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ONLINE SHOPPING APPLICATION WITH THE TECHNOLOGY OF AUGMENTED REALITY

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After days of searching through dozens of local furniture stores for the couch of your dreams, you finally find it online. While buying a chair or a sofa, you begin thinking whether it is fit in your room or not. Then it's all a blur: the "Purchase" button, the doorbell, and, finally, the couch... It was returned because it did not resemble the photo at all. Does this sound familiar? Fortunately, with modern AR furniture shopping apps, this will no longer be an issue. It can save your time and money, while giving customers a broader range of products to choose from. Simply scan your room or an empty area on the floor, and the app will show you which furniture will fit best in your space. You can try more products and see how they all look together if you want. This feature allows you to find furniture that is similar to what you already have in your room.

Augmented reality can be experienced on a variety of hardware such as handheld devices (smartphones and tablets), wearables, PCs and laptops, TVs, digital mirrors, network devices such as glasses, head-mounted displays, lenses, and even AR exchange rooms.

ABSTRACT

The software market has always been faced with obstacles about being tech-savvy, larger products but less time and so on. Many technologies have been developed, including Augmented Reality (AR) with the purpose of improving the quality and expressing more ways of an idea.

Unfortunately, the world is suffering from the global pandemic COVID which requires a lot of modern solutions to recover the situation. Online shopping is one of the commerce forms solving the needs for products of people. While E-commerce platforms only focus on delivery services, many shops have developed their own application to provide customers with convenience and full support.

This report provides the detailed information of an online shopping application along with AR technology and how it works in real life.

CHAPTER 1

INTRODUCTION

1.1. Background

Augmented Reality (AR) is a field of computer science that creates improved versions of the world from 3D text, images, videos, films, and even real-world simulations. The

Shopping applications play an important role in the shopping experience as it saves customers time and money. Today, the world is hit hard by Covid's pandemic, and shoppers are using their devices to search for information about the products and stores that are currently selling what they are interested in.

1.2. Problem Statement

Our furniture company wants to serve more customers not only in big cities but all over Vietnam. However, because of Covid19, the showroom does not attract a large number of people. Therefore, traditional methods cannot satisfy people's experience because they are worried about choosing our products.

We have decided to use AR technology to test a new feature that provides a live preview of furniture products in the room and an online shopping system that delivers the products you need at home.

1.3. Scope and Objectives

The goal of our project is to provide an app for online shopping using AR technology.

Scope of our project:

- The app provides full product understanding, creative design and comprehensive user interface (UI/UX).
- The app enhances visitor interaction and raises interest, while highlighting your company's brand and personality.
- AR technology provides user interaction with objects.

CHAPTER 2

LITERATURE REVIEW/RELATED WORK

2.1. Augmented Reality

It has been debated how long Augmented Reality (AR) technology has existed but a few early systems appeared in the 1960's which appear similar to today's definition of Augmented Reality. (Arshif, Kishor, Monoj Kr., Muchahari, 2021).

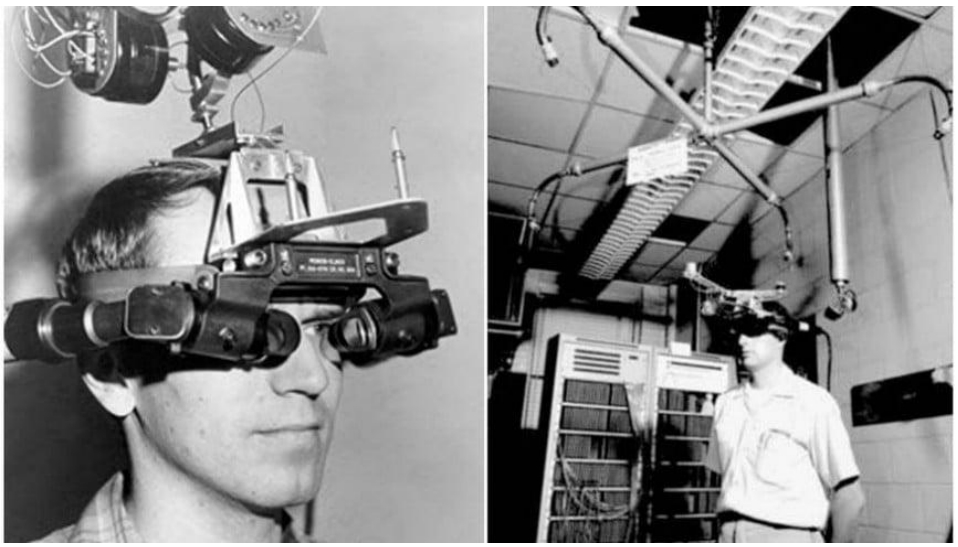


Figure 1: The first head-mounted display 'The Sword of Damocles' by Ivan Sutherland

