Cross Reality Vision on E-commerce

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Abstract
Extended Reality (XR) can be utilized to make more immersive and engaging experiences for online buyers, which should improve purchasing.By strengthening the bond between the consumer and the product, extended reality technologies in e-commerce are a terrific method to draw in a new generation of buyers.The buyer may be given a real-time perspective of the product's appearance in the physical world through the use of the simulated products.By offering a deeper level of involvement with the product and an immersive product demonstration, it enables the client to better comprehend the profit proposition of the commodity.Moreover, XR might be used to create a stronger customer service department, complete with accompanying virtual assistants and salespeople/women that can assist customers with their purchasing needs.In general, customers have the ability to test a product before buying it.To determine whether a product is worthwhile investing in, each buyer wants to try it and have others attest to its quality.Before, it could only be obtained by exceeding the store's expectations.Yet, clients may perform all of the desired brand modifications outside of the mount from their couches thanks to better computer simulation.All they have to do is look for the load and choose the desired quantity.

Keywords: innovative, online, technology, tracking, product, device, software.

I. INTRODUCTION

Online shopping applications typically do not allow users to view products virtually in their physical environments. Customers face difficulties in viewing an online product in terms of whether it fits into a home or not, which can vary depending on the type of product.According to data, 20% of items purchased online are returned, compared to 9% of items purchased in-store.72% of fashion items are returned due to problems with the product's size, fit, style, etc.These high figures show that information might be inaccurately and ineffectively delivered during online buying encounters.. For example, if the product is furniture or a large appliance, the customer may need to measure the space in their home to make sure the product will fit. If the customer is purchasing a smaller item, such as a lamp or rug, they may need to consider the style, color, and pattern of the item to make sure it will fit with their existing decor. With so many products to choose from, it can be hard to find something that exactly meets the needs of the shopper. Without the ability to ask questions or get advice from a real person, customers may not be able to get the help they need when shopping online.

The use of Cross reality (XR) in e-commerce has the potential to revolutionize the approach customers shop and interact with products, making the procedure more customized, interactive, and well organized. It describes a range of computerized technologies that allow users to experience a blending of physical and virtual environments.It encompasses a spectrum of experiences including:Virtual Reality,which is an entirely automated environment that a user can interact with; A perspective of the real world that has been enhanced with computer-generated sensory input, such as sound, video, graphics, or GPS data, is referred to as augmented reality. A blend of virtual reality and augmented reality, known as mixed reality, is a situation in which digital items are smoothly integrated into the real world.XR technologies are employed in a variety of fields, such as entertainment, instruction, design, and more.Users can get completely absorbed in virtual worlds thanks to the novel experiences and interactions they provide with digital information.

In this paper we have discussed how XR technology can be implemented to meet modern consumer expectations as a way to upgrade the shopping experiences. The usage of extended reality technologies allows for effective user interaction.Gamification and visualization made possible by XR technologies let people experience 3D perspectives.Businesses may employ XR to incorporate the benefits of real storefronts into online buying.Online viewing, testing, and product information are available to customers, which leads to better educated purchases and fewer returns.The application cases for product visualization, virtual try-ons, and interactive product demonstration using extended reality are highlighted in this article (XR).

II. LITERATURE REVIEW

Cross reality (XR) is a term that refers to a combination of augmented reality (AR), virtual reality (VR), and mixed reality (MR) technologies. XR has been rapidly gaining popularity in the e-commerce industry due to its potential to create immersive and interactive shopping experiences. Cross reality technology has emerged as a promising tool for enhancing the e-commerce experience. In this literature review, we explore the current state of research on the use of XR in e-commerce, with a focus on how it impacts consumer behavior and decision-making.First, a study conducted by Teixeira and colleagues (2021)[1] examined the effects of XR technology on consumer behavior in online retail. The study found that XR technology positively influenced consumers' attitudes towards online shopping and increased their willingness to purchase products.Another study by Zhou and colleagues (2021)[2] investigated the impact of XR technology on consumer purchase behavior in the fashion industry. The study found that XR technology enhanced consumers' shopping experience by increasing their perception of product quality and reducing their perceived risk of purchasing products online.In addition, Lee and colleagues (2020)[3] conducted a study on the impact of XR

