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AESTEX: An Innovative Smart Shopping System for Enhanced Customer Experience and Increased Sales

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Abstract: ***AESTEX is a counter less, queue less, smart shop- ping system that aims to enhance the shopping experience for both customers and shopkeepers. The system provides customers with counter less and time saving shopping feature that allows customers to scan QR/barcode on the products to add them to their virtual cart for the quick shopping eliminating the need long queues and the counters along with the product recommendation system to suggest personalized complementary/similar items. Thesystem also includes a virtual dressing room to visualize the clothes before purchasing to ensure perfect buy every time you shop and to ensure hygienic experience. Along ensure more conve- nient and efficient shopping experience for customers, the system supports the shopkeepers to expand their business while keeping the manpower at control and also incorporate digitalization in the physical shops as well. Additionally, the AESTEX system includes a payment gateway for cashless transactions, ensuringa safe and easy shopping practice.***

Index Terms: ***counter less shopping, virtual dressing room, cloth size prediction, retail analytics, hygiene friendly, time saving, personalized***

I. INTRODUCTION

Due to various reasons, in the last couple of years, on- line market has grown to a large extent as an alternative to traditional brick-and-mortar stores. According to statistics online retail has exploded at an astounding rate, yet the majority of people still prefer to shop-in store. With the riseof digitalization, physical shops are experiencing a decreasein sales. Many of their customers prefer to shop online attheir fingertip at the ease of their home. The convenience and ease it offers is attraction of the customers of all age groups. Also since corona, people have started preferring ev- erything contactless- contactless banking, contactless delivery,contactless payment. People have started prioritizing hygiene

Identify applicable funding agency here. If none, delete this over anything. When opted for the walk-in stores, the apparelsmight have been touched many times by different individuals leaving there no room for guarantee about the cleanlinessof the same. The rise of walk-in/walk-out retail reflects the tension between our growing demand for convenient and safe shopping experiences amidst the pandemic, and our inherent need for social interaction and a sense of belonging in a time marked by loneliness and isolation. Without trials, it came into picture that it becomes difficult to visualize the apparels on to one's body and ensure the perfect size, which leads to lot of return of products in the online as well as offline way of shopping. Even in physical stores and have to shop few things, then also one has to wait inthe long queues at the counter, which is a lot time consuming than the actual shopping. The concept of self-checkout lines isgetting popular day by day. Just scanning the required productsand pay at their own convenience helps to ensure the swift shopping. However, in certain categories of shopping, such as ap-parel, moving online completely is not likely possible. In such cases, buying items from in-store shelves seems to bethe most convenient option. However, shopping in physical stores also has its challenges, such as difficulty in findingthe correct size without trials, and people tending to avoid long queues. The manpower and investment for the physical stores and inventories, their management should not be ignoredas well. The present research has been made to suggest and develop some tools which will eventually be useful to the supermarkets, department stores, corner shops, convenience stores for queue less, counter less smart shopping experience for both customers and shop owners. The project AESTEX targets towards achieving digital dressing practice with nolong queues. The fact that moving online completely in certain categories of shopping is not possible. In such cases buying items from shelves store-in seems to be convenient. Some of the studies show various solutions to encountersuch problems at higher level. The substantial companieshave taken initiatives and invested a lot of capital to deliversuch solutions. Major companies like Gentex Corporation (US), Ficosa (Spain), Seura Solutions (US), Magna Interna- tional (Canada), Japan Display Inc. ("JDI") (Japan),

Murakami Kaimeido (Japan), Harman International Industries (US) starts operating smart mirrors into their systems. A smart mirroris a two-way mirror with an electronic display behind theglass. Such system are advanced mirror incorporated with tools such as sensors, cameras, displays, and connectivity equip- ment. They are most popular in verticals such as automotive, residential, healthcare. Recently a exponential growth in thefashion industry came into picture. At the same time, cost ofbuying a smart mirror can range up to $1000-2000 depending on the various sizes and features. Investing such a huge cost can be possible for substantial companies. It is still a challengefor the companies which are trying to advance in the market.To address these challenges, we propose the AESTEX project, a counter less, queue less, smart shopping system that enhances the overall shopping experience for both customersand shop owners. The system promotes nearly human lesstechnology. It is also trying to keep up with the cashlessIndia program. Taking inspiration from the Amazon Go andLenskart's technologies, team Aestex is trying to enhance thecustomer service and make it rousing practice for customers.The system uses advanced technologies such as augmentedreality and market-basket analysis to provide customers witha more engaging and efficient shopping experi ence. Addi- tionally, the system includes a payment gateway for cashless transactions, ensuring a safe and hygienic shopping experience.