2.1.1.History

It was 1990 when the term "Augmented Reality" was first coined by Tom Caudell. Two years later, one of the first and fully functional laboratories about AR was called "Virtual Fixtures' and it was created inside USAF Armstrong's Research Lab. Entertainment and Sports industry followed the trend, bringing AR to their matches.

Today, everyone with their devices can Access to AR and one of the most popular games using AR in real-time was Pokemon GO with 1 billion downloads globally in 2019. AR has also been implemented in a variety of products, including Google Glass or Microsoft Hololens which are both head-mounted displays instead of handheld devices. Snapchat's Dalmatian Filter is one of the implementations of AR, and is expected to be the technology of the future.

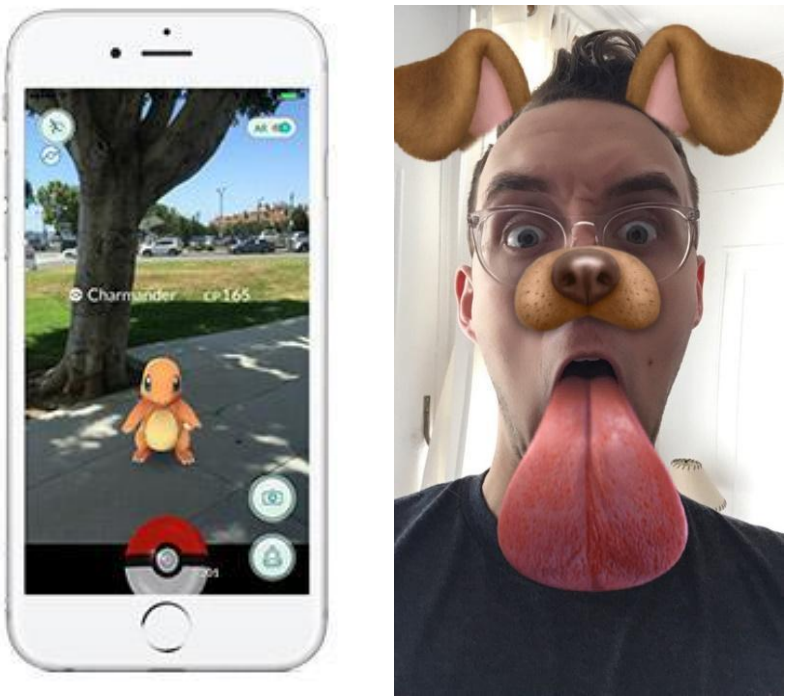


Figure 2: Pokemon GO and Snapchat's Dalmatian Filter

2.1.2. Types of Augmented Reality

Although AR is a technology, they are divided into several types to answer the questions such as what content is on the live camera view, the user view, for the user to interact with both real and virtual places. The three types of AR are: marker-based, markerless and location AR.

- Marker-Based Augmented Reality: Displaying the educational guides or the video attached to an image on devices. The user will have to use the

camera’s device to clip a page or a Picture on the screen. After that, the device will recognize this Picture as a particular shape or design and show animation on the correct location. The recognized pattern is called a marker.

- Markerless Augmented Reality: Displaying the 3D models in any places on the screen. The user will have to decide where to put the animation. This may cause the objects to appear on the air, but mostly the device will choose a flat surface to maximize realism for customers’ perspective.
- Location Augmented Reality: the virtual world is in a physical place.
  The device will detect flat ground and show every model and overlays available to users on the screen. Some auto-translating and AR City applications are a form of Location AR.

CHAPTER 3

METHODOLOGY

3. Overview

In this project, we will build an IOS app with the help of Unity3D and Xcode. The user's device must be in IOS version 14.0 or higher and support the AR kits. The name of this AR shopping app is RealOne.

