

Jewellery Tryon using AR

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Abstract:-

As the world becomes more digital, so Now-a-days individual prefer online shopping rather than going to shop and buying it. When the pandemic had struck, people were more likely to shop online since it reduces their exposure to the outside world. Hence in case of jewellery shopping online from website is challenging because as we don't have a proper idea about exact finite design of jewels as it displays the 2D view. Jewellery are the important part of the Indian culture. Hand jewellery specially plays very vital role in day to day lifestyle for women's. Therefore, to resolve this issue we have proposed our system, "Jewellery Try on Using AR," which will provide customers an idea of how that jewellery will look on them. Our system focuses on enhancing user experience by providing hand jewellery Tryon. This system uses Augmented Reality and Python Media Pipe to recognize the user's hand and augment jewellery on the detected hand in real time.

Keywords: Augmentation, hand detection, unity, mediapipe, jewellery, AR, landmarks, Tryon.

1. Introduction

In recent years, hand recognition systems have progressed at a quicker rate. In the Covid era, online purchasing had become a new requirement for people. People were forced to switch from offline to internet shopping. Purchasing something online provides you with a wide range of options. When it comes to internet shopping, jewellery shopping is a delicate subject for the customer. Jewellery e-stores have had a hard time attracting online customers. Jewellery is something that people enjoy to wear and gaze at from all angles to get a good feel for its shape

and design. Things you can find on the internet may have shape and design, but only in a 2D aspect.

This can only be resolved if the individuals themselves try on the items. Augmented Reality offers users to interact with their surroundings in real-time. Virtual Tryon's challenges can be mitigated by combining Augmented Reality with an existing 2D design model. People prefer to sample items before they buy them, thus try-on jewellery is the ideal option before the online shopping. Only jewellery of hand offers a wide range of options. Online jewellery purchasing falls short of providing customers with a 360-degree view of the jewellery and the opportunity to try things on in a real-world setting. The user

has a one-on-one experience with the jewellery when they try on items. Because the user is displeased with 2D visuals, personal trying on the things plays a vital role in enhancing the user's experience. Tryon choices attempts to replicate the experience of really wearing the jewellery through online means. Things can be tried at any time and from any location by means of the virtual try-on. By this user would have the same feel as if they were shopping in a store, by virtually trying out the things?

Rest of the paper is organized as follows, Section I contains the introduction of the system in detail, Section II contains the literature survey, Section III contains the proposed system, Section IV contains the results and discussion, section V contains the conclusion of the system, Section VI describes the future scope of the system, Section VII contain the references.

2. Related Work

The paper presented by Hu Peng, proposed a system where unity 3D and Augmented reality is used to develop an interactive system to detect face. This system is being made for android platform. After the detection of face is done using Open cv, the face mask which is developed in augmented reality design is superimposed on the detected face. The user needs to first install the application on the android phone. By touching on the screen, the users can interact with 3D face. [1]

In the paper presented by San Gunes, Okan Sanli and Ovgu Ozturk Ergun proposed a system that augments the wrist's watches by detecting the skeletal joints of hands using sensors. They used Kinect SDK that provides position of tracked skeleton joints in 3D, from which the wrist position of one arm is acquired. Then the selected 3D image of the watch is displayed on the wrist at calculated orientation angle. Depth camera space is used to color camera spacex and we calculate width of wrist from depth edge and resize the 3D watch model accordingly. [2]

In the paper presented by Kavyashree Yadav, builds virtual ornamental room which runs on personal computer. It virtually displays ornaments on buyer's image that is taken from user's database. It identifies the size of neck that fit the ornaments available in image database. The mid width of the ornamental image and image in database to plot the ornaments on the buyer's neck properly by centralizing the

mid width of the ornamental image and shopper image. The mid width of image is obtained by converting image into matrix and after that finding the midpoint at each row and then aggregating it. Augmented reality is used for the superimposing of the ornaments on the image. [3]

