FACULTY OF INFORMATICS

COURSEWORK COVERSHEET

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C. Group Topic :

Augmented Reality Application for Hospitality Industry.

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1.0 – Executive Summary

In this part of the project, we mainly focus on the implementing our proposed augmented reality features in the hospitality industry through an android mobile app.

Firstly, for the augmented reality features,[1] we planned to develop our augmented reality features based on the FURPS principal which consist of Functionality, Capability, Reusability, Security and Usability. In terms of functionality , our project focus on developing the following features an Augmented reality Game System, a 3D Augmented Reality Food Model Scanner System, a 360 degree Restaurant Environment View System, a Augmented Reality Hospitality Training Simulation System as well as a payment system that is all integrated in an android mobile app, For usability our focus will be ensuring our android mobile app have a clean interface with only the necessary features that is needed in the android mobile app in order to provide an optimal user experience to all our users. In terms of reliability, we planned to ensure our augmented reality system must be tolerant to operator errors. As well as consistently producing the same high-level quality augmented reality experience that meet the user demands. The system must also give stable result. On the other hand, for reliability, we are planning to ensure our system can be use on any android mobile phone version anywhere and anytime as well as ensuring the user can run all the features of our system without any disruptions. For reliability our focus will be on making sure the system is easy to maintain and extensible with its system design in a way that a developer can easily make any further updates or bug fixes.

Apart from focusing on developing the augmented reality and virtual reality features, we would also focus on the user experience (UX design) design and the user interface design (UI design) of our android mobile app. In terms of User experience, our focus would be ensuring that our app will further enhance a customer hospitality experience by providing the consumer an augmented reality feature that allow the customer to have a augmented reality view of the food offered by the restaurant menu before ordering it as well as having a chance to preview a restaurant setting before making a reservation. For the user interface, our aim will be ensuring that our user will enjoy a realistic kind of augmented reality features such as ensuring the augmented reality food model closely resemble its real counterpart as well as providing an efficient platform for the hospitality staff to have an augmented reality-based hospitality training system to help them to speed up their learning curve.

In addition to that,[2] in this phase of our group assignment we will also be looking at user evaluation and heuristic evaluation regarding our proposed augmented reality features for the hospitality industry whereby we would attempt to get feedback from various users such as restaurant owner, web developer and etc to ensure that our product full-fills Nielsen's heuristic rule for interface design.

2.0 – Introduction

Augmented reality (AR) is integration of digital information with the user's environment in real time. Augmented reality uses the existing environment and overlays new information on top of it. AR provides not only a sense of reality for the user, also enables users to connect the AR images with situations in real life, observing and learning from the cause and effect between two significant points of reality. AR apps are written in special 3D program that allow developer to tie animation or contextual digital information in the computer program to an augmented reality. AR applications for smart phone typically include global positioning system (GPS) to pinpoint user's real time location and lead users to their wanted location.[3]

In the past 30 years, most of the hospitality have no idea what is augmented reality and how augmented reality can improve their business. With our advance technology nowadays, augmented reality has emerged as an important concept within the hospitality field in recent years. AR allow hotels and others related business to enhance the physical environment they are selling. For example, restaurants, hotel, rooms, or enhance the experience of exploring the surrounding environment. With implementation of AR in hospitality industry, restaurant can attract customers with by pointing a smart phone inside the restaurant and explore something new that they never experience before. For example, with pointing a phone on the table it will display a short video on the phone screen until the food is done prepared.[5]

In this part B of the project, we work towards discovering the potential and flows of the design of AR we design. We hope that our AR design can implement in hospitality industry and to help the industry. Our AR included a function for users who are able to view the surrounding area with their smart phone before they decide to went into the shop to have their meal.[4]

3.0 – Functional & Non-Functional Requirement (FURPS)

All of the requirements listed below are acquired based on Nielsen's rule. According to Jakob Nielsen, it is crucial for a system to apply the usability heuristics to ensure the system get off to a good start.

3.1 – List of Functional Requirements

3.11 – Functional Requirement

Functional requirements are the desired functions or operations of a system. It describes what tasks should the system carry out to serve the users. It also can be understood that every system will come with at least one functional requirement.

In our project, there are 4 major functions which are:

1. Maze Game System
2. 3D Food Scanner System
3. Environment Observation System
4. Training Simulation System

Beside of the functions mentioned above, it will also come with some side function such as payment system. So, let us go into details of the functions mentioned above.

Firstly, maze game system. Sometimes when a restaurant gets busy, customer is required to wait for a long time to be served. So, if user have nothing to do during the time of waiting for the food, it is going to be unproductive. Thus, the function is created to provide the customer an option of playing game instead of staring at the environment of the restaurant.

Next, 3D food scanner system. Everyone sure had visited to a restaurant at least once in their life time. However, it is not always a positive experience. Sometimes we ordered a food with a high expectation while it turn out to be another 'type' of food. That's what this function is created for. Through these functions, user is able to have a look the augmented reality view on the food before ordering to prevent dissatisfaction. The augmented view of the food will be following the real-world looks to allow the augmented reality view of the food present in a natural form.

Following that, environment observation system. This system is also based on a restaurant setting. From time to time, we may want to host an event, such as birthday party, and the birthday party always come with a theme. That

being said, not every restaurant could fit every birthday party theme. By using this system, user can have an augmented reality look on the interior design of the restaurant to see if it fit his/her likes before making reservation.

If user want to make reservation, the system is also capable of providing the user to make payment. The objective of this is to avoid extra hassle for the user which he or she previously may require to log in to another website to make payment. To make payment, personal detail of user must be provided. Thus, the user's details must be kept confidential. Any leakage on user's details will result in the reputation of the system being tarnished.

Lastly, training simulation system. The function is aim to provide a comfortable learning environment for the user. If says the system is applied for front desk training, the tutor does not have to redo everything again every time a tutee come for training. It can solve the problem of the training being time and cost consuming in the past.

Summary of Functional Requirements

- **The system must be able to provide game function.**
- **The system must be able to visualize the food in the menu list.**
- **The system must have observation system to check the interior design of a restaurant before making reservation.**
- **The system must verify the user payment method before making reservation.**
- **The personal details of users must be kept confidential.**
- **The system must be able to train the staff in hospitality industry.**

3.2 – List of Non-functional Requirements

3.21 – Usability Requirement

Usability requirements are documented expectations and specifications designed to ensure that a product, service, process or environment is easy to use. It is often described as the learnability, user friendliness, error tolerance and so forth, of a system.

First of all, the application must have friendly user interface. A friend user interface is normally one of the most important factors, if not the best, on bringing high volume web traffic to an application. This is due to the fact that any age group is our potential user. Thus, he or she can be a kid or an old man who are absolute beginner in the technology kits. Having a simple user interface to guide them using the application can often lead to positive experiences for them.

Besides, to stay relevant or exist for a long period, it is essential for users to learn the application. It is important to minimize user's memory load on how to operate an application. So, they can have an easier time to recall of how the system work on their subsequent visits. If the user can effortlessly be familiar with the system, the application can have a high customer retention rate which will increase our profit indirectly.

Last but not least, user must not spend massive amount of time to rectify mistakes. If there is error message pop-out, the messages must be expressed in simple language. In addition, the error message should also precisely indicate what the problem is, and suggest a solution for it.

Summary of Usability Requirements

- **The system must guide users through a friendly user interface.**
- **The system must be easy to learn.**
- **The system must be easy to correct accidental mistakes.**

3.22 – Reliability Requirement

Reliability contains aspects such as accuracy, recoverability, and availability. The level of reliability shows the quality of our application. Hence, it is critical for our system to perform well consistently all year long.

First and foremost, the application must be tolerant to operator errors because users often choose system function by mistake. So, the system needs to be supported with the function of undoing the user act.

Moreover, blurry augmented reality images or views must not be generated for the user. A blurry augmented reality images or views can affect user decision making, for example, if an augmented reality view of food model is blurry, user will have a hard time on deciding whether to order the food. The experience of having unreliable performance will lead to a negative experience for the users.

Summary of Reliability Requirements

- **The system must be tolerant to operator errors.**
- **The system must give stable result.**

3.23 – Performance Requirement

Performance requirement is a requirement that define what the system must do and how well the system should perform under a particular condition. It is a key element when designing a product. High quality of performance requirements means that user does not have to worry about different situation bring different performance.

That bring us to our first requirement for performance, which is the user must be able to use the applicant regardless of place or time. It is important that the application be accessible at any place. For instance, one who are currently located in rural area should be provided equal access and opportunity to the application. Location should not restrict the accessibility of user.

Next, user must be able to perform multitasking when using the application. A part of people loves to open multiple application at a time or they do not have the habit to close an application after they are done with using it. So, it is important for our application to remain functional while there are system updating or performing in the background. In example, our application must still be allowed for operating while there are music application playing in the background.

Summary of Reliability Requirements

- **The system must be made to allow user to use it anytime or anywhere.**
- **The system must be allowed for multitasking.**

3.24 – Supportability Requirement

Supportability requirement is often defined as the maintainability, adaptability, compatibility, and so on, of a system. In order for the system to last for years to come, it is important for the system to have the ability to keep up its efficiency on the highest level constantly.

So, the system must be easy to maintain and also extensible. To have such requirements, it is a must to create the system with simple function. A simple function means it is easier to understand, it is easier to maintain, it is easier to expand. Eventually, the system will be a lot less buggy.

In addition, the system must be able to support all type of mobile devices' operating system. As if the application only support iOS, it would scare off our potential users as not everyone is able to afford another Android device for a specific usage. That being said, technology is always improving. We never know whether there will be new operating system replacing the old ones. Hence, a simple function also allows the system capable of migrating to a new operating system easily.

Summary of Supportability Requirements

- **The system must be easy to maintain and extensible.**
- **The system must be able to support all type of mobile devices' operating system.**
- **The system must be designed in the way of it can be migrated to new operating system easily.**

3.3 –Ranking of Importance

The ranking of the importance of the requirement is listed as below,

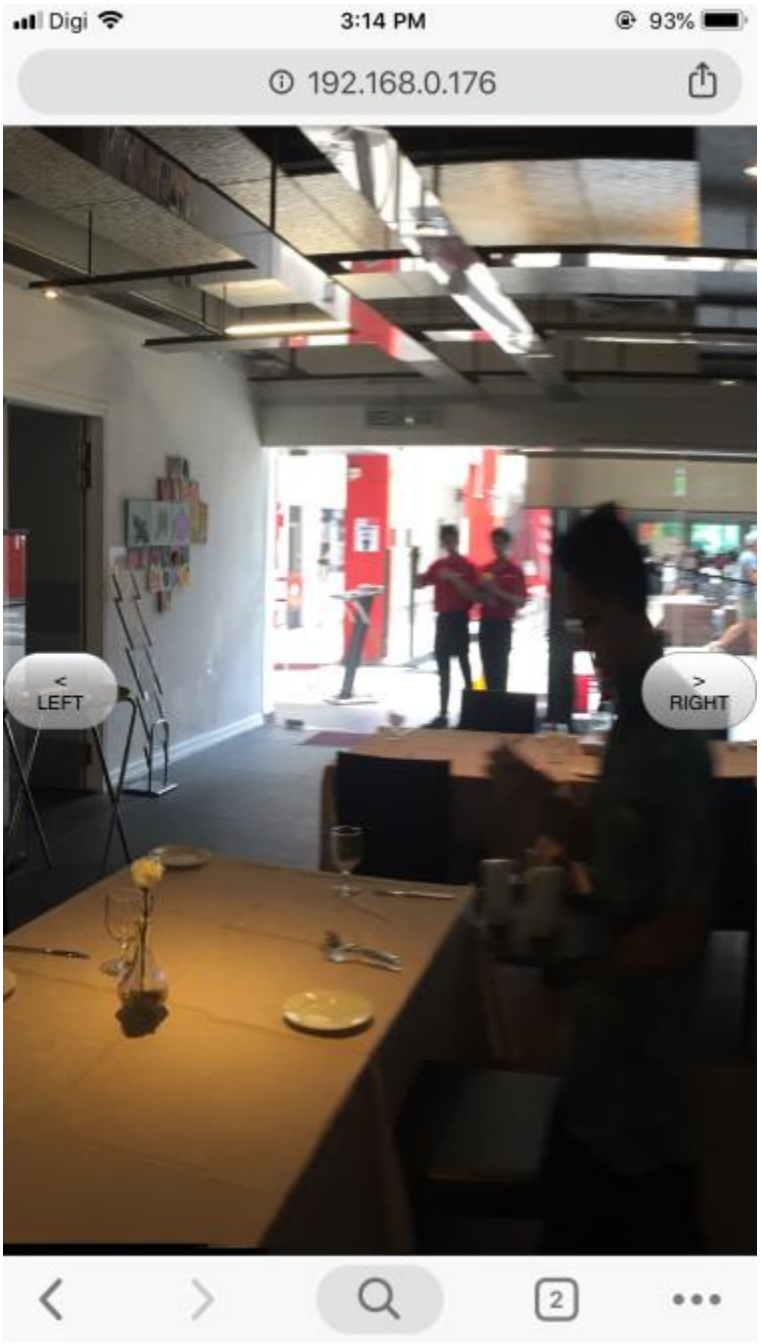
No.	Task	Rank
1.	The system must be able to provide game function.	6
2.	The system must be able to visualize the food in the menu list.	2
3.	The system must have observation system to check the interior design of a restaurant before making reservation.	1
4.	The system must verify the user payment method before making reservation.	4
5.	The personal details of users must be kept confidential.	5
6.	The system must be able to train the staff in hospitality industry.	3
7.	The system must guide users through a friendly user interface.	7
8.	The system must be easy to learn.	10
9.	The system must be easy to correct accidental mistakes.	12
10.	The system must be tolerant to operator errors.	14
11.	The system must give stable result.	8
12	The system must be made to allow user to use it anytime or anywhere.	11
13.	The system must be allowed for multitasking.	13
14.	The system must be easy to maintain and extensible.	9
15.	The system must be able to support all type of mobile devices' operating system.	15
16.	The system must be designed in the way of it can be migrated to new operating system easily.	16