3.1. Unity3D

Unity is a 3D/2D game engine and powerful cross-platform IDE for developers. Unity can provide many of the most important built-in features that make your game work. This means things like physics, 3D rendering, and collision detection.

From a developer's point of view, this means there is no need to reinvent the wheel. Instead of starting a new project, you build a new physics engine from scratch, calculate every final movement of each material, or calculate how light reflects off various surfaces.

In this project, we will use C# to code some basic functions (moving, scaling and replacing 3D objects) in the app.

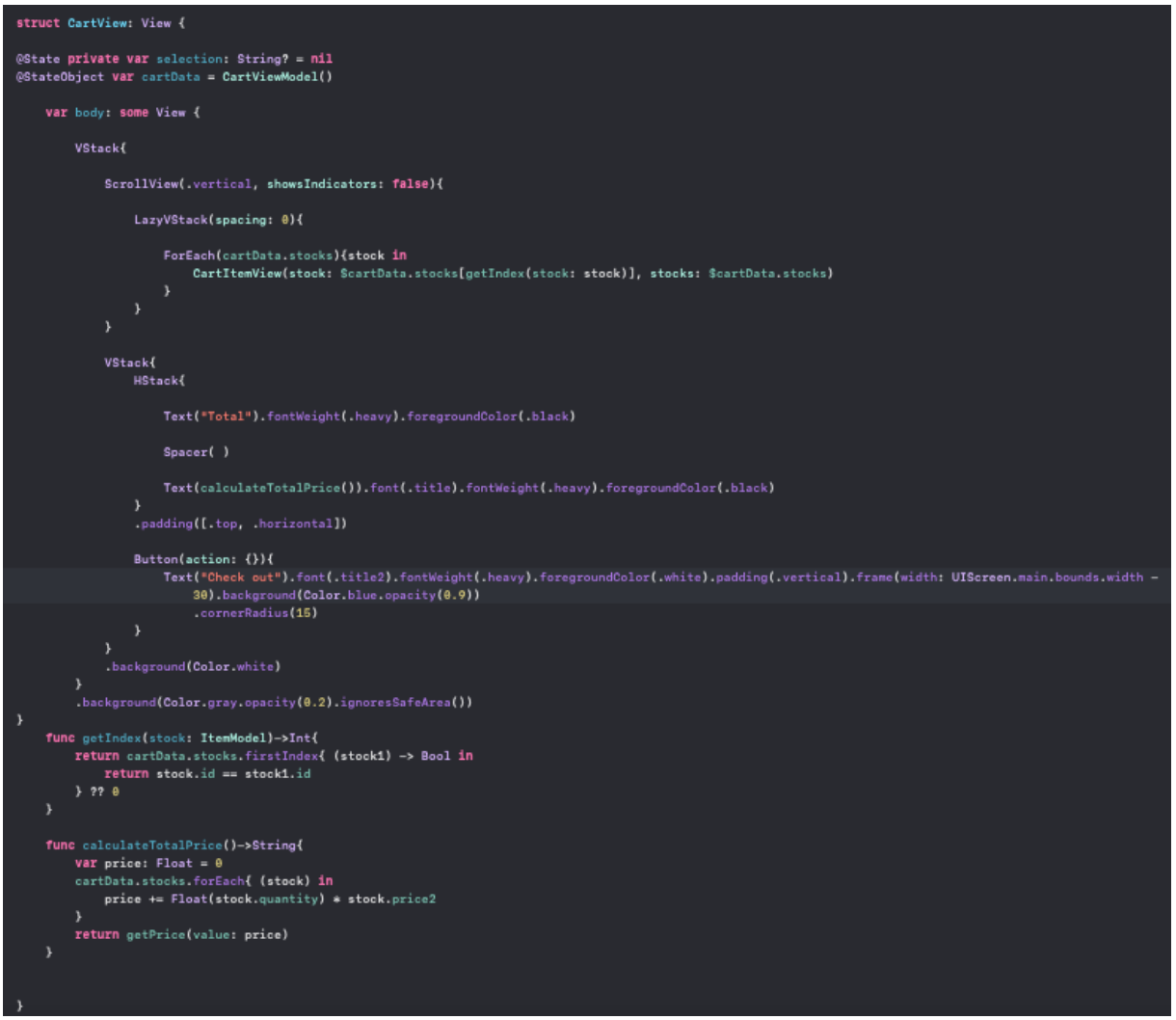
```
    void Update()
    {
        if(spawnedObject == null && placementPoseIsValid && Input.touchCount > 0 && Input.GetTouch(0).phase == TouchPhase.Began)
        {
            ARPlaceObject();
        }


        UpdatePlacementPose();
        UpdatePlacementIndicator();


    }
    void UpdatePlacementIndicator()
    {
        if(spawnedObject == null && placementPoseIsValid)
        {
            placementIndicator.SetActive(true);
            placementIndicator.transform.SetPositionAndRotation(PlacementPose.position, PlacementPose.rotation);
        }
        else
        {
            placementIndicator.SetActive(false);
        }
    }

    void UpdatePlacementPose()
    {
        var screenCenter = Camera.current.ViewportToScreenPoint(new Vector3(0.5f, 0.5f));
        var hits = new List<ARRaycastHit>();
        aRRaycastManager.Raycast(screenCenter, hits, TrackableType.Planes);

        placementPoseIsValid = hits.Count > 0;
        if(placementPoseIsValid)
        {
            PlacementPose = hits[0].pose;
        }
    }

    void ARPlaceObject()
    {
        spawnedObject = Instantiate(arObjectToSpawn, PlacementPose.position, PlacementPose.rotation);
    }
}
```