In the paper presented by Zhen Xiong, Lin Zhi and Jie Jiang, proposed system that describes the jewellery model and sets material by using three-dimensional modelling software. It captures the image in real time with the marker. To combine the virtual image with the image captured of the user it needs to make the black square whose middle part is the white square to determine the direction of marker. AR Toolkit is used to locate the video detection method relying on Open 3D virtual graphics rendering to the video stream. It includes the camera, set of tools and templates to create positioning mark. When the position of the user is changed, the message of the 3d virtual object change corresponded, and the virtual message and true environment fuse together perfectly. [4]

In the paper presented by Gaurav Salunke, Himanshu More, Rigved Shete and Prakash Kawade, proposed a system where augmented reality is getting used so that the virtual objects get superimposed on the real time detected objects. Here HAAR cascade algorithm is being used for the detecting of the face in real time. The model of virtual object is being created by measuring the shape and the reflectance of real object by using the RGB-d Camera. It captures the very depth and detailed image from the different viewpoint so that it can create 3D shape of the target object. After the detection is been completed, it marks the hot points so that it can be calculated then the virtual ornaments are being placed on the corresponding points. [5]

In the paper presented by G. Rajaram and B. Anandavenkatesan, proposed a system that is targeting both personal computer and the beagle bone board. This system is user friendly and its getting implemented using three stage algorithm where first the detection of the parts takes place with the help of HAAR cascade, rectangular boxes are getting displayed around the detected parts and then the sizing will be done, second detection of the reference point of the face detection takes place and then the augmented reality markers are being used to display or superimpose the cloths and the ornaments on detected parts. To detect the marker and then obtain the reference to superimpose the image of the seven stages used in the system. [6]

In the paper presented by Lingyan Jiang, Jian Yao, Baopu Li, Fei Fanf, Qi Zhang and Max Q.H Meng, proposed a system that constructs 3D human model and also the recognizing human action. In this systematic approach of the recognition that is used to detect feature point automatically in front and side image. Silhouette detection is using to represent contour curves with Freeman's 8-connected chain codes. In which 101 feature point are there in total are also get extracted which also includes 27 points which corresponding to definition of the landmark about the garment measurements. [7]

In the paper presented by Ioannis Pachoulakis and Kostas Kapetanakis, proposed a system that uses the multiple sensor like body scanners combined with the new algorithm. It uses the depth scanning techniques, virtual fitting rooms can be created accreting 3D models of shoppers and the digital catalogues, filter out the non-fitting items and then allow the customer access for the styling and matching aspects in the real time. There is also a feature to send the photos or videos for quick feedback. It uses Kinect, Asus Xtion pro live sensors for RGB and Depth. [8]

In the paper presented by Teddy Mantoro and Suhendi, proposed a system where the face recognition is considered as successful biometric methods among all the including fingerprints with the iris recognition and many more. For the detection of face HAAR cascade and Eigen face methods are getting used in the proposed system. It is getting used as it can detect the multiple face (55 faces) in a single detection process. With the help of this method of the detection process can be done during day time as well as the night time. This detection is for the straight faces that are frontal and can detect the faces from a minimum distance of more than the 200 cm using the webcams [9].

In the paper presented by Young Jae Lee and Dae Ho Lee, proposed a system of motion-based game production with new approach of detecting face and along with the hand. In this, the camera will be using for capturing the image using camera and tracking the movement. The detecting algorithm detects different parts such as the skin, face and hand and then further collision action algorithm is used. Then the image is being processed to the DC notch filter and labelling. The square boxes are shown to show the collision of the virtual object to it [10].

In the paper presented by Aras Dargazany and Mircea Nicolescu, proposed a system for tracking the human body part which is being done based on the torso tracking. This focusses on the main parts which includes such as torso, head and the hands. Connected components are used to improve the detected silhouette to detect the body parts with respect to the torso location and the size. Blob tracking the module which is composed of foreground detection. After that the for other parts gaussian blob modelling is used. This is applied to online body parts tracking as close real time application [11].

