CASE STUDY ON AUGMENTED REALITY VIRTUAL TRY-ON FOR RETAIL EVOLUTION

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Abstract: With the advancement of Virtual Reality and Augmented Reality technologies, it is now possible to replicate the offline buying experience on an online platform. Customers can use their camera-equipped gadgets to try on things through virtual try-on. Customers can digitally verify the size, style, and fit of a product they are interested in using augmented reality before making a purchase. Because users cannot physically try on the dress in online mode, this application will assist the user in making a more informed decision about how the product will appear on him.

Index Terms - **Augmented Reality, Virtual Reality, Virtual Dressing Room**

I. INTRODUCTION

During the COVID-19 pandemic, most businesses went into crisis mode, and not only large business owners, but even tiny merchants were concerned about how they would survive. Over the last few years, online shopping has been a common activity among individuals all over the world. It has made significant development and has become a regular hobby for many customers [1]. Virtual try-on technology combines augmented reality with virtual try-on to allow customers to view how the stuff looks on them before making a purchase. Augmented Reality (AR) is a branch of technology which blends computer-generated virtual pictures on the real world in such a way that the computer-generated images are aligned and can be viewed and interacted with real world objects, and might be seen as though they exist in real world and can be interacted [2].

Augmented Reality (AR) technology is widely used to create a system that combines virtual aspects with real-world visualizations, such as a snapshot taken with a camera. On globe photographs, virtual three-dimensional objects are frequently used to give the sense that they are a part of the scene [3]. Unlike a computer game, where the user is fully immersed in the virtual world, AR allows users to interact with partially submerged images. A photograph or a product can be brought to life using Augmented Reality. Customers can interact with brands and their inventory in completely new ways [4].

It applies to footwear, garments, accessories, jewelry, and make-up, where consumers have complete freedom in terms of higher cognitive process, trying, and selecting things at their own leisure, without feeling obligated to make a purchase [5]. The virtual try-on experience makes it much easier to explore additional options as well as adapt or personalize things to fit their body form.[6] The goal of virtual assume is to provide the same level of service and elegance that they would receive in a physical store. This goal was achieved by utilizing augmented reality technology to create virtual try-on applications that help consumers comprehend how things fit on them, how the top and bottom match, and how the product fits together, way the dimensions of products fits to them [7]. Therefore, online shopping would give more information and availability of every kind of products.

II. LITERATURE SURVEY

Table 1: Literature Review on Augmented Reality Shopping Applications

Year	Application used	Method	Underlying Process	Outcome Variables	Main findings
2022	VTNCT	Lab Experiment	CWM , SPM, Tryon synthesis module (TSM)	CP-VTON , ACGPN, PF-AFN	VTNCT improves performance of try on images in generation of realistic clothes
2021	Furniture application	Lab Experiment	PA, Interactivity(IN)	App Attitude , Brand Attitude	Positive effects of PA on AA
2020	Neural Network-MLP	Lab Experiment	CNN XG-BOOST	Convolutional Neural Network	Use of XBBOOST Recognizer
2020	CAD , 3D simulation	Lab Experiment	TAM	Model self-congruity	Positive effects of Virtual Try-On in Visitor numbers
2020	Makeup Genius, KEA place	Lab Experiment	Spatial Presence	Attitude towards the app (H2b, H2c)	Persuasive responses towards the app and the brand
2019	Pixel CNN, SVM Model	Case Study	CAPG-GAN,FID	CVAE, CMMA	Introduced deep convolutional generative adversarial networks
2019	PLS-MGA Technique	Research Model	Attitude Towards VTO	Perceived usefulness ,PEOU	Customers attitude towards VTO technology
2018	DSOS ,SQL ,MongoDB	Case Study	-	The write test system throughput	Behavioral analysis of customers and evaluation of performance
2018	-	Review Paper	-	CHAID Cluster analysis	Evolution of AR production .

Study	Yuan Chang *et.al* [1]	Javornik *et.al* [2]	Quiyun Cheng *et.al* [3]	Young Jae Jang *et.al* [4]	Anne R Smink *et.al* [5]	Xiang Wang *et.al* [6]	Tingting Zhang *et.al* [7]	Ganjar Alfian *et.al* [8]	Jamye K Foster *et.al* [9]

The Table 1 and Table 2 represents the literature review of various papers that compares the different adoption technique and different features of augmented reality virtual try on.

