My First Research Paper

**Title**:

Next- Gen Smart Mirrors: Exploring the fusion of AR and Internet Connectivity in Retail

Next- Gen Smart Mirrors: Revolutionizing Online Shopping Through AR and Internet Connectivity

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**Abstract**:

This research paper introduces a transformative approach to revolutionize the online shopping experience through the integration of Next-Generation Smart Mirrors. These cutting-edge mirrors seamlessly blend Augmented Reality (AR) and internet connectivity, featuring an advanced chatbot with natural language processing capabilities. The chatbot engages users in interactive conversations during virtual try-ons, recognizing personal preferences and offering tailored fashion recommendations through sophisticated data analytics. The primary objective is to address limitations in at-home online shopping by virtualizing the try-on process and incorporating post-purchase support elements such as size recommendations and real-time price comparisons.

**Keywords**:

1. Smart Mirrors
2. Augmented Reality (AR)
3. Internet Connectivity
4. Online Shopping
5. Fashion Exploration
6. Natural Language Processing
7. Virtual Try-On
8. Post-Purchase Support
9. Size Recommendations
10. Price Comparisons
11. Targeted Promotions
12. User Preferences
13. Advertising Strategies

**Introduction**:

The retail sector is always changing, and there has been a noticeable move towards online buying. Although this shift is convenient, it also highlights enduring issues, especially in the area of internet shopping from home. Customers frequently struggle to sort through the numerous of alternatives available to them and have a hard time of choosing appropriate clothing without the advantage of a real try-on experience and the best prices. These difficulties lead to a significant void in the entire experience of internet buying. The buying process is made less fun when customers must navigate a large range of options without having the opportunity to try them on in person. As a result, customers avoid shopping because they fear making a mistake and avoid trying things out, which results in a decline in customers that requires attention.

In response to this overarching problem, this research proposes an innovative solution— the integration of a chatbot with augmented reality smart mirrors designed specifically for online shopping. This intelligent chatbot serves as a virtual shopping assistant, addressing product inquiries, conducting price comparisons, and offering tailored recommendations. By seamlessly combining the capabilities of a chatbot with augmented reality, this proposed solution aims to redefine the online shopping experience, providing customers with the guidance and confidence they need to make informed and satisfying purchase decisions. The subsequent sections of this paper will explore the technical intricacies and transformative potential of this integration, offering a glimpse into the future of online retail where technology bridges the gap between choice overload and consumer confidence.

Literature

Several solutions exist to address challenges in at-home online shopping, each with its advantages and limitations. Some alternatives include **A virtual try-on system based on deep learning,** that emphasis is on achieving visually appealing virtual try-ons with high accuracy. This approach not only enhances the visual effects of try-ons but also employs sophisticated techniques, such as predicting semantic layouts and altering reference images for detailed clothing representation.

**The Future of Smart Dressing Mirror - an open innovation concept video**

Developed by the Lab of Intelligent Computing at Beijing Institute of Technology, this mirror digitizes clothing, employs machine learning, and utilizes computer vision technologies. It offers interactive features, recommends fashionable clothing combinations, and even facilitates e-shopping directly through the mirror interface, providing a futuristic solution to the daily dilemma of choosing the right outfit.

**Markerless Augmented Reality based application for E-Commerce to Visualize 3D Content.**

These innovations not only aim to enhance the virtual try-on experience but also address common challenges in online shopping, such as decision-making difficulties and the need for personalized, interactive solutions. The synthesis of these studies lays the groundwork for understanding the potential impact of Next-Generation Smart Mirrors on the online shopping landscape.

**Markerless Augmented Reality based application for E-Commerce to Visualise 3D Content**

Addressing the limitations of traditional 2D image views in online shopping, augmented reality emerges as a transformative solution. By combining the real world with the virtual, AR in e-commerce allows customers to visualize products in their physical space before making a purchase.

**Into 3D-Reconstructed Apparel over Virtual Try-On with Virtual Reality**

This approach aims to streamline decision-making by allowing users to try out garments virtually, both off-the-shelf and custom, without hindrance.

