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# Enhancement in Shopping Experience of Clothes Using Augmented Reality

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***Abstract*: Augmented Reality (AR) could be a technology that produces a synthesis between a computer-generated information and physical world of a viewer whereas the establishing 3D type registration and real time interaction. Among the big selection of application of AR, it's use in advertising looking experiences has recently been embraced by advertisers thanks to its novelty and fascinating potential. One among the appliance of increased in Reality is virtual room. A first-rate concern in today's world commerce providing has glad customers through a spread of the business and technical solutions. On-line looking is already been standard these days, however there square measure still the problems within the on-line looking. One among the largest downside is that the purchasers don't get the virtual expertise of truly attempting that product. There square measure already several planned systems associated with virtual attempting space. One among the planned system is by exploitation Kinetic Sensors to form virtual mirror for the outlets. However, Kinetic sensors value around 20k that created it troublesome to implement in little scale industries. Another planned system was to form the models of the users in line with its weight and height and that we will just about add garments to those models. However, this can be conjointly not a possible thanks to do therefore. Therefore, we've got planned a system that may place garments on the user's body for a far better and real expertise.**

***Keywords*: Augmented Reality, Online Shopping, Virtual Clothing, Kinetic Sensors.**

## 1. Introduction

One of the foremost time consuming tasks today is that the task of trying clothes in stores. Previously, people accustomed spend lots of your time while shopping. One couldn't see if the garments would fit without trying out the new ones, and should wait during a long queue outside the fitting rooms. Usually standing in long queue and time required don't seem to be acceptable, for instance when standing ahead of full fitting rooms isn't acceptable. Additionally, time is lost while changing clothes many time. Reducing now and helping people to place on an outsized collection of clothes in reduced time was a relevant motivation for the proposed system. the quantity of garments the buyers return might also be reduced to some extent. because of a more precise representation, 2D images of the material that they're willing to shop for using virtual room has been introduced during this project. It offers an answer for the mentioned aspects below. If an individual is standing ahead of camera, the person are able to select desired clothes. The garment which the user selects is then virtually superimposed over him/her with the image which is then recorded by the camera.

In general, this method is categorized under augmented reality (AR), where a real-time view of the fact is extended and additionally overlaid with additional information. Some of the technologies that will employed in virtual dressing are as follows[3]: Three-Dimensional Display that gives a visible display of a consumer considering their body size, Two-Dimensional Display which is that the application of the creator of the image where the patron as if seeing her wearing these clothes, body Scanners: recommend the suitable size supported the detection of the body, Tablets and Smart Phones: mobile applications, where consumers can interact digitally with the virtual product displayed, Internet Connectivity: virtual product which will be tested displayed online, and shared on social media, Cameras: recording video and taking pictures/photos when consumers try the merchandise, 3 Dimension Cameras: using face detection and mapping the same as the patron to be displayed on the glass virtual, Motion Detection Technology (like Kinect): to point out clothes who tried to follow the movement of consumers, Multi-touch Technology, Bluetooth Connectivity, Inventory Management and Synchronization Software, Robotic Mannequins: create images that have the scale and shape of a digital database room, and Cloud Database Technology [5].

Depth sensor Kinect makes customer possible to detect the movement of their body, then body tracking to the attached dress could move together with user movement. At the last, it's natural and realistic when displayed on the screen. the downside is that the dress usually displays in 2 dimensions, so it's just like the dress is attached only to the front of the body. Our system used 3D virtual dresses which wrapping round the consumer body. The smoothing enhancement for body movement we use 3D-rigid transformation: rotation, translation, and scaling on Madura batik 3D-model [6]. Another System proposed was creating models of the user and super imposing clothes on those models. Those models measurements i.e. we'd like to ask user his/her weight and height and reckoning on that, we've to make

the models of the user. Also we'd like to make 3D models of the garments so as to impose them on the user. So during this system, one in all the matter was that if user don't know their exact measurements, then it could cause problem in fitting of garments to it user. Also another problem with this proposed system was that user cannot still have the virtual experience of the garments he/she selected [7].

