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VIRTUAL REALITY TRIAL ROOM

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Abstract: It aims to redefine the way customers search, try on and buy clothes by seamlessly integrating computer vision and augmented reality. It solves the problem of negativity, reduces return, and increases satisfaction by measuring accuracy and virtual fit. It also offers personalized clothing recommendations to deepen the connection between customers and the platform. Overall, this initiative should usher in a new era of efficient and effective retail interactions while meeting the changing needs of today's consumers.

Keywords **– Evolution, Innovation, Digitalization, Customer Satisfaction.**

Introduction

The evolution of the garments industry relies heavily on the interconnected processes of design, production, distribution, and consumption. Within this dynamic landscape, there is a continual demand for innovation, particularly in understanding consumer preferences, increasing revenue, and strategically implementing technologies to engage audiences. As more individuals turn to fashion, digital engagement with clothing becomes increasingly important. However, the challenge lies in providing an experience similar to trying on garments in-store without physically visiting a store. In this digital space, there is a growing need for user-friendly applications that streamline processes and save time. The current difficulty in selecting and purchasing apparel, especially regarding fit, leads to a higher rate of returns. To address these challenges, retailers must prioritize customer satisfaction by embracing technology that eliminates barriers and inefficiencies. Strategies that balance customer satisfaction and profitability are crucial, allowing customers to virtually try on sizes, fits, and styles while easily navigating through apparel options. Traditional garment stores, despite offering diverse brands and designs, struggle as customers cannot try on all the dresses that may suit them, resulting in a time-consuming process. Early development models, utilizing technologies such as Microsoft's Kinect 3D for 3D tracking and positioning, ARCore, and ARKit, laid the foundation for more sophisticated e-commerce applications. By leveraging computer vision technology, this project transforms customers' homes into virtual garment stores, providing an immersive experience with rapid try-ons of various outfits. This integration of garments and e-prototyping not only improves the efficiency of purchasing and delivery processes but also reduces costs. The application encourages increased interaction between customers and sellers, fostering a friendly environment. By generating significant revenue for garment companies, this innovative approach becomes a breakthrough in the digital industry. Developed using computer vision technology, particularly with the OpenCV Python library and implemented through the Flask framework, the application offers features such as 2D rotation, zooming, and a virtual try-on experience with a wide range of brands and designs. The ability to adjust lighting according to the surrounding environment enables customers to evaluate and compare product efficiency, making informed decisions through personalized models compared to traditional purchasing methods.

LITERATURE REVIEW

[1] This paper introduces a rapid and dependable technique for automatically segmenting a person's face in images, particularly in head-and-shoulders views with intricate backgrounds. It employs a universal skin-color map applied to the chrominance component of the input image to detect skin-color pixels. Subsequently, innovative regularization procedures are applied to enhance facial regions. Simulation outcomes showcase the algorithm's effectiveness, accompanied by a discourse on its utilization in video coding, particularly in videotelephony, to amplify perceptual quality. This underscores the importance of face segmentation in augmenting visual communication experiences, especially in head-and-shoulders scenarios..

[2] This paper introduces innovative color local texture features, namely CLGWs and CLBP, designed specifically for face recognition (FR). These features utilize spatiochromatic texture patterns across spectral channels within facial regions, incorporating opponent color texture features to improve discrimination. A feature-level fusion approach combines multiple features for classification purposes. Experimental evaluations conducted on five publicly available face databases demonstrate the effectiveness of these features, particularly in scenarios involving varying illumination and low-resolution images, surpassing methods that rely solely on color or texture information. Comparative analyses with state-of-the-art techniques validate the feasibility and competitiveness of these features in color-based FR..

[3] This paper presents an innovative approach to generate lifelike 3D clothing, beginning with 2D CAD patterns derived from real garments. The objective is to construct an immersive virtual store where users can explore diverse garment designs on dynamically animated virtual bodies. By amalgamating practices from the fashion industry with distinctive techniques for crafting virtual humans, the methodology seamlessly drapes garments onto virtual bodies and simulates their behavior based on actual fabric properties. A real-time platform embedded within a web browser facilitates dynamic alterations in textures, clothing choices, body measurements, and animation sequences. This methodology transcends conventional virtual dressing rooms by providing visualization, animation, and interactivity for made-to-measure clothing, thereby transforming the online shopping experience into a comprehensive Virtual Try-On process..

In [4], In response to challenges such as proxy attendance and wasted class hours, an automatic attendance system utilizing facial recognition has been devised. Conventional methods such as passwords or ID cards are susceptible to manipulation, as they merely confirm presented information rather than verifying the individual. By prioritizing the distinctive three-dimensional features of faces, this system offers a more secure and precise method of student tracking, thereby improving efficiency in educational environments..

