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VIRTUAL MIRROR USING AI

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Abstract: The term specifies a Virtual Mirror application using Artificial Intelligence(AI) and Augmented Reality (AR)[12] which allows a user to try on clothes virtually. The user dimensions or alignment is mapped or calculated using the virtual clothes. The clothing moves and folds realistically and the lighting intensity of the cloth render is adapted to match ambient lighting conditions. The presented application improves on related augmented reality application by adding full user patterns tracking and by using 2D clothing models in addition to 2D images.

Keywords: Augmented Reality, OpenCV, 2D image, Alignments of clothing, Machine Learning

I. INTRODUCTION

A lot of shoppers have encountered a lot of problems while shopping at a high-end place for readymade garments, especially during peak hours, such as weekends. Tiresome lines, numerous restrictions, enormous crowds make it quite an unpleasant experience. Huge number of customers, and minimum numbers of trial rooms results in quite a lot of waiting time for customers, ultimately resulting in dissatisfaction. Due to security reasons, there is also a restriction on the number of garments that can be taken at one instance of time for trial. It increases the overall shopping time due to multiple trips from the shelves to the trial rooms.

From the boutique's point of view, a large percentage of thefts happen because of sneaking in garments while in the trial room. Also, they are unable to show the customers the fresh stock that is supposed to be delivered to the shop in the coming few days. To overcome these problems, we propose a Virtual Mirror.

This topic aims to create an augmented reality dressing room. This requires real-time tracking of the body dimension as well as realistic virtual clothing. For the pose tracking the Microsoft Kinect sensor is used which gives more complete and accurate tracking of the user pose than the marker based or image feature-based tracking which is traditionally used in augmented reality applications [1]. For the clothing we created a set of 2D models that can be rendered into the scene. The focus of this project is onrealistic interaction between the user and the virtual clothing.

To achieve this, the clothing needs to:
• Be aligned correctly with the user positions, Dimensions.
• Move and fold realistically.
• Be realistically rendered into the environment such as ambient lighting

Most of the early applications attempted to do this by overlaying a static image of clothing over an image of the user captured by a camera or any digital camera. But, like any other idea, the virtual mirror involved from very basic solutions to more advanced solutions which were more in sync with actual reality. This is in fact, the basic motivation behind any Augmented Reality application. These advancements in virtual mirror were done in mainly two sectors: the alignment of clothing with theuser, and the realism of the clothing.

In Figure-1[10] below, displays the general overview of the application where the user selects the clothes they would liketo try virtually.

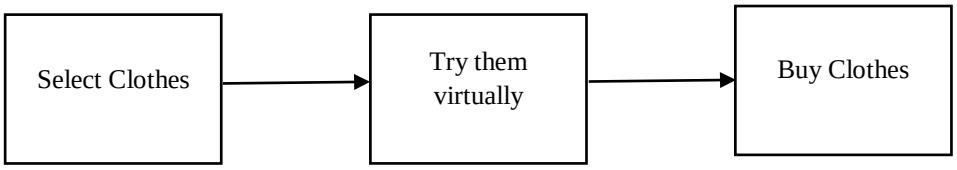

Figure-1: Overview of System

II. RELATED WORK

Et.al H. Kim, M.L. Damhorst[1] specifies that Modern foreign studies have established that globally there is a high degreeof dissatisfaction with a commensurate and well-fitting clothing that is largely determined by the incorrectness of the use of anthropometric information by consumers. Thus, American researchers from the State University of Iowa (Kim H., Damhorst M.L.,2010) have established a direct relationship between discontent with the shape of their own body and the proportionality of the clothes being chosen, between the unreliability of perception of their own size and the quality of fit. While the respondent's satisfaction with his or her appearance positively affects the quality of the clothes fit chosen for trying on and the intention to makea purchase on the Internet. But failed to have a word with respect to mapping software by augmented reality which contains alignment of clothing with the user and realism of clothing.

Et.al M. Aghekyan, P. Ulrich, L. Connell[2] specifies the study results of the American and Russian consumers behaviourconducted at the Long Beach University of California and the University of Alabama in Auburn, there is a significant difference inthe perception of the size and attractiveness of the body from Americans and Russians. Local respondents with the same body massindex (BMI) as Americans less correctly choose the size of their clothes and estimate the attractiveness of their figure with lesser scores. Therefore, we can say that for local consumers the problem of the right choice of clothing based on correctly defined anthropometric information is more relevant. These advancements in virtual trial room were done in mainly two sectors: the alignment of clothing with the user, and the realism of the clothing.

