An Augmented Reality application for Jewelry Shopping

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Abstract

Developing an augmented reality-based application to place virtual replicas of objects instead of real jewelry in jewelry shops. A virtual object is superimposed on some target that appears to be a real one. The user must wear a marker (different for the corresponding item), and that particular item will be superimposed onto that. By utilizing ICP calculation, the recreation of 3D items is conceivable. The item will be overseen itself, as indicated by the client, continuously by utilizing HAAR. Payment integrations, user authentication, and order functionality have been integrated to make this app as competitive as other e-commerce applications.

Keywords: Augmented Reality; 3D objects; HAAR; SLAM; Marker-based AR.

1.Introduction

AR stands for Augmented Reality. The technology allows an image/object to superimpose in a real environment virtually as if some real object is placed. The increased reality frameworks utilize methods dependent on perceptual and mathematical ideas for situating the 3D items. The main objective of AR is to place the object virtually in such a manner that it would be difficult to differentiate between the real and virtual one.

The expanded reality frameworks utilize methods dependent on perceptual and mathematical ideas for situating the 3D articles. The article creation in a virtual climate is an urgent part of the AR; for this, the item reproduction strategy is utilized to imitate the article's material appearance. Today, the majority of the gadgets support AR innovation. AR requires basic requirements like an accelerometer, GPS, CPU, displays, sensors, cameras, gyroscope, and digital compass for processing and projection. This AR-based app works similarly. It will superimpose the virtual 3D model of jewelry onto some target as if one has tried on the real one. Otherwise, there may be chances of breaking, damage, reduced polish finish, etc. There are two kinds of AR: Marker-less AR and Marker-based AR[1].

Marker-based AR requires a static image or trigger photo or a target marker that users can scan using their smartphone via a mobile app. This will serve as a marker to show the desired entity. The scan will look for the size, markers, and corners of the trigger image and accordingly show the visual. The AR gadget likewise computes the position and direction of a marker to situate the substance, now and again.

DOI: https://doi.org/10.54216/FPA.040203

Received: October 26, 2020 Accepted: July 01, 2021

Whereas marker-less AR works by scanning the environment. There is no need for a marker or trigger photo or target market. Apps with such functionality demand a flat surface like a table or floor for placing the AR element. Else, the object will look like floating in the air. This Virtual Jewellery Shopping Application works on Marker-based AR. The app scans the marker using a phone camera. This will serve as a marker to show the desired entity. It uses the Vuforia engine to scan markers and place objects.
Vuforia is used for feature extraction because it delivers a robust and precise AR experience in various environments. Each jewelry type has a unique marker. It helps to differentiate among the various jewelry types.

Figure 1: Vuforia integration with unity

AR renders objects through technologies like SLAM stands for Simultaneous Localization And Mapping and Depth Tracking.

SLAM: This makes it feasible for AR applications to Recognize 3D Objects and Scenes, just as to Instantly Track the world and overlay advanced intelligent increases. SLAM uses EKF Algorithm.

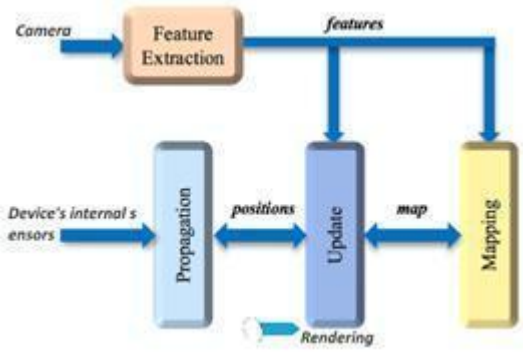

Figure 2: SLAM

2. Implementation

The Implementation of the application is a process of seven different steps :

1. User Authentication
2. Generation of the marker
3. Choosing the right article
4. Projecting the article on the marker
5. Add the selected item to the cart and enter other details.
6. Making a payment using Razorpay
7. Order status functionality
8. Let's discuss these steps one by one :

- **User Authentication:** It is the initial and most essential step of the process.

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- To Try out the application and proceed further, customers have to log in first. Users have to enter the credentials to login into the application.

Figure 3: Login Page

- We have implemented a firebase for user authentication.