## 2. Literature Survey

*Real-time augmented reality shopping platform for studying consumer cognitive experiences*

This paper presents how Augmented Reality (AR) can play a vital role in shopping experiences. Along with the experiences of the consumer satisfaction, this paper also presents how real time augmented reality works. The purpose of this paper was to augment the consumer's experiences in real world by augmenting the clothes over the customer's body with the help of Augmented Reality technology [1].

*Enhanced in-store shopping experience through smart phone based mixed reality application*

This paper presents how Mixed Reality Applications can be made in real time in order to experience in-store shopping. Using Mixed Reality can make the whole in-store shopping experience with a low cost, very easy to use and mobility is also provided. With this new technology emerging in the market, customers can receive a unique shopping experience during their stay in store [2].

*Effect of the fitting room environment on older clothing shoppers*

This paper provides informative data about the age-related physical challenges and a randomized field experiment with 72 females aged 65+ was conducted using fitting room areas. This fitting room areas consist of two stores with different variety in levels of Universal Design features as well as services. This paper was fully based on ANCOVA: which is the fitting room accommodation. It implies on the importance of the fitting room area and it should never be underestimated by the people as it can be a necessity in the upcoming future and it can also lead to a great fitting environment [3].

*Dressing Rooms: Love it or Leave it*

This paper greatly implies on how dressing rooms are important in day to day life and this dressing room can be implemented using various technologies. One can use Kinetic sensors in order to implement this Dressing Mirror whereas one can make use of

Augmented Reality Toolkit in order to create Dressing Rooms. This paper has greatly emphasized on the importance of Dressing rooms and why they should be implemented on daily basis else it can affect on real time. So a paper on dressing rooms love it or leave it was published for getting some main information regarding the importance of Dressing room in day to day life of normal people [4].

*Effects of dressing room lighting direction on consumers*

This paper greatly emphasizes on how Dressing rooms are becoming a key to the retail experience. It often represents whether the consumer will purchase that cloth or not. Therefore, it's necessary for the retailers to understand this and check out whether it increases the sales or not. This paper contains the results of both: with Dressing room and without dressing room and whether sales are increased or not [5].

*The impact of virtual fitting room technology on consumer*

This paper shows the positive experience of using the dressing room in a retail store and considered it as a key part of the purchase decision process and a way to increase the profits. However, Poor atmosphere can have adversely bad effect on the shopping experience and it would result in lost of sales. Even though the importance of dressing room is increasing in the market, no proper studies have been done in this area and proper implementation could have lead to positive results [6].

*Technology digital fitting rooms the latest in retail word link*

This paper talks about the latest trends of Virtual Dressing Room in real world and different ways of implementing them so that it can earn profits and the sales goes on increasing day by day. It also contains many facts regarding the number of increasing sales per year and how dressing room affects the total economy of the world [7].

*Double difference motion detection and its application for madura batik virtual fitting room*

This paper emphasizes on the Madura Batik Virtual Fitting Room. It shows how Madura Batik Virtual Fitting Room has implemented their way of virtual dressing room. They have been using double difference algorithms motion detection. This virtual dressing room mainly consists of three stages i.e. motion detection, determining the region of interest of the detected motion and superimposing the virtual clothes over the region of interest. Motion Detection means detecting the surface of the body of hum being where the clothes are going to be placed and we must determine the region of interest and augment the cloth over the interested region.

In this build of Madura batik virtual fitting room, there is also an added feature of the Madura batik online stores: the consumer is able to see whether the clothes is fitted to them or not, and this paper consisting of virtual fitting room is written for the promotion of Madura batik broadly [8].

*Virtual fitting room android based mobile application using augmented reality for the madura batik clothes*

This paper focuses on android application development of virtual fitting room for the exoticism of Madura batik in this app, the user will need to enter the following aspect that is given below: his/her weight and height and depending on that, we haveto create the models of the user. Also we need to create 3D models of the clothes in order to impose them on the user. So in this system, one of the problem was that if user don't know their exact measurements, then it could cause problem in fitting of clothes to that user. Also another problem with this proposed system was that user cannot still have the virtual experience of the clothes he/she selected [9].

