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ONLINE PRODUCT DISPLAY SYSTEM BASED ON AUGMENTED REALITY

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Abstract-Todaye-commerce is very popular, more and more products are sold through the online shopping. But the current online shopping websites are still using the traditional 2-Dimension animation, pictures and text information to display their products which can't satisfy the customer's needs to fully understand the product. Based on the analysis of display technologies of e-commerce systems, this paper includes virtual product display technology based on augmented reality.It can strengthen traditional display, enhance the customers' shopping experience and increase customers' desire to buy things and finally brings good benefit to businesses.
Keywords –Augmented Reality; Virtual Reality;

I.INTRODUCTION

In recent years the new display technology such as virtual reality, augmented reality technology are developing rapidly and widely used. In e-commerce, virtual reality can provide a virtual product of 3Dimension models which can do only zoom-in and zoom-out but Augmented Reality can give a shopping experience which is closer to customers. It can combine virtual object with real world objects, this can not only solve the traditional ways by fully displaying an online goods' general view and characteristic but can also fill the gap between the customer and seller by using augmented reality which make the customer feels immersing. The advantage of this technology is even greater when the customer wants to try out the product, it can enable the customer to have an over-view as well as sense of trust and security[1].

II.EXPERIMENT AND RESULT

FRAMEWORK OF ONLINE PRODUCT DISPLAY SYSTEM BASED ON AUGMENTED REALITY

The current products sold online can almost cover all that in real life. Because different kinds of products have their different characteristics, this study takes the corresponding way to use augmented reality technology to display the product. Products can be divided into three. The first kind of products called the marker less (hereinafter referred to as ML class), the second is called the marker less special (hereinafter referred to as the MLS class), the third kind is called the mark (hereinafter referred to as M class).

The framework is divided into four layers: the access layer, interface layer, service function layer and system support layer [2].

- **Access layer:** It is mainly for providing humancomputer interface for customers who browse the web through computers or portable mobile devices
- **Interface layer:** Interface layer includes an access interface of the entire system. Interface layer's main function is to set up a logical separation between the external system and the internal functions system to which portable mobile devices access and establishes the logic isolation belt.

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- **Service function layer:** This layer is the core layer of the system, including the system database, 3D model database and the implementation modules of each interface's function, such as the default module: Augmented Reality module, model module, and interactive module.
- **System support layer:** It includes basic network and its system and platform for data exchange, providing a basis for the operation of service function layer's system

