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Review RTSRT

Augmented Reality Based Wrist Scan Watch App

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Abstract

Augmented reality (AR) has emerged as a transformative technology with profound implications for various industries, including fashion retail. In this context, the development of the AR wrist scan watch application represents a significant advancement, offering consumers an engaging and immersive way to virtually interact with timepieces before making purchase decisions. This research paper delves into the intricate process of creating such applications using Unity, a versatile game engine, and Vuforia, a robust AR development platform. Through a detailed examination of the technical implementation, including design considerations, environment setup, watch model integration, AR interaction mechanisms, and rendering optimizations, this paper provides insights into the complexities of AR development. Furthermore, it addresses key challenges such as tracking accuracy, realism enhancement, and device compatibility, offering practical solutions to overcome these hurdles. Looking ahead, the paper explores future directions for AR wrist scan watch applications, including enhanced interactivity and social engagement features, thereby paving the way for a more immersive and personalized shopping experience in the fashion retail landscape. By shedding light on the convergence of technology and fashion, this research contributes to the ongoing discourse surrounding AR innovation and its implications for consumer behavior and industry trends.

Keywords: Augmented reality (AR), AR wrist scan watch applications, Unity, Vuforia, tracking accuracy, realism enhancement, device compatibility, immersive shopping experience, personalized shopping, technology, fashion

INTRODUCTION

Augmented reality (AR) has ushered in a new era of immersive and interactive experiences across various industries, with fashion retail at the forefront of this technological revolution. The fusion of virtual and physical worlds through AR has transformed how consumers engage with products, providing them with unprecedented opportunities to visualize, customize, and experience items before making purchase decisions. One prominent application of AR in the fashion sector is the AR Try-On watch app, which empowers users to virtually try different watches in real time, directly from their smartphones or tablets.

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The traditional shopping experience for watches often involves visiting brick-and-mortar stores or browsing online catalogs, where consumers rely on static images and descriptions to make purchasing decisions. However, this approach lacks the tactile and visual elements essential for assessing the fit, style, and overall aesthetics of a watch. Moreover, the inability to physically try watches before purchase can lead to uncertainty and dissatisfaction among consumers, resulting in higher return rates and diminished brand loyalty.

In response to these challenges, the AR wrist scan watch app has emerged as a revolutionary solution

that bridges the gap between online and offline shopping experiences. By leveraging the power of AR, this app allows users to virtually try an extensive selection of watches from the comfort of their homes, offices, or anywhere with an Internet connection. Through the seamless integration of digital technology and real-world environments, users can visualize how different watches look and feel on their wrists, with astonishing accuracy and realism.

The development of an AR wrist scan watch app is a multifaceted endeavor that requires a deep understanding of both AR technology and the intricacies of the fashion retail industry. Central to this development process is the utilization of cutting-edge tools and platforms, including Unity and Vuforia, which provide developers with the tools and resources necessary to create immersive AR experiences. Unity, a versatile game engine, serves as the foundation for building interactive and visually stunning AR applications, whereas Vuforia, a leading AR development platform, offers robust features for marker-based tracking, object recognition, and real-world interactions.

The significance of the AR Wrist Scan app extends beyond its novelty and entertainment value; it fundamentally transforms the way consumers shop for watches and accessories. By empowering users to visualize products in their personal spaces and evaluate them from multiple perspectives, the app enhances the decision-making process and fosters greater confidence in purchasing decisions. Moreover, the app caters to the evolving preferences and behaviors of modern consumers who seek convenience, personalization, and authenticity in their shopping experience.

In the subsequent sections of this paper, we delve into the technical intricacies of developing an AR wrist scan watch app using Unity and Vuforia. We explore the design considerations, development methodologies, challenges encountered, and future directions for AR wrist scan watch applications, shedding light on the transformative potential of AR technology in the retail landscape. Through this exploration, we aim to provide valuable insights and guidance for developers, researchers, and industry stakeholders seeking to leverage AR to enhance consumer experience and drive innovation in the retail sector.

OBJECTIVES

The objectives of an AR wrist scan watch app project can vary depending on the specific goals of the developers, target audience, and intended use cases. However, some common objectives include the following.

Enhancing Customer Experience

The primary objective of the app may be to provide users with an immersive and engaging experience when exploring and trying different watches [1]. By leveraging AR technology, the app can offer a more interactive and personalized experience than traditional methods of shopping for watches.