Table 2: A summary on VTO adoption by online customers

Study	Field	Year	Technologies used	Database	Programming language	Developmental tool
S.S Yao *et.al.* [10]	Clothes	2021	CNN Geometry matching PIFU	VITON	-	Android Studio
Chen-Yu Hsu *et.al* [11]	Clothes	2021	OpenGL 3D rendering,Azure		C#	-
Pedro Azevedo *et.al* [12]	Gaming	2020	Unity and AR toolkit	IBug & LFW databases	-	XCode
Omkar Jadav *et.al* [13]	Glass	2018	SVM local feature extraction,SIFT , SDM	Terravic research cooperation	C,C++	Visual Studio,Unity,3D studio max
Pranav Parekh *et.al* [14]	Glass	2016	RGB-D & face tracker technique	Pictures	-	CAD, Visual Studio
Boping Zhang [15]	Clothes	2014	ASM RGB-D	Caeser database	Pesudo code	FPGA
Liying Feng *et.al* [16]	T-Shirt	2012	TDTOS framework simulated in FPGA	-	--	OPENGL

The dlib library's face detector and face feature extractor gathers the facial landmarks from the frame of the camera sequence and the grayscale world white balancing approach is used to get the desired lipstick colour in the present lighting situation[8]. To replicate a real-time lipstick makeup test, the white balance processing employs the linear superposition fusion

approach to execute image fusion process on the face lips and the processed lipstick colour. The dlib package's dlib.get frontal face detector can extract facial features from an input face image or video using a previously trained model[9]. After the selected piece (lips, eyes, etc.) is recognised, the section is coloured according to the lighting situation. This method guarantees precision [10].

AR is defined as an augmented real-time perspective of the physical environment that mixes virtual computer-generated graphics into the real world, such as three-dimensional model (3D) which appears in real-time on a screen (e.g. smart phones) [11]. Advanced AR technology enables the users to freely interact between the virtual and physical worlds in the environment of reality, which can improve customer service by boosting users' views of the real world through their senses [12]. It alludes to augmented reality's meteoric rise in popularity over the last decade. Using augmented reality and a colour prediction technique, a virtual lipstick try-on is created.The colour prediction model estimates the RGB of the lips colour based on the undertone colour of the lips and the lipstick shade[13].

The learning models evaluated in this work include simple and the multiple linear regression, M5Pmodel tree, stacking method, reduced-error pruning decision trees, support vector regression, and the random forests[14]. The facial landmark detection of the sub-module of the Open Face toolbox is used to recognise and track lips. To evaluate prediction accuracy, Major Access Exchange (MAE) and Root Mean Square Error (RMSE) are utilised. Dark or light pink lipstick tones have been shown to produce more realistic effects than shades that closely resemble human skin[15]. Online Visual Merchandising (OVM) which is most commonly applied for online shopping analyses variables influencing online fashion buyers, their attitudes, and purchase intentions while employing Augmented Reality Virtual Dressing Room technology, using the Uses and Gratification theory as a framework[16]. The Virtual Dressing Room (VDR) technology is setting new benchmarks and has revolutionised the online fashion websites throughout the world, aims to address the lack of a "try before you buy" method, lowering consumers buying hesitation due to the difficulties of evaluating clothing quality and fit online[17]. Customers can virtually try on beauty products and possibly can take a picture of themselves wearing them utilising Augmented Reality (AR) Webcam VDRs. After that, captured photos can then be stored or shared on social media with friends and family [18].