Before entering the shop, one need to install the AESTEX android application into their handsets. Making use of one of the unique feature of AESTEX project ,which is QR/barcodes attached products in the shop to enable counter less shopping, 'JUST-WALK-OUT' shopping experience. The "Just Walk Out" experience, no need of queues and virtual dressing rooms seems to be more desirable. Products in the store will come with QR/barcodes for products which will be generated bythe shop owners and will be attached them to the items inthe stores. Customers can scan the QR/barcodes using theAESTEX mobile application to add items to their virtual cart. That enables the shoppers to make secure online payments, eliminating the need for long queues and payment at the counter. The customers can also opt to wander a little bit on our application. The feature of product recommendation helps to have a look at the related items to the scanned products on the same application. Customers if need to try the apparels can also navigate to our Virtual dressing room feature. It promoteshygienic and quick shopping without the trail rooms. Alsothe feature of size prediction in the application itself helpsto ensure there is perfect buy every time you shop without having to try on the apparels in the trial rooms. It takes a few parameters from the customer from the interface, after processing customer will be suggested the right size for his/herbody. In this paper, we will discuss the proposed method of the AESTEX project in detail, including the features, tech stack, and the benefits it offers to customers and shop owners alike. We will also review related work in the field and highlight thekey differences between our system and existing solutions.

II. RELATED WORK

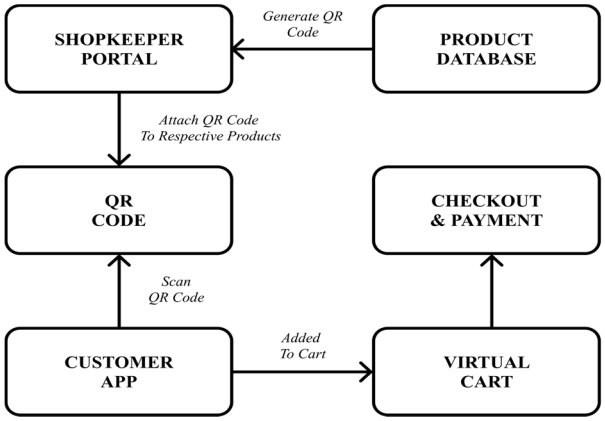
Previous work has explored the use of virtual dressing rooms in retail shopping, such as the "magic mirror" tech- nology used by Neiman Marcus and the "smart mirror" technology used by Rebecca Minkoff. A magict mirror, also known as a smart mirror, displays the time, weather, calendar, news, and social media updates. This mirror is developed by placing a transparent mirror over a screen such as a tablet, monitor, or TV. This smart technology is driven by a RaspberryPi or Windows PC, combined with voice recognition and touchtechnique. Such systems use augmented reality(AR) to allow the customers to see how clothing items would look on them without physically trying them on. However, these systems stillrequire customers to physically locate and select items from the store, which can be time-consuming and inconvenient.Other studies have explored the use of market-basket analy-sis to increase sales in retail shopping. For example, one studyfound that customers who were offered complementary items were more likely to make a purchase, leading to a 5.5. Several other projects have focused on improving the shop- ping experience by reducing queues and wait times. For exam- ple, Amazon Go uses a "Just Walk Out" shopping experience, where customers can simply take items off the shelf and walk out of the store, with their purchase automatically chargedto their Amazon account. The increasing popularity of 15- minute delivery services and the widespread adoption of Amazon Prime have created a growing expectation among consumers that retail experiences should be both instantaneousand effortless. The AESTEX project builds on these previous works by combining the use of virtual dressing rooms with market- basket analysis and a "Just Walk Out" shopping experience to provide a seamless and convenient shopping experience for customers while increasing sales for shop owners. The system employs advanced technologies, such as Android Studio, Re- act, Firebase, and ML, to create an innovative and engaging shopping experience for customers. Virtual try-on technology for glasses has been increasingly explored by both domestic and foreign sellers such as Meijing [8], Kede [9] and Biyao [10], following the initial application of glasses try-on systems in the USA by companies like Camirror, Smart Look, Ipoint Kisok, and Xview. The online try-on function allows users to experience the effect of wearing glasses and enhances the online shopping experience. The virtual try-on system for glasses uses technologies suchas computer vision, augmented reality, and image processing.

