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Virtual Object Representation using Augmented Reality

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Abstract:- **Construction of virtual 3D object and implementing the concept in a jewellery shop application in which a virtual object is represented in reality using augmented reality. Using augmented reality, the object could be superimposed virtually at real time. The existing system has drawback that the user has to manage himself/herself according to the object, the position of the object is fixed into the provided environment. By using HAAR algorithm to set the markers on the human face, as the object will be managed corresponding to the user in real time. The reconstruction of 3D object is done using ICP algorithm.**

Keywords: Virtual Reality, Augmented Reality, HAAR, ICP, jewellery shop application.

I. INTRODUCTION

Augmented reality is a technology that composites virtual object into real world. The jewellery shop application is the Augmented reality-based application in which user can wear the jewellery ornaments in real time.

The ornaments in the jewellery shops are precious, so it is necessary to take the extreme care of them. While shopping the customer handles the ornaments, because of which there might be possibility of ornaments getting dirty and if they are not handle carefully might also be chances of breaking down. For the solution and safety, the Augmented Reality proposes a solution as Augmented trial room. Augmented trial room is a digital interactive platform that helps the Shoppers try out glasses and jewelleries quickly. Here in this system the ICP algorithm is used for the 3D projection of the object for the inspection of the user before trial. The augmented reality program takes the image of the customer and chooses the desired accessory in front of screen which allows the customer to see how they look in it. HAAR algorithm is used to detect the face of the customer and set the markers. Thus, the system will take the decision of fashion accessories for the face that a person can try and watch in front of a mirror although they do not exist in reality. This is achieved by using webcam.

System starts detecting and tracking the movements of the user. When the user selects a particular item to from application, that particular item automatically sticks onto that relevant face part and hence the user can change (try out) various ornaments and decide whether that particular item suits him/her or not by them experience like manual shopping. The system mainly consists of a single camera and a display showing the output of the virtual mirror.

A. RELATED WORK

The augmented reality systems use the perceptual and geometric techniques for 3D positioning the objects [4]. These techniques use the Holo lenses to avoid the position errors. Although the geometric technique is more efficient than perceptual, the movement of objects is not possible.

The object creation in virtual environment is a crucial part in the AR, for this the object reconstruction method is used for reproducing the material appearance of object [1] with inclusion of ICP algorithm. The system captures depth and colour images of object using RGBD camera. The reflectance of object is obtained by estimating the parameters of a reflectance model from the reconstructed shape and colour images.

The errors of the occlusion problem i.e. the difficulty in producing the virtual image of hollow or semi-transparent objects are addressed in [5]. These problems can be overcome by using the Vuforia environment.

Scene reconstruction has already been utilized for remote collaboration. However, the resolution of the resulting models was often too low. Thus, the range of potential applications was limited. World stabilized annotations such as drawings and placemarks could only be used for simple instructions and view point of the user could vary only within a limited-range [2].

The study showed that in an interactive augmented reality setting, buyer's feelings of possession control and autotelic requirement for touch saliently impacted the relationship between striking recollection. The consequences of this review can help online merchants in utilizing enlarged reality intuitive innovation for building up purchaser influence model [3].

- In many previous works the human has to adjust himself such that he fits into the given image displayed in screen. This makes uncomfortable for user; the size of the humans may exceed the given frame on the screen.
- Hollow semi-transparent objects can't be constructed and presented in the AR environment properly.

II. PROPOSED SYSTEM

Our system provides a digital interactive platform to increase the security and reduce the chance of damage to the expensive ornaments. Moreover the past similar methodologies suffered with the occlusion/semi-transparent objects problems [2]. Such problems are overcome by the reconstruction of objects using the integrated closest point (ICP) algorithm.

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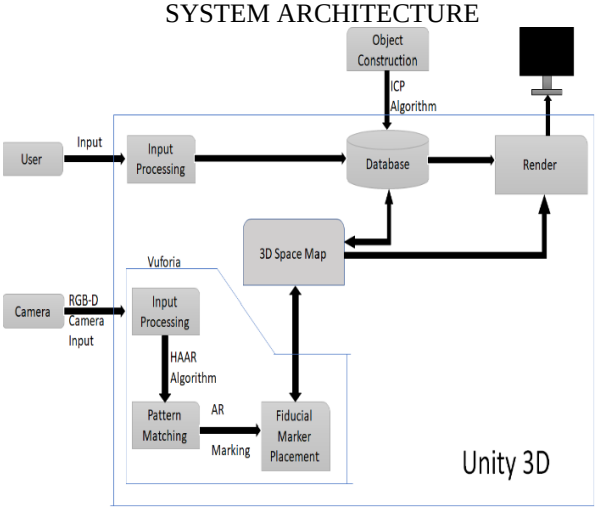
The model of virtual object is generated from the shape and reflectance of real object, which are measured using a simple apparatus consisting of an RGB-D camera [1]. The 3D shape of the target object is reconstructed by integrating the depth images captured from different viewpoints using RGB-D camera. Using the ICP algorithm the point clouds are aligned with high accuracy and estimate the object motion.

The system calculates the correspondence between each vertex of reconstructed 3D model and coloured pixels in all frames by projecting the vertices of all camera viewpoints, it is determined which pixel in each colour image the vertex corresponds to. Hence by picking corresponding pixel values, intensity change at the vertex overall frame is obtained.

Also in the previous the user had to adjust himself according to the frames to fit into the given images displayed on screen. This problem can be dealt by using the HAAR algorithm. This algorithm uses the AR markers for determination of the position of the virtual object on the screen.

The HAAR algorithm is the face detection algorithm. It marks the hot points on the real image, this point can be then calculated and the virtual object is placed on the screen on corresponding points.

SYSTEM ARCHITECTURE



III. ALGORITHMS

(A)ICP ALORITHM

Step 1: For each point in the source point cloud, match the closest point in the reference point cloud.

Step 2: Estimate the combination of rotation and translation using a root mean square point to point distance metric minimization technique which will best align each source point to its match found in the previous step. This step may also involve weighting points and rejecting outliers prior to alignment.

Step 3: Transform the source points using the obtain transformation.

Step 4: Iterate (re-associate the points, and so on).

(B)HAAR ALGORITHM

Step1: Pick a pixel location from the image.

Step 2: Now crop a sub-image with the selected pixel as the centre from the source image with the same size as the convolution kernel.

Step 3: Calculate element wise product between the values of the kernel and the sub image.

Step 4: Add the result of the product.

Step 5: put the resultant value into the new image at the same place where you picked up the pixel location.

IV. CONCLUSION

This system is developed in Augmented Reality could be used for enhancing security. Hence, using the application user can wear the ornaments virtually. In this system objects will adjust corresponding to the position of the user, and the resolution of the virtual object is also high, thus proposed system could be more reliable. In the application user can view the ornaments in 3D. The application is useful in jewellery shops to avoid the risk of theft.

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