

# Augmented Reality for Smart Store Assistant: an Application to Club Virtual Aspects into Real World Mall Experience



S. Chethan Sai Krishna, Guttula Swetha Sri, Vootkoor Samhitha, T. Venkat Narayana Rao

**Abstract:** Due to increase in online shopping portals, conventional offline stores are facing a crisis and are losing their prominence. The paper brings about a solution to this, by empowering offline stores with the perks of online stores using Augmented Reality. Enhancing users experience will be a stepping stone to tackle this issue. Augmented reality is the trend these days, anything and everything blended with Augmented Reality is the future we are yet to witness. Augmented Reality is a implementation of various technologies that combines computer generated content and real-world display. The main aim of this paper is to develop application to offer options associated with a certain object alive to the real environment. For example, the price tags being popped up when we arrive at the products, mannequins as similar as the living models, reviews and offer details of a specific product that a user ought to know or for a prospective purchase.

**Keywords:** Augmented reality, offline stores, online shopping portals, Unity and Vuforia.

## I. INTRODUCTION

AR is based on techniques developed in Virtual Reality and interacts not only with a virtual world but has a degree of interdependence with the real world. When we started to focus on the human being and on his perception of the world then we realized reality cannot be increased but its perceptions can be. The term Augmented Reality we would retain, even if we understand it as an "increased perception of reality". Developing technologies provided a huge scope for the vital research in the area of Augmented Reality [1]. The paper focuses on efficient usage of AR technology in shopping malls. AR technology is an effective tool that integrates the real learning world with the virtual world created by the computer software. Besides this, by using learning resources partly virtual and factual could increase the customers interaction and enhances user experience. Even shopping a normal product becomes more engaging and interesting [2][3].

Manuscript published on January 30, 2020.

\* Correspondence Author

**S. Chethan Sai Krishna\***, Student, Department of C.S.E, Sreenidhi Institute of Science and Technology, Hyderabad, T.S, India.

**Guttula Swetha Sri**, Student, Department of C.S.E, Sreenidhi Institute of Science and Technology, Hyderabad, T.S, India.

**Vootkoor Samhitha**, Student, Department of C.S.E, Sreenidhi Institute of Science and Technology, Hyderabad, T.S, India.

**T. Venkat Narayana Rao**, Professor, Department of C.S.E, Sreenidhi Institute of Science and Technology, Hyderabad, T.S, India.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

## 1.1 Existing Scenario

One of the main catch of digital advancements is the rapid growth in online. Wide range of varieties, quick payment, work done at a single click are an added asset to the online stores. On observation we could say that, despite these advantages exist there is still disinterest and latency in people picking up the benefits.

People still go to the conventional shopping mall and view the prices of each product through price tags in the shopping mall. There is no source of checking the reviews and recommendations in regular shopping malls. The user interaction is also casual and unintriguing. Conventional shopping malls have a quintessential aspect of touch, trail and assurance which overpowers everything.

## 1.2 Proposed System

There is a need for upgrading the existing system as much as inventing new systems and technology. To keep up with the strength of offline stores and empower them with features of enriched user experience as this is missing in the existing system. The aim of this paper is to evolve new application to provide options to buy certain object alive to the real environment. By adding all such features in the proposed system, the users would experience an easy way to use AR app in an efficient way. The user only requires an Android device with a fair performing camera in it, so that it can scan products and look for the details.

## II. SOFTWARE AND HARDWARE REQUIREMENTS

Following are the software and hardware employed in the development of the application:

**2.1 Vuforia:** is an SDK that can be incorporated in unity to work on augmented reality application. It extracts features from the fed objects. Vuforia Developers Portal is the online platform to create database of target objects. This database is further imported to unity [5].

**2.2 Unity:** Unity is a 3D Engine. It supports object-oriented scripting language. C# is one among them. It is famous for designing games and recently gained popularity for its packages to create AR/VR applications. It is famous for its swift development and easy deployment. Applications can be created once and deployed to work in many platforms. The tools that will be used across the process are Unity, Vuforia, C-SHARP(C#).

**2.3 Scripting Language:** Unity works on object-oriented scripting languages. One such object-oriented scripting language is C#. A script makes its connection with the internal workings of Unity by implementing a class.

**2.4 Operating system:** Windows 7, 8, 10, 64-bit versions only; macOS 10.12+, Android version above 7.0 and Visual Studio are supported.

**2.5 Hardware:** Processor: Intel Core i7-3770 @ 3.4 GHz or AMD FX-8350 @ 4.0 GHz or better, RAM: 8GB RAM, GPU: Graphics card with DX10 (shader model 4.0) capabilities.

### III. SYSTEM ARCHITECTURE

#### 3.1 Architectural Design

System design is the representation of architecture and modules that suffice the requirements[4].