3.3 – Evidence (FURPS)

3.31 – 360 Environment View System

File Link: https://drive.google.com/open?id=1exBS2cRmf6G8aBBx-cigixYc_vvxn9zR

```html
<!DOCTYPE html>
<html>
<head>
    <title>HCI Part B - 360 Environment View System</title>

    <style>
        body, html
        {
            margin:0;
            height: 100%;
        }

        #imgHolder
        {
            background-image: url("1.jpg");
            height: 100%;
            background-position: center;
            background-repeat: no-repeat;
            background-size: cover;
        }

        #left
        {
            margin: 0;
            position: absolute;
            top: 50%;
            -ms-transform: translateY(-50%);
            transform: translateY(-50%);
            float: left;
        }

        #right
        {
            margin: 0;
            position: absolute;
            top: 50%;
            -ms-transform: translateY(-50%);
            transform: translateY(-50%);
            float: left;
            right:00%;
        }

        button
        {
            width: 150px;
            height: 100px;
            font-size: 25px;
        }
    </style>
</head>

<body>
    <div id="imgHolder">
        <button id="left" onclick="viewLeft()"><<br/>LEFT</button>
        <button id="right" onclick="viewRight()">><br/>RIGHT</button>
    </div>

    <script>
        var currentPage=1;

        function viewRight()
        {
            currentPage++;

            if(currentPage==6)
                currentPage=1;

            if(currentPage==2)
                document.getElementById("imgHolder").style.backgroundImage="url('2.jpg')";
            else if(currentPage==3)
                document.getElementById("imgHolder").style.backgroundImage="url('3.jpg')";
            else if(currentPage==4)
                document.getElementById("imgHolder").style.backgroundImage="url('4.jpg')";
            else if(currentPage==5)
                document.getElementById("imgHolder").style.backgroundImage="url('5.jpg')";
            else if(currentPage==1)
                document.getElementById("imgHolder").style.backgroundImage="url('1.jpg')";
        }

        function viewLeft()
        {
            currentPage--;

            if(currentPage==0)
                currentPage=5;

            if(currentPage==2)
                document.getElementById("imgHolder").style.backgroundImage="url('2.jpg')";
            else if(currentPage==3)
                document.getElementById("imgHolder").style.backgroundImage="url('3.jpg')";
            else if(currentPage==4)
                document.getElementById("imgHolder").style.backgroundImage="url('4.jpg')";
            else if(currentPage==5)
                document.getElementById("imgHolder").style.backgroundImage="url('5.jpg')";
            else if(currentPage==1)
                document.getElementById("imgHolder").style.backgroundImage="url('1.jpg')";
        }
    </script>
</body>
</html>
```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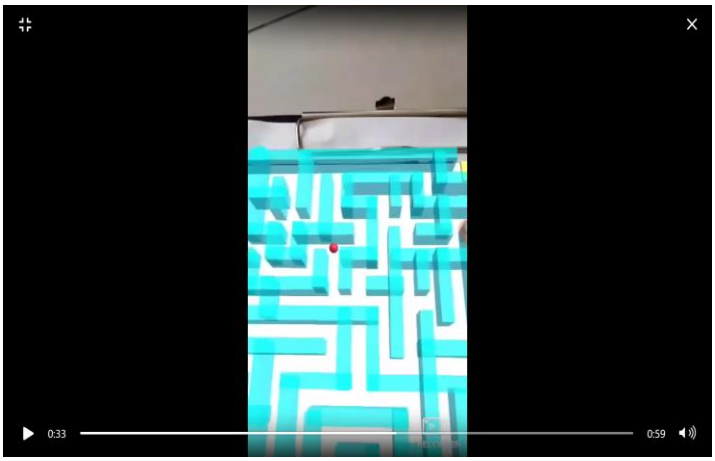
2

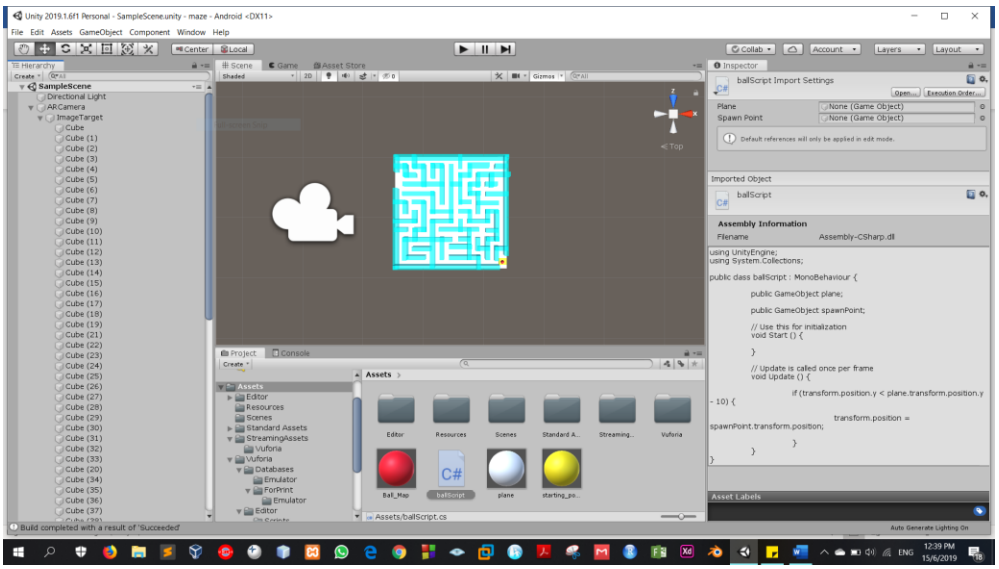
3.32 – Augmented Reality Maze Game

File Link: https://drive.google.com/open?id=1aFnlrjlKxQAfkPWfeXjU9i_t_GWVN239



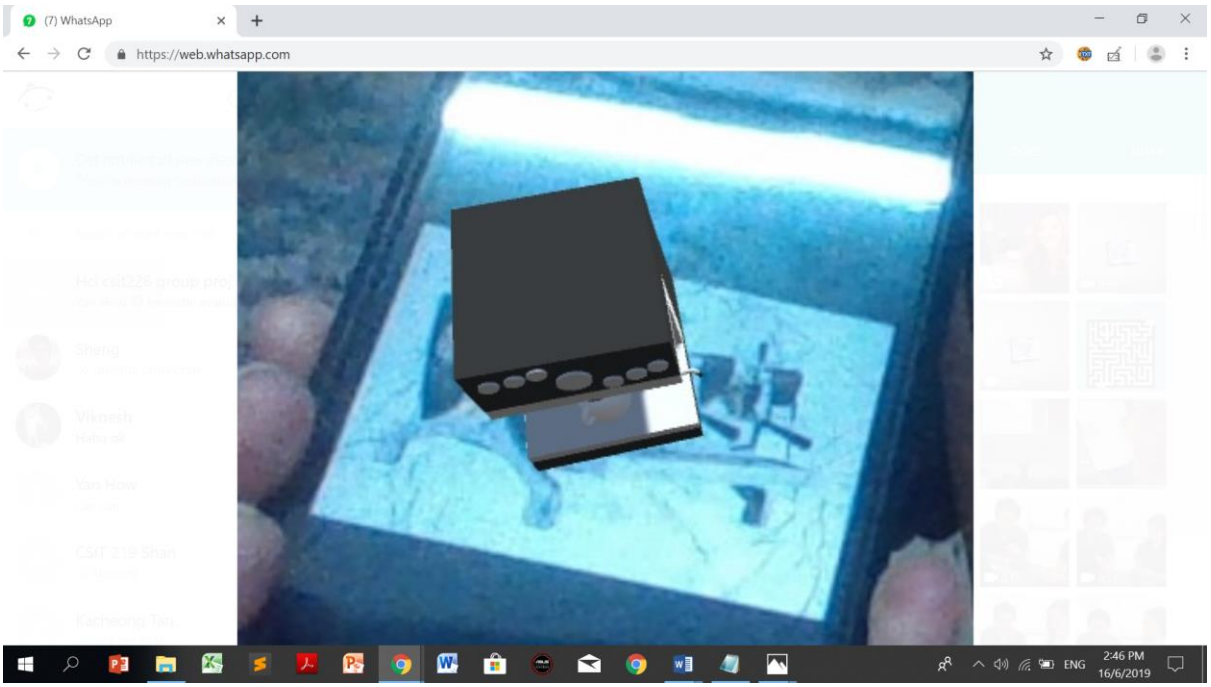
BallScript

```
using UnityEngine;
using System.Collections;

public class ballScript : MonoBehaviour {

	public GameObject plane;

	public GameObject spawnPoint;

	// Use this for initialization
	void Start () {

	}

	// Update is called once per frame
	void Update () {

		if (transform.position.y < plane.transform.position.y - 10) {

			transform.position = spawnPoint.transform.position;

		}
	}
}
```