Figure 3: Basic functions

3.2. Xcode

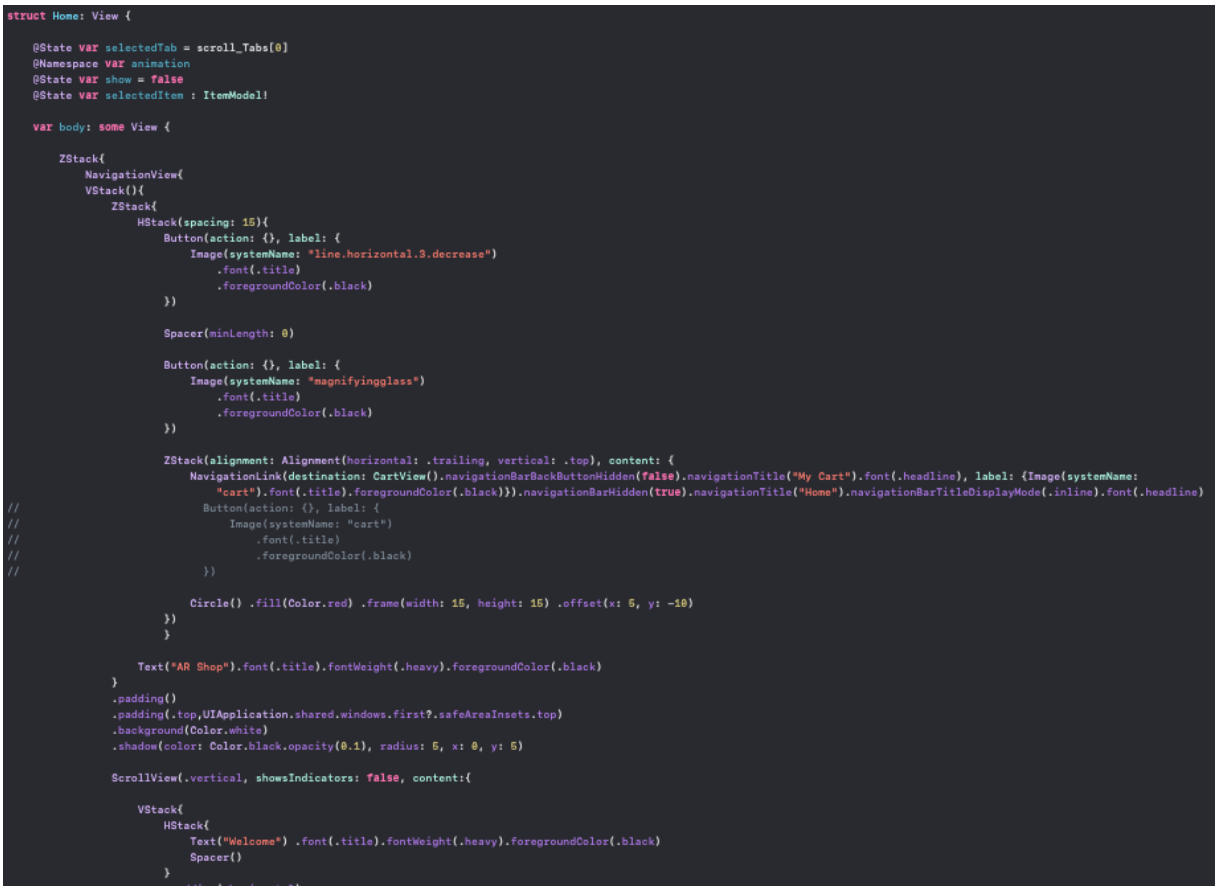
Xcode is an integrated development environment for building app on IOS's platform . In other words, it combines all the tools needed to create an application (especially a text editor, compiler, and build system) into one software package, rather than leaving it as a separate set of scripts. tool, …

