International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)
Web Site: www.ijettcs.org Email: editor@ijettcs.org
Volume 6, Issue 3, May- June 2017 ISSN 2278-6856

Smart Offline Shopping Based on Augmented Reality Interface

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Abstract: ***As retail is undergoing many changes and online shopping is increasing because of the features it offers, customer experience can further be improved by bringing online shopping features to offline retail. To achieve this, this paper proposes a solution by immersing Augmented Reality technology into offline retail. This will not only enrich customer experience but will take retail to a next stage with convenience and innovation with the help of Augmented Reality. Augmented Reality is submerged in physical environment thus adding a virtual view to the surrounding reality, enhancing user experience. The proposed solution allows users to purchase with ease and in less time with the help of a mobile hand-held system providing a 3D Augmented Reality based interface that combines online features with brick-and-mortar shopping. Shoppers can browse the shelves same as online browsing, getting same comprehensive or comparative information about products. The system proves to be a nexus between traditional and online commerce. The system includes tracking of the product, browsing the products on a shelf, product information presentation in real-time for enhanced customer experience.***

Keywords: Augmented Reality, Smart Shopping, Product recognition, Marker based tracking.

1. Introduction

Major role of the Internet is to interconnect people with each other as well as with information systems which are interconnected within themselves. Due to this physical objects have become new actors of Internet as proposed by the Internet of Things (IoT).

IoT is widely being used in retail industry because of which online shopping is gaining advantage over brick and mortar shopping. Hence offline retailers are facing hardships in order to attract people towards physical locations (as shopping destinations). The features and customer satisfaction provided by online shopping systems is not present in offline retail. Also the online counterparts of offline retail systems are more engaging. Hence there arises a need to bridge the gap between the two.

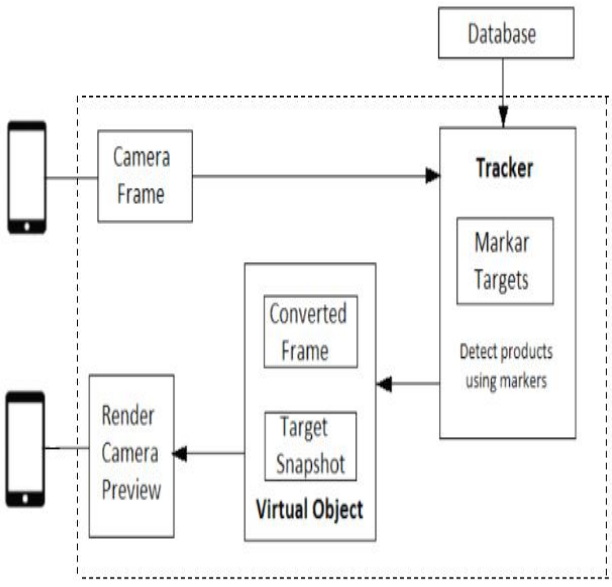
To make shopping systems social and connected, smart devices are being used increasingly by retail industries. Augmented Reality (AR) provides a way in which online and offline retail can be converged. AR improves user perception by overlaying digitally generated information over physical objects in real world.

The objective of this project is to build a solution to develop a system which will provide same comprehensive information one gets while using online shopping systems. This system will enable users to browse various products placed on shelves of the retail stores and get interactive information about them which will be overlaying on top of the real world (physical) products.

The standalone system is presented in this paper is based Using these interfaces on hand-held devices, users can browse through various products and switch between them in the same way as online browsing.

2. Methodology

2.1 System Architecture



System Flow Outline

1. Capture the marker when user points the device at a shelf or a product.
2. Identify the marker from server side.
3. Extract the information corresponding to the identified marker from the server side.
4. Augment the information over the marker.

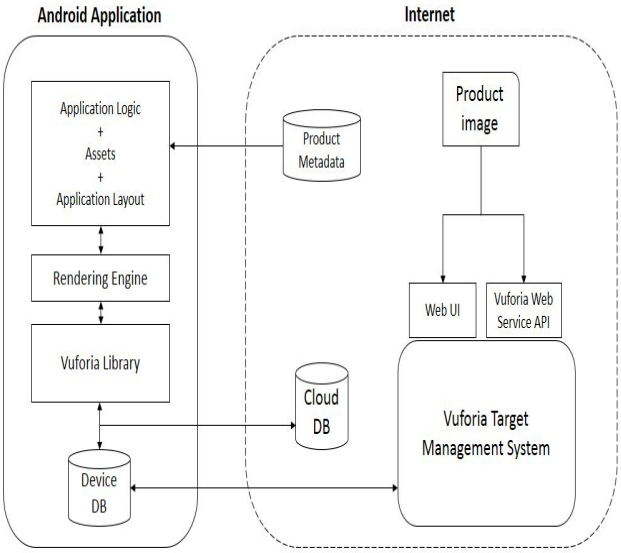


Fig 2. System Components

2.2 System features

1) Search

User can search for any product. The search button will be provided on the screen. Upon searching,
user will get related results and the location of the respective products.

2) Augmenting the list of products on the shelf

Once user points the device towards the shelf, the marker placed at center of the shelf will get captured by the camera of the device. A list of all the products present on the shelf will be displayed at the bottom of the screen and user will be browse through them on the screen with ease. User can also select a particular product from the list to gets its detailed information.

3) Augmenting product information

User will be able to get product information in two ways:

- He/she can select a particular product from the list of products augmented while pointing the device towards marker placed on shelf.
- Detailed information of the product can be augmented on top of the physical product just by hovering the device camera over the marker placed on the product itself.

