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MENU GUIDE: AN AR APPLICATION FOR SMARTPHONES

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Abstract— The world has seen an explosive rise of restaurants. The various food cuisines and cultures are spread globally. The choice of picking a restaurant and then later a dish from the diverse cuisines available is time consuming and confusing for the majority. Motivated by the desire to provide for the public and also benefit the food production community we have come up with a unique and way to present the menu- an essential part of the dining industry. The app scans any menu from a restaurant by using an OCR to provide ratings of each dish by doing sentiment analysis over the reviews provided by customers. The menu has a AR system to project that ratings for the dishes to provide a better user experience. It is aimed at faster processing and delivery of food as well as giving an opportunity for the Restaurateur to identify the bestselling, least liked/preferred, and likely replacement for the dishes on the menu.
Keywords: Optical Character Reader, Augmented Reality.

I. INTRODUCTION

India has always been a country of diversity be in religion, culture, or food. As society develops one major Industry which would no doubt benefit is the Food Industry. Non casual dining restaurants (NCDR) or fast casual dining restaurants have gained tremendous market share in the last 10-15 years. Non-Casual dining restaurants (CDRs) market in organized fast food sector in India is also projected to grow at a CAGR of 27% in next 5 years. In its early years at the beginning of this decade, food-tech was a term primarily associated with listing platforms that would help restaurants increase awareness about their businesses. This was followed by consumer internet companies entering into a deeper layer of agreements with brick-and-mortar restaurants to take orders on their behalf, thus becoming aggregators. The next progression for online firms, the form which they are in currently, was hyperlocal as per which, they become single-point source for restaurant owners to sell food and one-stop shop for customers to buy it. In this process, these start-ups burnt millions of dollars to acquire customers but ended expanding the market, for their own services as well as for eating joints.

These platforms have given a new ecosystem for the restaurants. Be it discovery, reviews, online ordering, it's a completely new ecosystem that has come up that has been supportive from a growth perspective for the brick-and-mortar restaurants," she added. This is in contrast with the retail sector, where growth of order volumes for e-commerce companies such as Flipkart and Amazon have negatively impacted traditional retailers. These aggregators, also available as apps on smartphones, have made it easier than ever for the Indian diner to order food from his/her favorite restaurant without worrying about whether the restaurant delivers to their location and if the person at the other end has heard their order and/or address right.

What's more, there are added benefits to ordering online such as consumers can take their time reviewing and choosing their dishes without someone breathing down their neck, they can double-check their orders before making payment, and they have a variety of payment options available to them ranging from the standard cash on delivery and credit/debit card payment to online wallets like Paytm and Google Pay.

II. RELATED WORKS

Fabio Ciravegna, Sanda Harabagiu [1], discussed about early NPL application range from querying archives (for example, the historical activity on querying databases), to accessing collections of texts and extracting information, to report generation, to machine translation. Matthew Lease [2] shows the methods for integrating modern Natural Language Processing (NLP) with state-of-the-art Information Retrieval (IR) techniques. Information Retrieval is to obtain conversational speech data, which poses a unique set of considerations in comparison to text. Hence, greater use of NLP has potential to improve both text and speech retrieval.

Navdeep Kaur, Vandana Pushe, Rupinderdeep Kaur [3] research in Machine Learning (ML) focuses on the development of algorithms for automatically learning patterns and making predictions based on empirical data, and it offers useful approaches to many NLP problems. The aim is to gather knowledge on how human beings understand and use language so that appropriate tools and techniques can be developed to make computer systems understand and manipulate natural languages to perform the desired tasks. Ahmed Ali Qatar, Steve Renals [4], measured the performance of automatic speech recognition (ASR) systems requires manually transcribed data in order to compute the word error rate (WER), which is often time-consuming and expensive. The estimated overall WER was 25.3% for the three hours test set, while the actual WER was 28.5%.