We will use Swift to create HomePage, CartView, ItemView and some basic functions (View items, Delete items from Cart, …)



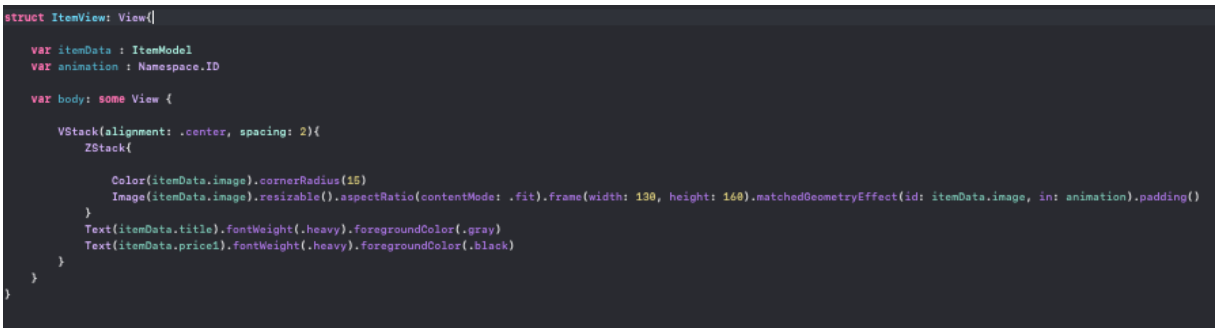
```
struct CartView: View {

@State private var selection: String? = nil
@StateObject var cartData = CartViewModel()

    var body: some View {

        VStack{

            ScrollView(.vertical, showsIndicators: false){

                LazyVStack(spacing: 0){

                    ForEach(cartData.stocks){stock in
                        CartItemView(stock: $cartData.stocks[getIndex(stock: stock)], stocks: $cartData.stocks)
                    }
                }
            }

            VStack{
                HStack{

                    Text("Total").fontWeight(.heavy).foregroundColor(.black)

                    Spacer( )

                    Text(calculateTotalPrice()).font(.title).fontWeight(.heavy).foregroundColor(.black)
                }
                .padding([.top, .horizontal])

                Button(action: {}){
                    Text("Check out").font(.title2).fontWeight(.heavy).foregroundColor(.white).padding(.vertical).frame(width: UIScreen.main.bounds.width -
                        30).background(Color.blue.opacity(0.9))
                        .cornerRadius(15)
                }
            }
            .background(Color.white)
        }
        .background(Color.gray.opacity(0.2).ignoresSafeArea())
}
    func getIndex(stock: ItemModel)->Int{
        return cartData.stocks.firstIndex{ (stock1) -> Bool in
            return stock.id == stock1.id
        } ?? 0
    }

    func calculateTotalPrice()->String{
        var price: Float = 0
        cartData.stocks.forEach{ (stock) in
            price += Float(stock.quantity) * stock.price2
        }
        return getPrice(value: price)
    }


}
```

