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VIRTUAL TRIAL OF FASHION ACCESSORIES USING AUGMENTED REALITY AND FACE DETECTION

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ABSTRACT: In-store shopping experience is still the first thing that springs to mind for a majority of people when they think of shopping. The project Virtual Mirror can change the way a person tries out accessories and shop for the right one. Using the concept of "Virtual Reality" and "Augmented Reality", the customers can try out a large variety of jewels without the need of physically wearing them. The concept of a Virtual Trial mirror, has been implemented by various research groups using different approaches. In this paper a model is generated using Augmented Reality. An AR system supplements the real world with virtual objects that appear to coexist in the same space as the real world entity. In Augmented Reality implementation generally, the media used is a video camera and a marker and by determining the position detected form the marker. To achieve this first the customer is bombarded with recommendation based on their age to select accessory and we use HAAR algorithm which takes the responsibility to detect the face detection there by merging the accessory as the object will be managed corresponding to the user in real time. Each new customer coming in the camera field will trigger the computer to track the markers of person. Then person selects item from shopping list item will be directly placed on that particular part of face.
KEYWORDS: Virtual reality, Haar Cascade, Camshift, Virtual Mirror

I. INTRODUCTION

Shopping is a time-consuming activity for some people, while for others a much enjoyed one. Many approaches have been tried in the past to make it possible to simultaneously answer two shopper concerns: "does it suit" and "does it fit", therefore reducing much of the guesswork involved in shopping Stores generally have a large and varied options for clothes. Although customers can try out accessory in real time, this process is too time consuming whenever there are insufficient trial rooms. It is physically impossible for a customer to try out all those varieties without having to spend hours on it. Also, in a physical store, in order to try on some selected clothes a common practice is to queue up and take turns to use the fitting rooms. Prolonged waiting time will affect customer's patience and health, which leads to lower customer satisfaction.

II. LITERATURE SURVEY

Literature survey is the summary, description of what works are done in the past in this field of research. Itis basically the description about various methodologies used for the same work and what are their results. So as our project deals with face detection so the literature survey basically discusses all other possible methods deployed for face detection other than the one we are using. Thus the following literature survey discussion deals with various other methodologies existing for the face detection and finding the face points. Since the basic idea of our project is to detect face and allow users to try virtually the accessories so the methods to be discussed are also for the same.

Methodologies for face detection
The various methodologies used for detecting the face are discussed below:

I Landmark Detection
In this method the facial 2D landmarks of the face are detected from the input using face tracker. The different face landmarks are detected in this method like eye landmarks, nose landmarks, mouth landmarks which gives an idea about different features of the face.

These face features are used extract only the important features of the face.

II Morphable Face Detection

This technique is used for detecting a model which best fits the input obtained from the camera take as input. In this a technique a database is considered which contains the 3D face models of different persons. So this database acts as the testing data set for the input face obtained. Firstly the process of data acquisition is carried out where in the input face from web came or smart phone camera is considered. The landmarks of input face are detected to find the 2D and 3D face points. Using point cloud 3D landmarks are detected and with the help of RGB frame 2D landmarks are detected. Based on these landmarks detected a morphable face model is designed. Then a 2d morphable from from the set of 3D morphable data set is chosen to find an exact fit or match. The most approximated face model is choosen then this model is trained and optimized to match the 3D face morphable model of the person found so that the real objects (i.e accessories) best fits or suits the person. The drawback in this process is that the optimization process of the 3D morphable face model is not accurate enough and hence doesn't give the best results.

Finding faces via motion(FVM) Blink detection technique is used here. This method is said to be finding face via motion of any part (such as blinking of eyes) of the face which gives

carried results. Blinkingisan involuntary task. Blinking provides a non periodic time and space signal which is unique to every other person. So two faces of the person are detected one when the eyes are not blinked and the other when the eyes are blinked. Two models are formed based on these motions and then from these models the face is detected since the blinking is unique to every person and hence the face can be detected. The model designed is called "the model of face shape and motion". FVM is time consuming and not reliable.

IV Camshift Algorithm (CS Algorithm)
This algorithm is used to track objects in video. It allows tracking the object using a histogram of pixel values. It is used to detect the face as well as the facial features so that the face can be tracked. Firstly a target is considered and an initial histogram for the same is generated. Then the portion to be searched initially is identified. From this region, the most populated pixilated region is identified along with the center position of the entire searched region. The center of the searched region is moved to the center of the entire region and a new search window is established. The process is repeated for all sub windows and the face is henceforth detected. This process of using CS is very expensive and not that effective in performance.

V Object detection using AdaBoost
AdaBoost is shorthand for Adaptive Boosting. In this method the objects are detected using boosted cascade of simple features. In this method, a series of classifiers are applied to every sub window to check for the face. If the classifier classifies that particular part of the face to the sub window then the process is continued and the classifiers are further applied. Hence the name cascade classifier is given as the classifiers are applied one after the other. Suppose if a classifier fails to classify a particular sub window then the process is stopped and it is started again from the beginning discarding all the correctly classified sub windows.