3. Methodology (Methods and Materials)

In the Jewellery Try on app, the user initially enters the app's user interface, which includes a button that says "Select hand jewellery with some recommendations to improve user experience." Then we move on to the Jewellery dataset phase, where the user selects the hand's jewellery based on their preferences, and the device camera is getting turned on. After the camera has been properly opened and the hand detection process has been proceeded, the Mediapipe dependencies will be getting loaded. It captures 21 hand landmarks and then encodes the detected points using mediapipe encoding algorithms. The selected jewellery will now be augmented on detected hand using encoded key points. The detailed system design is represented in Figure 1.

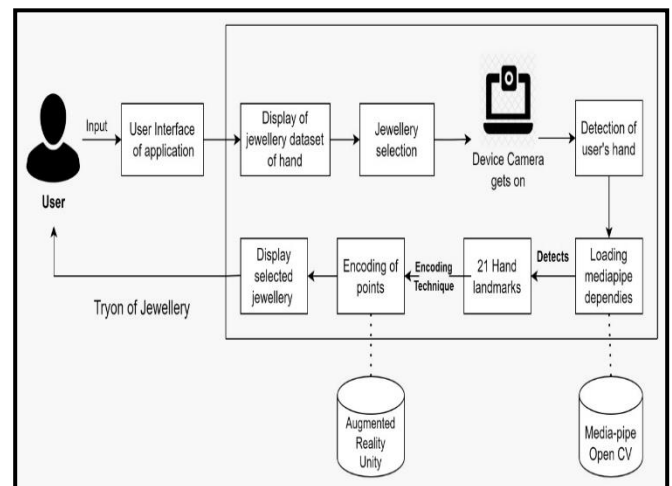


Figure1. System Architecture



Figure 2: Encoding the hand points

Following are the modules of the system:

a) Jewellery Selection

The user will be presented with the GUI page at first. The user will find a few suggestions for improving their try-on experience here. Along with the option to click for try-on jewellery. The user will be directed to the jewellery selection page after clicking the try-on button. The main categories of hand jewellery are shown here. Rings, bracelets, bangles, and ring bracelets are the options. When the jewellery category is chosen, the device's camera is activated.

b) Detection Process

The user must display their hands in front of the camera after it has been activated. The user's hand will get detected. User has to display the hand on which they wish the experience the jewellery try-on. From the exhibited hand, 21 landmarks will be extracted.

c) Connection Process

The connection between mediapipe open cv and unity AR is done using mediapipe plugins. Along with opencv and unity, other significant components required during the connecting process are Bazel, Nuget, and Python. AR Foundation is used in unity for the augmentation field and mediapipe in opencv for the detection process. The connection link is required to enable a seamless passage from hand detection to jewellery augmentation on the detected hand points.

d) Encoding the detected points

After the detection of hand and the 21 hand landmarks. Next step is to encode the particular key points for ring, bracelet, bangles and ring bracelet. So the

augmentation of the jewellery could be on the perfect desired points. Like point '0' for the wrist which is used for bangles & bracelet. Point '14' for the ring. And many like wise points used for desired try-on options. For this take the use of Hand Tracking graph of mediapipe. Figure 2 shows the process from the display of hand to encoding of points of the user hand.

e) Augmentation of Jewellery

After the user has chosen the jewellery, the hand points are recognized and encoded. The canvas is used to create a 3D model of the jewellery. The encoded points are taken and worked on to ensure that the jewellery is perfectly positioned on those points. The AR Foundation assists with the augmentation of jewellery. The augmentation of jewellery looks to provide the user with the opportunity to virtually try on the jewellery.

4. Results and Discussion

This section depicts the "Jewellery Tryon using AR" screenshots below are from the system which we have built to enhance the user experience for virtual jewellery try-on.

The Dashboard's user interface is depicted in Figure 3, which provides a button for accessing the jewellery try-on as well as advice for improving the user experience while trying on the jewellery.



Figure 3: GUI of Dashboard

Figure 4. shows a page with the complete package of the vivid variety of hand jewellery selections which includes the bracelet, ring, bangle, and the ring bracelet.