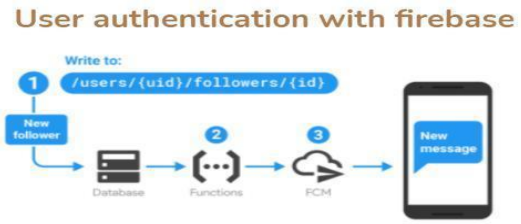

Figure 4: User Authentication

- **Generation of the marker:**
  To try any article on themselves, users need to download the marker first according to their size.
  A marked image that has almost every size is given in the application only. Marker[1][2] is chosen based on feature points it contains, i.e., Unique features that each image has in the form of edges, spots, or curves that look the same when observed from different angles. For selecting the markers, we have used a tool called Vuforia, which is used for feature extraction from an image and delivers a robust and precise Augmented reality experience in various environments [3]. Vuforia gives the star rating out of 5 based on patterns present in the marker. Some of the markers we have used are given below.

Figure 5: Markers in different sizes

Figure 6: Markers on different parts

DOI: https://doi.org/10.54216/FPA.040203

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- **Choosing the right article:** Users can explore different articles and options present in the application in e-catalogs.
  There is a lot of software available for designing 3D objects, and we have used Maya and Blender 3D for this project. For trying an article, you have to choose that particular item and then wear the requisite marker on that part. Some of the articles in the application are given below:

Figure 7: Different Articles

- **Projecting the article on the marker:** We have used unity for this purpose as Vuforia and Unity sync perfectly with each other.
  After choosing the right article, there comes the main concept of Augmented Reality. Users have to project the image of an article on the desired part. Whenever our application encounters the proper target, it displays the image on the user's marker. Hence users can see the projection of an article without even physically trying the article.

Figure 8: Displaying article on the wrist

- **Adding the selected item to the cart and entering other details:** After selecting the desired articles, users can add them to the cart for ordering. We have added the cart functionality to our application.
- Customers can add their products to the cart using the "Add To Cart" button.
  Customers can check their chosen items in the cart and can place orders using the same.

Figure 9: Selected items in the cart

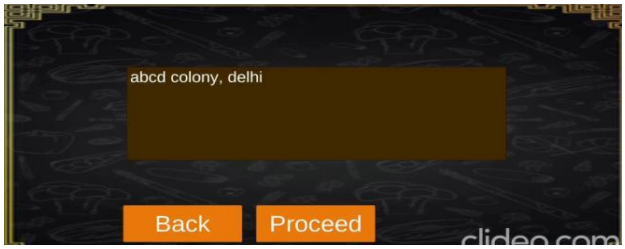

Figure 10: Adding user details

DOI: https://doi.org/10.54216/FPA.040203

Received: October 26, 2020 Accepted: July 01, 2021

- **Making payments using Razorpay:** We have integrated Razorpay into our application for payments. Razorpay allows users to pay virtually.
- Customers can place orders and make payments using Razorpay.
  Users can make payments using any online method, including net banking, UPI, credit, and debit cards.

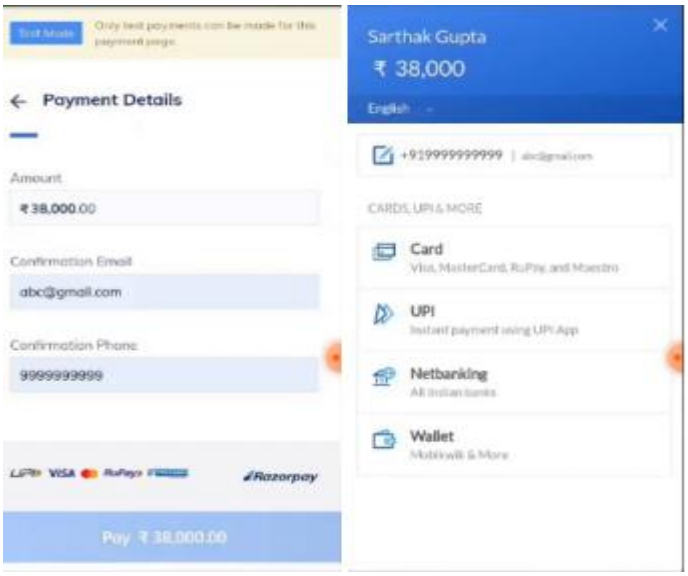

Figure 11: Making payments using Razorpay

- **Order status functionality:** After placing the order online from the application.
- Customers can track their orders in real-time.
- All the orders will be displayed in the My Orders section of the application.

