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Digital Food Menu Application for Restaurants Based on Augmented Reality

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Abstract - *The purpose is to implement an augmented reality application based on the android platform for the restaurants. In this application, a consumer can view realistic 3d models of the food items available in a restaurant, virtually using the augmented reality. Every restaurant associated with the application have been designated a sticker (An Image Target bearing the name and logo of the restaurant, When the user scans the sticker available in the restaurant, the list of food-items is displayed, after a selecting a particular food-item, A realistic 3D model of the food item is rendered on the sticker and is seen through the user's device camera. By using this concept, the end user can actually see the food in its regular or actual serving size thus, providing help to make greater order choices as it can visualize any food-item available in the menu, but unknown to the user and also saves the time, which the user may have spent imagining the food-item from regular verbal description of the dish. Additionally, the application also has features such as a Wine Classifier, which lets the user scan a Wine bottle and predicts the brand of the Wine. And, the application also has an interactive Chatbot, which guides the user for making a perfect choice of food, depending upon the user's input to it, as well as answer basic FAQs of the user.*

Key Words: **Augmented-Reality, Image Classification, Android device, Chatbot, 3D model, Restaurants**

1. INTRODUCTION

Nowadays, the excitement of being in restaurant business (Hotel Industry) lies heavily in the constant state of activity, then to 9 out of 10 restaurant businesses fail in their first year. The restaurants who are the early adopters of new marketing technologies seem to gain a number of several distinct benefits.

There may not be an immediate return on investments, those who take initiatives to test, learn and experiment new and early technologies usually end up with a long-term advantage over the other competitors. Augmented Reality is one of the most widely used trending technique for restaurant and food marketing. Augmented Reality is one of the trending fields of the Industrial Revolution 4.0. No doubt, Technology is one of the best ways to engage your visitors and turning them into loyal customers. The promising technology that can play a important role in increasing your restaurant sales is augmented reality technology or simply AR. It allows overlaying digital content in the real world using your own phone, engaging the user and customer more quickly and in a new way.

Use of Augmented Reality in to view Restaurant Menu can help the restaurant owners to scale up their business, by raising check averages, upsell food items at a higher margin, enabling brand recognition, along with it, increasing the overall customer loyalty percentage.

The main objective of the application is to replace paper-based menu cards with digital AR application. This makes the restaurant environment friendly as a menu cards are not used at all. Other aspect of the application is describing a food-item visually by displaying it in a real-world, this saves the time of the user to imagine the food-items which are unknown to the user. Another objective of this system is to generate a maximum revenue, as adopting the AR technology would lead to raising check averages, upselling food-items at higher margins, maintaining a brand recognition of the restaurant and increasing the overall customer loyalty percentage.

2. LITERATURE SURVEY

The survey regarding this application includes operations from various different sources. These sources include a variety of Augmented Reality applications and similar projects developed previously**.**

In 2014, Cheng Xiao and Zhang Lifeng *et.al* [1] proposed development of an AR application using registering an image target in the Vuforia SDK and then rendering an 3D object over it when the image target is scanned through a mobile device **.**This paper discusses about the application in which a 3D model is overlaid on the image (the image target is saved in a pre-processed database of Vuforia SDK , which is implemented using the principle of FAST algorithm) scanned by the mobile as the Vuforia SDK uses the image recognition .In this proposed system, only a single 3D model can be rendered on a single image target., making it supportable only a single image target.

In 2015, Dimas Arioputra and Chang Hong Lin *et.al* [2] proposed a development of an application that translates the name of food-items available in Chinese menu in English and displays the 3D model of associated food-item. The system

runs on an android platform device and uses image recognition to trace and register image markers (in this paper it is a Chinese word). Then it processed the input into a pre-processed feature database of menu items using FAST algorithm implemented by the Vuforia Library. The system will check the database and after matching the input, it will generate the 3D model of the food item using the Unity 3D engine. The system makes the uses of the OCR technology by making the use of Tesseract Engine to translate text from Chinese to English. The system proposed in this paper is currently capable of rendering up to five 3D models at a time and contain the 3D models of food-items available in a single restaurant.

In 2018, Kunal Raut, Priyanka Khare, Aishwarya Kamble, Sachin Deshpande *et.al* [3] proposed an AR application running on android mobile platform for a restaurant having the features such as real-time tagging, an interactive menu and a food identifier. The proposed system also provides you some extra features like restaurant offers, food item ratings, ingredients information, recipe videos and feedback option. When you scan the logo or any marker an augmented category will pop up, you have to select the category you want and the items in that category will be in front of you. So, you can just swipe to find more 3D dishes on your table through the android device. Then you can select any option like its price, ingredients, and rating given by other users on the side panel of the 3D view. If the user wants to leave any comments about the dish, user can tag any dish available in the restaurant. The user also can tag various images or videos as well as they can give a rating to that dish. So, whenever a new user visits that restaurant can find that tags. In this application, a user also can find previous ratings, hot dishes and dishes with the odd name which user can't understand and can be seen in an actual format so that most of the user's problems can be solved.