Figure 4: Jewellery Selection



Figure 5: Ring Tryon

Figure 5. Shows a real-time demonstration of the user trying on ring jewellery on the ring finger.



Figure 6: Bangle Tryon

Figure 6 demonstrates the bangle jewellery try-on on the wrist of the user in real time state.



Figure 7: Bracelet Tryon

Figure 7 demonstrates the bracelet jewellery try-on on the wrist of the user in real time state.

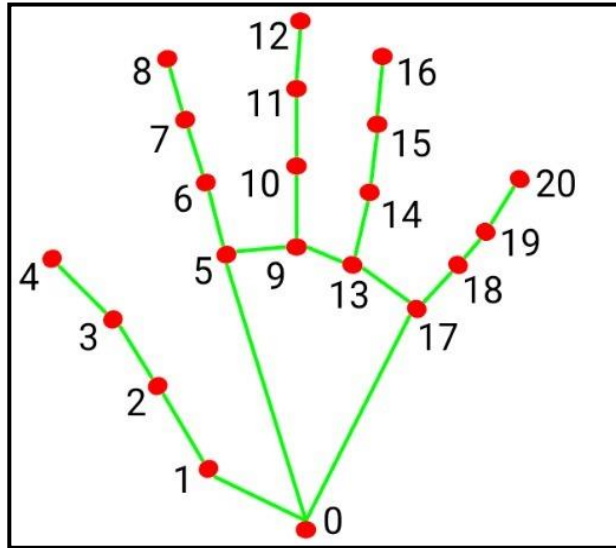


Figure 8. 21 Landmarks of the hand

Figure 8. Shows the land marking done by mediapipe, 21 hand landmarks model in order to extract the hand features of an individual.

The results of our system's qualitative analysis are presented in the table below, based on numerous parameters.

In our system, we have an easy-to-use UI also it's the cost effective system. Then the detection process takes place in real time mode only as it starts with encoding of points by 21 hand landmarks. Thus 21 hand landmarks further initiates the process of Augmentation in which display of jewellery takes place. Our system allows users to do try-on's with just a few mouse clicks. with accuracy rate nearly to 100% perfection.

Table 1: Parameters with its description

Parameters	Description
Cost	Cost Efficient
Usability	Easy to Use
Detection	Real time
Encoding Points	21 Hand Landmarks

Augmentation	Display of Jewellery
Datasets	Hand Jewellery images
User Work	Less
Accuracy	95.7%

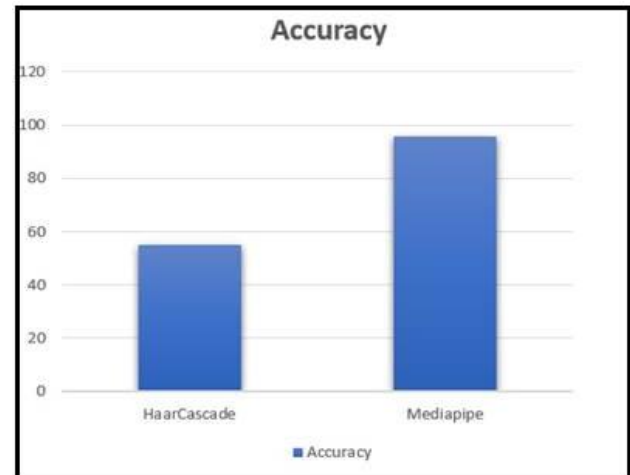


Figure 9. Represents the comparative analysis between HaarCascade and Mediapipe. The haarcascade registers an accuracy of 52% whereas the mediapipe returns 95% which is considerably higher.

5. Conclusion and Future Scope

Every individual who wears even a single piece of jewellery can use this approach of jewelley try-on. It provides user's to try the Jewellery on themselves to get the experience of virtual try on. With proper Augmentation and analysis of shape and designs of Jewellery.

6. Future Scope

Face jewellery has a lot of variety. Like necklace, ear rings, nose pin, mang tikka. These jewellery are day to day usage for women's. So try-on things are necessary before buying it.





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