International Journal of Web Technology
Volume: 03 Issue: 02 December 2014 Page No.22-26
ISSN: 2278-2389

Digital Online Shopping Using 3D in Augmented Reality

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Abstract- FitYour is a tailored web application urbanized with the intent of pamper patrons with the provision to view themselves in diverse attires (ie), Patrons can strive on outfit, footwear, headwear, bags and trimmings in 3D and in instantaneous with unrivalled pragmatism and interactivity. TryLive garb can be deploy in-store and can accomplish patrons wherever they are. For eg: in the digital living room. FitYour works with a computer and a habitual webcam for shoppers. It is the up-to-the-minute expertise which uses phizog gratitude modus operandi of Augmented Reality (ie), it acts as a virtual trial room for the customers that how they actually look on wearing the attire that they wish to purchase. With the help of this application, customers can upload their picture while registering for the use / trial and then they can select the accessories/dress they like, positioning, fine tuning the selected attire and they can also capture the image and share it through Facebook, Twitter, Instagram, etc. It takes only a couple of minutes to operate this web application. FitYour is very useful for all the E-Commerce websites. Web FitYour is a user friendly product especially designed for customers who like to purchase products online. This application not only saves time and effort but also gives a wider range of collection to try. It also brings a digital shopping experience for the customers to purchase the products online by using this latest technology. Thus this application attracts the customers, retain them, offers immersive and social shopping experiences that keeps customers coming back and it also reduces return rates.

I. INTRODUCTION

Turning Web customers from "window shoppers" into buyers demands an interactive sales model that informs them, gives them individualized attention, and helps to close the sale at the customer's request. Ideally in sales, gents should have in-person meetings with all prospective customers likely to be interested in new products or features. However, this may not be desirable or feasible. The next best thing for sales agents is to send promotional e-mails to their prospective customers. We believe that a good promotional message should be the one that has the following desirable characteristics:

A. CUSTOMER-SPECIFIC CONTENT

The short message briefly describes how the new product features apply to the specific situation of the customer, addressing any concerns of the individual.

B. PERSONALISED

Personalized greeting and communication by a person are familiar to the customers.

C. INTERACTIVE

Customer could find more information by following the hyperlinks embedded in the streaming presentation. When the customer follows the links, the sales agent could be notified automatically.

D. MEDIA-RICHCOMMUNICATION

Appropriate use of various media, ranging from PowerPoint slides to video to 3D-models, along with effective annotations and views helps in effectively communicating the message.

II. COST-EFFECTIVE PRODUCTION

The tool should allow the sales person to create such promotional presentation in a matter of minutes. In this paper, we present the development of an easy-touse direct marketing tool using Augmented Reality (AR). AR Technology combines real (familiar face of the sales agent) and virtual worlds (various 3D product models) together, allowing a sales person to present different aspects of the product while keeping eye-to-eye contact with customer. The inserted virtual objects are further hyper-linked to product specification. Web pages provides more detailed product and price information to the interested customers. Integration of virtual objects into the scene should be fast and effective. Most current real-time AR systems are built on high-end computing systems such as SGI workstations that are equipped with hardware accelerators for image capturing, processing, and rendering. Our system presented here is developed on an ordinary desktop computer with a low-cost PC camera. To use this system, the sales person will hold a plate on his hand with specially designed markers, and choose a 3D model of his product. As the sales person moves the plate, the system automatically superimposes the 3D model on top of the plate in live video images and displays the superimposed video on screen. The sales person can then explain features of this product, or even interact with an animated 3D model as if a real product were standing on the plate. The system could be implemented in such a way that after the sales person finishes talking, it automatically converts the composed video into a streaming video format. Our system consists of the following five subsystems: i) video input output, ii) image feature extraction and marker recognition, iii) camera

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calibration and pose estimation, iv) augmented reality superimposition, and v) messaging. In the following sections, we describe how each sub-system is implemented in more details.

VIDEO INPUT/OUTPUT

Currently, we use a Creative WebCam, USB camera or a ViCAM parallel port camera for video capturing. We use video capturing API functions to handle the video capturing and use Windows AV1 (audiohide0 interleave) functions to output AV1 movies.

