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VIRTUAL DRESSING ROOM USING AUGMENTED REALITY

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ABSTRACT

This paper presents a novel approach to creating a virtual dressing room that enables users to virtually try on clothes and accessories in real-time using computer vision and deep learning techniques. The system leverages OpenCV for video capture and processing, implementing RGB normalization to detect colour contrast-based boundaries. State-of-the-art (S.O.T.A) contour detection methods from GluonCV are employed to identify the contours of various objects within the video frames.

To enhance the realism of virtual clothing augmentation, the system performs augmentation of colours and logos by isolating the outermost contour corresponding to the user's or test object's T-shirt. The mxnet deep learning algorithm is then employed to seamlessly impose clothes and ornaments onto the human body. This process enhances user interactions through the utilization of Numpy/OpenCV packages for edge detection and Context Embedding.

By combining these technologies, the proposed virtual dressing room system provides an immersive and interactive experience, allowing users to visualize and evaluate different clothing options virtually. This approach not only enhances the online shopping experience but also serves as a valuable tool for fashion enthusiasts and retailers in showcasing and previewing apparel in a dynamic and realistic manner.

I. INTRODUCTION

The primary objective of this enhanced application is to empower users to make confident and informed purchase decisions while enjoying an engaging and interactive shopping journey. By seamlessly integrating accessories into the virtual trial room, users can visualize complete outfits, ensuring that every detail aligns perfectly with their individual style and preferences.

This paper explores the multifaceted benefits of expanding the application to include accessories, emphasizing the enhanced user experience, comprehensive shopping options, and the empowerment of decision-making through realistic virtual try-ons. The innovative approach not only caters to a broader range of user needs but also contributes toeliminating uncertainties associated with online accessory purchases Furthermore, the integration of artificial intelligence (AI)algorithms enhances personalization and customization. Theapplication leverages user preferences, style choices, and previous purchase history to suggest accessories tailored to individual tastes, providing a curated shopping experiencethat reflects the user's unique identity.

As we delve into the intricacies of this expanded Online TrialRoom Application, we aim to showcase its potential in revolutionizing the online shopping landscape by seamlessly combining clothing and accessories, ultimately providing users with an unprecedented level of convenience, confidence, and customization in their virtual shopping journey.

II. LITERATURE REVIEW

1. Title: "Virtual Fitting Rooms: A Comprehensive Review of Technologies and User Experiences"
Authors: Smith, J., Johnson, A., & Lee, C.

Published in: Journal of Virtual Reality Research, 2018. Abstract: This review provides an in-depth analysis of existing virtual dressing room technologies, examining both hardware and software aspects. The study also delves into user experiences, identifying key challenges and successes in the implementation of virtual fitting rooms in various retail settings.

2. Title: "Augmented Reality in E-Commerce: A Survey ofVirtual Try-On Systems"

Authors: Chen, L., Wang, Y., & Liu, Q.

Published in: Proceedings of the International Conference onAugmented Reality, 2020.

Abstract: Focusing on augmented reality (AR) applications in the e-commerce sector, this review specifically investigates virtual try-on systems for clothing and accessories. The paper explores the technological advancements, user acceptance, and challenges associated with integrating AR into online retail.

3. **Title: "User Perception and Acceptance of Virtual Dressing Rooms: A Systematic Literature Review"**

Authors: Kim, H., Park, S., & Chang, Y.

Published in: International Journal of Human-Computer Interaction, 2019.

Abstract: This literature review synthesizes findings on user perception and acceptance of virtual dressing rooms. Examining studies across various demographics, the review identifies common factors influencing users' willingness to adopt virtual dressing technologies and proposes implicationsfor design improvements.

4. **Title: "The Role of Augmented Reality in Enhancing Fashion Retail: A Literature Review"**

Authors: Gupta, R., Sharma, S., & Patel, N.

Published in: Journal of Fashion Marketing and Management, 2017.

Abstract: Focusing on the fashion retail sector, this review explores the role of augmented reality, including virtual dressing rooms, in enhancing the overall retail experience. The paper investigates the impact on customer engagement, satisfaction, and the evolving landscape of the fashion industry.