Figure 4: CartView



```
struct Home: View {

    @State var selectedTab = scroll_Tabs[0]
    @Namespace var animation
    @State var show = false
    @State var selectedItem : ItemModel!

    var body: some View {

        ZStack{
            NavigationView{
            VStack(){
                ZStack{
                    HStack(spacing: 15){
                        Button(action: {}, label: {
                            Image(systemName: "line.horizontal.3.decrease")
                                .font(.title)
                                .foregroundColor(.black)
                        })

                        Spacer(minLength: 0)

                        Button(action: {}, label: {
                            Image(systemName: "magnifyingglass")
                                .font(.title)
                                .foregroundColor(.black)
                        })

                        ZStack(alignment: Alignment(horizontal: .trailing, vertical: .top), content: {
                            NavigationLink(destination: CartView().navigationBarBackButtonHidden(false).navigationTitle("My Cart").font(.headline), label: {Image(systemName:
                                "cart").font(.title).foregroundColor(.black)}).navigationBarHidden(true).navigationTitle("Home").navigationBarTitleDisplayMode(.inline).font(.headline)
//                          Button(action: {}, label: {
//                              Image(systemName: "cart")
//                                  .font(.title)
//                                  .foregroundColor(.black)
//                          })

                            Circle() .fill(Color.red) .frame(width: 15, height: 15) .offset(x: 5, y: -10)
                        })
                        }

                    Text("AR Shop").font(.title).fontWeight(.heavy).foregroundColor(.black)
                }
                .padding()
                .padding(.top,UIApplication.shared.windows.first?.safeAreaInsets.top)
                .background(Color.white)
                .shadow(color: Color.black.opacity(0.1), radius: 5, x: 0, y: 5)

                ScrollView(.vertical, showsIndicators: false, content:{

                    VStack{
                        HStack{
                            Text("Welcome") .font(.title).fontWeight(.heavy).foregroundColor(.black)
                            Spacer()
                        }
```

Figure 5: HomeView



```
struct ItemView: View{

    var itemData : ItemModel
    var animation : Namespace.ID

    var body: some View {

        VStack(alignment: .center, spacing: 2){
            ZStack{

                Color(itemData.image).cornerRadius(15)
                Image(itemData.image).resizable().aspectRatio(contentMode: .fit).frame(width: 130, height: 160).matchedGeometryEffect(id: itemData.image, in: animation).padding()
            }
            Text(itemData.title).fontWeight(.heavy).foregroundColor(.gray)
            Text(itemData.price1).fontWeight(.heavy).foregroundColor(.black)
        }
    }
}
```

Figure 6: ItemView

CHAPTER 4

IMPLEMENT AND RESULTS

4.1. Implement

4.1.1. Shopping App

There are 3 main views in the shopping app:

- HomeView: is a screen that appears first when a user opens this app.

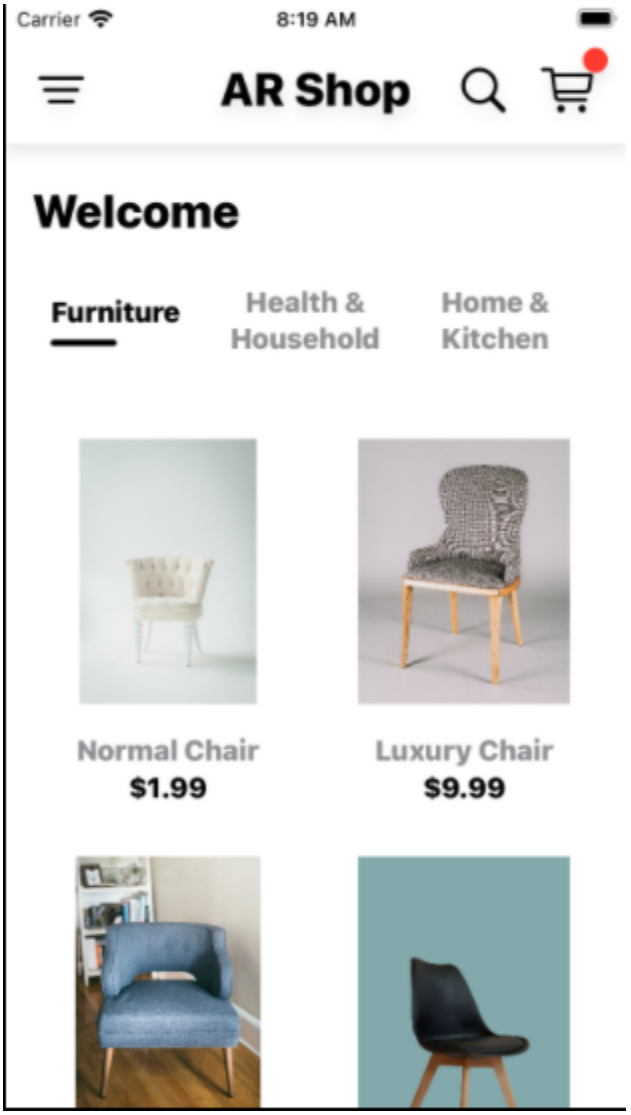


Figure 7: Home View UI

- ItemView: is a screen that shows some details of that item when the user taps in.