I. PROBLEM STATEMENT

Our Virtual Trial Room project presents a remedy to the obstacles encountered in traditional fashion retail, particularly with in-store clothing trials. Through the utilization of state-of-the-art technology such as augmented reality and computer vision, we furnish customers with a smooth virtual try-on encounter, effectively connecting online and in-store shopping. This inventive strategy not only elevates the entirety of the shopping journey but also tackles hygiene-related apprehensions, notably amidst global adversities like the COVID-19 pandemic. Ultimately, our initiative strives to transform the fashion retail landscape by guaranteeing a safer, more streamlined, and pleasurable shopping experience for customers..

II. PROPOSED SYSTEM

The passage discusses leveraging various techniques and technologies to enhance a Virtual Trial Room (VTR), including face segmentation, color-based features, body and garment creation, face tracking, interface design, and deep learning-based approaches. It aims to address challenges in online shopping, such as discrepancies in color, size, and appearance. The system integrates ideas from cited papers and recent advancements to improve accuracy and realism in virtual try-ons.

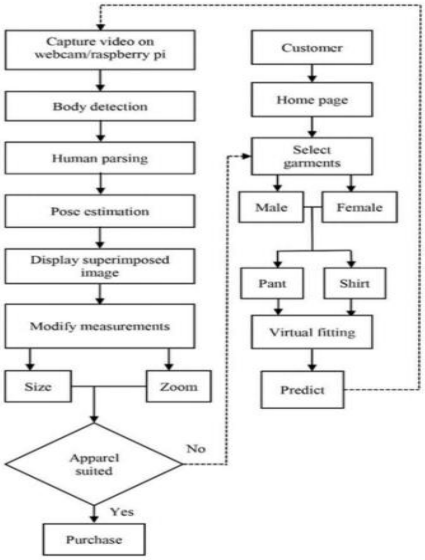

Fig.1 : system architecture

3.1 Technological Foundations for Enhanced Virtual Trial Rooms

In developing an advanced Virtual Trial Room (VTR), the integration of various technological components plays a crucial role. Face segmentation techniques are employed to precisely identify and isolate facial features, ensuring accurate virtual try-ons. Additionally, color-based features are utilized to enhance the realism and fidelity of virtual fittings, providing users with a more immersive experience. Innovative methods for body and garment creation further contribute to the seamlessness of the virtual fitting process, allowing users to visualize clothing items with high accuracy. Moreover, the integration of face tracking technologies adds a layer of dynamism and responsiveness to the virtual trial experience, enabling real-time adjustments and interactions.

3.2 User-Centric Design Principles and Interface Optimization

Central to the development of the Virtual Trial Room (VTR) is the adherence to user-centric design principles and interface optimization strategies. Specifically tailored for Android-based mobile devices, the interface is designed with a focus on user-friendliness and accessibility. Automated body feature extraction from 2D images streamlines the virtual fitting process, reducing user effort and enhancing convenience. Furthermore, interface elements are optimized to address potential dissatisfaction among online shoppers, with intuitive navigation and interaction patterns aimed at improving user engagement and satisfaction.

3.3 Deep Learning Integration for Improved Accuracy and Realism

The integration of deep learning technologies plays a pivotal role in enhancing the accuracy and realism of the Virtual Trial Room (VTR). Advanced human pose estimation techniques based on deep learning algorithms enable precise virtual try-ons, accurately simulating the fit of clothing items on users' bodies. Additionally, techniques such as edge detection on surfaces and feature detection on 3D face surfaces contribute to a more realistic virtual representation, enhancing the overall visual fidelity of the virtual trial experience. The systematic representation and application of a 3D computer-aided garment construction method further ensure accurate virtual fittings, providing users with a highly realistic and immersive shopping experience. Recent advancements such as Neutrosophic Cognitive Maps (NCM) for feature selection further enhance the system's intelligence, improving its ability to adapt to user preferences and requirements..

3.4 Addressing Challenges and Enhancing User Satisfaction

In addressing challenges inherent in online shopping, the Virtual Trial Room (VTR) aims to minimize potential dissatisfaction among users. Through accurate virtual representations of clothing items, including color, size, and appearance, the system mitigates discrepancies that often lead to user dissatisfaction. By providing an advanced VTR with enhanced features and capabilities, users' expectations are met, if not exceeded, resulting in a more satisfying shopping experience. Moreover, the emphasis on user feedback and iterative improvements ensures continuous enhancement of the virtual trial room experience, further enhancing user satisfaction and loyalty.

IV. RESULTS AND DISCUSSION

Take a journey through our intuitive user interface, designed to streamline your virtual shopping experience. With just a few clicks, you can explore a wide array of clothing options, from trendy tops to elegant dresses and everything in between. But it doesn't stop there - we've gone the extra mile to ensure that your virtual try-on experience is as personalized as possible. Choose from a diverse selection of avatars, each meticulously crafted to mirror a range of body types and characteristics. Whether you're petite or plus-sized, our avatars are here to help you visualize how your chosen garments will look on your unique physique.