The mentioned research papers contribute valuable insights to the field of augmented reality (AR) in e-commerce, they are considered insufficient because of few factors like Limited Focus on Post-Purchase Support, Inadequate Real-Time Price Comparisons.

Enhancing the creative idea of the Smart Dressing Mirror, Next-Generation Smart Mirror this paper introduces several key enhancements that significantly elevate the user experience, providing a superior and more comprehensive solution to the common challenge of deciding what to wear.

Central to the mirror's capabilities is its advanced chatbot, equipped with natural language processing (NLP) to address user inquiries comprehensively. The chatbot not only provides assistance during the virtual try-on process but also serves as a knowledgeable companion throughout the user's journey. Users can ask questions about product details, materials, and care instructions, receiving instant and accurate responses including size recommendations, information regarding shipping fostering confidence in their purchasing decisions. It can also suggest complementary items or alternatives based on the user’s feedback.

The present collection of research is unable to offer dynamic and real-time price comparison services, potentially limiting users' ability to make informed decisions based on the most current information.

One notable enhancement this paper provides over existing smart mirrors is the integration of real-time price comparison capabilities with the help of chatbot. The mirror scans various e-commerce platforms to provide users with a comprehensive overview of the prices for a chosen product. This feature empowers consumers to make informed decisions, ensuring they secure the best possible deal without the hassle of manually searching multiple websites.

Proposed Methodology

Hardware

Smart Mirror Specifications: - The Smart Mirror combines a sophisticated 32-inch LCD display with an interactive touch surface. Its dimensions, at 40 inches by 24 inches, provide an optimal balance between usability and aesthetics.

b. Input Devices: - The mirror employs an array of touch sensors, enabling users to interact intuitively with the interface. These sensors facilitate gesture-free navigation, ensuring a seamless and inclusive user experience.

c. Camera System: - Equipped with a high-resolution camera system featuring 1080p resolution and a wide-angle lens, the smart mirror enhances virtual try-on experiences and augments the functionality of the integrated chatbot for personalized interactions.

d. Display Technology: - The smart mirror utilizes an LED-backlit LCD display with a resolution of 1920 x 1080 pixels, providing crisp and clear visuals. The display technology ensures accurate representation of clothing items for virtual try-ons.

e. Processing Unit: - Powered by a robust quad-core processor operating at 2.5 GHz, the mirror's processing unit handles real-time image processing, machine learning tasks, and supports the integration of advanced functionalities such as real-time price comparison and post-purchase support.

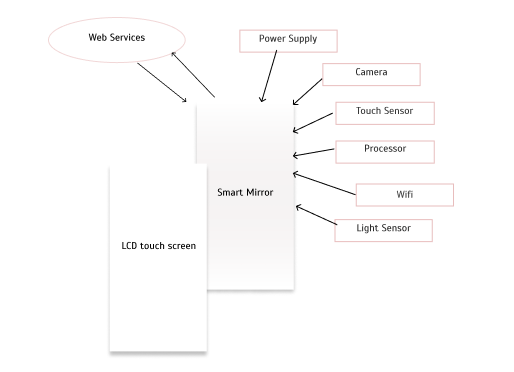
f. Connectivity: - With Wi-Fi 6 connectivity, the smart mirror establishes a seamless connection to e-commerce platforms for real-time price comparison. Bluetooth 5.0 support enables connectivity with external devices, enhancing the mirror's versatility.

g. Power Supply: - The mirror operates on standard electrical power, ensuring continuous functionality. Energy-efficient design principles are implemented to minimize power consumption.

h. Sensor Integration: - In addition to touch sensors, the smart mirror integrates ambient light sensors for automatic brightness adjustment. These sensors contribute to a comfortable and adaptive user experience.

j. Scalability and Upgradeability: - The hardware design is modular, allowing for scalability and future upgrades. Users can easily integrate additional sensors or upgrade processing units to accommodate emerging technologies.

*Architecture*



System Design and Process Flow

Start:

User approaches the Smart Mirror.

User Engagement:

Motion sensors detect user presence.

Interface Interaction:

Users interact with the mirror using touch gestures or voice commands.