3.33 – AR Hospitality Training Simulation System

File Link: https://drive.google.com/open?id=18fHE9HA2CenLNyA-p3AED6UaxHfyOD5D



3.34 – 3D Food Visualization System

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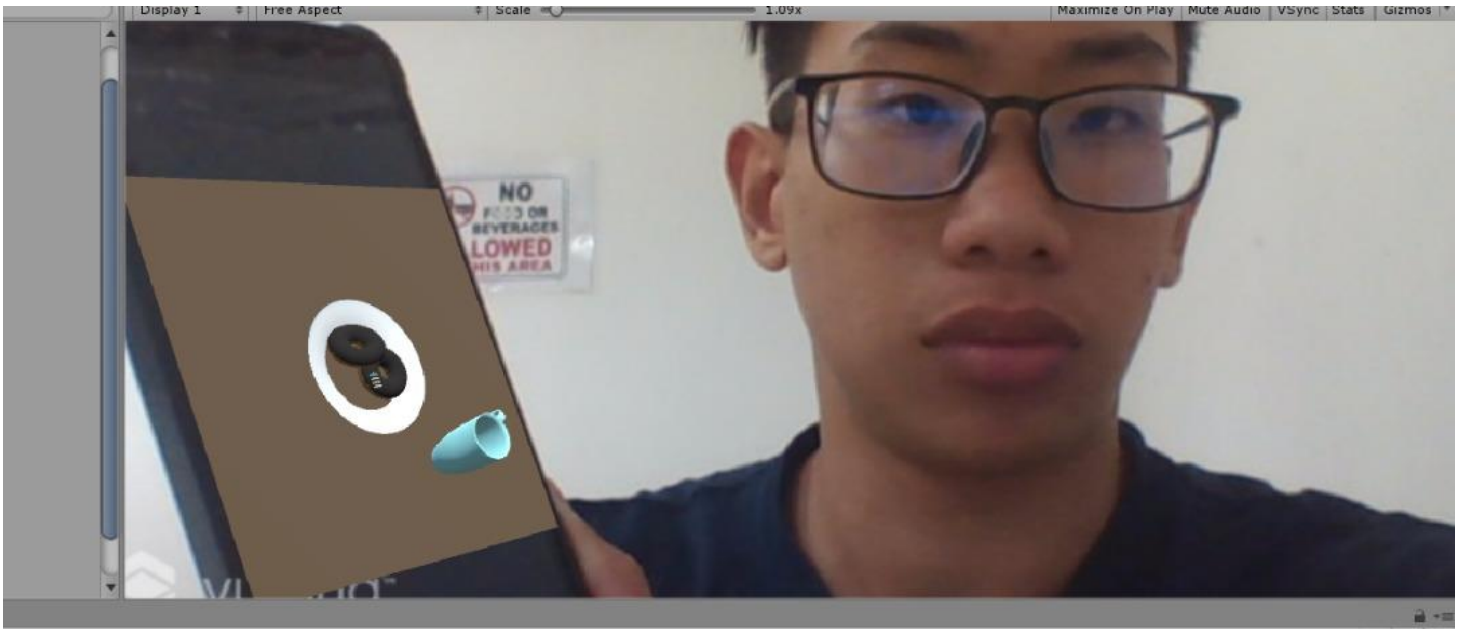
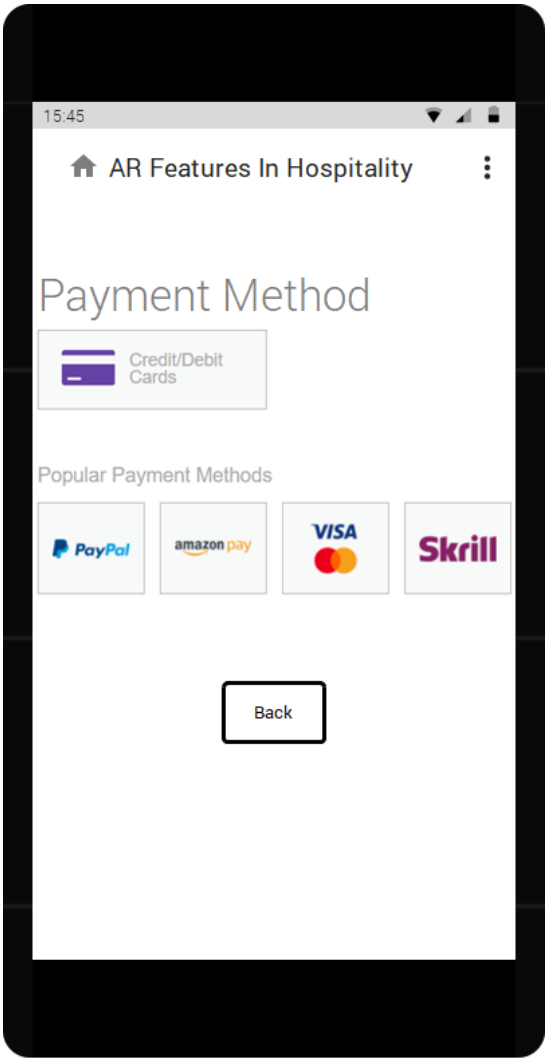
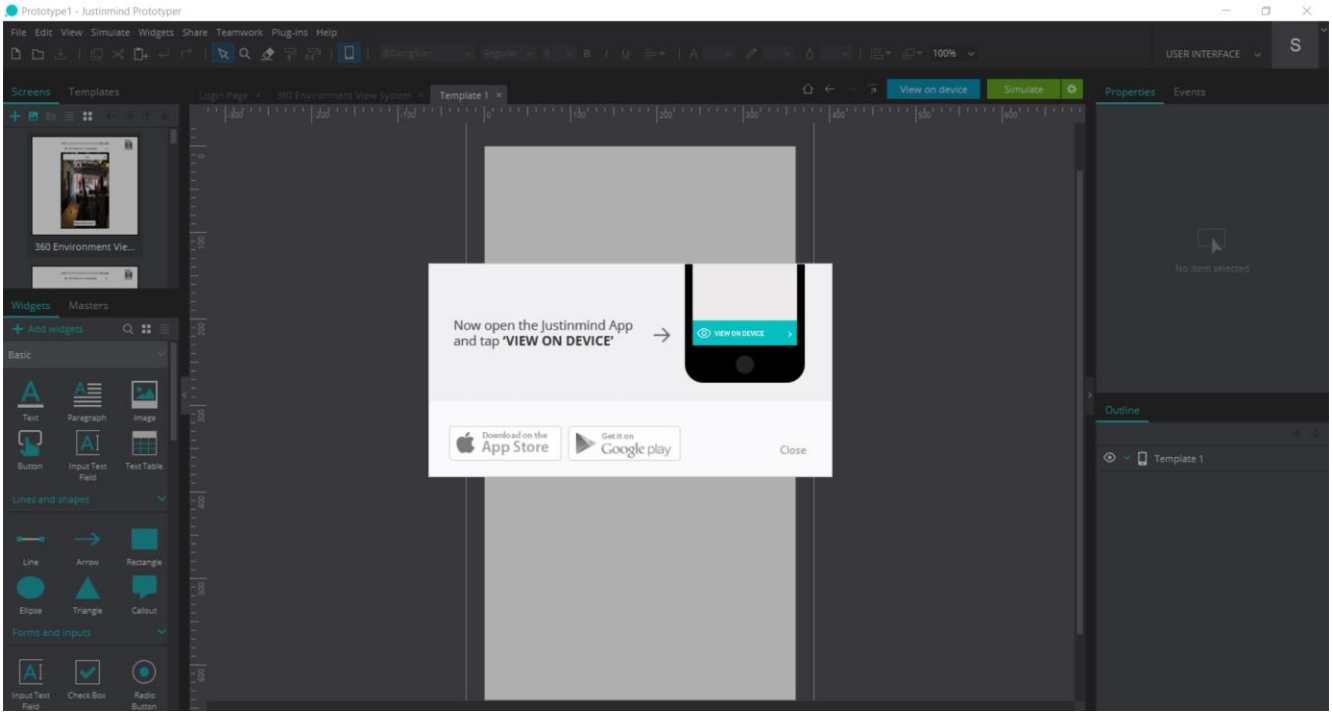
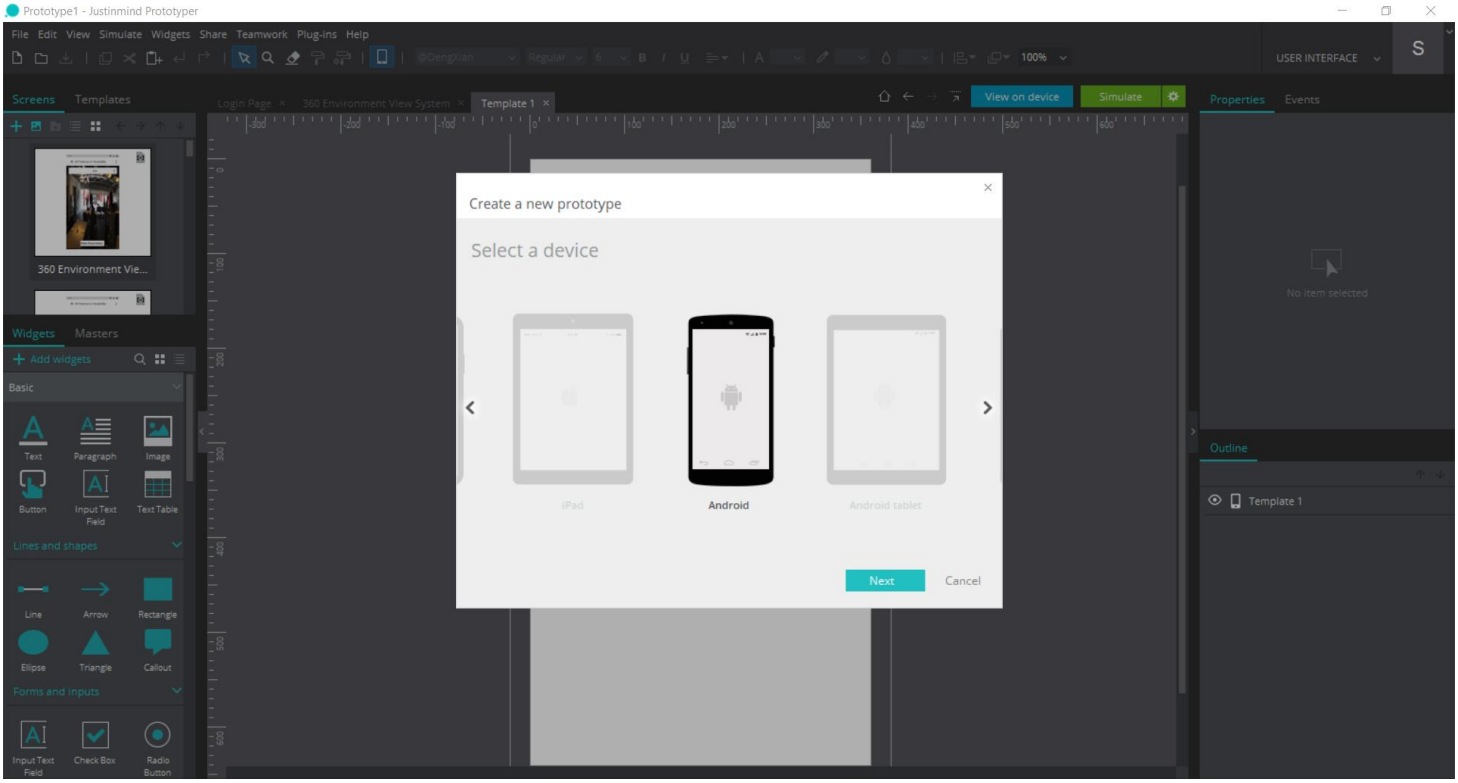


3.35 – Payment Method

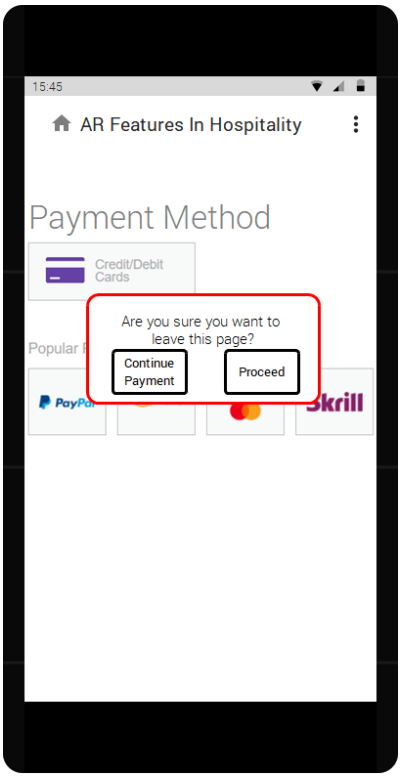


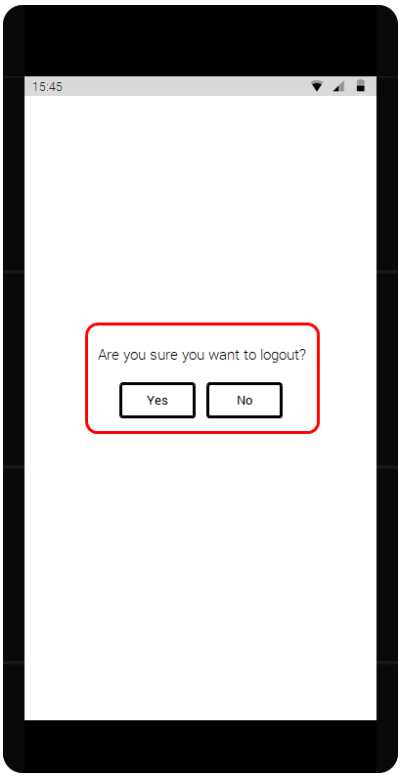
3.36 – Works in Android OS

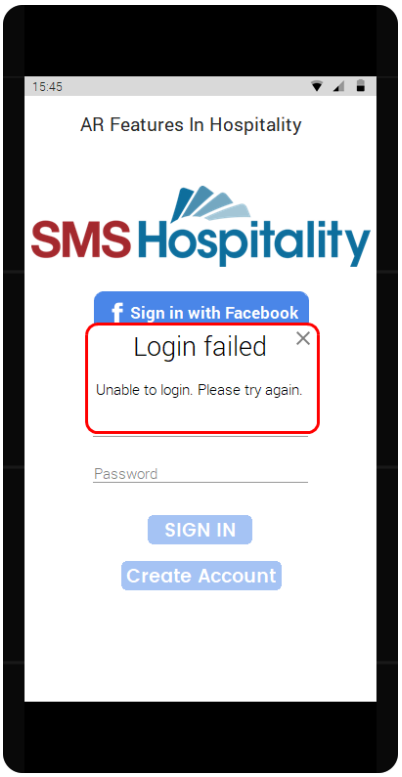




3.37 – Correcting Mistakes

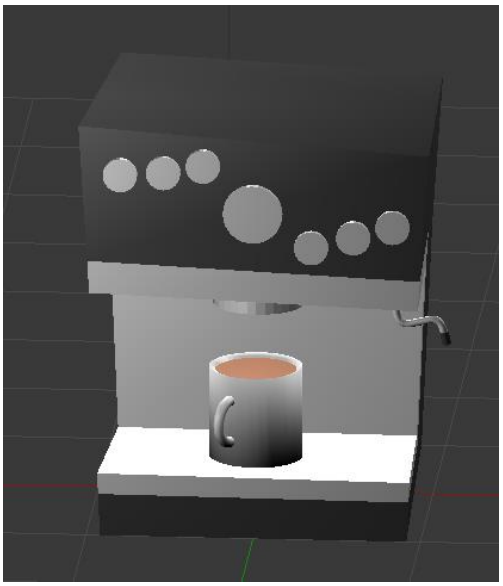




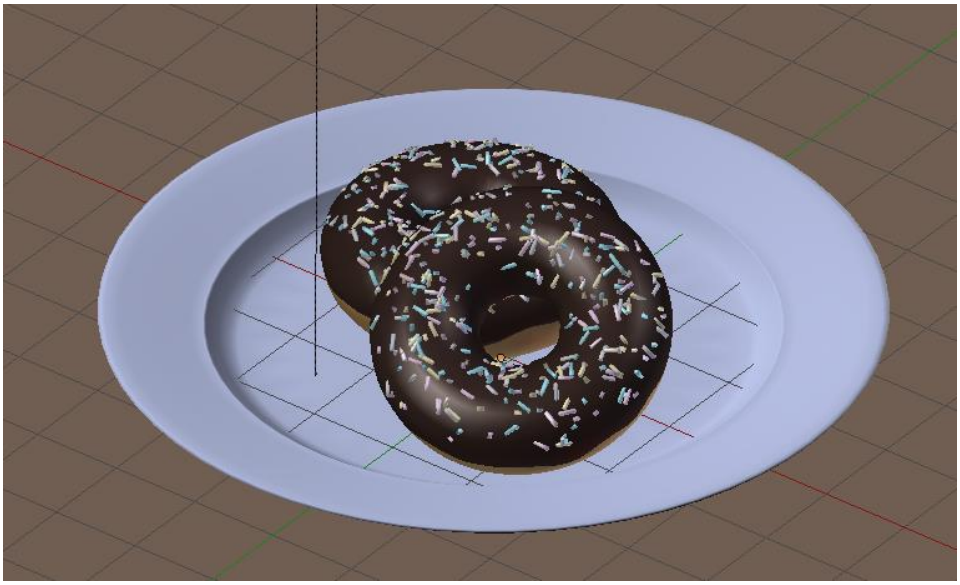


3.38 – Match between system and the real world

Example 1:

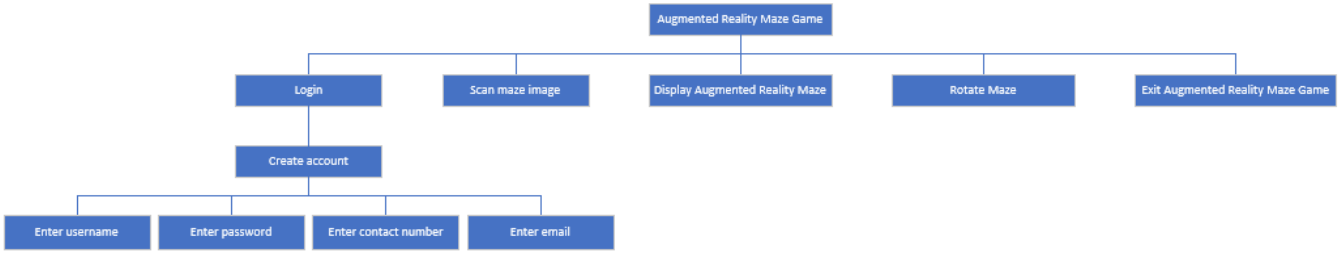


Example 2:



4.0 – Hierarchical Task Analysis (HTA)

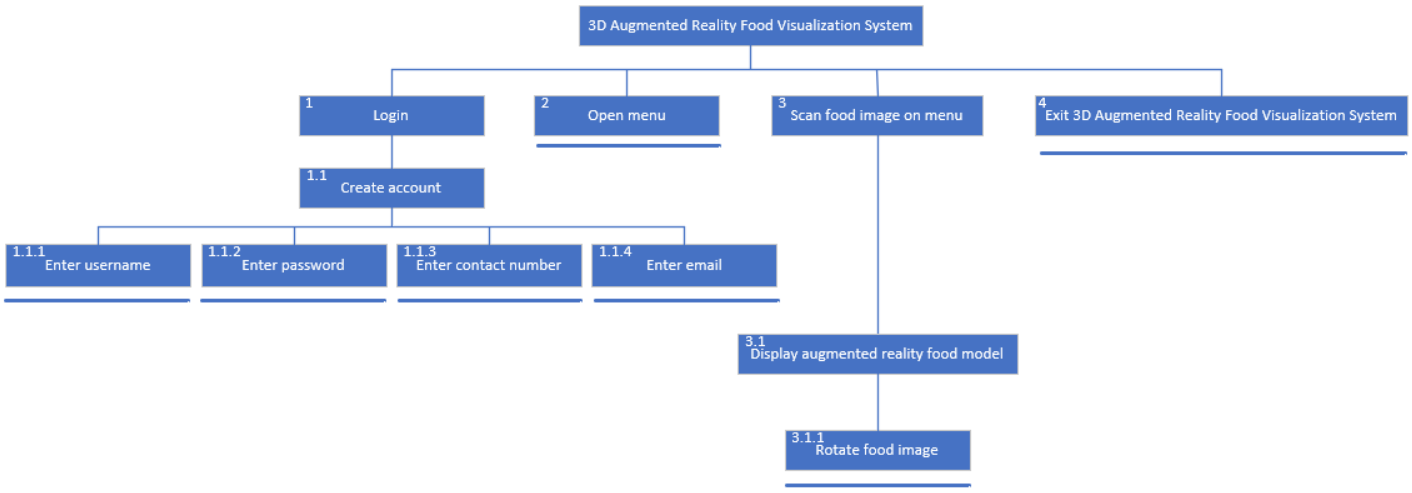
Augmented Reality Maze Game System



To use this app, user has to login first. If the user doesn't have an account, the user can create one by providing their details such as username, password, contact number and email address. Once the account is created, the user can login.

When logged in, users have to choose "Augmented Reality Maze Game". To play the augmented reality maze game, users have to scan an image of a maze. When scanning is complete, an augmented reality maze will display on the user's phone. Rotate the maze to interact with the augmented reality maze.

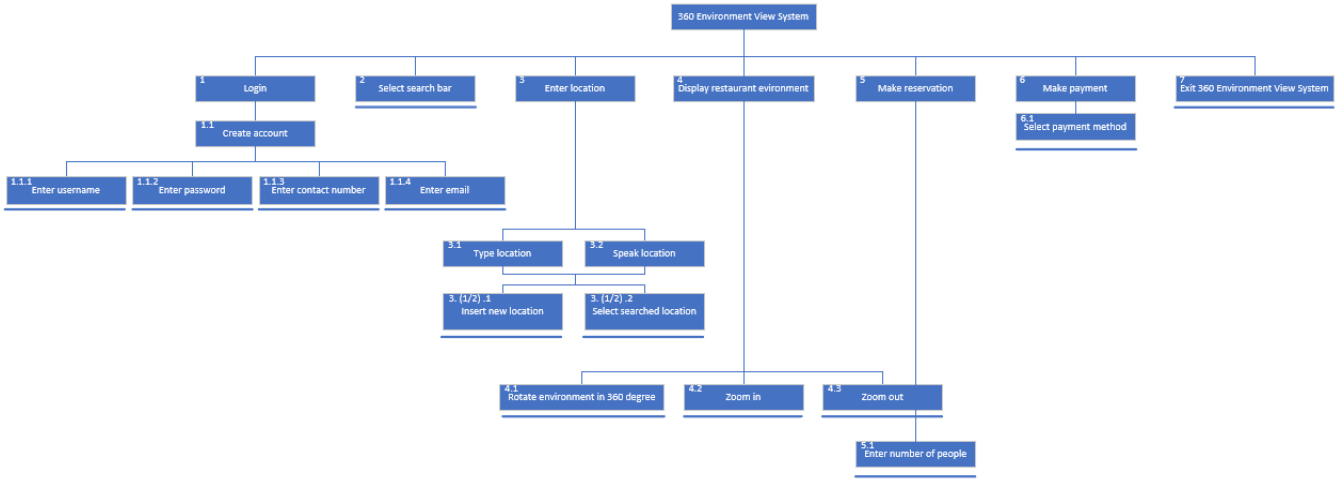
3D Augmented Reality Food Visualization System



To use this app, user has to login first. If the user doesn't have an account, the user can create one by providing their details such as username, password, contact number and email address. Once the account is created, the user can login.

When logged in, users have to select the "3D Augmented Reality Food Visualization System" to use the system. To use this system, user have to scan the image of the food on the menu. After the user scan the food, an augmented reality view of the food model will be shown on the user's phone screen. Then, the user can rotate the 3D augmented reality food model to see how its looks like.

360 Environment View System



To use this app, user has to login first. If the user doesn't have an account, the user can create one by providing their details such as username, password, contact number and email address. Once the account is created, the user can login.

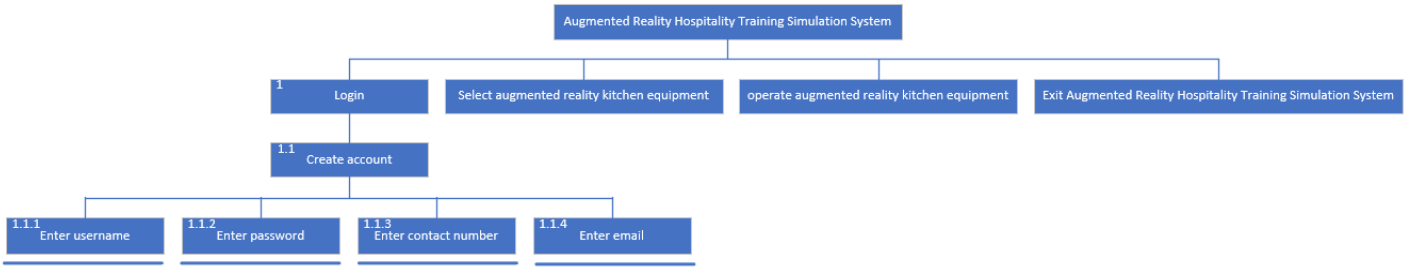
When logged in, users can search for their restaurant by using the search bar. To use the search bar, user has to enter their chosen restaurant location or name. The search bar will always show recent search history. Besides that, the search bar also has a speak-to-text function if the user has problems in typing the location's name or address.

When the search is complete and successful, users can display the restaurant environment. User can rotate the restaurant environment in 360 degree and the environment can also be zoom in and zoom out.

If the user like the restaurant environment, user can make a reservation for the restaurant by clicking on the "Make Reservation" button. After that, users are required to enter the number of seats that the user want to reserve. Since this app requires the user to login before they can use it, users are not required to enter any additional information as the information are already stored in the account.

Lastly, users are redirected to a payment page. In that page, users can select their preferred payment and once the reserve payment is successful, the reservation is book. Booked reservations are stored in the reservation history in the side menu.

Augmented Reality Hospitality Training Simulation System



To use this app, user has to login first. If the user doesn't have an account, the user can create one by providing their details such as username, password, contact number and email address. Once the account is created, the user can login.

When logged in, user can choose the "Augmented Reality Hospitality Training Simulation System". In this system, users can practice their kitchen equipment skill. The main page of this system will have a list of equipment for the user to choose from. Once the users have chosen one equipment, user will be redirected to a screen where the augmented reality equipment will be shown. User can interact with the augmented reality equipment and the augmented reality equipment works exactly like the ones that we have in our real life.

5.0 – Personas

<table>
<tr><td rowspan="6">  </td><td>Name:</td><td>Joey Leong</td></tr>
<tr><td>Age:</td><td>21</td></tr>
<tr><td>Gender:</td><td>Female</td></tr>
<tr><td>Nationality:</td><td>Malaysian</td></tr>
<tr><td>Status:</td><td>Student</td></tr>
<tr><td>Personality:</td><td>Highly cooperative and has many friends. Willing to take the role of leader whenever her friends need her.</td></tr>
<tr><td colspan="3">Joey is a picky eater. She will only dine out to restaurant or food courts that serves the type of food that meet her palette and expectation. Hence, Joey constantly faced a daily life challenge of having trouble to go out for lunch or dinner with her friends as her friend and her always endure unnecessary difficulty in finding a common restaurant or food court that serves the type of food that meet Joey palette and standard expectation. Hence, because of this Joey hope to have an app that can help her preview the food that is in a restaurant menu before she makes an ordered.</td></tr>
</table>

<table>
<tr><td rowspan="6">  </td><td>Name:</td><td>Ivan Chung</td></tr>
<tr><td>Age:</td><td>21</td></tr>
<tr><td>Gender:</td><td>Male</td></tr>
<tr><td>Nationality:</td><td>Malaysian</td></tr>
<tr><td>Status:</td><td>Student</td></tr>
<tr><td>Details:</td><td>A guy who have difficulty making decisions and is a good follower.</td></tr>
<tr><td colspan="3">Ivan is a guy doesn’t have his own judgement on eating. He will only follow to what his friends after asking them where to eat and which restaurant they should go. Hence, Ivan faced a problem on making decisions on where to eat with his friends as he cannot make his own judgement on eating. Thus, because of this Ivan hope to have an app that can help him and his friends from previewing the food that is in a restaurant menu before he makes an ordered so that he has a better thoughts of ordering what food to eat and have a better decision making.</td></tr>
</table>

Name:	Mr Wong
Age:	40
Gender:	Male
Nationality:	Malaysian
Status:	Married
Details:	He is an intelligent person who good in leading the team and is also good in problem solving.