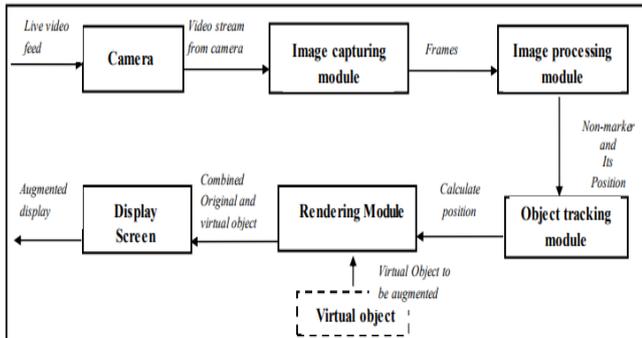


Figure 3.1 Architectural Design

As shown in Figure 3.1 the various components make up the architecture of the system. The key components are listed below:

**3.1.1 Camera:** Live video stream that camera captures is given as an input to the Image Capturing Module.

**3.1.2. Image Capturing Modules:** The input to Image Capturing Module is the live video feed from the camera of a mobile device. This module analyses the camera feed, by analyzing each frame in the video.

**3.1.3. Image Processing Modules:** Output from the image capturing module is the input to the image processing module. AR camera is detected using image processing techniques. Virtual object is positioned with the help of AR camera. The detected object is converted into pixels and those pixels are converted into frames.

**3.1.4. Object Tracking Modules:** This is the heart of the AR system. It determines the coordinates of the object with respect to the real world.

**3.1.5. Rendering Module:** Based on output of object tracking module, the objects positioned are configured and display is rendered on the mobile screen[8][5].

#### 3.2 Database Architecture

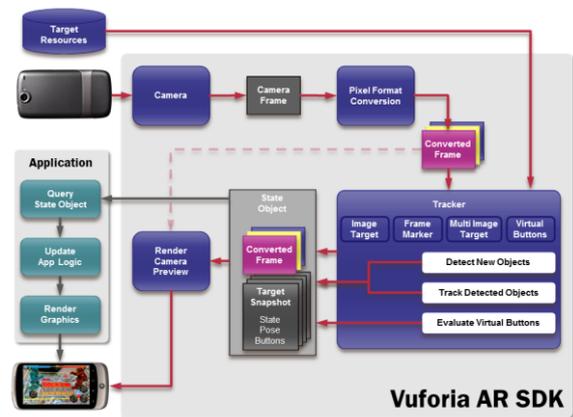


Figure 3.2 Database Architecture

Figure 3.2 depicts the database of the target images and necessary displaying pictures that are stored[7].

#### 3.3 System Architecture

The system architecture includes the layers in the application with a flow diagram. Here, the tier can be referred as a 'layer'. Here we have three layers.

**3.3.1 Vuforia:** In Vuforia we store the target images in the database and upload the images that are required.

**3.3.2 Unity:** Here we import the target images and we select the required game object and mention the functionality.

**3.3.3 App:** Open the app in the mobile. Project the phone on to the required target image and see required details like recommendations, reviews and price

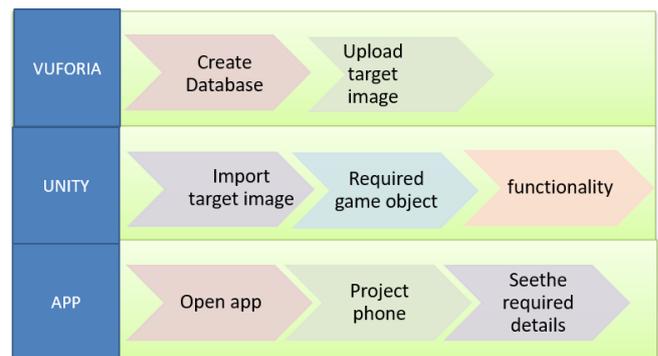


Figure 3.3 Project Architecture

Shown in Figure 3.3 are the various stages of project in vuforia, unity and app.

#### 3.4 Data Sets and Attributes

**A. USER:** The attributes of user are name and phone number and the type of data is string. User projects the phone in the required target image. He fetches the details of the required product or item. User also gives the feedback of a product or item or the app that is used[7].

**B. PRODUCT:** The attributes of the product are name and size and the type of data is string and integer respectively. We scan the product or replace it, fetch the details of product, get the reviews and recommendations of the product.

**C. APP DEVELOPER:** The attributes of the app developer are name, age and designation and the type of data is string, integer and string respectively. The app developer creates the database designs user interface, creates card and sets the functionality.

**D. PRODUCT SUPPLIER:** The attributes of the product supplier are name and id and the type of data is string. Product supplier gets the product details or information[8].

**E. CUSTOMER:** Customer projects the phone in the required target image. He fetches the details of the required product or item i.e., recommendations, reviews and price. User also gives the feedback of a product or item or the app that is used. He can zoom or drag the product details and after his use he closes the app.