Et.al B. Xu, W. Yu, T. Chen, Y. Huang[3] specifies the concept of mass customization of the garment industry based on the introduction of three-dimensional technology, helping to solve the problems of defining the size of the figure and designing clothes. The authors developed an integrated system for performing scanning of an individual figure, its virtual modelling and electronic measurements for conducting virtual apparel of various clothes offered on the Internet .But did not specify with respect to augmented reality.

Et.al M.L. Mpampa, P.N. Azariadis, N.S. Sapidis[4] develop interactive mass customization processes, Greek researchers from the Aegean University (Mpampa M.L., et al., 2010) developed methods for automatic sorting of clothing models on manufacturers' websites, to facilitate the search for products that are more suitable for specific consumers and proposed a method for calculating the index "The level of customer satisfaction with garments", tested on a group of mass-produced men's products. These advancements in virtual trial room were done in mainly two sectors: the alignment of clothing with the user, and the realismof the clothing.

Et.al Y.S. Ding, Y.C. Xu[5], specifies the concept of the intellectualization of the optimal choice of sizes and models of clothing (IAAHP), based on the Immune Algorithm and the Analytic Hierarchy Process, the complexity of which is caused by the variety of sewing products and forms of the human body, the difficulty of correctly selecting a suitable product that corresponds to individual measures (made-to-measure), which is especially urgent for online sales of clothing. These advancements in virtual trialroom were done in mainly two sectors: the alignment of clothing with the user, and the realism of the clothing.

Scientific research is widely used in the industry in the form of mobile applications and Internet portals that allow the userto make online virtual fitting and selection of finished clothes in accordance with their own sizes. Three-dimensional figure scanners are adapted for sales as a "virtual fitting mirror." According to the American company TC2, the virtual mirror ImageTwin is the best in the class [6]. Such a device allows the consumer to see himself in clothes from the store's assortment. The accuracy of choosing the size of the finished garment with the proposed system raises certain doubts, since the system is more intended for displaying the external features of the clothing model. These advancements in virtual trial room were done in mainly two sectors: the alignment of clothing with the user, and the realism of the clothing.

The company Metail from the UK [10], founded in 2008, based on research carried out at Cambridge University, has developed and offered the consumer an application where you can perform a virtual fitting and pick up clothes from the proposals online clothing stores with a simple workflow. The system builds a three-dimensional avatar of the figure, the developers claim thatthis avatar is 94-96% consistent with the figure of the consumer, reflects the hairstyle and colour of the skin. At the first stage, the user creates his own avatar, in the form of a three-dimensional model of the figure, close to your physique in less than 30 seconds.In the system database there is a list of clothing items offered by online stores connected to this portal. At the second stage, the user sees his avatar in clothes and can choose a wardrobe. The third stage is the purchase of selected clothes. These advancements in virtual trial room were done in mainly two sectors: the alignment of clothing with the user, and the realism of the clothing.

Another major portal, which allows you to make informed purchases of clothes online is mPort [11]. The portal allows you to create a passport of dimensional characteristics (measurement passport). To do this it is necessary to make a three-dimensional scan at the nearest point, which can be found on the map. The mPort system instantly compares the dimensional features with the sizes of the finished garment. The sizes of clothes are provided by brands that cooperate with the portal. As a result, the consumer sees on the screen only those clothes that can fit him in size. The system provides the opportunity to order clothes according to individual dimensions, which will be produced either in mass production or in a studio. These advancements in virtualtrial room were done in mainly two sectors: the alignment of clothing with the user, and the realism of the clothing.

III. PARAMETERS

Due to the growing interest in Augmented Reality, the idea of virtual clothes is not new. Most of the early applications attempted to do this by overlaying a static image of clothing over an image of the user captured by a camera or any digital camera. But, like any other idea, the virtual mirror involved from very basic solutions to more advanced solutions which were more in sync withactual reality. This is in fact, the basic motivation behind any Augmented Reality application.

These advancements in virtual trial room were done in mainly two sectors.