Virtual Try-On:

Users choose the "Virtual Try-On" option.

Camera captures real-time images for virtual try-ons.

Chatbot Interaction:

Chatbot engages in real-time.

Users ask questions, receive style recommendations.

Real-Time Price Comparison:

Users select an outfit.

Mirror scans e-commerce platforms for real-time price comparison.

E-Shopping Integration:

Users can transition to e-shopping directly through the mirror.

Browse, select, and purchase items.

Size Recommendations and Post-Purchase Support:

Mirror provides size recommendations based on historical data.

Offers post-purchase support for personalized assistance.

Checkout and Payment:

Secure checkout process initiated.

Users review selections, input payment details, and place orders.

Delivery Information:

Mirror displays order history.

Users track the status of deliveries.

Feedback:

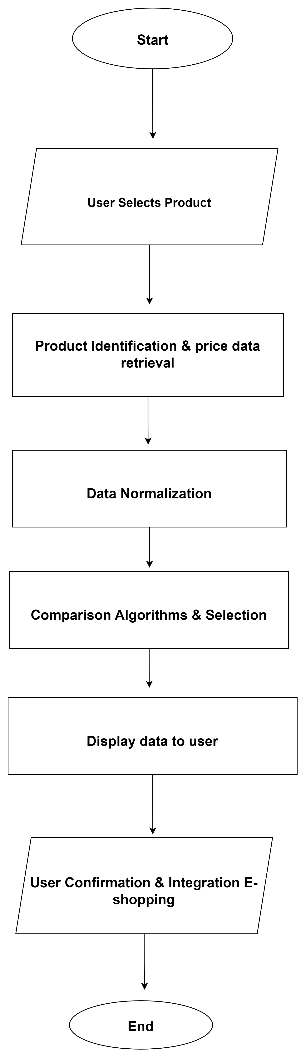
Users provide feedback on their shopping experience.

End:

Shopping process concludes.

## CONCLUSION

REAL-TIME PRICE COMPARISON MODULE



Explanation of the blocks:

In the user interaction phase, individuals engage with the smart mirror either by virtually trying on clothing items or exploring the available apparel. The Chatbot and User Interface Module play a pivotal role in managing these interactions, acting as the intermediary with the Real-Time Price Comparison Module. At the core of the system, the Real-Time Price Comparison Module is responsible for dynamically comparing prices in real time. The E-Commerce Platforms Integration Module establishes crucial connections with various e-commerce platforms to retrieve the most current data. Subsequently, the Product Identification and Price Data Retrieval process identifies specific products and gathers real-time pricing information from the connected platforms. To maintain consistency, the Data Normalization step standardizes pricing data formats. The Comparison Algorithm & Selection component then analyzes normalized data, ultimately selecting the e-commerce platform offering the most favorable price. The Display Results to User module presents these price comparison outcomes through the smart mirror interface, prompting User Confirmation & Integration with E-Shopping for a seamless and user-friendly purchasing experience.

Conclusion

In conclusion, the Next-Generation Smart Mirror revolutionizes online shopping by combining augmented reality, real-time connectivity, and intelligent features. With virtual try-ons, and real-time price comparison, it addresses common challenges. The mirror's commitment to post-purchase support and a sophisticated chatbot ensures a personalized and secure shopping experience. As a bridge between the virtual and physical, this innovation redefines the future of retail, offering users a personalized, inclusive, and efficient way to explore and purchase fashion online.

Smart Mirror  
LCD touch screen

LITERATURE

Abstract 1

<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=10213129>

**A virtual try-on system based on deep learning**

Abstract—This study introduces a deep learning-driven virtual fitting system that allows users to virtually experiment with garments, resulting in visually appealing effects. Firstly, We utilize cutting-edge style transfer algorithms to apply the user's input image style onto the virtual scene. Then, we employ a generative adversarial network (GAN) on the modified image to generate content while maintaining image details. Specifically, The initial step in achieving a realistic try-on and detailed clothing representation involves predicting the semantic layout of the reference image to be altered after the try-on process, followed by determining its image contents based on the predicted semantic layout.The network model obtained by training on the clothing dataset can realize the virtual try-on system for people through the network. Finally, the user's try-on operation is completed in the virtual environment, and the final effect picture is generated. The implementation and construction of the overall system is based on Python Web. Experimental results show that the system achieves more accurate and satisfactory recommendations. In conclusion, this system can effectively achieve virtual try-on operations with high visual effects.