Mr Wong is a good leader but sometimes picky in choosing restaurant he wants to host a company anniversary party. He will only pick the restaurant or cafe that is cosy and clean. Thus, he spends most of his own rest time to look for restaurant that looks cosy and clean. Because he wants his staff feels comfortable and enjoy at the same time. However, it usually takes very long time for him to do research as most of the restaurant don't have 360 view of their design. Therefore, Mr Wong hopes to have an app that can help him to preview the 360 view of each restaurant design before he makes decision.

Name:	Miss Lim
Age:	36
Gender:	Female
Nationality:	Malaysian
Status:	Married
Details:	She is a person who loves technology and is a creative person who loves to give ideas.

Miss Lim is a technophile who loves technology and is very picky at choosing which app to use. She will only dine out to the restaurant or food courts by using the apps that she thinks is good enough to meet her expectation. Because of that she likes to use those restaurant app to find which restaurant that meet her palette and expectation especially the app that has the feature to view 360 of the restaurants. However not all app has the feature to view 360 of the restaurants. Thus, she faced a problem on choosing what apps to use in order to dine out to the restaurant. Hence, she hopes to have an app that has the feature to view 360 of the restaurants before she decides to go to the restaurant.

6.0 – Scenario

Scenario 1:

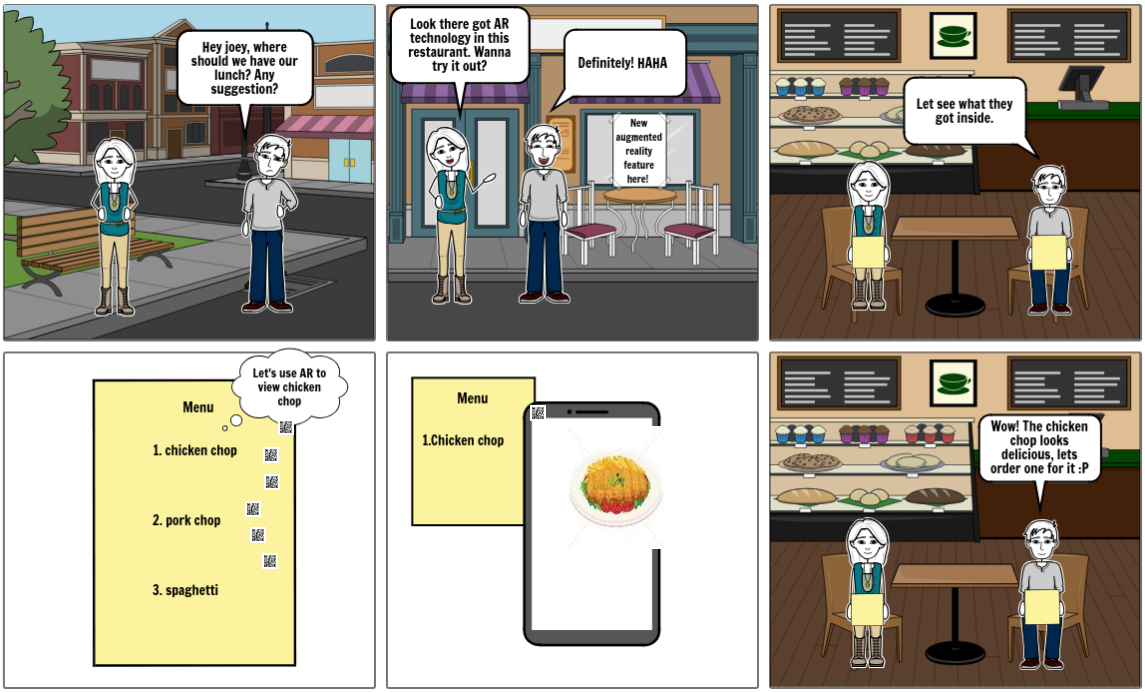
After finishing their daily lecture class, Joey and Ivan discuss on which restaurant would be an ideal choice for them to go have lunch. This is an important discussion as Joey is a picky eater and would only dine at restaurant at that meet her expectations. Hence, Joey suggest to Ivan that they use an android mobile app to help them make their decision. Joey first registered for a profile in the android mobile app by providing her. Once she finishes registered her profile, she searches the restaurant that offer an augmented reality view of their food in their menu before ordering that is supported by our android mobile application. Once she found a suitable restaurant that serves the type of food that fit her preference, Joey and Ivan head to the restaurant and utilized the app augmented reality food model features by scanning on the food picture on the restaurant menu before making an order so that they can determine whether the restaurant food meet their expectation.

Scenario 2:

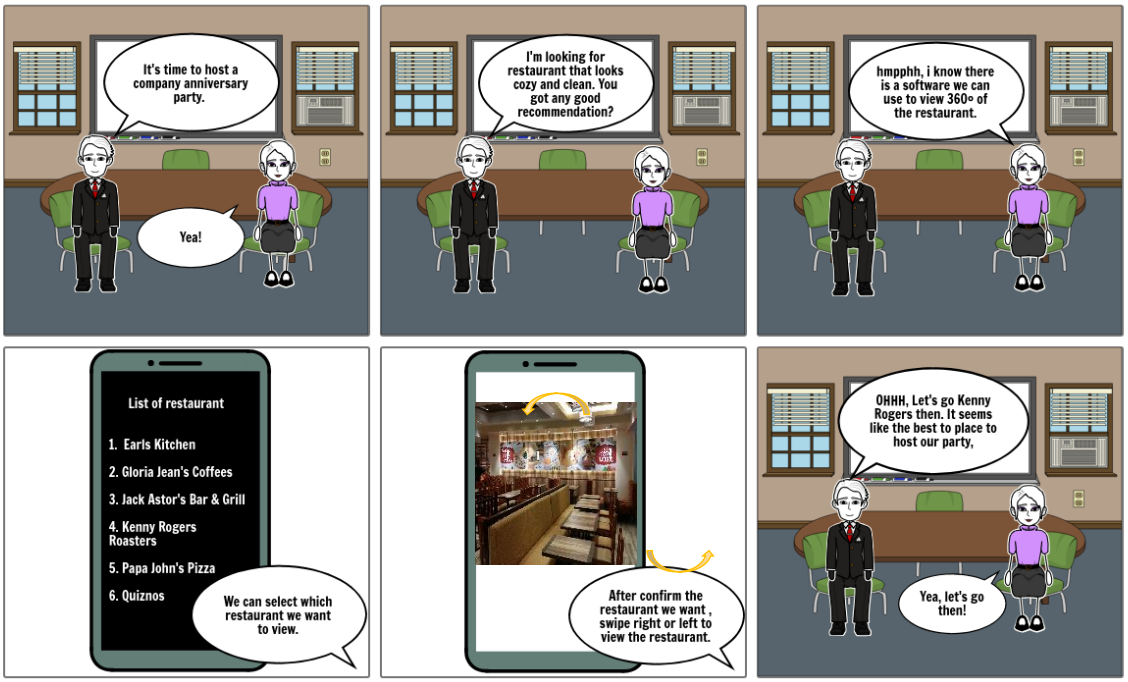
Mr Wong is an extremely busy businessman, who is looking to plan for his company anniversary. Hence due to his busy schedule, Mr Wong hired Mrs Lim to help plan the company anniversary. Mrs Lim being an event planner, thus suggest that they use an android mobile app that allows the users to have a 360-degree view of the restaurant before making a reservation. Hence, Mr Wong agree to try the app as for him the restaurant interior environment and design is important for him before deciding to make a reservation for the company anniversary to be planned at a restaurant. Mrs Lim first registered a in the mobile android application. Once a profile is made, she login to our system and would use the search bar to search for restaurants that was available in a location area. After the list of restaurants appear for that location area, Mr Wong and Mrs Lim examined each restaurant interior design through our android mobile app before selecting the restaurant that they wish to make a reservation through our 360-degree view features. Once they came to an agreement of the restaurant, they wish to have their company anniversary held, they have the option to make a reservation through our android mobile app.

7.0 – Storyboard

1. 3D Food Visualization System

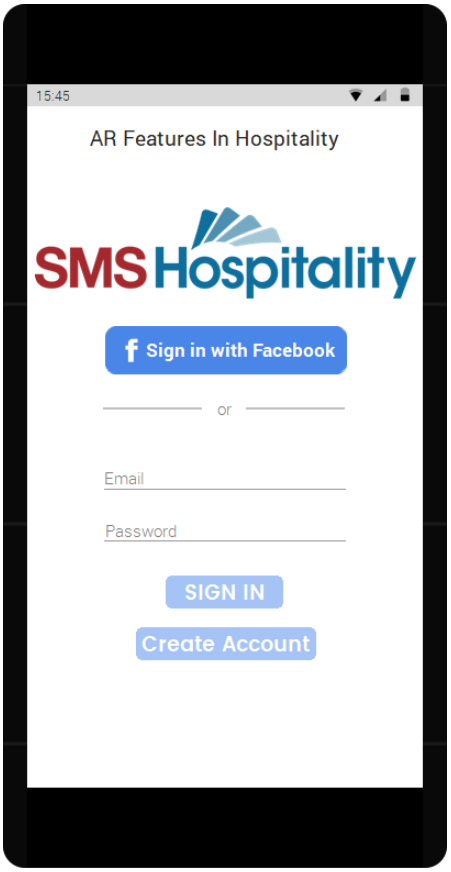


2. 360 Environment View System



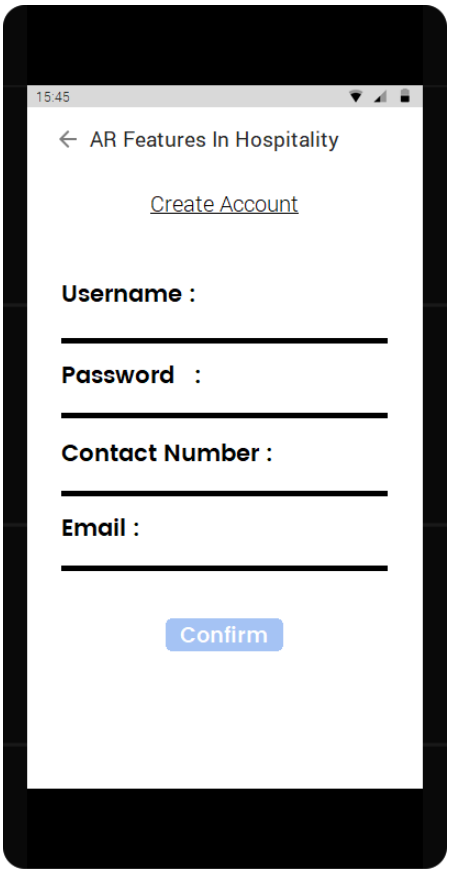
8.0 – High Fidelity

8.01 – Login



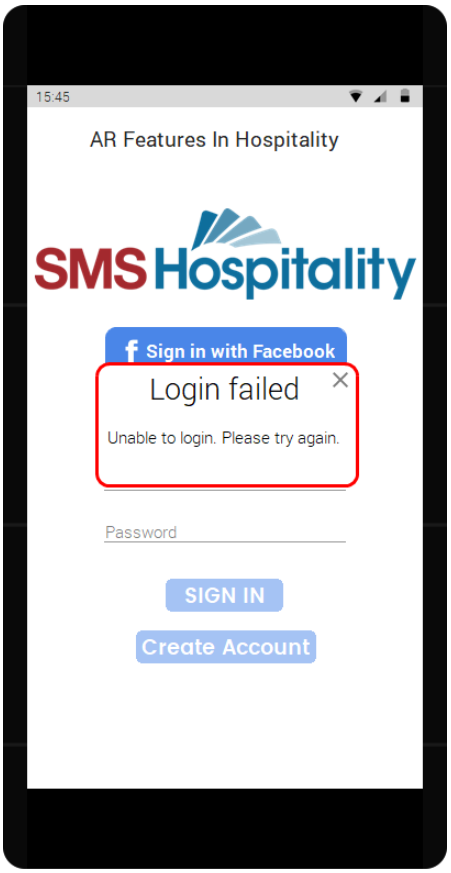
This is an index page. User will see this page once they entered the application. User can sign in to use the application with existing Facebook account or else user are required to create an account.

8.02 – Create Account



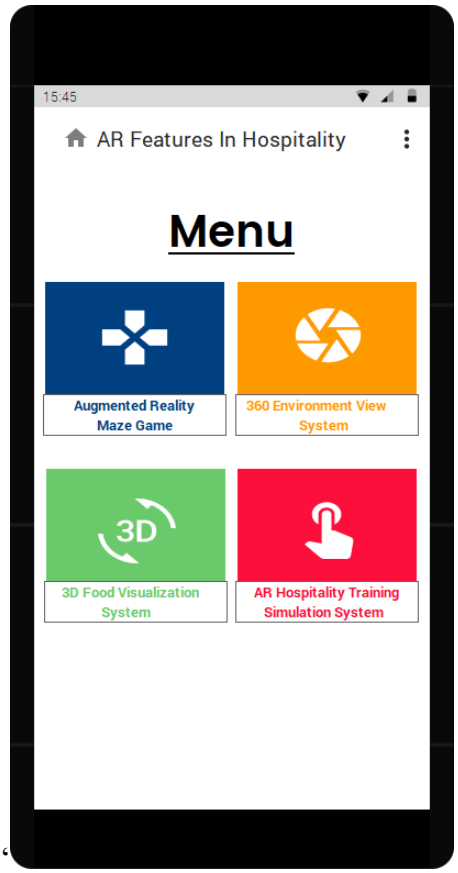
If user choose to create account at the login page, this is the page where user will bring to. User must fill in the details shown to create a unique account to use the application. After user filled all the data required, user need to press the confirm button to create the account officially.