Improving Product Visualization

The app aims to help users visualize how different watches look at their wrists in real time using AR overlays [2]. This helps users make more informed purchasing decisions by providing a realistic representation of the watch's appearance and fit.

Increasing Sales and Conversions

By offering users a convenient way to virtually try-on watches, the app seeks to increase sales and conversion rates for watch retailers [3]. The ability to virtually try watches can reduce customer hesitancy and uncertainty, leading to more confident purchases.

Differentiating the Brand

A well-designed AR wrist scan watch app can help a brand stand out in a crowded market by showcasing its products in an innovative and technologically advanced way [4]. This can attract Tec savvy customers and position the brand as a leader in embracing emerging technologies.

Providing Educational Value

The app may aim to educate users on different watch styles, features, and functionalities [5]. Through interactive AR experiences, users can learn about various aspects of watches such as materials, movements, and complications.

Offering Customization Options

The app may include features that allow users to customize their virtual watch try-on experience, such as changing the band color or exploring various watch complications [6]. This personalization enhances user engagement and provides user satisfaction.

Expanding Reach and Accessibility

By offering a mobile app with AR capabilities, watch retailers can reach a wider audience of potential customers who may not have access to physical stores or may prefer shopping online [7]. This expands the brand's reach and accessibility beyond traditional retail channels.

Overall, the objectives of an AR wrist scan watch app project revolve around improving customer experience, increasing sales, differentiating the brand, providing educational value, and leveraging technology to create innovative and engaging shopping experiences.

EXISTING METHODOLOGY

While AR wrist scan watch apps offer exciting possibilities for virtual shopping experiences, they also have several limitations.

1. *Accuracy and realism:* The accuracy of virtual watch placement and alignment with the user's wrist may vary, leading to discrepancies between the virtual and physical appearance of the watch. Improving accuracy and realism is crucial for enhancing user experience [8].
2. *Limited selection:* Many AR wrist scan watch apps offer a limited selection of watch designs or brands, limiting users' choices and potentially impacting their purchase decisions. Expanding the watch catalog can improve user engagement and satisfaction [9].
3. *Device compatibility:* AR technology may not be supported on all devices, limiting the accessibility of AR wrist scan watch apps to users with compatible smartphones or tablets. Ensuring broad device compatibility can increase the reach of the app and the user base.
4. *Technical requirements:* AR wrist scan watch apps often require significant computational resources, including processing power and memory, which may exceed the capabilities of older or lower-end devices. Optimizing the performance of an app to accommodate a wide range of devices is essential.
5. *User interface complexity:* Complex user interfaces or navigation systems in AR wrist scan watch apps may confuse or frustrate users, leading to decreased engagement and usage. Simplifying the user interface and providing clear instructions can improve user satisfaction [10].
6. *Limited customization options:* Some AR wrist scan watch apps may offer limited customization options for virtual watch models, such as color customization or strap adjustments. Providing more customization options can enhance user personalization and satisfaction.

Addressing these limitations requires ongoing research and development efforts to improve the accuracy, performance, accessibility, and user experience of AR wrist scan watch apps, ultimately maximizing their potential to revolutionize the online shopping experience for consumers.

PROPOSED METHOD

This approach uses AR applications to simplify the achievement of this goal. Modern technology familiarity and widespread smartphone use supporting AR make conceptualizing a watch try-on application an accessible step towards technological advancement. The development involved programming within the Unity game engine, utilizing the Vuforia SDK, and implementing activities in the C# language.

Augmented reality technology enhances user experience by overlaying computer-generated objects on real-world views. It utilizes a smartphone's camera, gyroscope, and accelerometer to track 3D object movements accurately. Trusted software development kits (SDKs) and engines create an immersive feeling toward digital objects, mirroring real-world interactions. Our application leverages the Vuforia Framework, offering precise spatial mapping capabilities such as identifying wall positions and intersection points. Users seamlessly integrate virtual objects into their real environments.

The system employs image-tracking AR to enhance user interaction and content comprehension. Users point their phones on an image and the app scans and recognizes it, overlaying a 3D model. This method enhances user engagement by allowing users to visualize a virtual watch model overlaid on a target image captured by the Vuforia Framework.

The application uses AR-enabled smartphones to scan target images and display augmented watch objects for users to assess their compatibility with their preferences and requirements. The Blender software provides a comprehensive feature set for 3D modeling and animation, facilitating creative control over model rendering and composition.