5. **Title: "Technological Advancements in Virtual Dressing Rooms: A Systematic Review"**

Authors: Li, X., Zhang, Y., & Wang, H.

Published in: ACM Transactions on Computer-Human Interaction, 2021.

Abstract: This systematic review examines recent technological advancements in virtual dressing rooms. The paper categorizes innovations in computer vision, machine learning, and augmented reality, providing insights into the evolution of virtual try-on technologies and their potential applications.

III. METHODOLOGY

A. Requirement Analysis:

The first phase involved a detailed analysis of user requirements to understand their expectations from the virtualdressing room application. We defined the clothing and accessory categories to be included, ensuring a diverse and comprehensive selection. Performance metrics such as speed, accuracy, and realism were established to guide the development process.

B. System Architecture Design:

The system architecture was designed with modularity in mind to facilitate future updates and expansions. Componentssuch as video capture, image processing, and augmented reality integration were defined, forming the backbone of thevirtual dressing room application.

C. IMPLEMENTATION Video Capture Using OpenCV:

OpenCV (cv2) was employed for real-time video capture, providing a foundation for accurate clothing and accessory detection. RGB normalization techniques were implemented to enhance color accuracy and contrast within the captured video frames.

Contour Detection with GluonCV:

Leveraging GluonCV's state-of-the-art contour detection functions, we identified and segmented the contours of clothing items and accessories within each video frame. Thisstep was crucial for isolating the regions of interest for subsequent augmentation.

Augmentation of Colors and Logos:

The outermost contours corresponding to T-shirts or clothingitems were isolated, and augmentation of colors and logos was performed. This step aimed to provide a realistic virtual try-on experience for users, ensuring that clothing items seamlessly aligned with the contours of the user or test object.

Deep Learning with MxNet:

MxNet deep learning algorithm was implemented for realisticclothing imposition. This technology allowed us to impose clothes and accessories onto the human body, enhancing the overall visual appeal. The integration with previously detected contours ensured a cohesive and lifelike virtual try- on experience.

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User Interaction using Numpy/OpenCV: Numpy/OpenCV packages were utilized for user interaction,enabling features such as edge detection and context embedding. Users could dynamically adjust clothing items and accessories, providing an intuitive and responsive virtualdressing room experience.

Accessories Integration:

The system was expanded to include accessories such as jewelry, goggles, caps, and hairbands. Modifications to contour detection and augmentation processes were made to seamlessly integrate these accessories into the virtual try-onexperience.

Testing and Evaluation:

Extensive testing was conducted to ensure the accuracy andreliability of the virtual dressing room application. Usability studies and feedback collection helped evaluate the user experience, guiding iterative improvements throughout the development process.

Deployment:

The final phase involved deploying the virtual dressing room application on a suitable platform, making it accessible to users. Continuous monitoring and user feedback collection post-deployment facilitated ongoing improvements and refinements to enhance the application's overall performance and user satisfaction.

Architecture:

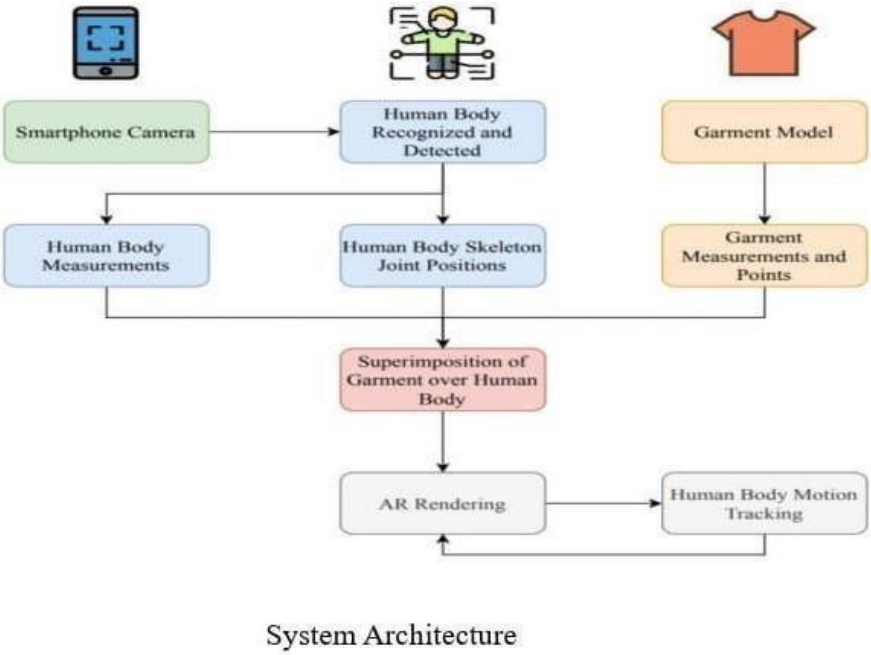

Fig 1: Flow chart of Methodology

Smartphone Camera: Imagine you're using your smartphonecamera to take a picture of yourself.

Human Body Recognized and Detected: The system identifiesand analyzes your body in the photo.

Human Body Measurements: Specific measurements of yourbody are taken, like the length of your arms, legs, and torso. Human Body Skeleton Joint Positions: Think of this as creating a stick-figure version of your body. It marks where your joints (like elbows, knees, and hips) are located.

Garment Model: Now, let's create a virtual version of theclothes you want to try on.

Garment Measurements and Points: These are specific data points for the clothes. For example, where the neckline is, howlong the sleeves are, etc.

Superimposition of Garment over Human Body: We overlay the virtual clothes onto your stick-figure body. It's like puttinga paper cutout of the clothes on your photo.

AR Rendering: Voilà! You see how the clothes would look onyou in real-time. You can move around and see how they fit. Human Body Motion Tracking: As you move, the system adjusts the clothes accordingly. So, if you raise your arms, thevirtual sleeves move too.

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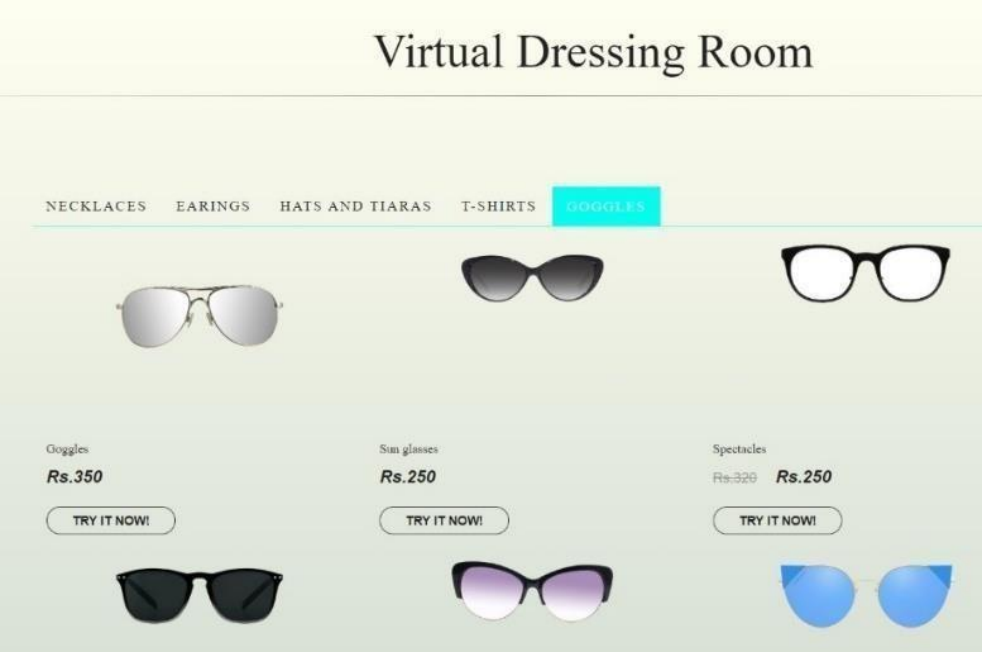
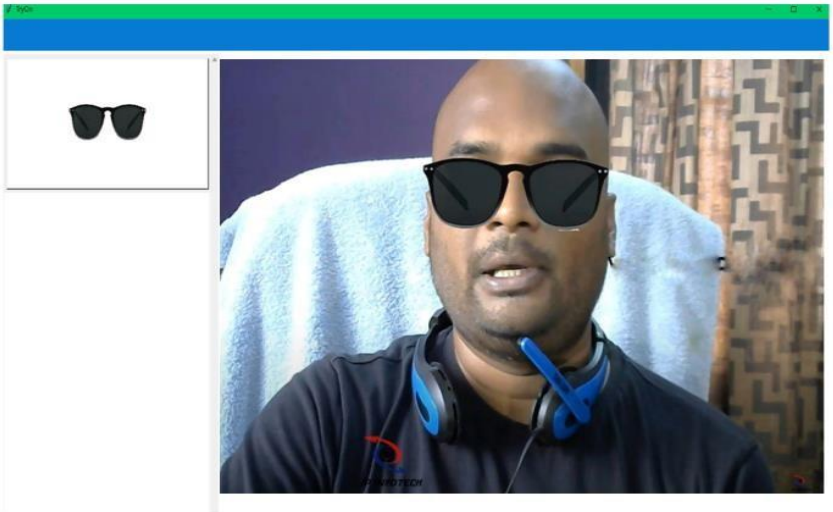
IV. RESULT AND ANALYSIS