technology on consumers' emotional responses to e-commerce websites. The study found that the use of XR technology increased consumers' positive emotional responses towards e-commerce websites, which subsequently led to higher levels of purchase intention.Furthermore, a study conducted by Kim and colleagues (2020)[4] explored the potential of XR technology in improving the effectiveness of online product presentations. The study found that XR technology improved consumers' engagement and attention to product presentations, resulting in higher levels of purchase intention.Several studies have investigated the impact of XR on consumer behavior in e-commerce. For instance, Choi et al. (2020)[5] conducted an experiment to examine how the use of XR in online shopping affects consumers' product evaluations and purchase intentions. The study found that the use of XR technology led to a more positive evaluation of the product, higher perceived usefulness, and increased purchase intention compared to traditional online shopping methods.Similarly, Zhu et al. (2021)[6] conducted a study to examine the impact of XR on consumers' perceived risk in online shopping. The authors found that the use of XR technology significantly reduced consumers' perceived risk in online shopping, leading to increased trust in the seller and a higher willingness to purchase.Moreover, several studies have explored the impact of XR on consumers' decision-making in e-commerce. For instance, Kim et al. (2019)[7] conducted an experiment to examine the effect of virtual reality (VR) technology on consumers' purchase behavior. The study found that VR technology significantly increased consumers' purchase intention and willingness to pay compared to traditional e-commerce methods.Similarly, Homburg et al. (2020)[8] investigated the impact of augmented reality (AR) on consumers' purchase decision-making. The study found that AR technology significantly increased consumers' product evaluations and purchase intention, and reduced the likelihood of product returns.Finally, a study by Wang and colleagues (2020)[9] examined the impact of XR technology on consumers' online shopping satisfaction. The study found that the use of XR technology significantly improved consumers' satisfaction with their online shopping experience.Overall, these studies suggest that the use of XR technology in e-commerce can have a significant impact on consumer behavior and decision-making, leading to increased purchase intention, reduced perceived risk, and improved product evaluations. However, more research is needed to explore the long-term effects of XR on consumer behavior and its potential for enhancing the e-commerce experience.

Fig.1: Extended Reality (XR) Market

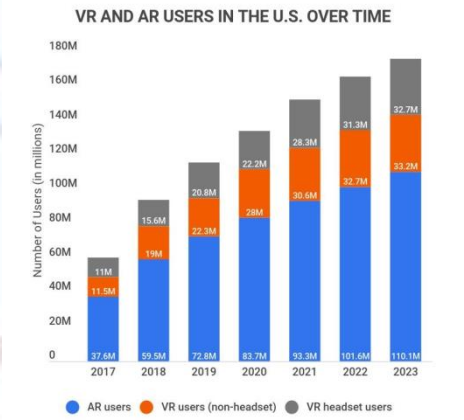

Fig.2: VR and AR users in US over time

III. EQUIPMENTS

a. VR:

Virtual Reality employs various sensors, including lighthouse base stations, accelerometers, gyroscopes, and controllers, to track the user's head and hand movements and positions. Motion controllers featuring buttons, triggers, and touchpads enable users to interact with virtual objects and navigate the VR environment. Additionally, PC/console systems are used to run VR experiences on high-powered computers or game consoles, which possess the necessary processing power to execute complex simulations and produce high-quality graphics.

b. AR:

For Augmented Reality to render 3D graphics and track real-world objects, it requires a robust processor to perform intricate computations. AR devices utilize displays, such as transparent screens, projection systems, or holographic displays, to superimpose digital images onto the user's real-world view. To power the hardware components, a reliable power source, either batteries or a wired connection, is needed. Furthermore, AR devices typically necessitate connectivity to other devices or networks for content access and data sharing. This connectivity is established via Wi-Fi, Bluetooth, or other wireless protocols.

c. MR:

The sensors and cameras that are built into smartphones and tablets allow them to follow the user's position and motions while also superimposing virtual items on the actual environment.Particularly, two well-known instances of this technology are Apple's ARKit and Google's ARCore.Another well-liked MR technology are "smart glasses," which resemble Head-Mounted Displays (HMDs) but are fashioned to resemble regular spectacles.The Vuzix Blade and Nreal Light, for instance, are well-liked choices in this area.Wearable sensors may track a user's movement, position, and biometric information to provide MR experiences.Holographic technology creates interactive virtual holograms to create experiences that are only partially immersive.These holograms may be used to create 3D images that can be downloaded, saved, and shared anywhere utilising edge technology.