Sentiment identification is a very complex problem, and thus much effort has been put into analyzing and trying to understand its different aspects. Oskar Ahlgren [5], showed common sources of opinionated texts have been movie and product reviews, blogs and Twitter posts. A fast and simple method for determining the sentiment of a text is using a pre-defined collection of sentiment-bearing words and simply aggregating the sentiments found. More advanced methods do not treat all words equally but assign more weight to important words depending on their position in the sentence. Augmented reality actually superimposes virtual objects into the real environment with the real objects for enriching the viewer's experience Augmented reality with virtual reality in virtual space, also enhances the audience perception by displaying additional information. Vikas Tiwari, Vijay Prakash Tiwari, Dhruvesh Chudasama, [6] did a survey on technologies that are involved in the implementation of augmented reality. These technologies are displays which are used for used for displaying or combining the virtual object by the real environment, tracking or gesture recognition helps in real time interaction part while the modelling is used to register the objects into 3D for enhancing the quality and perception of the viewer. AR Technology basically works on the three aspects or characteristics Combination of real and virtual environment, Real time interaction and Register in 3 Dimension.

Augmented Reality applications on Android. Offers an object oriented, pure Java API, hiding all the native library calls. It uses the Java API to access the camera and retrieve a video stream from it. The images are then in turn handed to the AR toolkit library. G.Rajasree, K.Varsha, E.Susmitha, J.Praveena, G.Harika [7], worked on images that convertes to an appropriate colour space by using multithreading and synchronization .Transformation matrix for the 3D object is calculated inside the library. The converted image will be loaded as a OpenGL texture, 3D object is drawn by applying transformation matrix. Augmented Reality application combines 2D (video stream) and 3D graphics. Android has an API for both use cases. It always has to be connected to a surface on which it can directly draw the video stream. If no preview surface was set Android smart phones will not provide video stream. Android smart phone have to register a call-back method in order to get the video stream. Every time when a new frame arrives, providing the image this method has to be called as a byte array. The formats that might be supported by the camera hardware is, is defined by the Android compatibility program. Generally, the most important part is tracking the head as the user wears a Head Mounted Display (HMD) from which the augmented images of the real world are displayed. The improved accuracy of the AR system due to tracking also prevents problems such as visual capture and does not allow visual sensors to gain a priority over other sensors. For instance, inadequate registration accuracy can cause the user to reach wrong part of the real environment because the augmentation has been displayed on another part as shown by Erkan Bostanci, Nadia Kanwal, Shoaib Ehsan, and Adrian F. Clark [10]. The eyes of the users get used to the error in the virtual environment and after some time of usage they start to accept these errors as correct which is not desirable. AR applications under four main categories: indoor methods, outdoor methods, fusion strategies and recent approaches

III. REQUIREMENTS

The Android SDK provides the API libraries and developer tools which are necessary to build, test, and debug apps for Android which includes the essential Android SDK components and a version of the Eclipse IDE with built-in ADT (Android Developer Tools) to streamline Android app development. For AR module we used unity 2018.3.3f1 with ARToolKit package. Installing the application need a minimum of 1GB RAM and 100MB of storage capacity with access to the internet and the camera.

IV. METHODOLOGY

The application is divided into five modules: 1.Retrieve the food review data using API, 2.Perform process on BLOB, 3.Generate rating for each dish, 4.Render the menu and instruction scene, 5. Display the augmented menu based on the marker. The flow is shown below in Figure 4.1.