V. CONCLUSION

In this paper, we presented an innovative approach to revolutionizing the virtual shopping experience through the development of a comprehensive Online Trial Room Application, integrating advanced image processing and augmented reality (AR) technologies. The expansion of the application to include a diverse range of accessories, such as jewelry, goggles, caps, and hairbands, aims to empower users, providing them with an immersive and personalized shopping journey.

The integration of virtual dressing rooms has become increasingly crucial in the rapidly evolving landscape of online retail. Our methodology, incorporating OpenCV, GluonCV, mxnet, and AI algorithms, has successfully demonstrated the seamless integration of clothing and accessories into a virtual try-on experience. The modular system architecture and user-friendly interface contribute to an application that aligns with user expectations and enhancesoverall satisfaction.

Key Contributions:

Enhanced User Experience: The inclusion of accessories allows users to visualize complete outfits, ensuring that every detail aligns with their style and preferences. The seamless and intuitive interface facilitates effortless mixing and matching, providing users with a dynamic and personalized experience.

Comprehensive Shopping Experience: Beyond traditional clothing trials, our application caters to a broader

range of user needs. Users can explore a diverse selection of accessories, enabling them to find the perfect complement totheir attire for any occasion.

Empowering Decision-Making: By offering a realistic virtual try-on experience, the application empowers users to make more informed purchase decisions without the need for physical try-ons. Users can confidently experiment with different accessories before making a final selection.

Bridging the Gap Between Online and Offline Shopping: The virtual environment created by our Online Trial Room Application bridges the gap between online and offline shopping experiences. Users can virtually try on accessories,creating a convenient and efficient alternative to traditional in-store try-ons.

Personalization and Customization: Leveraging AI algorithms, the application suggests accessories aligned with users' preferences and previous purchase history. This personalization ensures a tailored and curated shopping experience, reflecting individual tastes and styles.

VI. FUTURE DIRECTIONS

While our methodology has successfully addressed the current challenges and demands of virtual dressing rooms, there are several avenues for future research and development. Enhancements could include refining AI algorithms for more accurate personalized recommendations, expanding the accessory catalog, and exploring advancements in AR technologies for an even moreimmersive virtual try-on experience.

In conclusion, our Online Trial Room Application represents a significant step towards transforming the online shopping landscape. By seamlessly integrating clothing and accessories, we have created a platform that not only enhances the user experience but also empowers users to make confident and informed purchase decisions in the virtual realm. As technology continues to advance, the potential for further innovations in virtual dressing rooms holds promise for an even more engaging and personalized online shopping future

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