns, and a modernized shopping experience.

The system provides a more convenient, hygienic, and futuristic alternative to traditional fitting rooms.

Output

The system developed is a Virtual Dressing Room application that uses Augmented Reality (AR) and computer vision to allow users to:

Digitally try on clothes in real-time via smartphones or AR-enabled devices.

View how garments fit and look from different angles.

Mix and match outfits, colors, and styles interactively.

Personalize the shopping experience without physical trials.

VI. CONCLUSION

AR-powered virtual dressing rooms are transforming online fashion shopping by enabling virtual trials, reducing return rates, and enhancing customer satisfaction. Despite growing adoption, challenges like body scanning accuracy and cross-device compatibility remain.

Future Scope: Advancements in AR and AI will enable personalized fashion recommendations, style predictions, and enhanced immersive shopping experiences. The integration of AR glasses and wearable devices will further elevate online shopping,

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