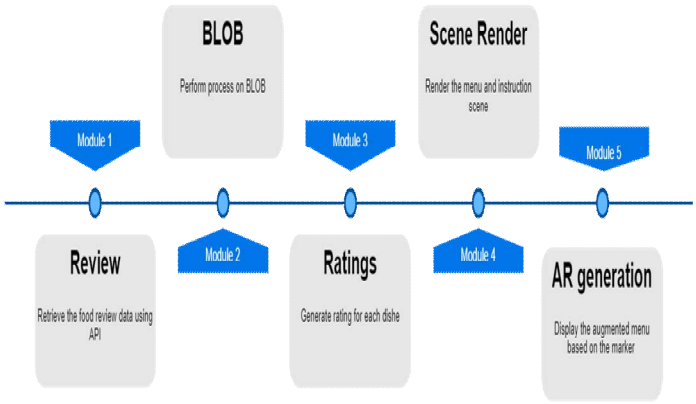

Figure 4.1: Process Diagram

(i). Retrieve the food review data using API : Food ratings of different dishes are pulled from the zomato API. These reviews are analyzed using TextBlob library. The dishes identified from reviews are given corresponding ratings that invoke emotions. Some words like 'bad', 'poor' connote a bad experience thereby reducing the dish preference. Likewise positive words like 'good', 'great' and 'amazing' convey a liking which uplifts the overall rating.

(ii). Perform process on BLOB: The text is processed and matched based on keywords. Sentiment analysis is done on reviews for each dish. Python TextBlob library is used to perform text analysis. Corresponding JSON ratings are returned for each dish.

(iii). Generate rating for each dish: The rating is utilized to change & render values for each scene. The returned range is used to segregate each dish's review. The rating is returned as a JSON object that is either 'very good', 'good' and 'average'. The Application runs this on the server and the Support ensures the values are modified at timely intervals.

(iv). Render the menu and instruction scene: Making marker using (one time): we make use of mkpatt.exe application. The created marker is detected as a patt. 'marker' file and included in the AR Marker library. Use of mesh & shadow to create AR object, set camera, and directional light components. Generate additional objects - quads, cubes & planes. And then generate the 3D scene.

(v). Display the augmented menu based on the marker*:* Camera detects the specified marker defined using the ARToolKit Camera Script. The scene corresponding to each marker is rendered relative to the marker on the scene. The position & size is relative to the distance from the marker and the size of the image.

V. RESULT

Food ratings of different dishes are pulled from the zomato API. These reviews are analysed using TextBlob library. The dishes identified from reviews are given corresponding ratings that invoke emotions. Some words like 'bad', 'poor' connote a bad experience thereby reducing the dish preference. Likewise positive words like 'good', 'great' and 'amazing' convey a liking which uplifts the overall rating. The text is processed and matched based on keywords.

Figure 5.1: Collecting reviews from user

Sentiment analysis is done on reviews for each dish. Python TextBlob library is used to perform text analysis. Review are taken from the user as shown in Figure 5.1 and corresponding JSON ratings are returned for each dish. The rating is utilized to change & render values for each scene. The returned range is used to segregate each dish's review. The rating is returned as a JSON object that is either 'very good', 'good' and 'average'. The Application runs this on the server and the Support ensures the values are modified at timely intervals. Making marker using (one time): we make use of mkpatt.exe application. The created marker is detected as a patt. 'marker' file and included in the AR Marker library. Use of mesh & shadow to create AR object, set camera, and directional light components. Generate additional objects - quads, cubes & planes. Generate the 3D scene. Camera detects the specified marker defined using the ARToolKit Camera Script. The scene corresponding to each marker is rendered relative to the marker on the scene. The position & size is relative to the distance from the marker and the size of the image. The final AR application is shown in Figure 5.2 having different menu items with the respective food rating.

CONCLUSION

Figure 5.2: Menu scene as seen from device

The food industry is growing every day and is also introducing multiple changes to the cuisine and service. The most traditional yet unchanged part remains the menu. The menu is a simple yet unidentified as a useful component for benefitting the sales as well as improving customer satisfaction. Thus with the proposed project, objective is to implement machine learning concepts in order to maximize the food industry beginning at a grass root level. Hopefully to generate a new approach to viewing every restaurant in a better light. Later down the line the user can make modification to the system and possibly add additional functionalities. The possibilities can range from predicting the appropriate food items preferred during various months or seasons, identifying the preference of people living in a particular area and hence create an ideal menu based on the situation and culture at that place, and even possibly predict the dishes which may make a ideal comeback due to change in trends.

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