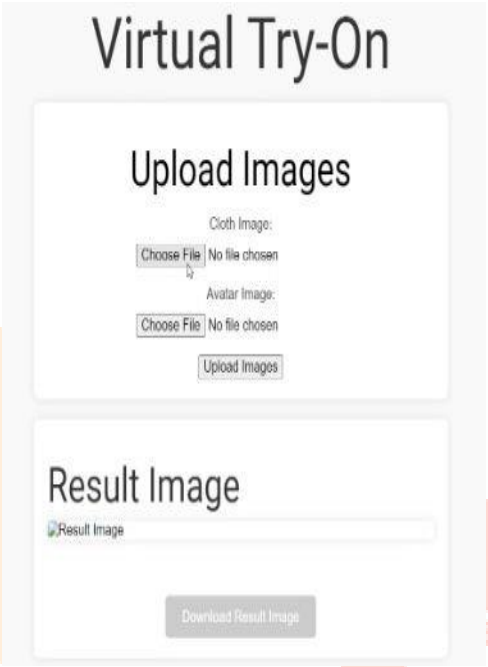

Fig 2 : User Interface for VR trial room

Please find attached the user interface of our website, where you can conveniently select the clothes you wish to try on. Upon selection, you have the option to choose an avatar that closely matches your body characteristics. Once chosen, the results will be generated within minutes, allowing you to visualize how the selected garments will appear on your chosen avatar. Please ensure to navigate through the interface and verify that all features function smoothly and accurately. If you encounter any issues or have suggestions for improvement, kindly provide feedback for further refinement of the user experience. Thank you for your cooperation in testing our platform. Explore our website's user interface to effortlessly browse and select your desired clothing items for virtual try-on. Tailor your experience by choosing an avatar that best represents your body characteristics. Within minutes, witness the results as your chosen garments are seamlessly superimposed onto your selected avatar, providing you with a realistic preview of your potential outfit. Your feedback on the interface functionality is invaluable in ensuring a smooth and satisfactory user experience.

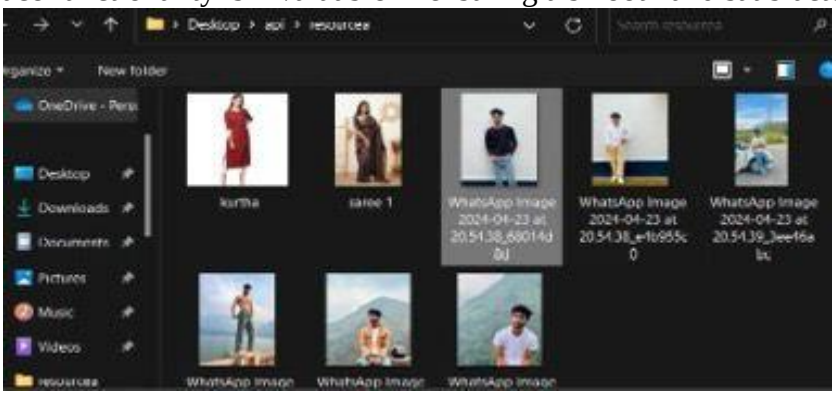

Fig 2.1 : Choosing the cloth

As technology advances, we're committed to pushing the boundaries of what's possible in the realm of virtual shopping. In the future, envision being able to print small fabric samples to physically feel the material, adding a tactile dimension to the virtual experience. Implemented successfully with Python and OpenCV, our virtual trial room utilizes smart garment technology to offer a superior alternative to traditional shopping. By tracking human posture movement, the system adjusts the outfit accordingly, displaying a superimposed image on the screen without requiring users to align themselves, thus enhancing the overall user experience.

Fig 2.2 : Selecting the Avatar

This application facilitates users in dynamically wearing and assessing garments based on color, style, and fit, reducing decision-making time and enabling clear choices. But it's not just consumers who benefit - retailers stand to gain as well. By leveraging emerging technology, retailers can enhance their market presence by selling apparel online through this innovative platform. Importantly, the application is designed to be user-friendly, catering to both technical and non-technical users alike.

Fig 2.3: The Result

In essence, our virtual trial room serves as a transformative solution, bridging the gap between online shopping and the physical try-on experience, thereby revolutionizing the way consumers interact with fashion in the digital realm. Join us on this exciting journey and experience the future of fashion firsthand.

III. CONCLUSION

In the domain of e-commerce, choosing clothing and accessories online often poses challenges due to discrepancies in color, size, and appearance upon delivery, resulting in dissatisfaction and returns. To tackle this issue, the project proposes a virtual trial room service, aiming to revolutionize online shopping. This platform enables users to virtually try on garments, assisting in size and appearance decisions prior to purchase. Additionally, it incorporates a social aspect, allowing users to share their experiences on social media, fostering collaboration and interaction during the shopping process.

Implemented with Python and OpenCV, the virtual trial room utilizes smart garment technology to adjust outfits based on human posture movement, enhancing user experience without necessitating alignment. This facilitates dynamic evaluation of garments, reducing decision-making time. Furthermore, it benefits both consumers and retailers by providing a convenient online shopping experience and a profitable sales platform

respectively. A user-friendly design ensures accessibility for all users, bridging the divide between online shopping and physical try-ons, thereby transforming the digital fashion landscape..

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