*Virtual Try-on using Kinect and HD camera:*

This paper presents a virtual try-on system - EON Interactive Mirror - that contains one Kinect sensor and one High - Definition (HD) Camera. With the help of kinetic sensors, it will first detect the human body and will sense the whole environment it is currently working on. An another device is HD camera for clicking the pictures of the customers and the kinetic sensor will sense the body of the customers. Using kinetic Sensors may give accurate results as it would cost around 20k for buying it and this would lead to high cost implementation of project just because of kinetic sensor and HD camera [10].

*Measuring user experience in digital gaming: theoretical and methodological issues*

This paper tries to understand the methodological issues of user experience in wearing the clothes using an android app. It tries to understand the user experience in different technologies such as computer games, augmented reality and virtual environments which are reliable and valid concepts are needed for measuring relevant user reactions and their experiences. Here in this paper, they presented the approach of creating the both theoretically and methodologically sound methods for quantification of the rich user experience in different digital environments The main aim of their approach was to grasp the complex and multivariate nature of the experience and make it measurable so that it can be implemented [11].

*Mobile collaborative mixed reality for supporting scientific inquiry and visualization of earth science data*

This paper focuses on how to apply the emerging virtual and mixed reality techniques to visual exploration and visualization of data. With the help of this paper, a novel system has been developed in order to facilitate a collaborative mixed reality visualization, enabling both in- site and off-site users to simultaneously interact with each other and visualize the scientific data. It has also implemented the prototype system as per stated in the paper. And have reported out the current prototype effort along with their preliminary results [12].

*Piloting mobile mixed reality simulation in paramedic distance education*

This paper presents emphasizes from the implementation and testing of a mobile mixed reality invention in a science classroom. The context of this mobile simulation study was skills acquisition in airways management which was focusing on direct laryngoscopy with foreign body removal. The intervention aims to assist this distance education learner in practicing skills prior in order to create mixed Reality app. Also their attending mandatory residential schools helps them building a baseline equality between those students that study face to face and those at a far distance from them [13].

*Hybrid indoor and outdoor tracking for mobile 3d mixed reality*

This paper describes about a new hybrid tracking system that integrates outdoor augmented reality trackers with a low cost indoor tracker based on the use of fiducial markers. Integrating both the outdoor augmented reality trackers with the indoor tracker is the main job. They have used multiple cameras that separates the orientation sensing, and scene graph integration in order to make an improvement on the similar previous systems. So 3D Mixed Reality app has been developed to gain more profits [14].

*Mixed reality simulation for mobile robots*

This paper focuses on the mobile robots that have been increasing with the help of mixed reality by providing simulations. Mobile robots are increasingly entering the real and complex world of humans in ways that can real make this world a place like master slave combination where robots would play as a master and we humans would be slave for them. There is a need for robot developers to have a more flexible approach for conducting experiments and to obtain a better understanding of how robots perceive the world. Mixed Reality (MR) presents a world where real and virtual elements co- exist. By merging the real and the virtual in the creation of an MR simulation environment, more [15].

## 3. Terminology

All the previous proposed systems had some of its drawbacks which were listed above. So we are going to implement this virtual dressing room using another approach which will help us to remove the above disadvantages of other systems. In our System, we are going to use opencv and haar's classifier algorithm in order to detect the upper body and lower body of the user in order to augment the clothes over the user. Along with that, for augmenting the clothes over users body, we have to use unity and vuforia sdk to implement it. Unity is android development application which is mainly used in developing games as well as augmented reality applications. Vuforia is the SDK for storing images of the clothes and acts as the database and can be integrated with unity.

### *A. Haar's Classifier Algorithm using OpenCV*

Object Detection using Haar feature-based cascade classifiers is a good object detection method. Its basically a Machine Learning algorithm where we need to create our own cascade classifier for better results.

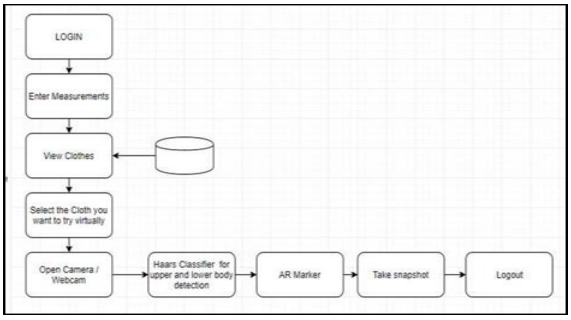


Fig. 1. Flowchart of proposed system

Here, we need to extract features from it. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier.