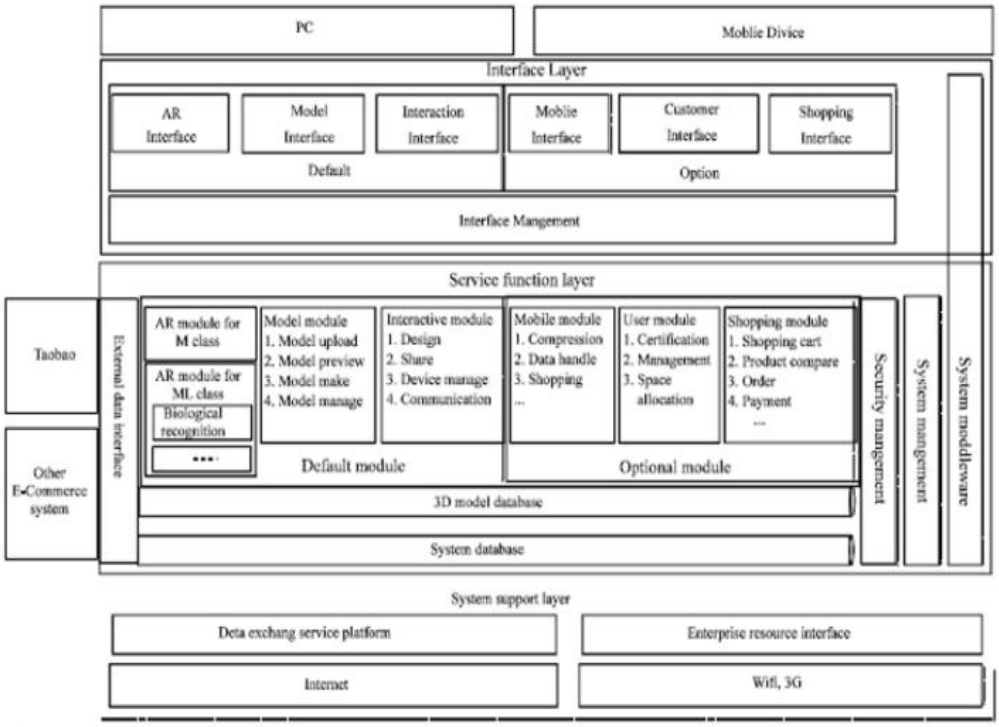

Fig. 1: Online product display system based on augmented reality

Module introduction

Model module: This module mainly controls the 3D model, including the upload, preview and relevance. The current system supported 3D models are dependent on external 3D library, supports the common formats of 3D model such as .3ds, .dae, .ase, .kmz, etc. The making of models mainly depends on external modeling software, such as 3dsMax, SketchUp, etc. Model interaction is the relationship between products which are set on the e-commerce platform and the model associated.

User management module: This module has the function of user authentication, user management, space distribution of the users' model etc. When the e-commerce platform which has the function of user authentication and user management does not necessarily need to choose this module, so this module is optional.

Shopping module: This module is optional module too. This module includes shopping cart, products comparison, products purchasing, payment and other functions. Users can also customize this function.

Mobile module: The module is also optional. It is mainly for needs of mobile shopping users. When using the module, the system optimizes the display of the content to adapt to the requirements of the mobile bandwidth and screen and optimize correspondently to adapt to different mobile devices.

Interactive module: This module is mainly for the interaction between consumers and the content displayed. it also includes Internet share function; the user can send the augment reality image or video to the micro blog and other sharing platform. This not only increases interaction but also advertises the product. In addition, the communicate function between the system and electronic commercial platform is also very important which is the hub to connection the system and the platform.

Augmented reality module: This module includes two kinds of augmented reality function: The marker and the marker less. This module sets correspondently according to users' classification of products when upload models.

For M class, this study takes the augment reality technology based on marker. This system uses FLARToolKit which is a real-time video detection library based on rectangular markers. It applies the technology of computer vision to calculate position and posture to the observer that is, by using the coordinate of camera, rectangular markers, display screens and then using the transformation matrix to get rectangular position and posture of the objective, so as to realize the tracking and overlaying of virtual object.

For MLS class and ML class, this study takes augmented reality technology based on the maker less. The display of these two kinds of products is relatively difficult when compared to M class. The products of MLS class and ML class need biometric identification of specific parts of the human body. For the ML class, the biological recognition technology can be used but the products to wear must be rigid, such as glasses, earrings and other commodities. Because of its properties, characteristics can be restored well through 3D modeling and the final fusion of the real scene and the virtual objects can be pretty realistic. The glasses display system introduced in the following two sections, is the system using cameras equipped computer to carry on the face recognition and "wear" 3D glasses model. This system is a positive application in the e-commerce which combines the biological recognition technology and augmented reality technology. Users can enjoy the auditioning in the "real" optical shops without even leaving home which greatly enhances the user's shopping experience and stimulate users' desire to shop.

For the products of MLS class, wearing those have a series of deformation, so 3D products also need to have certain changes when the human body changes the posture. Only in this way the system have a real effect. So this kind of products' augment reality application not only needs biological recognition technology but also needs special equipment to response to human body' posture.

III.DESIGN OF AUGMENTED REALITY MODULE

For display of products of M class based on augmented reality, the most used tool is FLARToolKit developed by HirokazuKato.This tool is the most popular open source library based on markers . This study uses the FLARToolKit library of AS3 to implement online display of marked products.