Fig.3: View of Extended Reality

IV. MATERIALS AND METHODS

Our team has developed a device called the XR headband, which combines AR, VR, and MR technologies to offer retailers photorealistic try-on capabilities and precise size recommendations, resulting in a more superior shopping experience for customers. The market offers different types of XR headsets, such as standalone headsets that operate independently without requiring a connection to a computer or smartphone, and tethered headsets that rely on a connection to a computer or gaming console for processing power. These headsets are utilized in various industries, including education, healthcare, gaming, and entertainment. Our goal is to implement this immersive technology in the e-commerce industry to enhance the overall shopping experience.

The SteamVR platform provides a complete VR experience, allowing users to move and position themselves freely within a 360-degree, full-room virtual environment. The SteamVR Controllers are wireless and feature sensors on top, offering precise tracking and low latency. With one controller held in each hand, users have access to a trigger and a circular haptic trackpad. The Lighthouse Tracking System is used to track the position of the controllers and the headset within the room, using two high-mounted base stations that emit infrared signals to track the user's movements. This enables users to move around a virtual space with the use of the headset and controllers, creating a more immersive and realistic experience. The OLED displays, one for each eye, offer a wider field of view, deeper blacks, and more vibrant colors than other display technologies. The Chaperone system uses two cameras to track the user's movements and prevent collisions with real-world objects. It creates glowing outlines and silhouettes of physical objects within the user's field of view, allowing for safe movement and use of available space. With the Room Scale Tracking System, users have full control of their virtual world and can interact with objects and move across the environment. Overall, SteamVR provides an advanced VR platform that offers users a high-quality and immersive experience through precise tracking, realistic displays, and advanced safety features.

AR uses marker tracking to follow a predefined image or pattern, which allows AR content to remain fixed in place relative to the image. This is done by placing artificial structures called markers in the tracking environment, and the application uses knowledge about the markers, such as their position within the environment and their measurements, to track their movements. Convolutional neural network (CNN) techniques are used in object detection and identification to estimate the position and size of items within a scene, and AR software may display digital objects to overlay physical ones and facilitate interaction between the two.3D rendering converts a 3D model generated by a computer into a 2D image, and it can produce both photo realistic and nonrealistic images. To make sure that the virtual object looks realistic, precise mathematical modeling and refraction calculations are needed for all types of surfaces. Conventional rendering techniques, including ray tracing, simulate shadows, reflections, and refractions by casting rays from the camera's point of view onto the 3D model and producing secondary rays that emit shadow, reflection, or refraction rays,

depending on the surface. Haptic technology simulates the sensation of touch with various mechanisms, including gloves, suits, pens, helmets, and more, which simulate pressure, temperature, and texture. Different technologies are used to give sensations that feel like solid objects and resistance, and some haptic technology allows the user to feel the difference between materials such as water, sand, and rock or even to carve a pot and feel the give of the clay beneath their fingers.

There are several uses for computer vision technologies, including autonomous cars, face and gesture recognition, object recognition, and object detection.It is also employed in the medical sector for illness diagnosis, in the agricultural industry for crop monitoring, and in the security industry for surveillance and monitoring.GPS technology is used in a variety of applications, including navigation, tracking, and location-based services. It is commonly used in mobile devices to provide location-based services, such as finding nearby restaurants or attractions. Augmented reality geolocation apps use GPS technology to locate the user's device and then overlay augmented reality images and information onto the real world. This technology has many applications, including gaming, education, and marketing. Display technology plays a critical role in the success of augmented reality. It allows users to see the augmented reality content overlaid on the real world. There are many types of display technologies available today, including LCD, OLED, and LED displays. Digital displays have many advantages over traditional displays, including the ability to show dynamic content, easy content updates, and the ability to target specific audiences. They are commonly used in public spaces, such as airports, shopping malls, and train stations, to provide information and advertising to large audiences. Overall, computer vision technology, GPS technology, and display technology are all critical components of augmented reality. Together, they allow us to create immersive and interactive experiences that can enhance our understanding of the world around us.Nebula built-in XR Streaming enables you to live stream XR content from PC to XR headband via your Wi-Fi network.