2.3 Techniques and Technology

1) Marker detection:

1. Input from camera:
A real world live video captured using camera is the input given by user. This video feed is then given as input to the image capturing module.

2. Image Capturing:
Once it receives the live video feed,each frame in the video is analyzed and binary images are generated. Binary image is a digital image in which each pixel can have only two possible values.Usually Black and white colors are used to generate binary image. After this to reduce noise, thresholding is applied i.e.intensity of each pixel is compared with threshold value and then it is converted to either black or white color.

3.Marker detection and matching:
Feature detectors and descriptors are used to find key-points of the scene,which are the used to find corners of the marker in video frame and its matching marker.

2) Rendering:

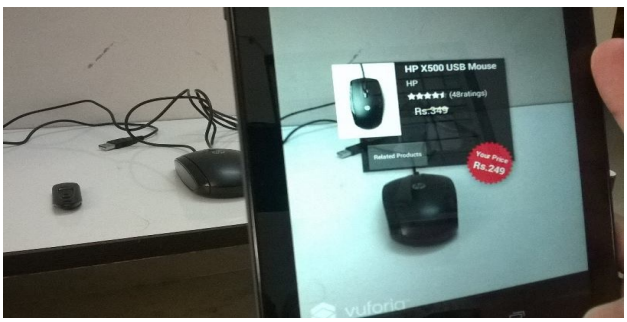
When the matching marker is found,its corresponding virtual object has to be augmented on the device screen. For that the virtual information is combined with original camera view and rendered on display screen.

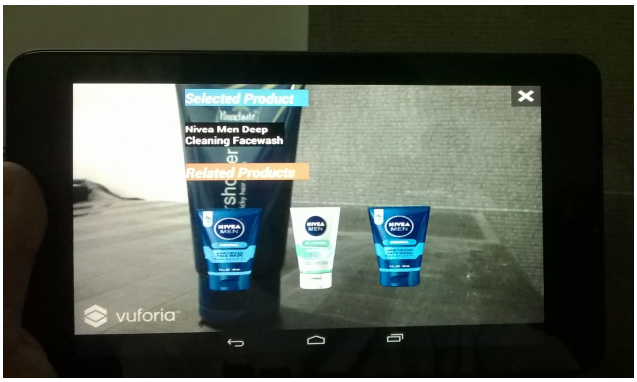
3. RESULT

The application uses Vuforia SDK. It implements two different use cases of augmentation in shopping mall scenario. 1) Product augmentation and 2) Shelf augmentation.

3.1 Product Augmentation

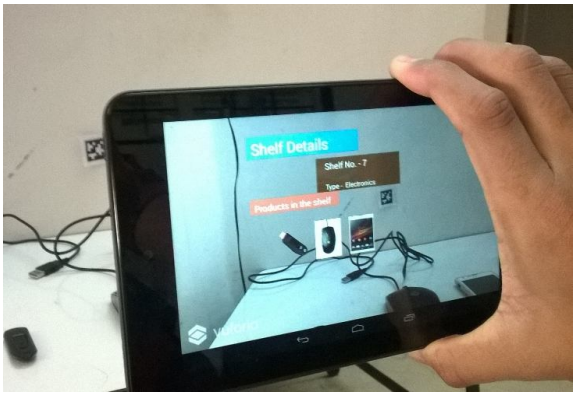
After pointing mobile towards the product, the application starts scanning the product. Then it augments the product's information on the top of that product including product name, company, price, specifications, discount and many more. The information is retrieved from the metadata file stored at the server side in JSON format. We can scan those products which are stored in the Vuforia cloud. Along with the augmented information, it displays the 'Related products' button which displays the related products and we can browse through them.





3.2 Shelf Augmentation

When the mobile device is pointed towards the marker attached to the shelf, system retrieves the marker information from the shelf's metadata file. Then it augments the basic shelf details including shelf number, type of the products on the shelf, capacity etc. along with the list of the products on the shelf at the bottom of the screen through which we can browse to get information of the product.



Application provides few other functionalities. It includes searching for the product which returns the information of the product and its location (shelf number). We can see the list of related products right from the augmented information.

The application is tested on the small physical shelf, where we placed 3 sample products on a wooden board and a marker for shelf augmentation.

Application works fine with most of the Android mobile devices having minimum version 4.0 of Android OS. The performance is faster for launching the application, scanning and augmentation. As the information is retrieved online, the mobile device must be connected to the internet. Speed of the internet affects the time required to retrieve the information and thus time required to augment the information after starting the product scan. It works well with multiple screens. The information is augmented on the right spot regardless of the orientation of the mobile device.

4. Conclusion and Future Scope

This system takes the shopping to the next level providing seamless, faster and more appealing way to shop. System makes use of IoT phenomena meaning connecting the digital world with the physical world. The system shows very high accuracy while detecting the product and augmenting the information which concludes that the system can be deployed in the shopping malls at ease and without any problem.

This will help retailers to provide better service and will let consumers make more informed choices about what they buy. Shopping mall is one of the many scenarios where we can use augmented reality for getting the necessary information on the spot, on the top of the real world which provides an immersed and pleasing experience while doing many things.

In the future this system can be taken to higher level by providing the application to show information of various things, not only products but the restaurants, monuments, statues, zoos, botanical gardens and many other places. The same technology can be applied to develop the application which will provide the information of the vehicles in vehicle shops, information of the industrial machines, household things etc.

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