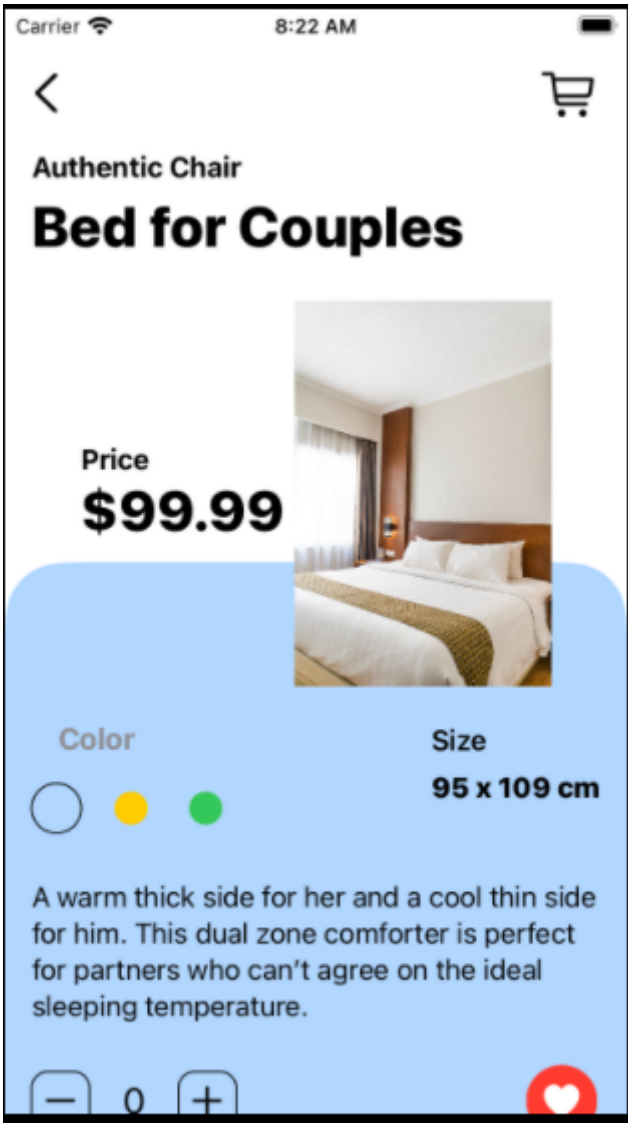


Figure 7: ItemView UI

- CartView: is a screen that shows items when users tap button "Add to Cart".