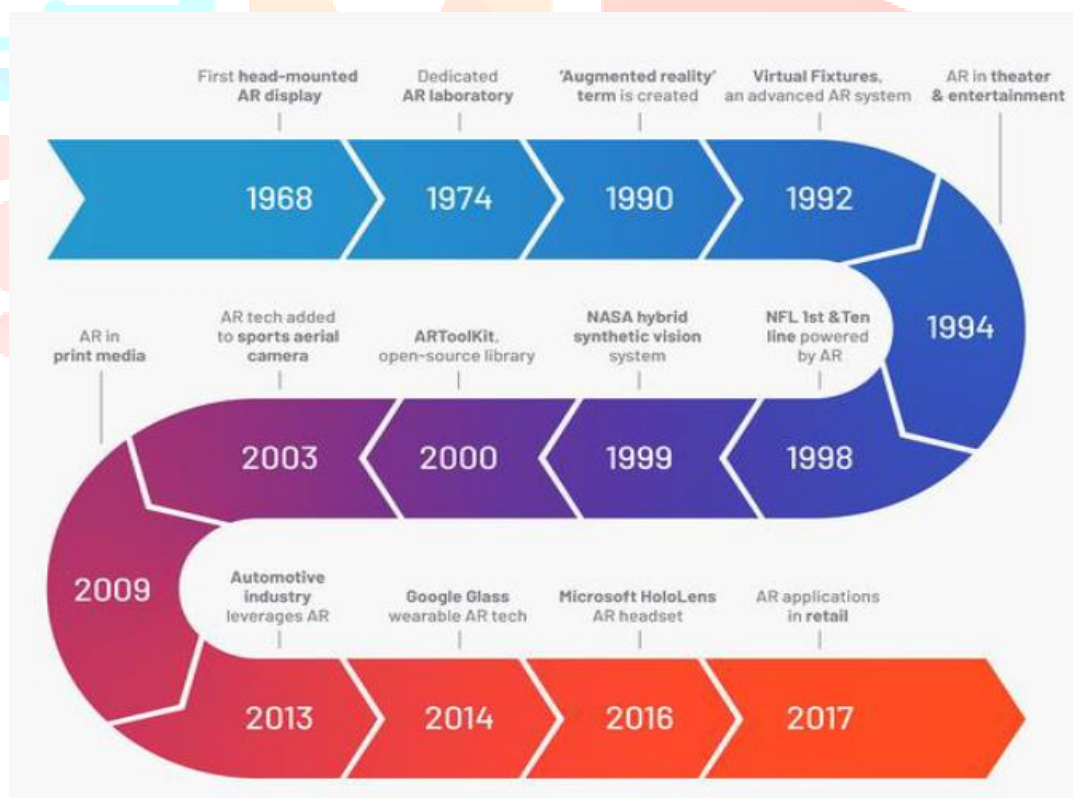### III. RESEARCH AND METHODOLOGY

Fig.1 History of Augmented Reality

The use of Augmented Reality and Virtual Reality (AR and VR) is on the rise as depicted in figure 1. This method created a 3D image for the viewer by using an image for each eye[19] . Headsets have enabled gamers and designers reinvent their interfaces in recent years [20]. They're also being used by businesses to train personnel and sell new items. Although the technology was developed in 1838, it has stayed on the periphery of society. Non-development countries' people are still watching videos on antiquated 2D screens [21]. 3D devices are expensive for average users, yet 3D videos improve the user experience. When the developer/user adds new stuff to videos or games, AR boosts the enjoyment. [22].