8.03 – Login – Error



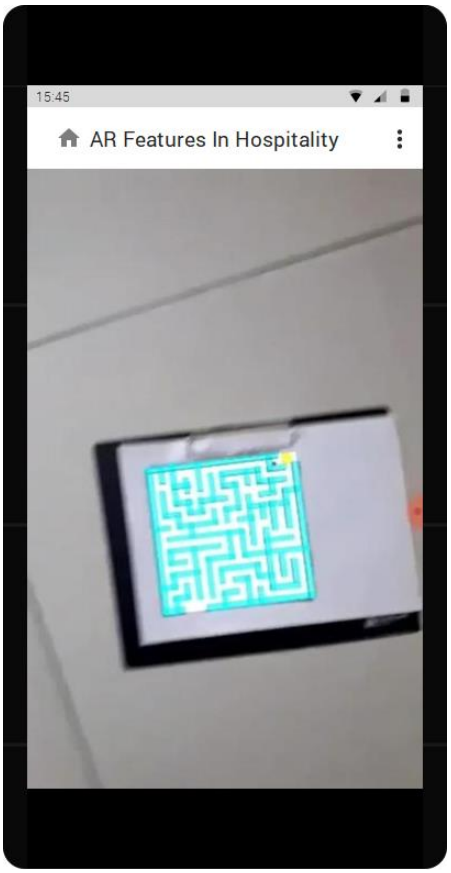
If user entered the wrong email or password while logging in, a message will pop out to notify the user. The message informs the user that the system is unable to login with the information that user entered, and user is suggested to attempt for the process of authentication again.

8.1 – Menu



Once user login successfully, user will be direct to the menu page. The functions provided in the application is all listed and shown in this page. There is a total of four functions can be chosen in this page, which are Augmented Reality Maze Game, 360 Environment View System, 3D Food Visualization System, and Augmented Reality Hospitality Training Simulation System.

8.2 – Augmented Reality Maze Game



If user press ‘Augmented Reality Maze Game’, user is required to scan the image of the maze. After scanning the image, an augmented reality image of the maze will be displayed and user can use their phone to control the yellow ball to play the game.

This feature is aimed to improve customer experience while waiting for the food to be prepared. This is due to the fact that the chef often takes a long time to serve the food to his or her customer, and this will may cause the customer having an unproductive time. So, to avoid such situation happen, user can get to play the game while waiting for the food to be served in the meantime.

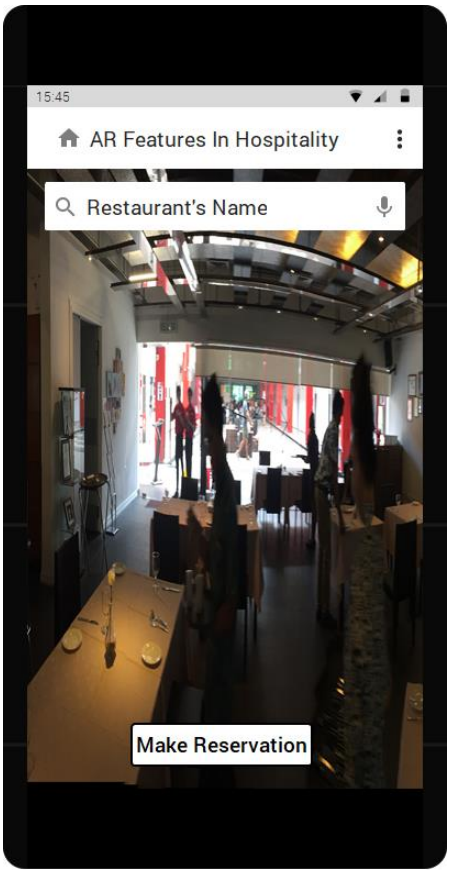
Video link on how it works:
https://youtu.be/tIP6c1_a62E

8.3 – 3D Food Visualization System

If user choose '3D Food Visualization System', user is required to scan the image of the food on the menu. After scanning the image, an augmented reality view on the food will be shown on the user's phone screen.
User can move around the augmented reality image of the food to get a full glimpse on how the food looks like.

The objective of this system is to provide an overview on how the food looks like before ordering. Occasionally, customer have a hard time on deciding what food to order because they have no idea on how the food looks like. Thus, using this function, customer can avoid disappointment if they already know how the food is going to be.

8.4 – 360 Environment View System



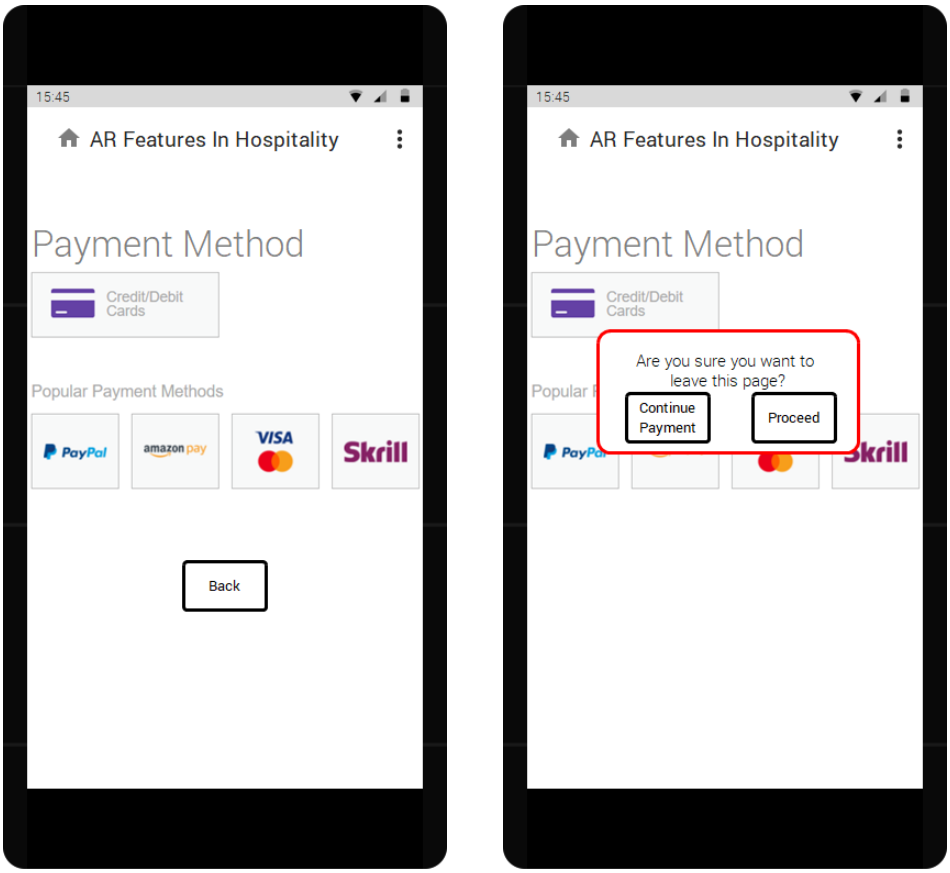
If user choose ‘360 Environment View System’, user need to enter a restaurant’s name. Same as ‘Navigation System’, a speak-to-text function also will be supported in this function to aid the user who have disability in typing or not in a situation where the user is free to typing.

After entering the restaurant’s name, user will be shown with the view on the environment of the restaurant. User can freely surf around the environment of the restaurant as wide as 360 degree.

If user is satisfied with the restaurant’s environment, user can choose to make reservation.

The intention of this system is to view the layout of the restaurant first before they made any decision. This allows the customer to find the restaurant which fit their theme for the night. If customer want to book it to hold an event, it also avoids extra work for the customer to add on decoration because they already know the ambience of the restaurant matched with their event.

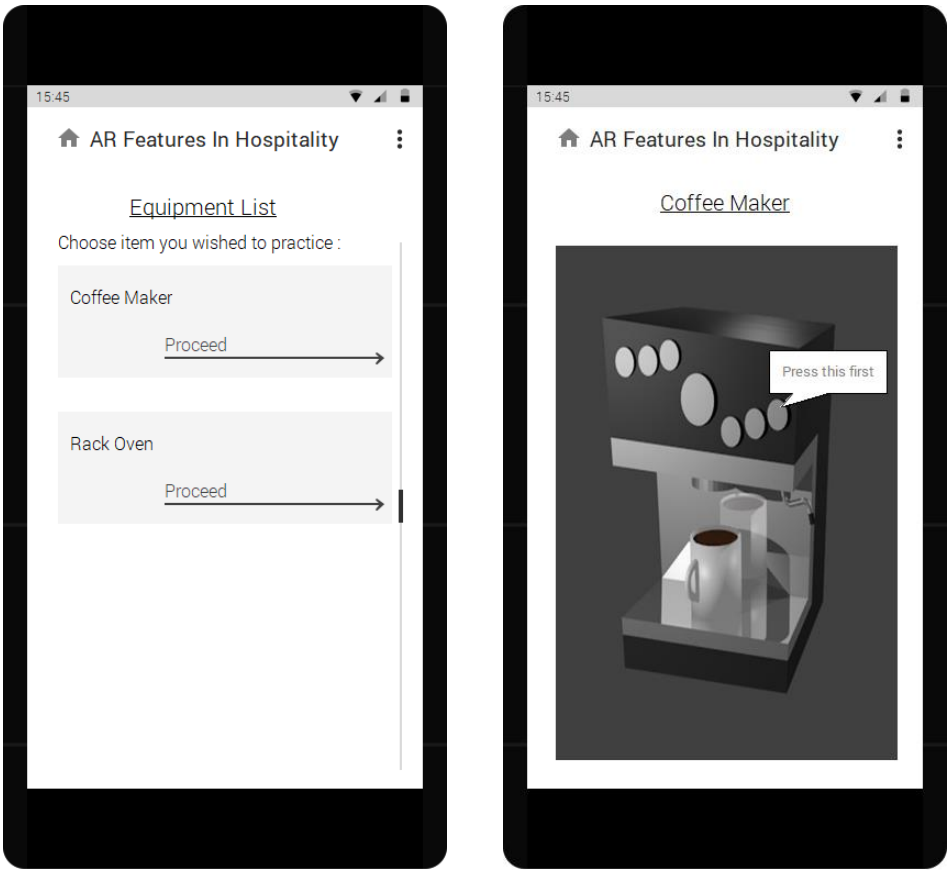
8.41 – Payment Page



After user pressed ‘Make Reservation’ button on the previous screen, user will be redirect to this screen shown above. User are provided with several payment method. All kind of popular payment methods is supported in the application.

If user press ‘Back’ button without confirming the payment, a message will be shown to ask if user want to continue payment or proceed to leave the payment page.

8.5 – Augmented Reality Hospitality Training Simulation System



If user choose ‘Kitchen Equipment Practice System’ on the main page, a list of kitchen equipment will be shown on the screen. After user made a decision on the kitchen equipment that he or she wan to practice on, user will be direct to a screen where the augmented reality view of the chosen kitchen equipment will be shown on the phone. The augmented reality object of the kitchen equipment works exactly like the one in real world. So, user can make the best out of their practice from the system and apply it in real world.

The purpose of Kitchen Equipment Practice System is to help the apprentice in the kitchen to practice procedure until they become proficient on it, in our case, barista training. Baristas are given access to an augmented model of an espresso coffee maker, and the baristas are taught how to make a great cup of espresso. Until they master them in the augmented reality world, they will be scheduled to practice in front of a real espresso coffee maker to see how well they had retained the information they learnt from the augmented reality application.