VI Face detection based on OpenCv
OpenCv in an in built library in python used for face detection. The main objective of the library is to detect the important features of the face and to track these features to obtain the face further. In this the face embeddings are extracted from the face of the person using some deep learning techniques. Then these features are used to train a face recognition model. This model acts test data using which the face is to be detected. This model is then used to recognize faces from both images and video streams.

III. IMPLEMENTATION

STEP 1 : RECOMMENDATION ENGINE SET UP
Cloud Object Storage instance is created which is used to store data. A bucket is created inside the cloud object storage instance which holds the images of the jewellery.

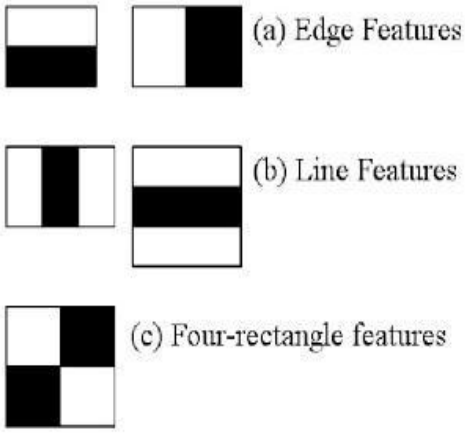
DB2 instance is created. A table by name "PRODUCTS" is created inside the user schema in DB2 which stores the details of all the products which are stored in the bucket. K-Means is used to recommend the products based on the age given as input by the user. Finally, K-Means is deployed on the recommending- engine app as a python application on the cloud.

STEP 2 : VIRTUAL MIRROR SETUP
Face API to detect face: Face API uses "Triangle Algorithm" to detect the face. Triangle comprises 2 eyes and tip of the nose. Eyes and nose are identified using the Haar cascades.

Face API :
Input : Live Video Stream
Output : Facial Markers

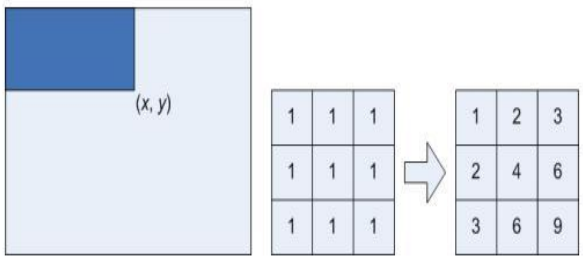
Tiny Face Detector(Face API Model) is smaller and less resource consuming compared to the SSD Mobilenet V1 face detector. It performs slightly less well on detecting small faces, but this model is extremely mobile and web friendly. Hence, this model is used in this implementation.

HAAR CASCADES



▲ = avg(dark) - avg(white)

ideal ▲ = 1



Integral image generation
The shaded region represents the sum of the pixels up to position (x, y) of the image. Integral image representation reduces the time complexity of calculating the delta (▲) value. Hence improves the performance of the system

STEP 3 : MOBILE FOUNDATION
Images Fetch adapter is deployed which has links of

- Bucket
- Recommendation Engine API
- Virtual Mirror API

STEP 4 : APP DEVELOPMENT

Ionic Framework is used to develop the application. The main advantage of using Ionic is that it is a hybrid framework; hence the application can be deployed on Android, IoS and Windows phones. Ionic uses HTML, CSS and TS. Finally the application is registered to the Mobile Foundation.

IV. RESULTS

Virtual Trial of fashion accessories using Augmented Reality enables the user to try on the accessory of their choice virtually without physically trying them on. The user is required to enter the name and age. The recommendations of the accessories will be based on the age that the user enters. The recommendation screen will display all the recommendations according to the age of the user from which the user can select the accessory of their choice for which there are two options available, either it can be added to the cart or the user can choose to try it on virtually. If the user chooses to try it on virtually, then the virtual mirror comes into play where the live video stream will start and the user's face will be detected in front of the camera. The user's face should be clearly visible in the camera for the app to detect the features of the face which is very much required to place the choice of accessory accordingly. The user can view how the accessory looks on them and even take a screenshot to share it with friends and family for a second opinion. Virtual trial of accessories is a less time consuming process and also does not incur any hygiene threats due to the uncertainty of infections the previous customer had.

V. CONCLUSION

This paper presented a study on Virtual trial of fashion accessories using Augmented Reality which can be implemented in shops to forego any space or hygiene related constraints. The recommendations generated according to the age are based on K-means algorithm. The virtual mirror is showing faultless results which can be further developed to give a more accurate approach. Presently the addition and removal of the accessories in the database is done manually.

For further study, the system can be deployed to add and delete accessories automatically according to the shopkeeper's needs and convenience. This can also be developed into a full-fledged e-commerce website by developing the checkout screen accordingly. The system can either be developed into an e-commerce website or can be linked to local shops and given to the shopkeepers to keep the system in their shops for virtual trial at their own shops which will also be beneficial in a way since shopkeepers are handling the accessories first hand according to what they can provide to their customers and also customers can walk in shops and try and buy the accessories without physically trying them to eliminate any threat of infection. Second opinions are also welcome just at the speed of a click which is also a good factor to eliminate any doubtful shopping. Along with all this, it also reduces the time consumed in shopping since a large number of accessories can be tried in a short period of time.

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