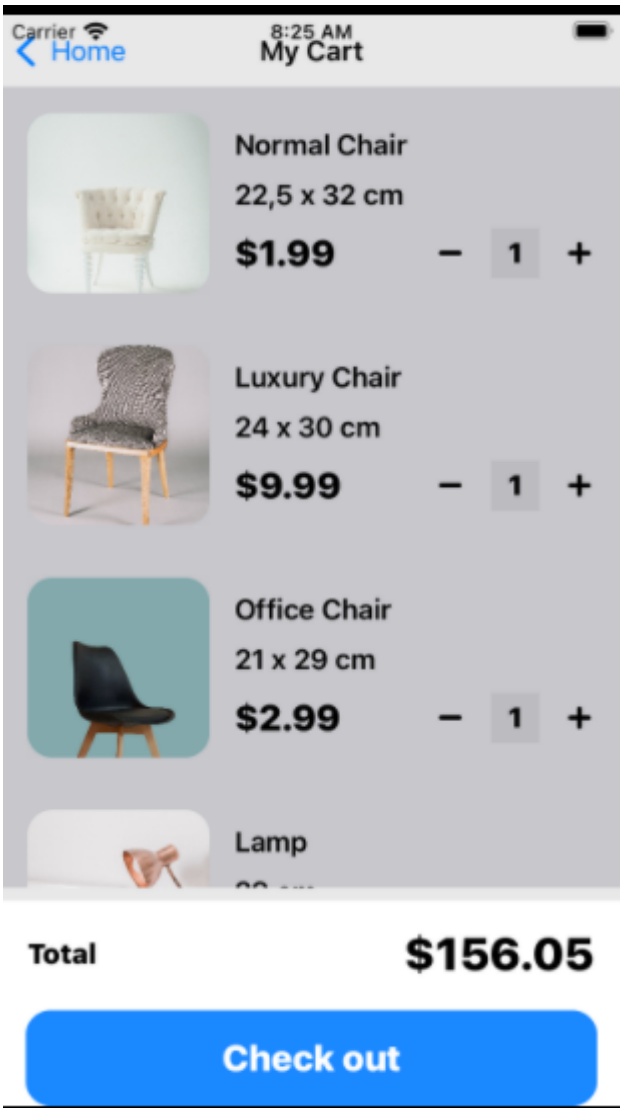


Figure 8: CartView UI

4.1.2. AR App

When users tap the button “View in your room”, the screen will open the camera. Next, users have to place the black dot at the place they want to view the object and tap on the screen.

Figure 9: Place object UI

Figure 10: Modify object UI

4.2. Results:

As the result, we will have an completely AR shopping app named RealOne.

Figure 11: Logo of our app

4.3. Contribution:

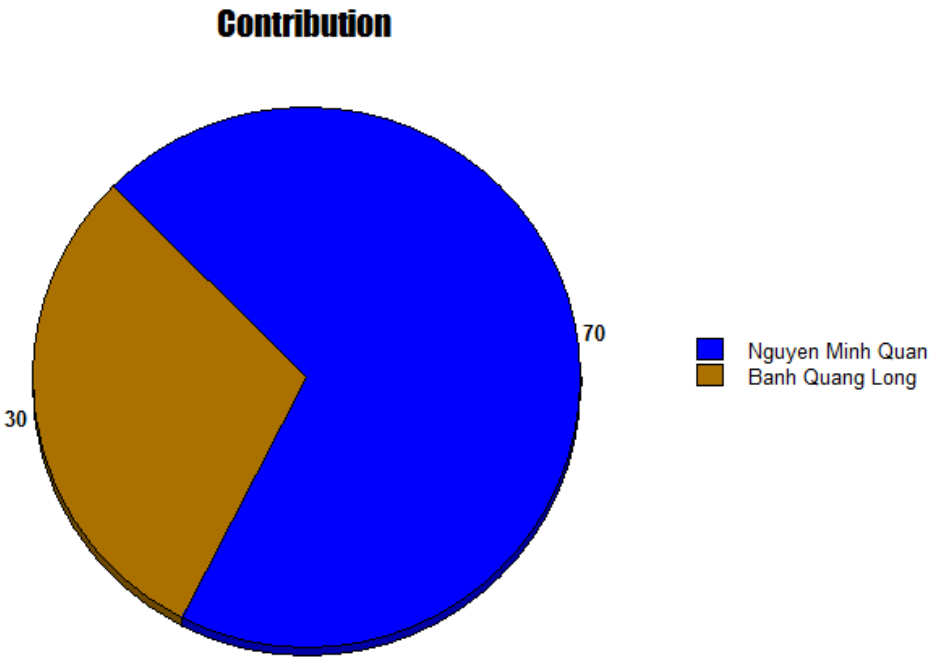


Figure 12: Contribution

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1. Conclusion

Overall, our application serves the most basic purpose of Augmented Reality (AR) by making a live preview of the 3D furniture in a targeted room or on a selected plane. Users can select the items they want and can see their cart to consider the cost. However, the UI and the AR application, as being implemented on different platforms, cannot switch between each other.

6.2. Future work

In real life practice, we have to connect to our delivery partners to deliver the products to any place based on customers' desire. A database will be built later to easily organize a large number of furniture. Our intention is to deploy more paying methods such as credit cards, E-wallets besides Cash-on-delivery (COD).

More than that, we want to improve the performance of our app:

- Put more work on designing the UI / UX
- Develop and implement more functionalities for all of the screens.
- Add Login page for customers to store their information.

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