8. 6 – Side Menu

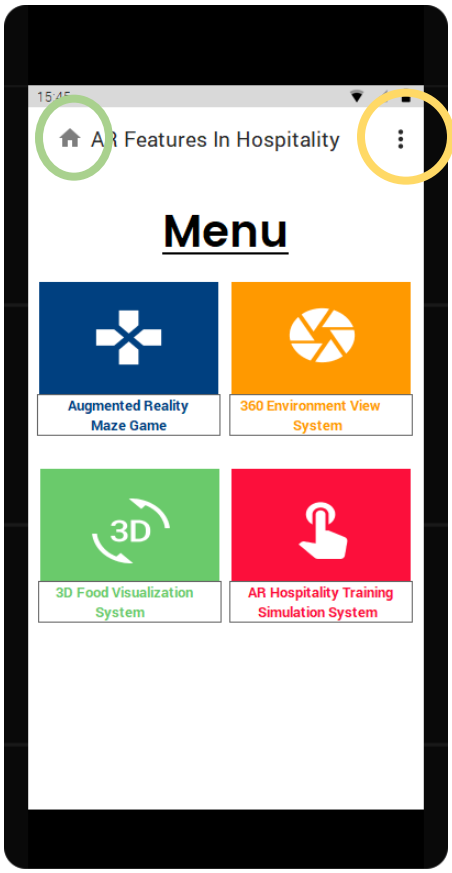


Image 1

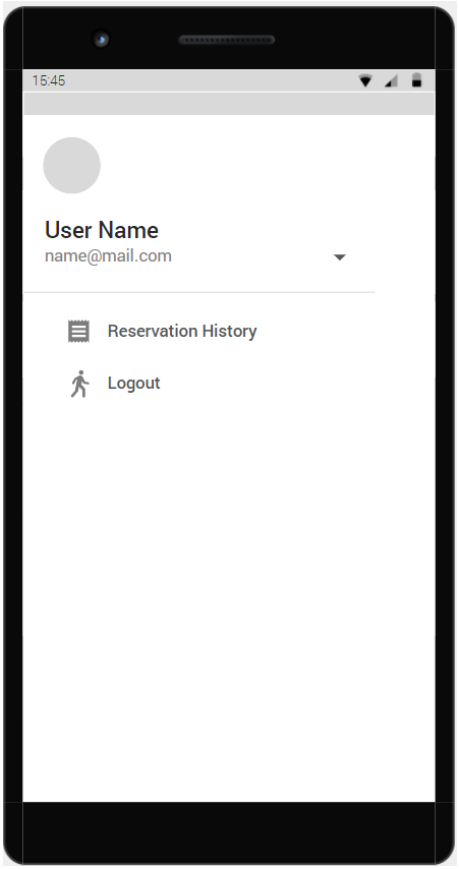
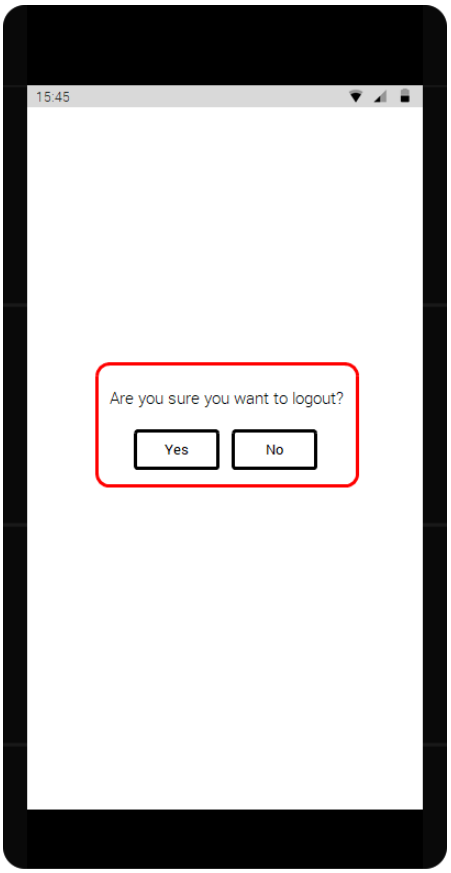


Image 2

If user press on the 'Home' icon on Image 1 which is shown on the majority of the pages, user will be redirect back to the menu page. If user choose the vertical 3 dot icon, a side menu will pop out, the side menu will display the username and email of user.

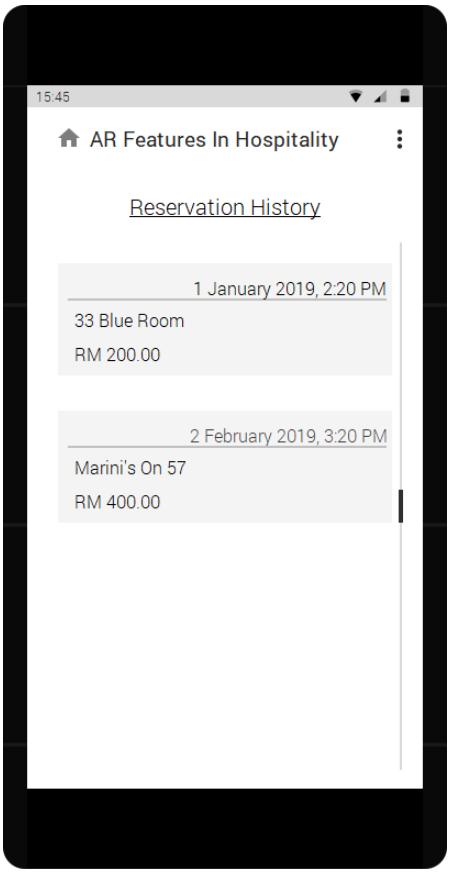
In addition, user can choose to explore their reservation history at side menu too. A logout function is also provided at the side menu.

8.7 – Confirmation on Logging Out



If user pressed ‘Logout’ on the side menu, a confirmation box will pop out to reconfirm user intention. This is due to the fact that user often make accidental logout when performing action with the application. Thus, a confirmation box is created to avoid the problems user may face in situation mentioned in the previous sentence.

8.8 – Reservation History



If user pressed ‘Reservation History’ on the side menu, user will be redirect to the screen shown above. User can have a view on their past reservation on restaurant in the application. All of the details of the reservation made will be displayed, including the total fee, restaurant’s name, and the time made on the reservation. Having history function, user is able to track their behaviour based on the reservation history.

9.0 – Heuristic Evaluation

The evaluation is based on Nielsen Normal Group Us Abilities Heuristics for User Interface Design

A. Visibility of system status
B. Match between system and the real world
C. User control and freedom
D. Consistency and standards
E. Error prevention
F. Recognition rather than recall
G. Flexibility and efficiency of use
H. Aesthetic and minimalist design
I. Help users recognize, diagnose, and recover from errors
J. Help and documentation

The heuristic evaluation has been done by 5 different people namely Mr. Steven Lee, Mr. Jason Choo, Mr. Erwin Lim, Mr. Chua Wai Loon and Mr. Leong Keng Siong. They each come from different field of expertise such as Mr Steven Lee is an executive chef whom specialized in the hospitality kitchen side of management, while Mr Chua Wai Loon is a full-time web developer, whom is in charge of making websites according to the customer demands. The information on our human expert evaluators can be seen in the next page.

The heuristic evaluation was done after the first iteration of our prototype that is based on our wireframe which can been seen in our report, pg. 29 – pg. 40. The reason behind this move is to make sure that our product is a perfect is can be before user testing so that we do not waste resources on getting users to come back again and again

Before the heuristic evaluation begin, we guided them on how to use the augmented reality features of our system functions on their android mobile phone. For example, before any heuristic evaluation took place, we first show our human expert the augmented reality features that was available in our android mobile app as well as the steps they need to adhered to in order to use such augmented reality features on their android mobile phone. Aside from that, we also brief them on a couple of scenarios that we foresee our mobile app can play a significant contributing part in order to get a more accurate heuristic evaluation from our human experts.

After the briefing, we led the experts through the application twice, the first time is just for the user to warm up to our system and the second time is for them to ensure that our user fully understand the augmented reality features

of our system. After the user finish using our system, we provide them a list of Nielsen's 10 rule Usability heuristic Interface design guideline with empty spaces beside them for our user to put in their feedback.

The response from the human expert can be seen in the following page.

Interview video with Mr. Leong Keng Siong: https://youtu.be/gvlzCxz-W9U , https://youtu.be/T0QaLcPwl64

***Consent Form can be seen in Appendices, pg. 61.**

User Name : Mr. Chua Wai Loon

Occupation : Web Developer

Section	**Result**
1. Visibility of system status	The user interface is clean.
2. Match between system and the real world	The augmented reality image of the food resembles closely to an actual food
3. User control and freedom	It is great that I can undo my decision on logging out of I did it accidentally
4. Consistency and standards	The overall design is consistent throughout the system.
5. Error prevention	I like the concept of having a back button that allowed me to exit the payment method just in case I accidentally enter it.
6. Recognition rather than recall	In the 'Augmented Reality Hospitality Training Simulation System' page, it was provided with several options. Hence making it easier for me to operate the functionality.
7. Flexibility and efficiency of use	In the '360 Environment View System' page, it is a great feature as it is flexible for me to use my touch screen android phone to move left and right to view the restaurant surroundings.
8. Aesthetic and minimalist design	The design is simple, but every component is well placed throughout.
9. Help users recognize, diagnose, and recover from errors	The error message is short and straight to the point.

10. Help and documentation	The overall experience of the application is good.

User Name **:** Mr. Leong Keng Siong

Occupation **:** Business Owner

Section	**Result**
1. Visibility of system status	The user interface is clean.
2. Match between system and the real world	The augmented reality image of the food resembles closely to an actual food
3. User control and freedom	It is great that I can undo my decision on logging out of I did it accidentally
4. Consistency and standards	The overall design is consistent throughout the system.
5. Error prevention	I like the concept of having a back button that allowed me to exit the payment method just in case I accidentally enter it.
6. Recognition rather than recall	In the 'Augmented Reality Hospitality Training Simulation System' page, it was provided with several options. Hence making it easier for me to operate the functionality.
7. Flexibility and efficiency of use	In the '360 Environment View System' page, it is a great feature as it is flexible for me to use my touch screen android phone to move left and right to view the restaurant surroundings.
8. Aesthetic and minimalist design	The design is simple, but every component is well placed throughout.
9. Help users recognize, diagnose, and recover from errors	The error message is short and straight to the point.
10. Help and documentation	The overall experience of the application is good.

User Name **:** Mr. Jason Choo

Occupation **:** Hotel Manager

Section	Result
1. Visibility of system status	The user interface is clean.
2. Match between system and the real world	The augmented reality image of the food resembles closely to an actual food
3. User control and freedom	It is great that I can undo my decision on logging out of I did it accidentally
4. Consistency and standards	The overall design is consistent throughout the system.
5. Error prevention	I like the concept of having a back button that allowed me to exit the payment method just in case I accidentally enter it.
6. Recognition rather than recall	In the 'Augmented Reality Hospitality Training Simulation System' page, it was provided with several options. Hence making it easier for me to operate the functionality.
7. Flexibility and efficiency of use	In the '360 Environment View System' page, it is a great feature as it is flexible for me to use my touch screen android phone to move left and right to view the restaurant surroundings.
8. Aesthetic and minimalist design	The design is simple, but every component is well placed throughout.
9. Help users recognize, diagnose, and recover from errors	The error message is short and straight to the point.
10. Help and documentation	The overall experience of the application is good.

User Name : Mr. Steven Lee

Occupation : Executive Chef

Section	Result
1. Visibility of system status	The user interface is clean.
2. Match between system and the real world	The augmented reality image of the food resembles closely to an actual food
3. User control and freedom	It is great that I can undo my decision on logging out of I did it accidentally
4. Consistency and standards	The overall design is consistent throughout the system.
5. Error prevention	I like the concept of having a back button that allowed me to exit the payment method just in case I accidentally enter it.
6. Recognition rather than recall	In the 'Augmented Reality Hospitality Training Simulation System' page, it was provided with several options. Hence making it easier for me to operate the functionality.
7. Flexibility and efficiency of use	In the '360 Environment View System' page, it is a great feature as it is flexible for me to use my touch screen android phone to move left and right to view the restaurant surroundings.
8. Aesthetic and minimalist design	The design is simple, but every component is well placed throughout.
9. Help users recognize, diagnose, and recover from errors	The error message is short and straight to the point.
10. Help and documentation	The overall experience of the application is good.

User Name : Mr. Ervin Lim

Occupation : Beverage Manager

Section	Result
1. Visibility of system status	The user interface is clean.
2. Match between system and the real world	The augmented reality image of the food resembles closely to an actual food
3. User control and freedom	It is great that I can undo my decision on logging out of I did it accidentally
4. Consistency and standards	The overall design is consistent throughout the system.
5. Error prevention	I like the concept of having a back button that allowed me to exit the payment method just in case I accidentally enter it.
6. Recognition rather than recall	In the 'Augmented Reality Hospitality Training Simulation System' page, it was provided with several options. Hence making it easier for me to operate the functionality.
7. Flexibility and efficiency of use	In the '360 Environment View System' page, it is a great feature as it is flexible for me to use my touch screen android phone to move left and right to view the restaurant surroundings.
8. Aesthetic and minimalist design	The design is simple, but every component is well placed throughout.
9. Help users recognize, diagnose, and recover from errors	The error message is short and straight to the point.
10. Help and documentation	The overall experience of the application is good.

10.0 – User Evaluation

Scenario and Observation

1) A user is asked to register a profile in our android mobile app

A user took just 5 minutes to register for a profile in our android mobile app after filling out their name, password, email and contact number. After filling out the details they were able to login into our system. The user found this registration function to be flexible and efficient to be use as it they can easily register to login to our system.