The proposed solution essentially allows a website user to browse products while simultaneously keeping track of the customer's browsing history. The figure 2 depicts the general architecture of the customer behavior analysis, which is based on real-time picture processing [23]. When a customer visits the website, the model generates a unique random id for them, and the items are selected using that id from the Digital Signage based Online Store (DSOS), which subsequently generates a random integer called a session id for each visitor, giving them a regular id [24]. Another identification is the tool id, which is used to gather information stored in the DSOS (i.e. location). Real-time processing recorded the browsing history of each and every customer (together with a unique session id) and saved it in the NoSQL database on the server[25-26].
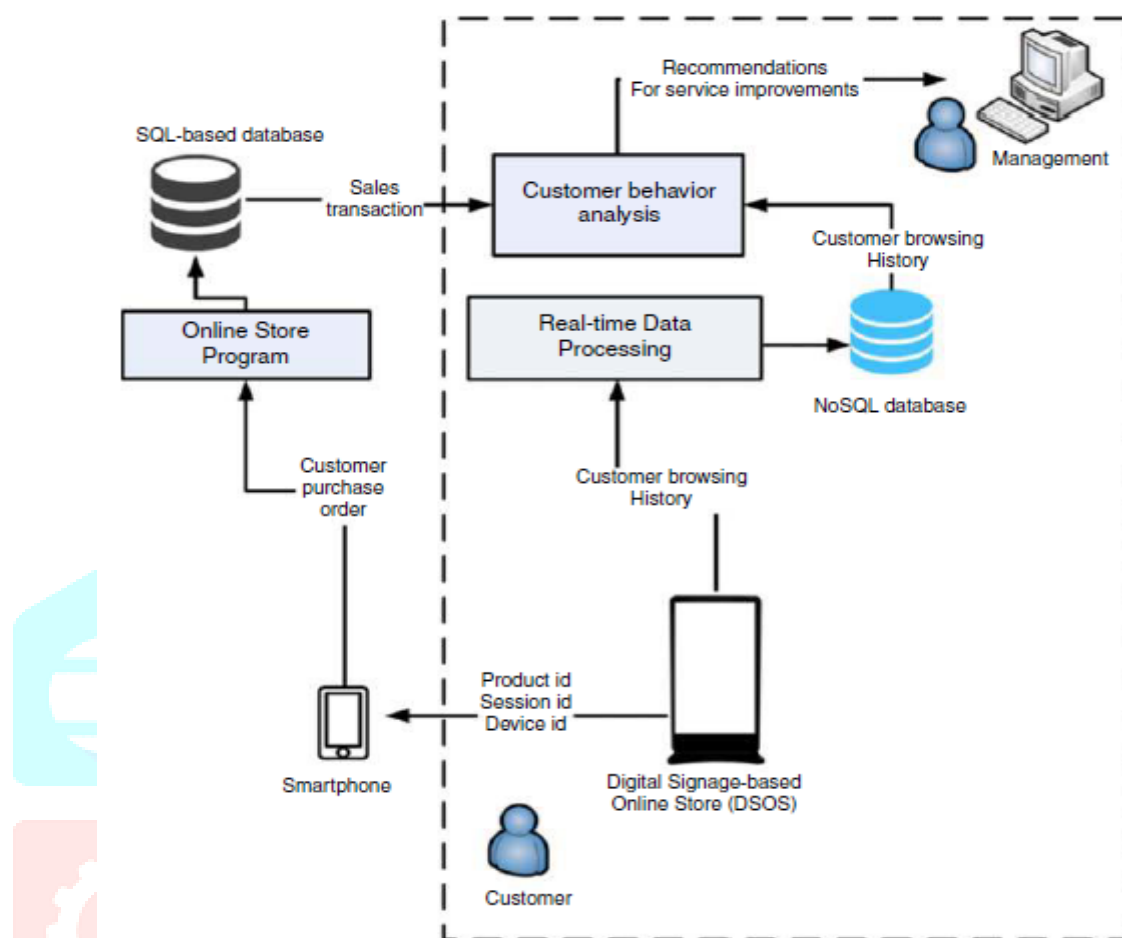

Fig.2 Analysis behavior of customer using real-time data processing

When a consumer wishes to buy something, he can do so by scanning the Quick Response (QR) code, which was generated by DSOS [27]. Customers must either download the app or access it on their smartphone's browser before placing an order. Customers must first register with the portal and scan the product's QR code. The merchandise id, session id, and device id were all included in the QR code created. After scanning the QR code, the information created includes information about the commercial document, which includes session id and device id. This information is processed by a website application on the server, and the generated data is stored in a SQL-based database [28].

Customers' browsing histories and sales transactions were gathered from two databases and integrated (grouped) depending on their session id, that was used to determine and connect the items being purchased and viewed by a consumer [29]. This consumer behavioral analysis data assists organizations in better understanding their customers' likes and dislikes, which adds to the firm's economic status. This research primarily focused on combining DSOS recorded consumer browsing history data with transactions, which could be analyzed to provide data to assist management in making real-time decisions [30].

IV. CONCLUSION

We gave a comprehensive analysis of AR in this paper, which will aid researchers in recognizing the benefits and trends of the technology. The use of DSOS should be encouraged. Customers' shopping experiences should be enhanced via DSOS. For real-time data processing, the data technologies such as NoSQL, MongoDB and Apache Kafka are used. The suggested system kept track of user's browsing history as well as DSOS purchase data. We have forecasted customer behavior to some level, which will assist merchants in gaining a better knowledge of customer minds and their behavior while purchasing in the shop, and store managers will be more efficiently displaying recommended products in the store. Furthermore, for assessing customer behavior, the comparative analysis of data mining methodologies is required.

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