III. REVIEW LITERATURE

In general, people go for shopping malls or instores to purchase dress, accessories etc. After selecting their desired attires they wish to try whether it fits them or not (ie), they go to the trial room for trying the product that they wish to purchase. If the customer is not satisfied then they have to try the actual product that fits them exactly. Its difficult to get the exact size and exact model that they selected earlier, so in that case they have to make alterations to make that dress fit. Since the same costume is tried by many people it reduces the quality of the product that is used often and it also creates an illusion in the minds of customers to purchase in that particular mall or in store. To overcome these problems, Fityour which is the latest technology that uses the face recognition technique of augmented reality for the customers. This acts as a virtual trial room for the customers with the facilities to view themselves in different attires. Customers can upload their picture with the help of a webcam by selecting the desired attire and capture the image, share it via facebook, twitter etc (ie) it is a user friendly product especially designed for customers who like to purchase products online. This application not only saves time and effort but also gives a wider range of collection to try. Thus this technology attracts the customers, retain them, offers immersive and social shopping experiences that keeps customers coming back and it also reduces return rates.

DIGITAL ONLINE SHOPPING IN 3D

The act ofpurchasing products or services over the internet. Online shopping has grown in popularity over the years, mainly because people find it convenient and easy to bargain from the comfort of their home or office. One of the most enticing factor about online shopping, particularly during a holiday season, is it alleviates the need to wait in long lines**.**

ONLINE SHOPPING SAFETY TIPS

1. Online shopping is quick, easy, and convenient – however, there are still some safety factors that need to be considered when using our credit card to make purchases online.
2. Only place an order with our credit card on trusted websites that are verified as secure sites (look for the lock image on the toolbar).
3. On the Web page where we enter our credit card or other personal information, look for an "s" after ‘http://’ in the Web address of that page - it should read: ‘https://’. The encryption is a security measure that scrambles our data as it is entered.
4. Ensure that the website is authentic and secure by finding out what other shoppers say. Do not send emails that contain personal information such as our card number and expiry date.
5. Use good quality antivirus software – such as the free software we provide our Internet Banking and WAP-based Cell phone Banking customers.

IV. AUGMENTED REALITY

Augmented reality (AR) combines real world and digital data. At present, most AR research uses live video images, where the system processes digitally to add computer-generated graphics. In other words, the system *augments* the image with digital data. Encyclopaedia Britannica gives the following definition for AR: *"Augmented reality, in computer programming, is a process of combining or ‘augmenting’ video or photographic displays by overlaying the images with useful computer-generated data."* Augmented reality research combines the fields of computer vision and computer graphics. The research on computer vision as it applies to AR includes among others marker and feature detection and tracking, motion detection and tracking, image analysis, gesture recognition and the construction of controlled environments containing a number of different sensors. Computer graphics as it relates to AR includes for example photorealistic rendering and interactive animations. Researchers commonly define augmented reality as a real-time system. However, we also consider augmented still images to be augmented reality as long as the system does the augmentation in 3D and there is some kind of interaction involved.

AUGMENTED REALITY APPLICATION

- Augmented reality technology is beneficial in several application areas.
- It is well suited for on-site visualisation both indoors and outdoors, for visual guidance in assembly, maintenance and training.
- Augmented reality enables interactive games and new forms of advertising. Several location-based services use augmented reality browsers.
- In printed media, augmented reality connects 3D graphics and videos with printed publications.
- Augmented reality has been tested in medical applications and for multi-sensory purposes.

MESSAGING

After the recording is stopped, the system could automatically converts the resulting AV1 file into a Real Media file, and creates a SMIL file using the Meta file generated in the previous step. Both Real Media and SMIL files could then be uploaded to the server. E-mail with a URL link to the SMIL file is sent to selected recipients.

V. NATURAL INTERACTION SENSORS AND SUPPORTING SOFTWARE PLATFORMS

Natural Interaction (NI) is the ability to command and control the digital world using hands, body and voice, making traditional peripherals such as remote controls, keypads and

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mice obsolete. Based on technologies where the entire body is the controller, Natural User Interfaces (NUIs) deviates massively from the classic desktop paradigm, as they use body gesture recognition to navigate applications and complete tasks such as browsing, selecting, adding to shopping basket and checking out. At the same time, accommodating gestures by nature are highly personalized.Some of the basic players in the Virtual Fitting Room industry appears where current technological advances from multiple areas converge. Presently, the main NI players in the hardware sensor consumer market are Microsoft with Kinect and Asus with Xtion, both of which utilize the PS1080 chip from Prime-Sense in competing implementations. Real-time modeling of natural scenes with commodity sensors and graphics hardware has catapulted augmented reality (AR) to an entirely new level by allowing real-time reconstruction of dense surfaces with a level of detail and robustness beyond the capabilities of previously available solutions that used passive computer vision. These multi-sensor bar products collect synchronized audio, video and depth data streams to be manipulated to suit a rich gamut of applications using a number of software frameworks