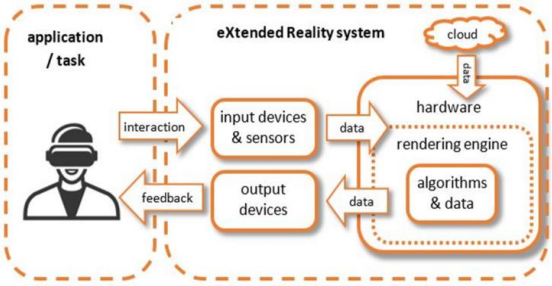

Fig.4: Extended Reality System

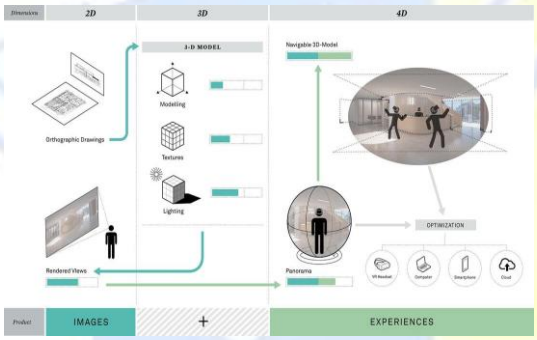

Fig.5:Dimension conversion

V. IMPLEMENTATION

Implementing an XR (extended reality) headband using Bluetooth requires a similar set of components and steps as implementing a VR headband. However, an XR headband typically includes additional sensors and features to support augmented reality (AR) and mixed reality (MR) experiences. The key components and steps involved in implementing an XR headband using Bluetooth: Bluetooth module or chipset that supports data transmission and reception wirelessly. Microcontroller or processor to control the Bluetooth module and interface with the XR sensors and display.XR sensors such as cameras, depth sensors, and position tracking sensors to enable AR and MR experiences. Display, such as an OLED or LCD screen, to show the XR environment to the user.Audio components, such as speakers or headphones, to provide audio feedback to the user.Battery or power source to provide power to the device. To connect XR headband to a mobile device using Bluetooth typically the XR headband is powered on and in pairing mode. On the mobile, go to the settings menu and select "Bluetooth." Make sure Bluetooth is turned on. Mobile will begin scanning for nearby Bluetooth devices. Wait for the XR headband to appear in the list of available devices.Select XR headband from the list of available devices. The mobile device will then attempt to pair with the XR headband. If prompted, enter the PIN or passcode for XR headband. Once the mobile has successfully paired with the XR headband, we can be able to use the XR headband to view and interact with the XR content on our mobile device.

VI. RESULT

PROS: Extended Reality (XR) is currently in widespread use. This idea incorporates the three phenomena, and its emergence can be attributed to their growth and convergence. XR is also gathering momentum and having an impact on several processes and events at the same time. Through an unusual experience, XR transports us to a vastly different reality. enables businesses to offer their customers the chance to experience something or visit a location of interest without having to leave the house. Another convenience that gives users a more accurate understanding of their subject matter and enables more successful training is efficient information intake.

CONS: It is still expensive to develop, update, and support software and headsets for VR, AR, and MR.To accommodate augmented reality (AR) and mixed reality (MR) experiences, an XR headband often has additional sensors and functions.

VII. CONCLUSION

The way consumers shop has changed significantly over the decades. As digital technology and innovations continue to shape in-person interactions are quickly being replaced by hybrid or virtual experiences. XR (Extended Reality) technology provides disruptive retailers with a unique way to engage and convert their audience, wherever they are.Implementing XR solutions into the retail and ecommerce environment opens a host of doors for business leaders. Companies in the ecommerce world can allow consumers to test and experiment with products before purchasing them, reducing the risk of returns and lost revenueFrench Luxury retailer Lacoste saw a massive 7.4 point increase in brand awareness and sales after adding Instagram and Facebook ads with extended reality innovations to its assets. In the traditional retail environment, XR solutions can make shopping simpler and safer, allowing consumers to learn more about various items even when a retail representative isn't available.

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