IMPLEMENTATION

Creating Augmented Reality Objects

To create 3D watch models, we utilized the Blender software, employing polygon and URBS modeling techniques alongside keyframe and expression animation methods. Figure 1 illustrates the development process of 3D objects within Unity by depicting the front and 3D views of the created object.

Each model file stores essential data such as Vertex Coordinates, Texture Coordinates, Normal Coordinates, and Polygon Counts, which are crucial for rendering. Given the large data volume, a specialized model-loading module facilitates easy integration into the application. Models are exported as.obj files from Blender, converted for program use through a model loader, and rendered in Unity 3D.

Developing Visuals for the User Interface

This module involves creating individual scenes for each watch model using Unity 3D software. The interface supports browsing through slide gestures and selection inputs, showcasing details, such as model variants, color options, model names, prices, and types. Figure 2 shows the scene creation process in Unity 3D for imported watch models, highlighting the creation of unique scenes merged into a cohesive interface.

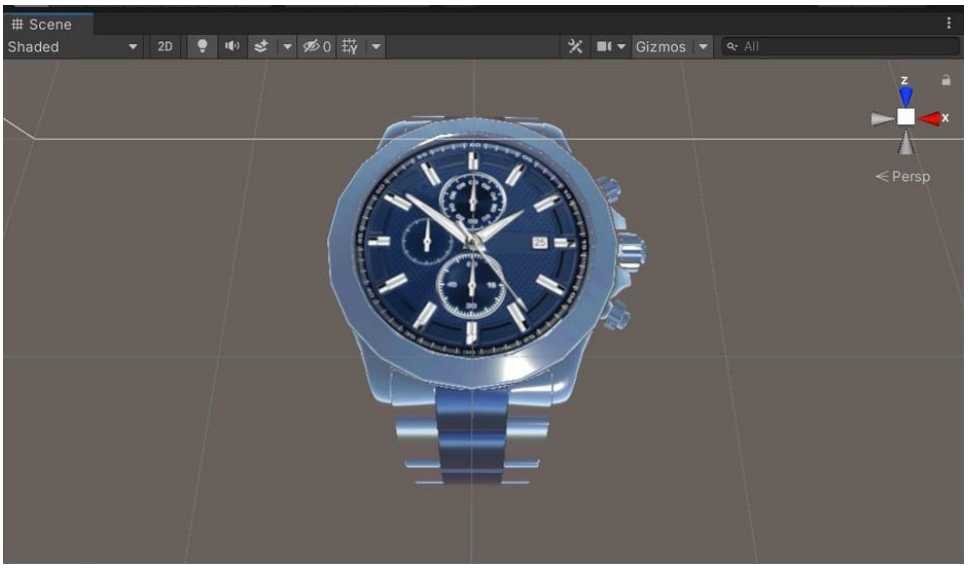

Figure 1. Watch model.