Researchers are focusing on improving the speed, user expe- rience, and immersion of the try-on process. Previous studies can be categorized into four types: 2D image superposition, 3D glasses superimposed on 2D face images, 3D face modeling, and AR technology based on video stream[11,12,13,14]. One study by Huang [15] introduced a virtual optician system that detects the user's face and eyes, estimates the pose and scaleof the face in real time using two corresponding isosceles triangles formed from three points selected from the face and glasses images. However, this method can produce unrealistic deformations in the glasses model, which affects the realismof the glasses.

The typical procedure for face recognition involves various steps, including detecting the presence of a face in an imageor video, tracking the face over time, extracting relevant features from the face, reducIing the dimensionality of those features, and then matching those features with known facesto determine the identity of the person in the image or video.

III. PROPOSED METHOD

The AESTEX project proposes a counter less, queue less, smart shopping system that enhances the overall shoppingexperience for both customers and shop owners. The proposedmethod uses an Android Studio application that provides customers with a virtual dressing room to try on clothes before purchasing. This system eliminates the need for physical queues and ensures a more convenient and efficient shopping experience.



In addition to the virtual dressing room, the AESTEX app incorporates a counter less shopping feature that allows customers to scan QR/barcode on products to add them to theirvirtual cart within the app. The app also enables shopkeepers to generate QR codes for products and attach them to the respective items, so customers can easily scan them and add them to their cart. This feature eliminates the need for physicalqueues and checkout counters, providing a more streamlined shopping experience.

The AESTEX app presents several important components. The virtual dressing room uses augmented reality to allow customers to visualize how apparels would look on them without having to try them on. Customers can select items to try on items without touching them. This technology allowsfor the overlaying of a virtual item onto a live video feed, allowing customers to see how the item fits, its style, and size before making a purchase. To try on from the app, theapp will generate a virtual model wearing the selected items. Customers can customize the model to match their body shapeand size and see how the selected items would appear on them.

$$\text{Girth} = \pi(A+b) \times \sqrt{1 + 3 \times (A+B)^2 \div [(A+B)^2(10 + 4 - 3 \times (A-b)^2 \div (A+B)^2)]}$$

$$x_3 \text{ and } x_4 \qquad y = 1.408 + 1.790\,x_3 + 1.258\,x_4$$
$$x_3 \text{ and } x_4 \qquad y = 3.976 + 1.681\,x_3 + 1.261\,x_4$$

The proposed method also employs market-basket analysis to recommend complementary/similar items that customers may be interested in purchasing. The system can use data anal- ysis and artificial intelligence algorithms to identify patterns in customer behavior and recommend products that are likely to be of interest. It uses Natural Language processing techniques for recommendation system which involves two types of approaches- content-based recommendation and collaborative recommendation approach.

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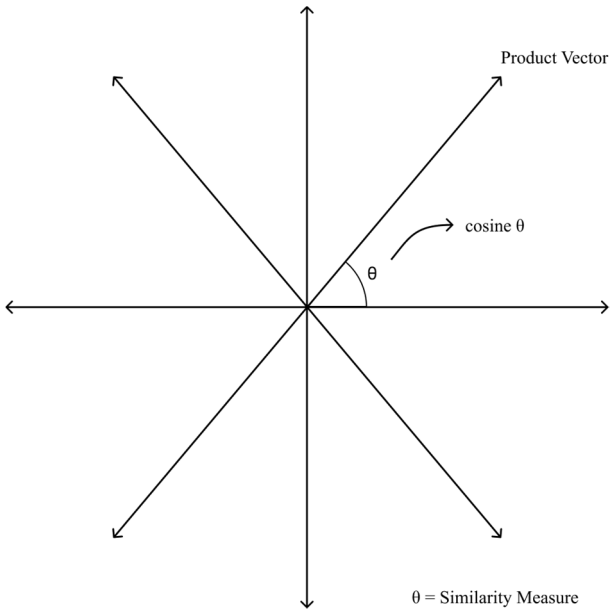
In addition, the AESTEX system includes a payment gate- way for cashless transactions, ensuring a safe and hygienic shopping experience. Customers can simply take items offthe shelf and walk out of the store, with their purchase automatically charged to their account.