**F. PRODUCT:** We scan the product or replace it, fetch the details of product, get the reviews, price and recommendations of the product. It checks the feature points of the product through app interface.

**G. APP INTERFACE:** It looks for the target image and displays the product details such as price, reviews and recommendations of the product. Customer can zoom or drag the product in app interface. Customer can close the app[6].

**H. DEVICE DATABASE:** The target image is stored in the database. It checks whether that item is found or not. If found it gives the details of the product such as price, reviews and recommendations of the product.

**3.5 The Implementation Process**

This includes flow of activities performed in a study. It speaks the dynamic nature of a system involving following components[3].

**A. CUSTOMER:** Customer projects the phone in the required target image. He fetches the details of the required product or item i.e. recommendations, reviews and price. User also gives the feedback of a product or item or the app that is used. He can zoom or drag the product details and after his use he closes the app.

**B. APP INTERFACE:** It looks for the target image and displays the product details such as price, reviews and recommendations of the product. Customer can zoom or drag the product in app interface. Customer can close the app.

**C. DEVICE DATABASE:** The target image is stored in the database. It checks whether that item is found or not. If found it gives the details of the product such as price, reviews and recommendations of the product.

**IV. RESULTS AND DISCUSSION**

**Table I : Data Set Used for Experimentation**

SNO	INPUT IMAGE	FEATURE POINTS	OUTPUT IMAGE 1	OUTPUT IMAGE 2
1				
2				



As mentioned earlier this application clubs the virtual aspects with the real-world objects and gives the augmented image as the output. The above are the few result outputs that has been obtained by testing on various products similarly we can implement on other products as well.

As shown in the Table I, the first column is the serial number. The second column is the input image. This is the image that application renders upon when we project the camera of the phone on the

product as soon as we open the application. Third column tells us the feature points that are generated in vuforia developers portal on images upload to database. As the camera captures, that particular image is our required target image or not is detected based upon these feature points. If the feature points of any are matched then further the associated objects are augmented and output is displayed. Fourth column is the output column. This displays the output with the augmented images over the real entities on the phone screen. These include product price that is displayed in a rotation animated cube, recommendations, reviews if any and expiry date as per requirement. Last column is another output column. Rendered augmented objects can be resized and repositioned to user's convenience with finger gestures on screen. Such resized and repositioned augmented object outputs are put under output image 2. Augmented objects can be translated to the required place with finger movements. Using the pinch and scale finger gesture, they can also be zoomed in and zoomed out.

**1.Target Product:** Lays (Green colored American Style Cream and Onion Flavor). When camera is projected towards this target product, augmented 3d objects of its price(Rs 20) and other flavors of recommendation that is Light green colored yogurt & herb, yellow-colored classic, violet-colored bacon are rendered with real world environment and displayed.

**2.Target Product:** Book (To kill a mocking bird by Harper lee). When the camera is Projected towards this target product, augmented 3d objects of its price(Rs 399) and other books written by the same author are given as recommendation that is 'Go set a watchman' and 'The emperors cool clothes'.Along with these the reviews and ratings of the book are also displayed.All these are rendered with real world environment and displayed. `When camera is projected towards this target product, augmented 3d objects of its price(Rs 50) and other recommendations that is mouth wash, toothbrush and tongue cleaner are rendered with real world environment and displayed.

The above products are just an exemplary that allows u to visualize the practical functionality of the application and

this similarly can be applied to all the other products in a shopping mall but the details that has to be included as the augmented objects might differ from product to product because some might have reviews,expiry date but some might not have.

## V. CONCLUSION

AR now has to come out of the labs to be used in daily life on mass level. The paper implementation has evolved a solution to empower offline stores with the perks of online stores using Augmented Reality making the buyer shopping experience effortless. Augmented Reality is the future we are yet to see. Anything with respect to augmented reality would remain as a milestone. Hopefully, in the near future the progress towards this field would be elevated by improving the scope and resources to work on.