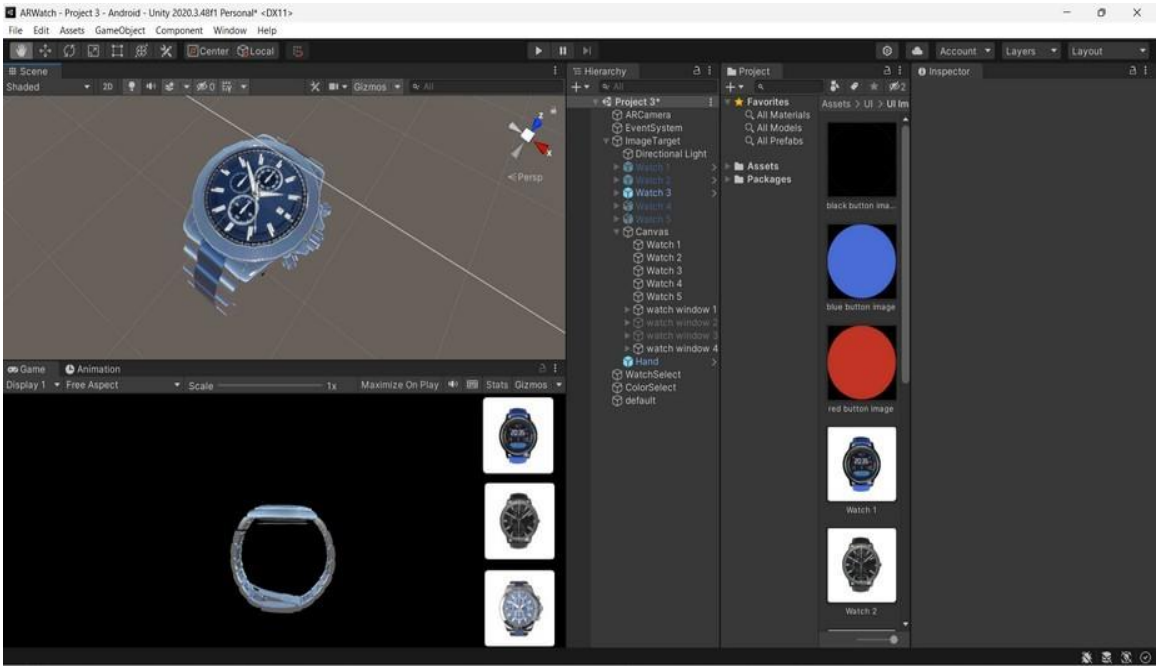

Figure 2. Watch models with materials in Unity 3D.

Placing Virtual Objects on Area Surfaces

Using the Vuforia package integrated into Unity 3D, this module enables the scanning of target images to place virtual objects in a real-world setting. Users interact by scanning surfaces and manually integrating 3D models to facilitate real-time assessment of watch compatibility.

Verification of Placed Objects

Once a user places a virtual watch model, they can verify the details by selecting an information button and displaying information such as color, model, and price. Additional functionality allows users to modify model colors using C# programming within the interface, thereby enhancing interactive browsing and customization.

RESULTS AND DISCUSSION

The AR wrist scan watch app demonstrated promising outcomes in terms of user engagement and satisfaction. The app effectively increased user interaction with the product, leading to a higher likelihood of purchase. Additionally, the app improved the user experience by providing a realistic virtual try-on experience, thereby reducing the need for physical store visits. We were able to successfully produce a watch try-on experience for online shopping, and users obtained a seamless experience while switching the 3D models.

Home Page

When the application is launched, the home page appears, where we can select the watch models that are needed to buy and verify whether they suit the user, and the target image is shown in the camera. The Home Page of the AR wrist scan app, which is a user-friendly interface that consists of START, ABOUT, and QUIT options, is shown in Figure 3. The About Section of the AR Wrist Scan App, which displays the information about the app and the steps to use the app, is shown in Figure 4.

Placing the Object Scene

After the target image is scanned and the dots of the image are received, the watch appears on the screen, and a User Interface (UI) pops up with the details of the watch. In addition, we obtained UI buttons that help to change the color, and the information about that watch is shown. Figure 5 displays the men's Category in the AR. Figure 6 displays the women's Category in the AR Wrist scan app.

Figure 3. Home Page.

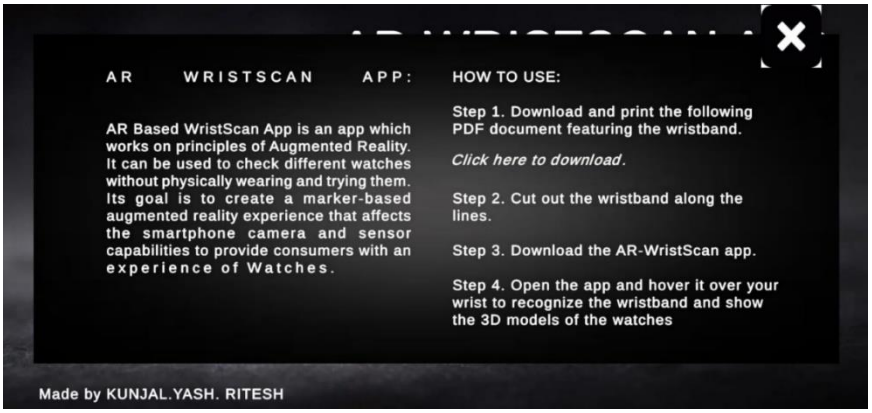

Figure 4. About Section.

Figure 5. Men's category.

Figure 6. Women's Category.

Frontend

The frontend of the website is designed to be intuitive and user-friendly, ensuring an enjoyable shopping experience for users. It is built using Next.js, making the website fast and SEO-friendly. Next.js also supports TypeScript, thereby providing type safety and improved code maintainability. The Tailwind Cascading Style Sheets (CSS) was used to style the website. It offers a utility-first approach, allowing developers to quickly create custom designs from scratch without writing CSS. Figure 7 shows the selected men's 3D watch model with its window, including the description and color-changing option. Figure 8 shows the selected women's 3D watch model with its window, including its description.