Overall, the proposed method of the AESTEX project leverages advanced technologies and innovative approaches toprovide a more engaging and convenient shopping experience for customers while increasing sales for shop owners.



IV. RESULTS AND DISCUSSION

As the AESTEX project progresses, we are pleased to reportthat several key features have been successfully implemented, including the authentication system, QR code generator, and scan to cart functionality. Additionally, the manual input valuespredicting cloth size have been integrated into the system, pro-viding customers with more accurate size recommendations.

The market-basket analysis feature is currently in the devel-opment phase, and we anticipate that it will provide valuable insights into customer behavior and preferences. With thisfeature, shop owners will be able to optimize their store layout,product placement, and marketing strategies to increase sales and customer satisfaction.

We are also excited about the development of the virtual dressing room feature, which is expected to significantly enhance the overall shopping experience. Through the useof augmented reality technology, customers will be able to virtually try on clothes, eliminating the need for physical trials and reducing the chances of returning an item due toan incorrect size or style.

By utilizing advanced technologies such as augmented reality and market-basket analysis, the AESTEX system aims to provide customers with a more engaging and efficient shopping experience while also reducing wait time and elimi- nating the need to physically visit the counter to pay for their purchases. The payment gateway feature ensures a safe and hygienic shopping experience, which is especially importantin the current global climate.

Overall, the AESTEX project has shown promising results thus far, with several key features successfully implemented and others in the development phase. We believe that this system has the potential to revolutionize the shopping expe- rience and provide a more convenient and efficient shopping solution for both customers and shop owners. We look forward to conducting further research and development to evaluatethe effectiveness of the AESTEX system in enhancing the shopping experience.

V. CONCLUSION

AESTEX project presents a unique and innovative solution to the challenges faced by physical shops in the digital age. Byutilizing advanced technologies such as augmented reality and market-basket analysis, the system aims to provide customers with a more efficient and engaging shopping experience, while also providing valuable insights to shop owners to optimize their business. The implementation of the ”Just Walk Out” technology offers a significant improvement in the shopping experience for customers and provides substantial benefits to retailers, which outweigh the associated high implementation costs. The behavior has also helped to fuel our idea of cashless,walk in/walk out stores.

The project will continue to develop as the need of the market to provide a out-and-out solution. The project is still in the development phase, the successful implementation of several key features and the promising results thus far demon- strate the potential of the AESTEX system to revolutionize the shopping experience. With further research and development, we anticipate that the system will continue to improve and offer a more convenient and efficient shopping solution for both customers and shop owners.

VI. FUTURE SCOPE

The AESTEX project has a promising future scope as it has the potential to revolutionize the shopping experience for customers and shop owners. As the project continues to develop, we anticipate several new features to be implemented, including market-basket analysis, virtual dressing rooms, and personalized recommendations based on customer behaviorand preferences.

Currently we are continuously progressing to achieve accu- racy in measurement of height of a person by the user and he/she has to insert few extra parametes like weight manually in the system to get more precise prediction.Our future scope isto devise a better version of the size prediction model whereinthe extra paramters are reduced and predict only analysing the picture yet maintaining the accuracy.Thus the project servesall the necessities and we will be working upon enhancing features by powering them with more tools and add some innovative tools that will help growing in applications.

One potential future direction for the AESTEX project is the integration of machine learning algorithms to further enhance the accuracy of the cloth size prediction and personalized rec- ommendations. Additionally, incorporating natural language processing (NLP) techniques could improve the chatbot's ability to understand and respond to customer inquiries.

Another potential area for future development is the ex- pansion of the AESTEX system to include other types ofretail stores, such as grocery stores or electronics stores. By adapting the system to different types of retail stores, we can provide a more personalized and efficient shopping experiencefor customers across different industries.