3. PROPOSED SYSTEM

Due to the limitations in the existing system such as limitation in rendering of a fixed number of 3d models, so to overcome it, we proposed a new system. In the proposed system, we are going to implement an augmented reality application which would include a list of various items. Also, each restaurant has a unique sticker (image target bearing name and logo of the restaurant). When the user visits a restaurant and scans the sticker ,then the user can select a particular sub-category, then various food items included in that sub-category is displayed. When the user clicks on any of the food item's name, the system scans if the correct sticker (image target) is detected or not and then renders the 3d model of the food item on the sticker accordingly. The image target (here sticker) is being distinguished by making the use of the FAST algorithm (Features from Accelerated Segment Test), which is a corner detection method, which could be used to extract feature points and later used to track and map objects in many computer vision tasks, for this to happen we're making the use of the AR framework of Vuforia Library in Unity 3D. The user can ask queries to the chatbot and also the chatbot suggests food dishes to the user depending upon the input from the user. The system also comprises of a Wine Classifier based on Image Classification, In which the user can scan a Wine bottle and the classifier displays the predicted brand name of the Wine bottle.

4. BLOCK DIAGRAM

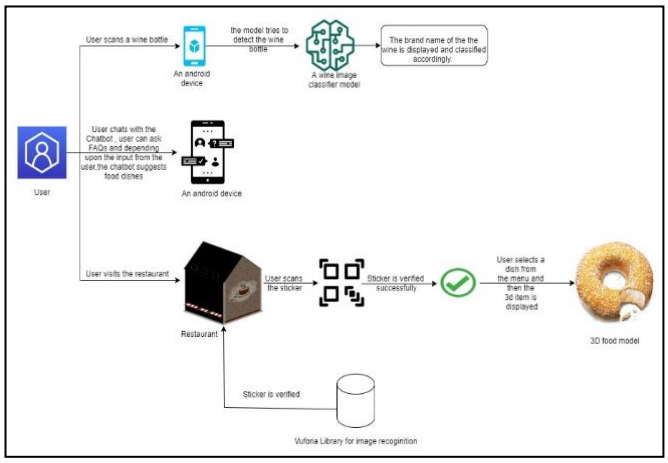

Fig -1: Block Diagram of Digital Food Menu Application based on Augmented Reality

Figure 1 shows the block diagram of the proposed system. In this system, the user signs in or registers in the application, then the user can perform tasks such as Classifying Wine brands, asking queries to the Chatbot and Viewing the Food in AR. Firstly, to classify a Wine, the user scans a wine bottle and the Wine classifier predicts and displays the brand name of the Wine bottle scanned. Secondly, a user can chat with chatbot ask queries related to the Food dishes available in the restaurant, get suggestions from the chatbot to try out various dishes, based on the user's input and lastly the user use the Augment Reality Food menu, by selecting a category of dishes, then scanning a sticker (image target bearing the name and logo of the restaurant), and after user selects a food-item, a realistic 3D model of the related Food-item is rendered on the sticker. Due, to this, user can see the food-item from all the angles, view the cost and veg/non-veg status of food-item virtually on the user's device.

5. RESULTS

This application is tested on Android smart phone Realme 7 Pro with Qualcomm Snapdragon 720G octa core processor having 6gb RAM with android version 11, installed in it.

Fig -2: Initial UI of the application

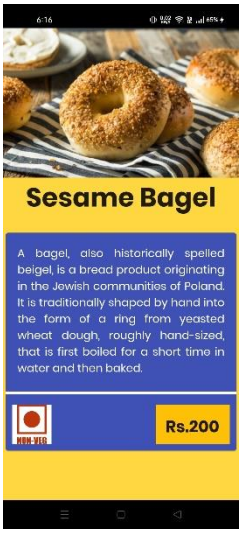

Fig -3: Food-item view

Fig -4: Wine Classifier

Fig -5: Chatbot

Fig -6: UI of Desserts category with undetected sticker

Fig -7: The sticker is detected and 3D model of selected food-item is displayed on the screen

In Fig. 2 and Fig. 3, This UI is displayed initially to the user and then the user can select any item from the list and can view the following UI, which displays the information , cost and veg/non-veg status about the selected food-dish

In Fig. 4, we could see the Wine Classifier, scanning and predicting the brand name of the wine bottle. In Fig 5, we could see the user chatting with the chatbot, where the chatbot suggests the user regarding the food dishes and answer the basic FAQs of the user about the restaurant.

In Fig. 6, The UI of Desserts displays “Scan the sticker”, as the sticker is not yet detected and will not displayed any 3D model until the sticker is detected.

In Fig. 7, After the sticker is detected, we could see the 3D model of the selected food-item along with its feature and cost details are displayed on the screen of the user’s device.

6. CONCLUSION

The proposed system shows the overall sequence, structure and working of the Food Menu using Augmented Reality application. The application provides good user interaction and secure environment. This application is also helping in removing all the language barriers and odd names of food-item problem. So, we can conclude that the proposed system performs all the operations such as Wine Classifier, Chatbot and Augmented Reality Food-menu efficiently and accurately.

7. FUTURE SCOPE

Since, the application currently consists of food-items available in a single restaurant, we could include multiple restaurants in the restaurant list in the future development. Additionally, the application could also include online order placing facility in the future development.

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