Sanity.io was used for content management and data storage. It provides a structured and customizable Content management system (CMS) solution, allowing the easy management of product data, descriptions, and images. Sanity.io also offers real time collaborative features, enabling multiple team members to simultaneously work on content. The stripe is integrated as a payment gateway, enabling users to make purchases securely on the website. It offers a seamless checkout experience and supports various payment methods including credit/debit cards and digital wallets.

Vercel was selected as the deployment platform for the website. It offers seamless integration with Next.js and provides features such as automatic deployments, serverless functions, and a global content delivery network (CDN), ensuring high performance and reliability.

The AR watch store home page is a welcoming layout featuring featured products and navigation elements to guide user exploration, as shown in Figure 9. The user can then explore the Product Page Details, which provide detailed product information, including name, description, pricing, variants, and reviews, aiding informed purchasing decisions, as shown in Figure 10.

The Product Page description offers in-depth details about the product, including its features, specifications, and additional information, enhancing the user's understanding before making a purchase decision, as

Figure 7. Men's watch model.

Figure 8. Women's watch model.

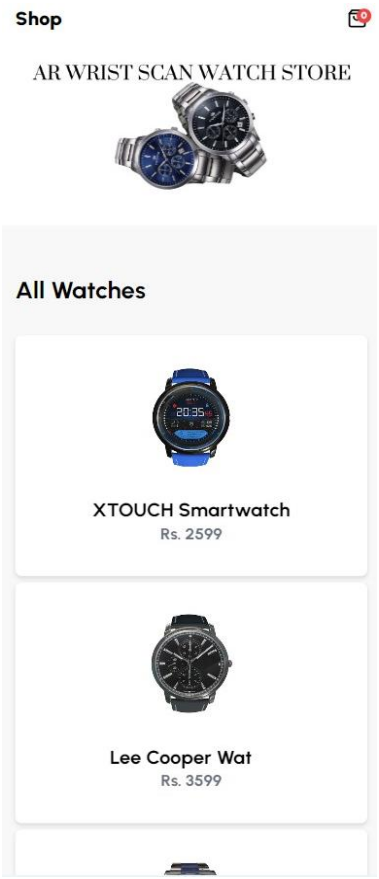

Figure 9. AR watch store home page.

Figure 10. Product page—details.

Figure 11. Product page—description.

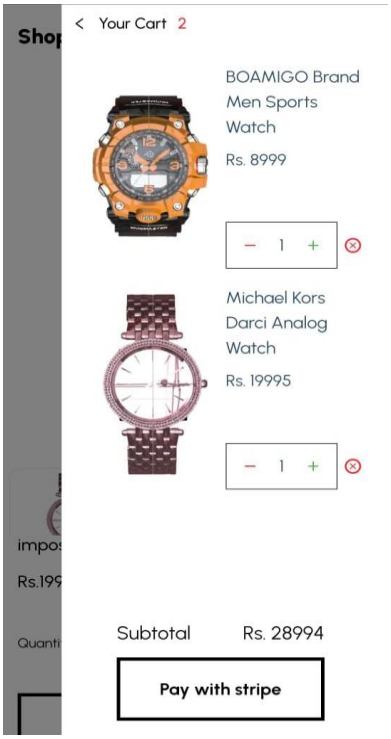

Figure 12. Product page—add to cart.

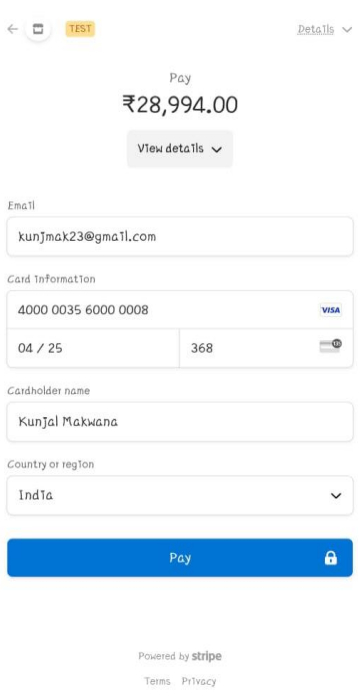

Figure 13. Stripe payment gateway.