Abstract 2

<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7518259>

**The Future of Smart Dressing Mirror - an open innovation concept video**

This a commonly headache issue in our life, that is before dinners, meetings, movies, visits, or even only a walk, we all hesitate or finally annoyed on question ”What am I gonna wear today?” Imaging such a scenario, a fashionable lady is called to meet her boyfriend when she is working in the office. Right after, she is going back home to well prepare for the date. After several try-ons and comparisons, she picks a simple but elegant shirt. She is standing in front of a full-length mirror, and trying clothes one by one for hours. Meanwhile, her boyfriend is urging her to come over. But still, there are no trousers to match it. Finally, both of them may get a bad mood or even worth, they quarrel with each other for not coming on time. This is a common problem for almost everyone, especially for lady, that they have serious difficulties to make decision on which clothes to wear, or match their clothes, every time, every day. But now, a gospel, named the Smart Dressing Mirror, designed by the Lab of Intelligent Computing at Beijing Institute of Technology, China, appears for you, with some of fantastic functionalities that you need. This is also what we introduced today, a future idea of your life in the new era of smart. Generally, this Smart Dressing Mirror is nearly the same as the traditional full-length mirror in every home in appearance, and the only difference is that the smart dressing mirror has some smart functions, which can interactive with you or be friend with you. Given that all your clothes are digitalized firstly after you bought it, and the digitalized image can be captured from the homepage of the clothes shop or pictured and normalized by the camera hidden in the top of the smart mirror. After that, with simple gestures, you can interactive with the smart mirror, and picking those digitalized clothes as you wish. You can see whether it fits or not. Furthermore, with its equipped machine learning and computer vision technologies, the Smart Mirror will recommend you a bunch of fashionable and suitable upper/lower clothes for you. For example: 1) when you choose an upper/lower clothes, the system will recommend you a bunch of matched lower/upper ones; 2) when you tell the mirror which scenario you will go for, it will also suggest you a series of clothes. At the same time, clothes from e-Shopping stores will also be recommended. You can buy it immediately, and it will be delivered to you as soon as possible. This is what we offer, a fantastic smart dressing mirror, to replace the traditional mirror in every home, in the near future.

Abstract 3

**Markerless Augmented Reality based application for E-Commerce to Visualise 3D Content**

<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9545009>

Augmented reality has three principal features: combining the real world environment with the virtual world, real-time interaction for users, and accurate representation of 3D objects. Augmented Reality in E-commerce allows customers to view products or experience services in their physical space before purchasing the required items. Current online shopping services only allow customers to see 2D images of the products they are buying. This type of experience is not personalized and sometimes leads to bad shopping choices choices; the customers find it difficult to shop only with a static image view available. Customers cannot accurately predict whether the product they purchase will fit their home environment. This results in a lot of people returning or exchanging the things their purchases. AR resolves these issues. Thus, a method has been proposed for adding a virtual object in the real world by just using a real-time camera. The main aim of this paper is to provide user visualization of high resolution E-commerce products in a real environment.

Abstract 4

**Into 3D-Reconstructed Apparel over Virtual Try-On with Virtual Reality**

<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=10226992>

Virtualization technologies are still growing bigger and faster. Despite the greatness of its advancement, the costume industry is still very accessible when it comes to real trials. Off-the-shelf stuff are inadequate details for the desired individual to assess its in-depth utility for each garment trying on for a second, including custom stuff are much harder to try out right away. To this end, 2D image-based 3D reconstruction inclusive of touchable-virtualized space is accessible easier to stuff details for mans' decision making in purchasing. We establish the overall end-to-end pipeline from reconstruction until visualization for one instance to be triable on its stuff for a moment. As an expectation, our proposed approach can bring objects into the experimental area and use them immediately without any obstacle