Figure 12: Placing orders

3. AR Technology Today

Some of the applications of AR in different industries are :

A. Education:

B. When new technologies are made, tries are consistently made to evolve them for educational and informative settings. Augmented Reality is no particular case, and for more than ten years, AR headway has endeavored in various diverse instructive applications. These preliminaries have shown that AR can be more helpful and simple for understudies to learn and comprehend ideas without any problem in explicit conditions.

DOI: https://doi.org/10.54216/FPA.040203

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With AR, homeroom training can be remarkable and more intuitive. AR can empower instructors to show virtual ideas and add gaming components to offer course reading material help. This will empower students to learn quicker and remember data. Some examples of such applications are:

- An AR application called "**Dinosaur 4D+**" with many cheat sheets empowers clients to see 3D dinosaurs looking over the card. With this, students can see the activities of dinosaurs and use application highlights to pivot, zoom, and the sky's the limit from there. Plus, the application additionally gives some data about every dinosaur.

Figure 13: Dinosaur 4D+

- The "**Element 4D**" AR application is another good illustration of Augmented Reality in schooling, making learning science fun. The application empowers users to track down the nuclear weight, compound components, the response between two synthetics, and their names by basically putting two paper 3D squares for an extraordinary component block.

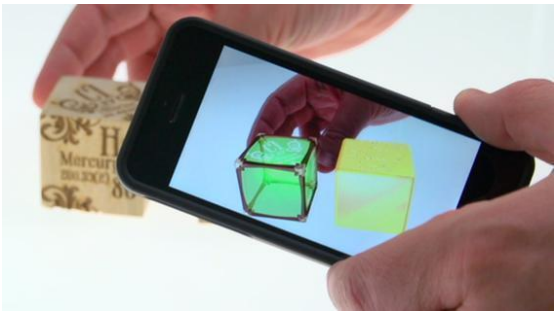

Figure 14: Element 4D

- Another appreciated illustration of AR/VR in training is "Google Expeditions," which empowers users to see 3D items in the homeroom, for example, volcanoes, storms, and even DNA. This

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application gives more than 100 AR campaigns that incorporate the historical backdrop of innovation, the moon landing, and then some more.

Figure 15: Google Expeditions

C. Architecture:

D. Augmented Reality is an optimal development for setting virtual information superimposed over the current Reality. As such, it will, in general, be used to handle conceivably the fundamental issues in design, i.e., you can see whatever hasn't been assembled at this point [7], [8], [9].

For the most part, creators used an extent of different devices to show their clients what their constructions will take after, including 2D plans, genuine models, 3D renderings, wise walkthroughs, and vivified fly-throughs. In any case, there are various insufficiencies with these systems. For example, 2D plans can show the arrangement of a design comprehensively. However, at this point and again, the client encounters trouble imagining what the construction would look like from the 2D drawing. Genuine models, 3D renderings, and insightful fly-throughs help the client get what the construction looks like; in any case, they are a diminished scope interpretation of the first space. These may not reflect a sensible appreciation of what the design will take after full-size on the first region. Increased Reality can be used to see full-sized 3D virtual models of future designs on the destinations where they will be manufactured. This allows those propelled by design to appreciate what it will look like. Moreover, the application could be used as an orchestrating gadget, putting a couple of types of comparative construction on the site and allowing the client to give input about the particular arrangement decisions.

Figure 16: AR in Architecture

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E. Entertainment:

F. For entertainment purposes[6], AR has been utilized successfully in PR and advertising drives for movie, TV, and other media special missions. Regularly, these have included printed realistic or genuine item acknowledgment where the product distinguishes a unique image using a webcam or phone camera.

G. Examples of such applications are:

H.

- **REAL STRIKE:** This is a mainstream shooting AR game that is accessible just on iOS. The users get a genuine shooting experience in this game and record their battles and make recordings. A pool has been dirtied by atomic waste, and a gathering of vermin is not far off, so players need to prevent them from contaminating the earth. Clients utilize their telephone to filter the imprint. The game offers night and warm vision goggles to get an excellent view to finish your central goal, even in the evening.