Overall, the AESTEX project has a promising future scope and has the potential to significantly enhance the shopping experience for customers while also providing valuable in- sights and benefits for shop owners. We look forward to continuing our research and development efforts to bring this system to fruition and evaluate its effectiveness in enhancing the shopping experience.

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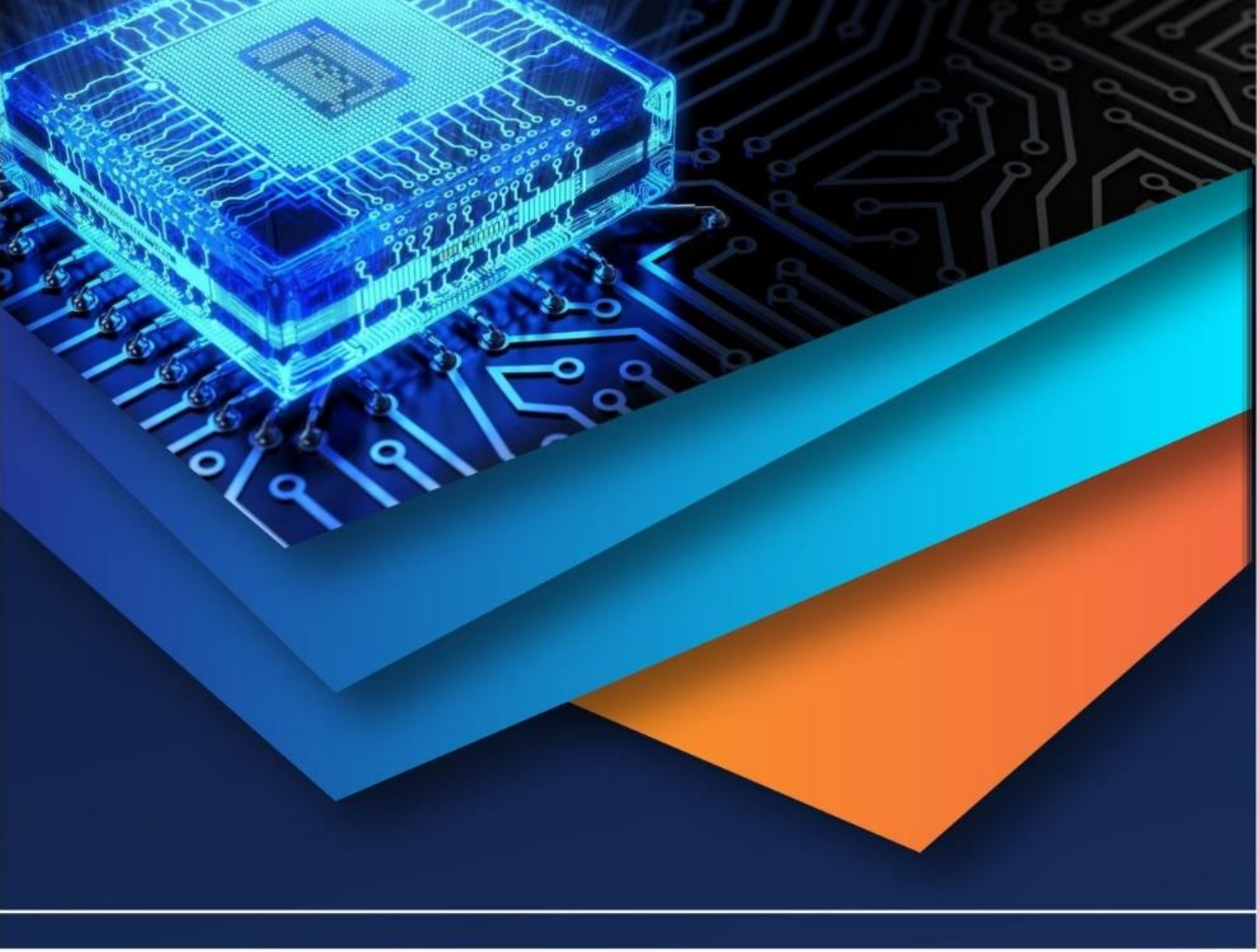

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