Then we need to extract features from it. They are just like our convolutional kernel. Each feature is a single value obtained by subtracting sum of pixels under the white rectangle from sum of pixels under the black rectangle.

Face detection algorithm is used for checking whether the given input image contains any human face or not, and if face is present, it returns the position of face in image. Face is an important thing for identifying presence of people. Here we are using face detection algorithm using haar classifier. Object detection for haar classifier is done by haar like feature. These features use the change in value of contrast between the adjacent rectangles. OpenCV has a trainer as well as detector. This OpenCV can be trained using classifier for any object like car, rackets, etc. here we have to deal with face detection. OpenCV already contains the pre-trained classifier like eye, face. These trained classifiers are stored in an XML file and these XML files are stored in a desired path. Initially we need to load XML classifier in our system. The image of the user captured by the camera is loaded. Then we find the face. If face is detected, then it returns position of detected face as rect(x,y,w,h). However, we don't want to detect face in our case. What we have to detect is upper and lower body detection using two xml files i.e. upper body detection and lower body detection with which we can detect both the upper body as well as lower body in order to augment clothes over the user. It will detect using haar's classifier algorithm and will give us the output of the detected surface over the user.

### *B. Vuforia sdk with unity integration*

Vuforia Engine is a software platform for creating various Augmented Reality apps. Developers can easily add advanced computer vision functionality to any application, allowing it to recognize images and objects, and interact with spaces in the real world. The Vuforia Engine platform supports AR app development for Android, iOS, and UWP devices.

Vuforia is a cross-platform Augmented Reality (AR) and Mixed Reality (MR) application development platform, with robust tracking and performance on a variety of hardware (including mobile devices and mixed reality Head Mounted Displays (HMD) such as the Microsoft HoloLens). Unity's integration of Vuforia allows you to create vision apps and games for Android and iOS using a drag-and-drop authoring workflow. A Vuforia AR+VR samples package is available on the Unity Asset Store, with several useful examples demonstrating the most important features of the platform. Vuforia supports many third-party devices (such as AR/MR glasses), and VR devices with back- facing cameras such as the Gear VR.

## 4. Experimental results

With the help of Haar's Classifier, we have done implementation of upper body and lower body detection. We have provided two results i.e. with the Pre-defined classifier as well as the one with our trained classifier. After testing with the pre-defined classifiers, the results weren't that much accurate. So we decided to train our own made classifier by providing a large number of positive as well as negative images and training it with the help of Classifier. In positive images, we provided a bunch of images of upper body whereas in negative images, we provided a bunch of images of surroundings. Given below are the results of both the classifiers.


(a) (b)

Fig. 2. (a) Pre-Defined Classifier, (b) Trained Classifier

## 5. Conclusion

The problem and motivation of this proposed system is that most of the existing online shopping system are unable to provide trial of the product, our proposed system provides a virtual dressing room where customers can actually try on the items virtually and select the best fit for them, also they can share the item with others and take reviews. The application allows the user to login and asks for his measurements, accordingly it will show the items available in his size. The user can select desirable product and virtually try it and share amongst other users. This will help to make the shopping experience more realistic, fun loving, interactive and user-friendly.

We can say that for implementing the real time virtual dressing room with different technologies, frameworks and algorithms are used. We conclude that this is very time saving activity since the user is provided the same experience of window shopping while sitting at his home. It does not require more efforts and virtual machine is used by any non-technical person. It does not require much technical knowledge. So it is an optimal addition for cloth store. Overall, the presented virtual dressing room seems to be good solution for quick and accurate try on of cloths virtually.

## 6. Future Scope

Online websites regarding clothes that are mature in outsourcing have an increased focus on augmenting the clothes over the user as it may increase their profits since this isn't implemented by any other company. Simply the user will select the clothes he/she desires to wear and that clothes will be augmented over that person. Additionally, in future, we can also add other products such as Shoes, glasses, jewellery and other accessories too. Augmenting shoes over the customer's feet will

help him in deciding the perfect size for him. The application can be made more secured by using different latest technologies such as blockchain mainly for transactions. Reviews and Feedbacks can also be further added by the customers.

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