3.1 Alignment of Clothing

When you are feeling uncomfortable or unattractive in your clothes, it's when you are out of alignment. The first attempt at Virtual Mirror focused on alignment of the user, rather than its reverse. In this very primitive application, just a fixed staticrendering of clothing was displayed on the screen. In order to gain a visual experience of the wearing the garment, the user had to align himself to the clothing image.

A more appropriate technique to align the clothing would be to adjust the position, rotation and scale of the garment to the tracked user. With the use of hand-held markers by the user, and combining video tracking and image identification techniques, it was possible to receive some 2D information from RGB images using a normal webcam. Position, rotation and scale were adjustedby moving the marker, as shown in Figure-2[9][12].

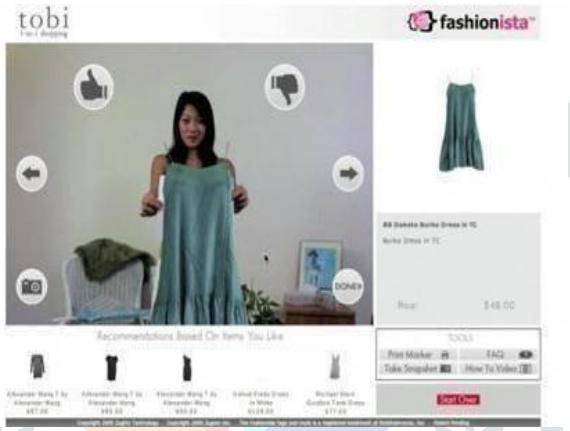

Figure-2 - Depth sensing using markers

The introduction of the Kinect sensor made it relatively easy and cheap to get access to a depth sensor. Using the depth sensor with open-source middleware such as OpenNI Framework made it possible to track the user's pose quite accurately. One such application was that of Fitting Reality which used the Kinect sensor to create a Shape ID of the user. The Shape ID would store the measurement and size of the user. And finally static clothing would be rendered on the user (Figure-3)[12].

Figure-3- Static clothing

3.2 Realism of Clothing

One of the primary goals of a virtual dressing room is to give a realistic visual experience of trying on different garments. Beside the alignment of the clothing, the realism of the clothing movement is an important aspect in providing dressing experience.

Different materials have a different patterns or gesture with respect to cloth or garment type. For example, silk or leather have different gesture. In the first versions the clothes were just static 2D images. It was only possible to see how the clothes looked fromthe front. In more advanced dressing rooms such as the one created by FaceCake multiple 2D images of the clothing from different angles provided a more realistic experience, as it was possible to turn around and have a look from different sides. However, the clothing is still static and there is completely no interaction with the clothes besides changing its location, rotation and scale.

Compared to our approach which uses 2D models of clothes designed using Blender [Figure 4], the current approach of using 2D images is limited in several ways. Since the clothing is photographed from a limited number of angles it does not rotate smoothly, but in fixed intervals, while a 2D model can be rotated freely. Furthermore, cloth simulation can be performed on a 2D model making it move and fold as a reaction to the user's movement and thus allowing physical interaction between the virtual clothing and the user avatar, something which is not possible with 2D images.

Figure-4 - 2D Mesh[12]

IV. Design:

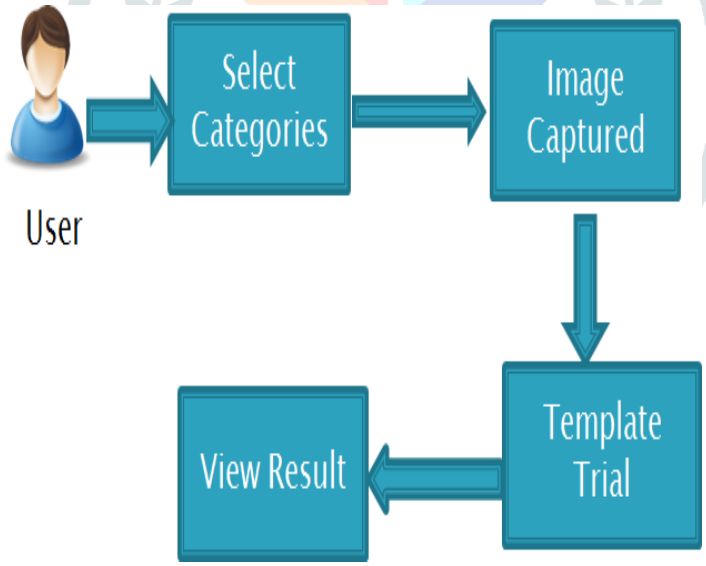

Figure-5 - System Architecture

The user will stand in front of the Kinect sensor, which has an RGB sensor and a depth sensor. Using these sensors, the user willbe calibrated and his skeleton will be tracked.