## REFERENCES

1. Prof. Dhananjay Gaikwad, Akash Chikane, Shrikrishna Kulkarni, Aishwarya Nhavkar. Augmented Reality based Platform to share virtual worlds. International Research Journal of Engineering and Technology (IRJET). 2018.
2. Nor Farhah Saidin, Noor Dayana Abd Halim& Noraffandy Yahaya.A Review of Research on Augmented Reality in Education:Advantages and Applications. 2015.
3. V.G.Karthiga , Beniel.D , Aravind Kumar.M , Siva Shankar.S .Augmented Reality Game Development Using Unity and Vuforia,2018.
4. Dipti Rajan Dhotre. Research on Object Based Augmented Reality Using Unity3d in Education System.2016.
5. Ivar Grahn. The Vuforia SDK and Unity3D Game Engine. Linkoping University.2017.
6. R. Silva, J. C. Oliveira, G. A. Giraldi, Introduction to Augmented Reality, National Laboratory for Scientific Computation, Av. Getulio Vargas, 333 - Quitandinha - Petropolis-RJ Brazil rodrigo.jauvane,gilson@lncc.br.
7. Mikko Kyto, Barrett Ens , Thammathip Piumsomboon, Gun A. Lee , and Mark Billingham.Pinpointing: Precise Head- and Eye-Based Target Selection for Augmented Reality. Aalto University, Espoo, Finland.
8. Sneha Kasetty Sudarshan. Augmented Reality in Mobile Devices.Approved for the department of Software Engineering,San Jose state University,2018.

## AUTHOR PROFILE



**S Chethan Sai Krishna, (2020)** S Chethan Sai Krishna, pursuing a Bachelor's degree in Computer Science Engineering, Srinidhi Institute of Science and Technology, Hyderabad. He is also a part of Technology Entrepreneurship Programme at ISB, Hyderabad. His specialization includes Design Thinking, Web Development, Android Development, Java, C++, Augmented Reality (AR), R programming, Machine Learning (ML), Algorithms, Data Structures, Octave and Data

Science. He interned at Vanna Infotech and worked on java swing to create graphical user interface. He interned at Coign Consultancy and worked on Machine Learning. His achievements include a self-coded portfolio website. He is interested in problem solving through technology and business management. He can be reached at chethansaikrishna@gmail.com.



**Guttula Swetha Sri, (2020)** Guttula Swetha Sri, pursuing a Bachelor's degree in Computer Science Engineering, Sreenidhi Institute of Science and Technology, Hyderabad. Her specialization includes python, R programming, Web Development, Android Development, java, C, C++, Augmented Reality, Machine learning and Data Science. She interned at Algoleap Technologies (IIITH) and worked on Data Science for prediction analysis

using R programming language. She is interested in developing Applications using Machine learning.



**Vootkooor Samhitha, (2020)** Vootkooor Samhitha, pursuing a Bachelor's degree in Computer Science Engineering, Sreenidhi Institute of Science and Technology, Hyderabad. Her specialization includes Web development, Android development, Augmented reality, Python, Artificial Intelligence and Data science. She interned at VLabs hosted by IIIT Hyderabad and worked on Debugging. She interned at Central Institute of Tool design and

worked on Deep Learning. Her achievements include Gold in NPTEL Joy of Computing with Python and Silver in DBMS and Java.



**Dr. T Venkat Narayana Rao, CSE, SNIST,** is B.E in Computer Science and Engineering from Nagpur University; he has completed M.Tech (CSE) from SIT, JNTUH, Campus, Hyderabad. Holds Ph D from JNTUK, Kakinada. He has also done M.B.A with Systems and Marketing as his specialization. Presently he is working as Professor in CSE, Sreenidhi Institute of Science and Technology. He has industry experience as a software engineer in MNC such as HCL Technologies Ltd, Bangalore and

has worked in high end project such as "Singapore Provident Fund". During his tenure in the Industry, he has visited countries such as Hong Kong, USA, Malaysia and Singapore for an onsite assignment for H.C.L Technologies Ltd. for a Client: Union Bank of Switzerland. His total Experience spans 28 years.

He has more than two decades of experience in teaching and industry. His passion and flare towards research is exhibited in his number of publications and association with leading International & National journals. He has authored several articles and Books in renowned publications which include Papers/Articles/Chapters in Journals, conferences and Books. The publications includes International refereed journal papers- 155, National Journal Papers-25, International Conferences- 05, National Conferences-06 and Books -03, with a Total of 180 Paper Publications so far. He is instrumental in conducting 25 Seminars/Workshops and Symposiums as Convener and has attended 30 Workshops and Refresher Courses. He has delivered several Guest Lectures on Research Methodology and Outcome Based Education. He is a recipient of "Best Faculty Award" for the years 2012-2013, 2013-14, 2014-2015 in a row. He is an active life member of 12 Reputed Technical Professional Bodies such as *IACSIT, CSI, IETE*, International Association of Universities, *ITEEA, UACEE etc.* He has been a member on Advisory Board for 8 International Conferences across the world such as ICACET Malaysia, ICCEET 2013 -Dubai, ICET5E -Thailand, ICACSET 2014-Thailand, ICACE 2014-Mysore, ICMT 2015-Australia, ICVR 2015, Los Angles, USA etc. His research interest includes Medical Image Processing, Network Security, Cyber Forensics, Augmented

Reality, Web Technologies and Emerging Technologies. He can be reached at [venkatnarayanaraot@sreenidhi.edu.in](mailto:venkatnarayanaraot@sreenidhi.edu.in).