2) A user is a given a profile and told to use the 360-degree view feature

The user took 10 minutes to view their profile and the 360-degree view of the restaurant. The user found it very easy to use the 360-degree view feature to explore the restaurant interior design. Furthermore, the users thought that this feature was simple and effective as it allowed them to easily view the restaurant surrounding as well as is facilities.

3) A user is a given profile and asked to carry out the process of viewing the augmented reality food model by scanning the picture of the food.

The user spends 10 minutes to carry out the entire task of viewing the augmented reality food model by scanning the picture of the food menu. The user was impressed that the food model, was closely resemble to an actual food.

4) A user is given a picture and asked to scan the picture in order to play an augmented reality maze game.

The user spends 10 minutes to carry out the entire task of playing the augmented reality maze game by scanning the picture. The user notes that the augmented reality maze game was impressive as it looks like an actual maze game design that they commonly see online. Plus, the user finds the maze game functionality was efficient as it was interactive in nature.

5) **A user is asked to make a reservation in a restaurant through our mobile android application and check their reservation in the reservation history spectrum of our android mobile application.**

The user just took 5 minutes to make a reservation in a restaurant. The user thought these features matches with the system with the real world, as through these features a user can easily make a reservation without going through the hassle of driving all the way to that establishment location just to make a reservation. The user was also pleased that the android mobile application was able to show the proof of their reservation took place in the reservation history.

6) **A user is asked to make a payment through one of the payment methods offered by our android mobile application.**

The user just took just 10 minutes to make a payment to confirm a reservation in a restaurant. The user though this feature was convenient as it provides them a choice on the type of payment methods, they can use to make a payment through our android mobile application. The user also thinks this feature is aesthetic and minimalist in its design as it provides them with the essential features required to make a payment without anything unnecessary.

10.1 – User Evaluation Interview

The consent form can be seen at Appendices, pg. 60.

Video Link: https://youtu.be/GUpQS9ZXEao

During the user evaluation period, we interviewed 5 of our fellow Human Computer Interaction classmates for their perspective on our augmented reality features that we have developed.

1) Tay Jie Ying

a) What do u think about our features?

I find your system flexible, efficient to use, pleasant to eye and overall, I think it is a good system that people would use if it is for free.

b) What is your overall opinion of our system?

Overall, I think your system can play a significant part in the hospitality industry, as it helps people like to me find the restaurant that offered the food that I want to eat.

2) Chen Ling

a) What do you think about our features?

I find your features to be innovative and pleasant to the eye. It has all the features that I want in a hospitality application.

b) What is your overall opinion of our system?

Overall all your system can help people to make better decision when dining out.

3) Xue Jun

a) What do you think about our features?

Your features are easy to use, help to solve my daily life problem to eat, pleasant to the eye and have all the features that I want in a hospitality app

b) What is your overall opinion of our system?

Overall, I think your system can make dining experience more fun especially the food augmented reality features.

4) Alicia Morris

a) What do you think about our features?

I think the features is quite user friendly, everything is arranging properly hence the user can locate the functions easily.

b) What is your overall opinion of our system?

I think the system is good, is quite good it can help me to find restaurant that I can eat at, and the features are well layout.

5) Min Lee

a) What do you think about our features?

I find your system is quite innovative system find good place to eat and it is easy to use as your features are well places.

b) What is your overall opinion of our system?

Overall, I think your system can help the hospitality industry and it is useful for people like me to find a good place to eat.

Interview with Dr. Ang Chee Hui

1) Have you heard before the term 'Augmented Reality'? If yes, what do you know about it?

Yes. It mixed the real world with the virtual world together.

2) How is your experience with augmented reality so far?

Not to say experienced, just watched some video related to it.

3) Have you heard before the concept of Human Concept Interaction (HCI)?

Yes, it is concept which discussed about how to design user interface and how can it be user friendly.

4) What is your thought on the 360-environment view system?

It is good but I would like to see more feature instead of just a 3D tour.

5) What is your though on providing the customer with an augmented reality view on the food before they order it?

It is a good idea. This is due to the fact to that because we have no idea how it looks like based on the flat image on the menu.

6) What is the heuristic features you look for in the usage of augmented reality?

I think it's important to have the system to not provide many unnecessary features as it may confused the user. It should stay simple as what the prototype looks like now.

7) Do you think the concept of Human Computer Interaction (HCI) can play an important role in the hospitality industry?

Yes.

8) What is your opinion on providing training simulation system to the apprentice in hospitality industry with the augmented reality technology?

It is conceptually a good idea. However, it is difficult to program the system. In your case, how it is going for the system to judge that coffee he or she made is a good cup of coffee. Still, it is a good idea because the apprentice can practice it anywhere or anytime.

9) What are your thoughts on the GPS system evaluation to Human Computer Interaction (HCI)?

It depends on the applications. If the application requires to know the users' location then GPS is needed.

10) What about using GPS to guide the user to the restaurant?

But that one you can use Google Maps, Waze right. So, you can incorporate that in your overall system so it could be one of the features.

11) Because we are planning to create an augmented reality map. If the users find that Google Maps and Waze are not sufficient to guide the user to the restaurant, they can have an augmented reality guidance as well. Like giving them the directions where they can find the restaurant. What do you think about these extra features adding to the existing GPS system in the concept of human computer interaction, would it be beneficial or would it bring more negative than positive?

I think it would be more useful if it is indoor, because if it is in indoor situation, you may not have a GPS signal. Let's say the restaurant is inside a plaza, when we drive, it's no problem because Waze can do that and once, we are inside the plaza, after we park the car, how to reach the restaurant is the main problem. If we can build some kind of guidance system which can guide the user from the parking until the restaurant but is inside the building using the augmented reality, that would be nice.

12) Before we end this interview, in your professional point of view. How do you see augmented reality can help in the hospitality industry in term of human computer interaction?

Augmented reality can help a lot in the hospitality industry because hospitality includes a lot of restaurants, hotels. So, to win over the customer, adding extra features or app would help.

13) What features that we had not mention that you would like to see the use of augmented reality in the hospitality industry?

Maybe you can consider some kind of virtual reality or augmented reality that show the process of how the chef prepare the food.

11.0 – Conclusion

In this project, we actually targeted to hospitality industry to overcome their business issue with new technology AR. Nowadays, most of the people are unable to live without their phone. It is the reason why we choose to program the AR application for android mobile. This is because majority of the current publicity are still android user. In our application, we have different features provided for user, the first feature is a real time 360-degree surrounding view. This feature could let user have a view of the restaurant before they decide to go in to the restaurant to have their meal. Second feature of the application was, AR food model is one of the new functions for consumer and owner of the business. With this AR food model function, it benefits for business owner that can save cost on printing menu and electric menu board that hang on the wall. For consumer, it makes it easier for consumer to check out what food do they want by scanning the food images with the application.

Other than that, our application can be used to play games while waiting for our ordered meal. To play the maze game, user is able to play a maze game with just using our apps. In order to make it all these feature work successful, we spent 3 weeks to program all the coding and do for research try to make it perfectly. Anyway, we believe that our android mobile application was an success in overall as it meets majority of the Nielsen's rules and we have received positive feedback from user and human expert during the data collection period. Overall success of our android mobile app in providing the features. Furthermore, our future plan was to making the application available for OS phone so not just android user are able to play around with our application. And also, we plan to expand to all cuisine food market include others cuisine in the AR food model and not only western food so consumer have more choices to choose what to eat.

12.0 – References

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13.0 – Appendices

13.1 – Group Contribution

	Student Number	Name	Contribution to Group Project	Marks
Group Members	5982169	Kelvin Chee Khai Loon	1. Executive Summary 2. Scenario 3. Interviews 4. References	
	6207777	Wong Wai Hong	1. Introduction 2. Video Edits 3. Heuristic Evaluation 4. Conclusion 5. References	
	6166386	Choo Yan How	1. FURPS 2. Hierarchical Task Analysis 3. User Evaluation 4. References	
	6165916	Woon Seet Kent	1. Personas 2. Storyboard 3. References 4. Augmented Reality Maze Game	
	6203103	Calan Moy Ka-Shing	1. References 2. 3D Food Virtualization System 3. Augmented Reality Hospitality Training Simulation System	
	6203139	Lim Sheng Xian	1. FURPS 2. High Fidelity 3. References 4. Appendices 5. 360 Environment View System	
Group Name	Group HaramBae			

Topic	Augmented Reality Application for Hospitality Industry.
Lecturer	Ms. Pawani A/P T.Rasaratnam

13.2 – Ground Rules

1. Cannot be late for meeting, unless got emergency and provide explanation to the whole group.
2. Task delegated must finished on time, if task is struggling to meet deadline must inform team members for help.
3. Every form of research must be referenced before writing into the report.
4. Group meeting is set weekly and the date, time and setting must be agreed by all team members.
5. Not allowed to do other assignments during group meeting.
6. Team members have to communicate with the rest of the team once completing his assigned task.
7. Each team member has to post their topic task on google doc.
8. Weekly group minute report is updated by team member.
9. No form of plagiarism from other group is allowed.
10. No fabrication of data is allowed during the requirement gathering.

13.3 – Minute Meeting

1. https://youtu.be/-cpvLugo7bU

MINUTES OF THE CSIT226 – Human Computer Interaction MEETING (1)

Date: 16th May 2019

Time: 1018 PM

Venue: Skype Phone Call

Present	:	Kelvin Chee Khai Loon, Calan Moy Ka-Shing, Choo Yan How, Woon Seet Kent, Lim Sheng Xian, Wong Wai Hong
Absent with apologies	:	-
Absent without notice	:	-

Item No.	Particulars	To take note
1.	Prioritization of the functions	- In order, 1. 3D Food Model 2. 360 Degree View on Environment of Restaurant 3. Navigation System 4. Training System
2.	Distribution of tasks	- Tasks is distributed equally for everyone in the group.

The meeting ended at 16th May 2019, 1042 PM.

Prepared by,

Lim Sheng Xian

2. https://youtu.be/bi_TZwLoX6A

MINUTES OF THE CSIT226 – Human Computer Interaction MEETING (2)

Date: 26th May 2019

Time: 1009 PM

Venue: Skype Phone Call

Present	:	Kelvin Chee Khai Loon, Calan Moy Ka-Shing, Choo Yan How, Woon Seet Kent, Lim Sheng Xian, Wong Wai Hong
Absent with apologies	:	-
Absent without notice	:	-

Item No.	**Particulars**	**To take note**
1.	Discussion on the approach for questionnaire	- Every group member agreed to do online survey.
2.	Discussion on the ideas for questionnaire	- Group leader instructed members to do research and write out their ideas for questionnaire on google doc.
3.	Confirmation for questionnaire	- Every group member agreed on final sketches of the questionnaire.

The meeting ended at 26th May 2019, 1148 PM.

Prepared by,

Lim Sheng Xian

3. https://youtu.be/LHdophMIgsM

MINUTES OF THE CSIT226 – Human Computer Interaction MEETING (3)

Date: 9th June 2019

Time: 1100 PM

Venue: Skype Phone Call

Present	:	Kelvin Chee Khai Loon, Calan Moy Ka-Shing, Choo Yan How, Woon Seet Kent, Lim Sheng Xian, Wong Wai Hong
Absent with apologies	:	-
Absent without notice	:	-

Item No.	**Particulars**	**To take note**
1.	Inspection on the Augmented Reality functions	- Choo Yan How, Woon Seet Kent, Calan Moy, and Lim Sheng Xian show their progression on the function respectively.
2.	Discussion on the progression of everyone	-
3.	Review on the feedback of last report	-

The meeting ended at 9th June 2019, 1119 PM.

Prepared by,

Lim Sheng Xian

13.4 – Consent Forms

1. For User Evaluation.

You are invited to participate in a research project being conducted by a group of students from CSIT226 (Bachelor of Computer Science) where their name is listed below:

1. Kelvin Chee (Leader)
2. Wong Wai Hong
3. Choo Yan How
4. Woon Seet Kent
5. Calay Moy
6. Lim Sheng Xian

In order for us to be allowed to use any data you wish to provide; we must have your consent. In simplest term, we hope you will use any electronic devices to

- Share your opinion on our research
- Share ideas that you can help us to improve the design
- Most importantly, complete the form

However, you may also stop participating at any time.

*The research is prepared under the supervision of Ms.Pawani.

My signature indicates that I have decided to participate having read the information provided above.

☐ I agree to participate in the research study outlined above.

☐ My participation is voluntary, and I can withdraw at any time.

Name : _____

Date : _____

2. For Heuristic Evaluation

You are invited to participate in the heuristic evaluation on the system which is being conducted by a group of students from CSIT226 (Bachelor of Computer Science) where their name is listed below:

7. Kelvin Chee (Leader)
8. Wong Wai Hong
9. Choo Yan How
10. Woon Seet Kent
11. Calay Moy
12. Lim Sheng Xian

It should take approximately 5 minutes to complete.

RISKS

- There is the risk that you may find some of the questions to be sensitive.
- Some of the questions may be distressing to you as you think about your experiences.

☐ You have read the above information.

☐ I agree to participate in the research study outlined above.