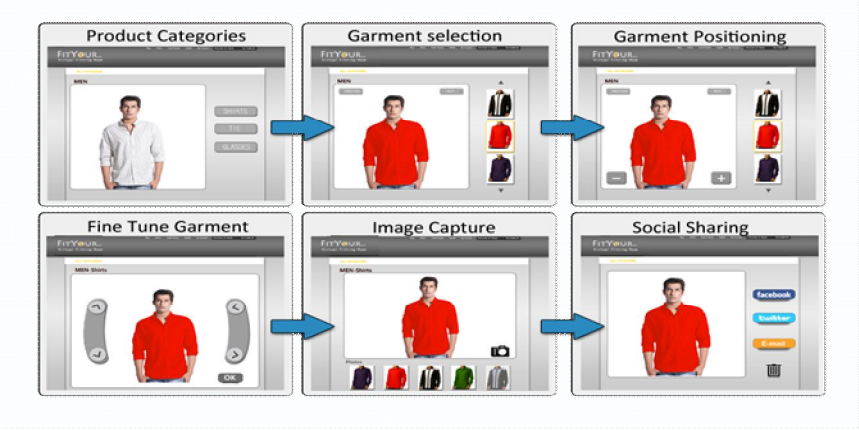

Figure 1. Various players in the Virtual Fitting Room Arena

In the above figure 1, the image is uploaded via webcam and the product categories are displayed. The customers can select the product they wish to purchase. Then after selecting the product they can position the objects to get a virtual image. The objects are finely tuned to get a clear picture of the image. Finally the finely tuned images are shared via facebook, twitter etc.

VI. VIRTUAL FITTING ROOM

VFR-enabled shopping is available for stores, homes and smart mobile devices. Successful VFR applications, successful representatives of which will be discussed presently, automatically generate precise body scan data to guarantee the quality of fit. These "Body Shape" IDs can be manipulated to various purposes. One is to create accurate 3D avatar-type models of the customer's body on which to fit clothes as an alternative to fit on the shopper's image itself. Another way to go is to combine 3D scan data with information such as gender and age to meaningfully query virtually unlimited clothing databases across multiple retailers, to order for family and friends, etc. Furthermore, granting access to accurate 3D models of garments and apparel from designers enables VFR technologies to incorporate physics to enhance and make more realistic the shopping experience. In addition, the incorporation of the communication and feedback capabilities of social media to obtain advice and feedback (e.g., tweeter, facebook) make the shopping experience even more enjoyable. Finally, smart-phone applications may also alert users for wish-listed items available in nearby stores so that local shopping and deal finding can be usefully combined.By successfully addressing the suit/fit dilemma, VFRs present unique opportunities for retailers in multiple directions. Shoppers assurance of a "perfect fit" removes an important obstacle for online shoppers and should result in increased sales and decreased return rates. Multiple marketing channels increase on-line brand visibility. Interests shown on per-item or per-category basis can also be utilized on individual or at an aggregate (e.g., regional) level. In the following we will review some of the most successful applications in the Virtual Fitting Room industry.

"IMAGE THAT" ONLINE VIRTUAL FITTING ROOM

VFR moves along the lines of the previous solutions, providing 3D models of apparel, 360o views of the customer, a natural interaction user interface based on hand gesture recognition and social media integration. The in-store kiosk version uses a big-screen TV as a full-body mirror on which it projects a live video stream of the customer from the NI sensor's RGB camera or a created avatar of the customer as well as menus for navigating through the onscreen inventory. The customer can select various items to mix-and-match, narrow the selection and tag favourites to show sales staff for an actual try-on. The on-line version claims full integration with existing web sites and uses body scanning and analytics technologies for virtual try-on in the comfort of the customer's own home.

TRY LIVE EYE WEAR FROM TOTAL IMMERSION

Total Immersion provides AR commercial solutions such as the D'Fusion Studio Suite which enables the development of secured AR applications across a variety of fields and domains (digital marketing, event organizations and industrial applications). Total Immersion has released various commercial AR platforms for web, mobile and kiosk

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deployment under a common TryLive logo: Virtual Fitting Room, Eyewear, Watches, Shoes and Jewellery. TryLive Eyewear, in particular, requires a camera-equipped computer, tablet or smart phone and uses automated face recognition algorithms such as face shape classification to filter through a large database of fashion or optical eyewear. Customers can virtually try on selected items, preview them interactively from various angles, interchange lenses and frames for a customized fit, filter out selections and populate a shopping cart.