Figure 17: Real Strike

4. AR Market Analysis

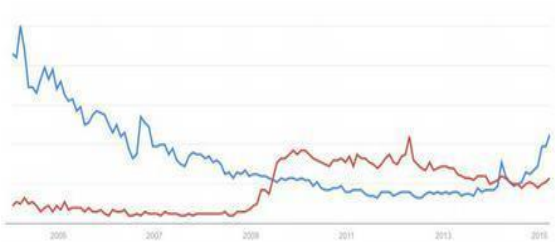

Figure 18: Google search trends of Augmented Reality

Figure18 illustrates the Google search trends of Augmented Reality[4][5][6] compared to Virtual Reality. Google search keywords: "Virtual Reality" in blue and "Augmented Reality" in red.

There was a steep decline in searches for Virtual Reality. Then, at that point, in 2009, the hunt pace of Augmented Reality rose, passing the Virtual Reality look and turned out to be twice as famous continuously.

This was mainly because of the main three factors:

1. Flash-based AR
2. AR compatible Smartphones
3. Adoption of AR in global marketing campaigns.[5]

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All these factors altogether drove billions of people to have had the AR technology experience. In June 2013, VR again ignored AR since Oculus Rift and other modest HMDs showed up with Virtual Reality. In 2008, the Flash platform gave rise to Flash-based AR when Adobe added camera support to its popularity. The ARToolKit library was ported to Flash, creating FLARToolKit by a pair of Sqoosha and Nyala. This was the first time, within their web browsers, people could have an AR experience. This led to a large number of web-based AR applications. The rise of smartphones was the second important factor.

Because of slow graphics power, slow processing, and limited sensors, it was challenging to develop. Still, the iPhone launch in 2007, with a fast processor for real-time computer vision tracking and powerful 3D graphics, provided a platform that was easy to develop. In October 2008, the first Android phone provided a significant boost to mobile AR. Qualcomm's Vuforia19, ARToolKitand authoring tools like BuildAR20 make it non-programmers possible to create AR experiences. 42.9 million people are willing to use VR, and 68.7 million people can use AR at least once per month. (2019)[4][5]

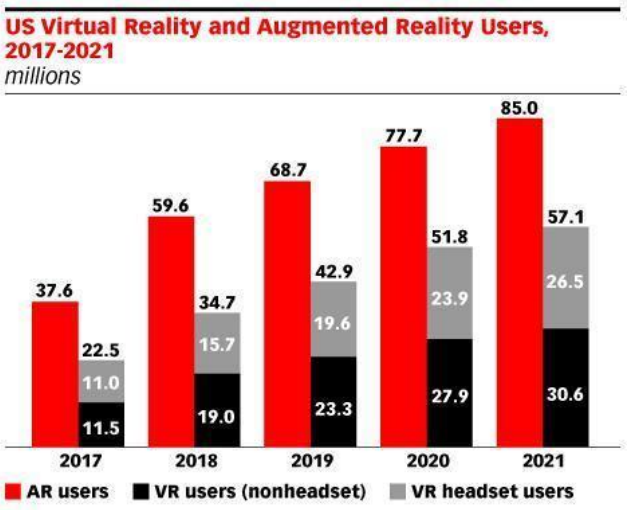

Figure 19: VR vs. AR users

5. Summary

The AR Research and Development past can be divided into four phases:

1. Pre-80s: Experimentation: Early research and experiments help define the concept of Augmented Reality and show the types of technology required.
2. 1980's-Mid-90's: Basic Research: Research on tracking, displays, and input devices.
3. Mid 1990's - 2007: Tools/Applications: Develop early applied and explore interaction techniques using AR enabling technologies with enhanced design and usability.
4. 2007 - Present: Commercial Applications: Application areas such as marketing, medicine, gaming, mobile, etc.

6. Conclusion

The application that we've developed brings about a fresh approach to augmented Reality. It accredits the buyer to scrutinize the product to a greater extent. The foremost step is to log in with the user credentials, which guarantees

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identity security. Coming to the spellbinding feature of our application, the size-based marker generation process. After generating the marker, the user can bounce to the available articles categories, including watches, rings, and earrings. After choosing the article, the customer will be able to browse the designs available, and that's where Augmented Reality comes into projection. To access the try-on feature, the users will have to project the marker on the desired part, which will result in the projection of the desired article.

Along with that comes the 'Add to cart feature, where the user can directly add the article(s) into their cart while the item is being projected. Eventually, users are directed to the Razorpay payment gateway. Customers have also been provided with the competence to track their orders' status in the 'My Orders' section of the application.

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DOI: https://doi.org/10.54216/FPA.040203

Received: October 26, 2020 Accepted: July 01, 2021