FLARToolKit is a real-time video detection library based on rectangular markers. It applies the technology of computer vision to calculate position and posture to the observer that is, by using the coordinate of camera, rectangular markers, display screens and transformation matrix to get rectangular position and posture of the objective, so as to realize the tracking and overlaying of virtual object. FLARToolKit is a function library implemented by AS3 language. Augmented reality program tracks the scene by using the WEB cameras, then after using the tools in Utils to convert the image, it detects the marker by FLARToolKit marker detector. The detector uses FLARToolKit core packages' calculation to get the eventual register position of virtual products. And finally by using the 3D library of the flash, such as PV3D/Away3D, etc, it completes the integration of virtual and reality.

FLARToolKit Processor lib is management library of one or more markers.FLARToolKit Detector lib coordinate with FLARToolKit core lib's operation function, it is a library that can test out the specific marker. It can identify individual markers and multiple markers in image as well. FLARToolKit Core lib is a combination library of many operations. It includes matrix computation, patternrecognition, image filtering, label operation, etc. The class in this library also can be used alone. It is usually invocated by using FLARToolKit Detector.

The display process of products of M class , first users need to print a special FLARToolKit objective which meet sellers' standard , the size is adjusted to the actual products. Then open the corresponding product page, click the flash player to allow the use of camera. FLARToolKit detects whether the camera starts normally or not. If normal, the camera's fixed parameters are initialized and at the same time imports custom markers. It makes the comparison with the after marker possible. After this, video cameras start to catch scenes. According to the custom threshold value, a frame of color image is binary processed into black and white binary image and be processed with reverse color[4]. After that binary image goes through edge detection and connected component analysis which screen all the candidate rectangular areas which meet standards. And then these candidates area are matched to custom markers and similar probability can be calculated. If it is higher than the custom reference value, the match is successful. After that a marker is found and camera transformation matrix is calculated by using the shape change of marking areas.The position and posture relative to camera is calculated and the virtual products' overlaying is finished.

Augmented reality for products of ML class: For MLS class and ML class this study takes method of marker less augmented reality. The display of these two classes is more difficult compared to M class. MLS class and ML class need the biometrics of specific parts of the human body [3].

It needs to recognize the physiological characteristics of head, hand or human body to apply to different goods when detecting, such as hat, glasses, earrings and other commodities of head; watches, bracelets and other commodities of hand or clothes, pants etc.

For the products of ML class this study uses the biological recognition technology but the products to wear must have a rigid body, such as glasses, earrings and other commodities. Because of its properties, characteristics can be restored well through 3D modeling and the final fusion of the real scene and the virtual objects can be pretty realistic.

The glasses display system based on augmented reality in the following sections, is the system using cameras equipped computer to carry on the face recognition and "wear" 3D glasses model. This system is a very good application in the e-commerce which combines the biological recognition technology and augmented reality technology. Users can enjoy the auditioning in the "real" optical shops without even leaving home which greatly enhances the user's shopping experience and stimulate users' desire to shop.

For the products of MLS class, wearing those have a series of deformation and their 3D also needs to have certain changes when the human body change the posture, only in this way it have a real effect. So this kind of products' augment reality application not only needs biological recognition technology but also needs special equipment to response to human body' posture.

For display technology based on marker less augment reality, this study offers a general flow of biometrics augment reality. Since the system is designed to be applied to flash therefore, the uses first need to click on "allowed to use camera", then the system test whether camera normal starts nor not and starts the initialization of camera's fixed calibration parameters. After that the camera starts to capture and detect whether there is a target creature feature in the scene, the extraction of characteristics is made if there is and the accurate characteristic is judged to screen the area met the standard and finally it calculates the registered points of virtual products and add it into a real scene.

VI.CONCLUSION

Based on the recent analysis of the display of online products in e-commerce, this study aims at applying the technology of augmented reality to e-commerce and solves the insufficiency of current products display. It also provides a technology based on facial recognition and augmented reality to try on glasses. Through this function, users are able to see themselves wearing different glasses without leaving the house.In this study, online products display system framework based on augmented reality can be used in most of the products and has a broad practicability. In addition, with the development of the mobile network and the better function of mobile phones, this technology makes mobile e-commerce possible; users can enjoy shopping experience of augment reality by using mobile e-commerce.

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