CAMERA CALIBRATION AND POSE ESTIMATION

We use the camera calibration algorithm presented for calibration and pose estimation. This algorithm requires at least four coplanar 3D points and their projections on each image. Note that by obtaining R and t frame by frame, our approach here does not need any filtering process to track the motion of the markers. We briefly describe this algorithm as follows:

The pinhole camera model describes the relationship between a 3D point, $M = [X, Y, Z, 1]^T$, and its 2D projection, $m = [u, v, 1]^T$, on the image plane as

$sm=A\,[Rt]\,M,$ (1)

where s is a scaling factor, R = [r1, r2, r3] the 3x3 rotation matrix, t the 3X 1 translation vector, and A the camera intrinsic matrix given by

$$\mathbf{A} = \begin{bmatrix} \alpha & \gamma & u_0 \\ 0 & \beta & v_0 \\ 0 & 0 & 1 \end{bmatrix},$$

with (uo, vo) be the coordinates of the camera optical center on the image plane, Ct and p the focal lengths in image U and v directions, and ythe skewness of the two image axes. Since all 3D points are on the model plane, we construct the global coordinate system with Z = 0 on the model plane. Thus Eq.(1) can be rewritten as

$sm = A[r1\ \ r2\ \ r3\ \ t][X\ Y\ 0\ I]^T$

$= A[r1\ r2\ \ t][X\ Y\ I]^T$ (2) $sm=H[X\ Y\ 1]^T$ (3)

where H is the 3 X 3 homography describing the projection from the model plane to the image plane. We note

$H=[h_1\ h_2\ h_3]= \lambda A[r_1, r_2\ t].$ (4)

If at least four coplanar 3D points and their projections are known, then the homography H can be determined up to a scaling factor. Then the intrinsic matrix A can be extracted from Eq.(4) by making use of the fact that r_1 and r_2 are orthonormal. In the case that the intrinsic matrix A is determined, the rotation matrix R and translation vector t can be obtained. We refer the interested readers for more details of this calibration algorithm.

Before we use these A, R, and t for AR, we optimize the data by minimizing the following functional for a set of n images each with m known coplanar 3D points:

$$\sum_{i=1}^{n}\sum_{j=1}^{m} \| \mathbf{m}_{ij} - \mathbf{m}'(\mathbf{A}, \mathbf{R}_i, \mathbf{t}_i, \mathbf{M}_j) \|^2, \quad \textbf{(5)}$$

where m‘ (A, R_i , t_i, M_j) is the projection of point M_j in image i. This nonlinear optimization problem is solved with the Levenberg-Marquardt Algorithm. To reduce the amount of computation in our implementation, we only calibrate the camera for intrinsic parameters at the beginning of the video sequence. Once the camera intrinsic parameters are determined, we directly use them to compute the extrinsic parameters, i.e., R and t from the homography H.

VII. ADVANTAGES AND LIMITATIONS

Shopping is not limited to retail store hours. We can now shop anywhere and at anytime. This means that if ours daily schedule doesn't allow for picking up house hold necessities or if we get the shopping bag at 12am; our shopping mall is now just one click away. Comparison shopping has been made easier due to online shopping. Instead of driving around wasting gas or spending hours on the bus in travel time we can visit all the stores that we are interested in at once. This eliminates time going from store to store to see what is available and at what price. If we love knowing the latest styles, or having unique pieces then online shopping makes it easier to do so as well. Websites such as Ebay, Amazon and many other websites offers amazing prices. Online stores usually offers online specials as well, and there are multiple websites dedicated to sharing these deals with you.

VIII. CONCLUSION AND FUTURE WORK

We developed the prototype of a direct marketing tool using AR technology. This ***AR*** system is developed for common desktop or laptop computers without any special hardware support. Also, with a friendly user interface, a sales person can pick up any 3D product model and make customized advertisement video pieces. The speed of our program has reached 7-10 frames/sec for processing 320x240 size 24-bit RGB video, which enables the user to create the presentation in a real-time manner. The performance of the system can be largely improved by choosing a faster video capturing mechanism, such as using a USB camera instead of the parallel port one. It is predictable that we can farther improve the real-time performance of the ***AR*** system by using better capturing device or dealing with video of less colour images (e.g., 16-bit RGB). A clear future direction is to integrate this real-time AR system into Internet communication systems, such as the web conferencing system.In future, we can view the objects in different dimensions and it automatically allocates the size of the object to get a clear picture of the uploaded image. The objects loaded creates a real time shopping experience to the customers from their living room.

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Volume: 03 Issue: 02 December 2014 Page No.22-26
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