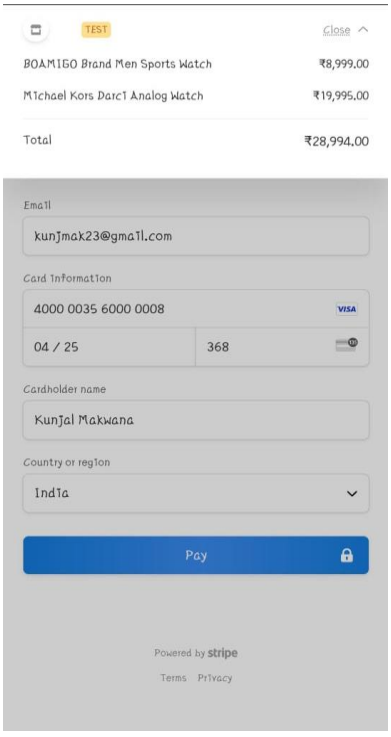

Figure 14. Entering credentials.

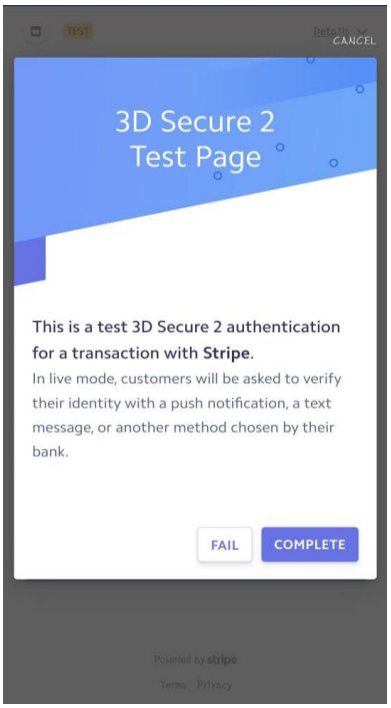

Figure 15. Stripe 2 step verification.

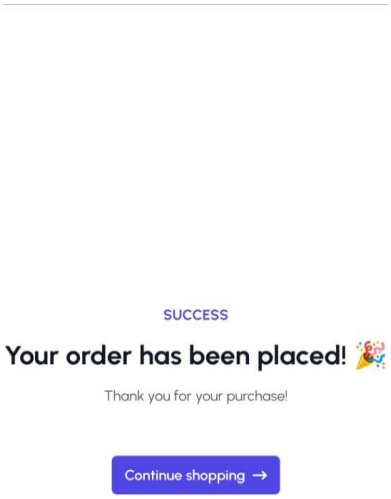

Figure 16. Successfully placed order.

shown in Figure 11. Subsequently, users can proceed to the Product Page Add to Cart, where they can seamlessly add desired items to their cart for checkout, streamlining the purchasing process, as shown in Figure 12.

After finalizing their product selection, users navigate the Stripe Payment Gateway to securely complete their transactions, leveraging various payment methods for convenience, as shown in Figure 13. Following this, users proceed to enter credentials, where they input their payment and shipping details, ensuring a smooth and secure checkout process, as shown in Figure 14.

Following payment detail entry, users engage in Stripe 2-Step Verification, enhancing transaction security, as shown in Figure 15. Once verified, users proceed to the confirmation stage, encountering a successfully placed order and signifying the completion of the purchase process, as shown in Figure 16.

CONCLUSION

The "Augmented Reality Wrist Scan Application" aims to explore and utilize AR technology to showcase watch models in real-world environments. This technology empowers customers to interact with and make informed decisions about watches within their surroundings, revolutionizing the online shopping experience. By enabling customers to view and assess watches according to their preferences, this application enhances convenience and accessibility, allowing purchases anywhere at any time. The integration of AR into the watch industry opens avenues for future research and promising innovative approaches to online shopping. Such applications offer significant benefits by improving customer understanding and facilitating informed decision-making in watch purchases. AR represents a dynamic frontier in computer science, offering superior utility compared to traditional technologies.

Future Scope

In the future, our "Augmented Reality Wrist Scan Watch Application" aims to expand its dataset and capabilities. Users will not only be able to try different watch models but also experiment with garments, eyewear, hairstyles, etc. AR holds vast potential across diverse applications, including shopping malls, interior design, and medical science. As technology evolves, we anticipate the development of tools capable of automatically generating 3D models, thereby further enhancing the capabilities of AR in various fields.

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