The OpenCV framework, which acts as a middleware for the Kinect sensor, tracks the gestures of the user. The gestures are deciphered, and their corresponding semantics are given to the Unity engine. The Unity engine takes two inputs. First, is a clothmesh which is imported from Blender. Unity 2D engine uses the PhysX drivers to apply physics properties to the rendered garments.

The Virtual Mirror engine is responsible to render the selected item on the calibrated user, and track his movements and gestures. All this is then displayed on a screen, which can be a projector canvas, a TV screen or even a laptop.

V. CONCLUSION

The title specifies augmented reality application where in the users are made to try out clothing that is rendered on a screen over the image of the user. The lightning is adapted to match the intensity of the user's environment. The clothes are properly aligned according to the user's positions and movements. The system is an improvement to the existing system where the tracked user is able to try 2D clothes that include cloth simulation and can be viewed from different angles and react as real clothes

REFERENCES

[1] H. Kim, M.L. Damhorst, "The relationship of body-related self-discrepancy to body dissatisfaction, apparel involvement, concerns with fit and size of garments, and purchase intentions in online apparel Shopping", Clothing and Textiles Research Journal, 2010, vol.28, 4, pp. 239-254.

[2] M. Aghekyan, P. Ulrich, L. Connell, "Using body scans in assessing perceptions of body attractiveness and size: cross-cultural study", International Journal of Fashion Design, Technology and Education, 2012, vol.5, 2, no.7, pp. 81-89.

[3] B. Xu, W. Yu, T. Chen, Y. Huang, "Three-dimensional technology for apparel mass customization: Part II: Human body modeling from unorganized range data", Journal of the Textile Institute, 2003, vol. 94, 1-2, no.1, pp. 81-91.

[4] M.L. Mpampa, P.N. Azariadis, N.S. Sapidis, "A new methodology for the development of sizing systems for the mass customization of garments", International Journal of Clothing Science and Technology, 2010, vol.22, 1, pp. 49-68. 2019 International Science and Technology Conference "EastConf" 978-1-7281-1931-1/19/$31.00 ©2019 IEEE.

[5] Y.S. Ding, Y.C. Xu, "Intelligent optimal selection of garment sizes by using immune algorithm and AHP method",Journal of the Textile Institute, 2008, vol.99, 3, pp. 281-286.

[6] New era of mirrors is here, URL: https://tclabsllc1.godaddysites.com/imagetwin-mirror.html(Accessed 12.02.2018).

[7] Buying clothes and virtual try-on, URL: https://trymetail.com/ (accessed 12.02.2018).

[8] Passport of dimensional characteristics, URL: https://mport.com (accessed 12.02.2018).

[9] V.V. Getmantseva, E.G. Andreeva, "Generalized model of the process of parametrical designing of clothes", Proceedings of the Int. scientifictechn. Symposium, Modern problems of engineering sciences, Moscow: Kosygin StateUniversity of Russia, 2017, pp. 86-90.

[10]K. Shah, M. Pandey, S. Patki and R. Shankarmani, "A Virtual Trial Room using Pose Estimation and Holography," 2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 2020, pp. 685-691, Doi: 10.1109/ICICCS48265.2020.9120947.

[11]S. Sanzam, S. G. Das, Sifat-Ul-Alam, M. I. Jubair and M. F. Ahmed, "Image-to-Image Attire Transfer for Virtual Trial Room," 2020 23rd International Conference on Computer and Information Technology (ICCIT), DHAKA, Bangladesh, 2020, pp. 1-6, Doi: 10.1109/ICCIT51783.2020.9392671.

[12] Kamani, Shreya, Neel Vasa, Kriti Srivastava and Dwarkadas J. Sanghvi. "virtual trial room usingaugmented reality." (2014).