Augmenting Food Experience While Traveling Abroad by Using Mobile Augmented Reality Application

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Abstract. Local cuisine is an essential part of a travel experience. Food is not only nourishment and entertainment but also helps travelers understand the people, traditions, and culture of a particular country. However, communication gaps and lack of information make it very challenging for travelers to experience truly local cuisine and the restaurants that serve it.

In this paper, I present a solution which makes travelers' food experience manageable and engaging by combining augmented reality with location-based functions, translation for both language and currency, and food-focused social networks on smartphones.

Keywords: Augmented reality · Mobile devices · Food · Experience design
Travel · User-centered design · Human-computer interaction

1 Problems

1.1 Background

According to an article from the International Trade Administration [7], "Of the more than 25 subsectors that make up the travel and tourism industry, three sectors – food services, air travel, and accommodations – account for over 45% of total output." In 2016, travelers spent nearly $174 billion on food and drinks, supporting nearly 1.9 million U.S. jobs. When people travel abroad [5], tasting local cuisine is an essential part of travel experience. Beyond energy and nutrition, food also links them with entertainment and culture. Therefore, improving the travelers' experience around food while traveling abroad is significant, which can either boost or degrade local business and economic development.

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1.2 Research and Problems

Out of 143 travelers surveyed, over 90% were concerned about where good local restaurants were located, what true a local cuisine was, and how to best engage with a local food culture.[1]

A later set of interviews[2] helped identify two major problems:

Language Barrier. Language is a major barrier to understanding and communication while traveling abroad. Most American interviewees only spoke English. When they were in countries where people did not speak English, they could not communicate well with locals. For the same reason, travelers had difficulty to fully understand the regional menus and to order dishes that required them to talk with local people.

Some interviewees said that they used translation tools to translate local languages into English one word at a time to understand a local menu. Or, they translated English into the local language and then showed the translated result to a waitress while ordering food. Both activities were time-consuming and inconvenient.

Limited Knowledge and Information About Local Restaurants and Foods. Almost all interviewees stated they wanted to know which restaurants were favored by local people and what foods local people liked to eat, but they had little information. Therefore, some interviewees had to use online resources in advance, which was time consuming and difficult.

When asked how they chose food in a local restaurant, interviewees responded that they normally asked servers' recommendations if the servers could speak English. Or they observed what other people were eating and then evaluated whether they also were interested in that food. Some mentioned that they used Yelp or Trip Advisor to seek information for reference. However, they could not always find information, or results were too broad and there were many unrelated comments that were not about the dishes.

2 Solution

2.1 Objectives

In order to make the entire food experience easier and simpler, including helping with decisions of where to eat, what to eat, how to order, and what to do while waiting for food, I designed objectives in different stages to enhance the overall experience that solves the main problems identified in user research.

- Stage 1: Learning about a local restaurant: Showing primary information about a local restaurant is necessary, including its food, price, service, and reviews, with a special emphasis on comments from people who have eaten there several times.

[1] Online survey about traveling abroad conducted by the author in 2017.

[2] Remote user interviews with twenty American travelers whose ages are from 22 to 55 years old and who had previous experience traveling to foreign countries.

- Stage 2: Recommending dishes from a local menu: Aggregating related comments from different user-generated content applications and efficient on–the–fly translation will be crucial for the application, the digital translation includes both language and currency.
- Stage 3: Ordering food: Help ease communication issues with the server and make travelers easily know if the total-order price matches their budget.
- Stage 4: Waiting for food preparation: The time waiting for food could be utilized for accessing supporting editorial content about food, culture and other engaging content for a person who expressed interest and initiative in finding the best the host country has to offer.

New digital technologies make implementation and use of advance mixed reality (MR) technology easy to build and easy to use [2]. I anchor ideas in that space, as the potential is vast and adaptation is likely to become exponentially positive in years to come. I expect to use augmented reality (AR) [1] for real–time translation, user generated reviews and other supporting content. The user experience (UX) paradigm will layer digital information on top of physical local menus to bring the travelers high convenience.

2.2 Persona

Based on research findings from the user interviews, I have created a user profile named Steven who is 27 years old and lives in New York City. He is a travel enthusiast and a food lover, but he only speaks English. He believes that food not only means great taste but also it is a good way to learn local culture. He likes walking around to explore local restaurants and local food without a precise travel plan when traveling abroad.

However, it is not easy for Steven to get information about a local restaurant if it is good before he directly walks into or uses search engines for comments. Due to the language barrier, it is also hard for him to fully understand a local physical menu and decide what to order. Furthermore, it is time-consuming for Steven to identify helpful and relevant reviews while making a food decision among a large volume of user-generated reviews, such as on applications like Yelp, Foursquare or Trip Advisor. He hopes travelers like him discover and experience local food in an easier and simpler way.

2.3 Use Senario

Steven travels to Shanghai, China for one week. It is his first time to China. Based on his friends' recommendation, he installs an AR mobile app named Foodies, which can help him choose good local restaurants and good local foods with ease.

He walks around and wants to have lunch. When he passes by a local restaurant, he sees some local people go into a restaurant. He is curious and wonders if it is a good local restaurant. So, he uses Foodies to scan the name of the restaurant for information.

The screen shows rating, specialties, average price, number of returning customers. These data look good to Steven. Therefore, he walks in.

A waitress brings him a menu after he sits down. Steven uses Foodies to scan the physical menu. Instantly, a digital translated menu shows on his mobile screen. He well

understands the Chinese food menu and easily knows how much a dish costs in US dollars. He is happy to see the most popular dishes highlighted on the digital menu.

He taps the non-spicy items within the most popular dishes on the filter function. Based on these filtered results, he is interested in stewed pork in brown sauce. Therefore, he taps the dish on the digital menu for more details.

A summary indicates that 90% comments from a local food application, Yelp, and Foursquare about the current dish are positive. Steven quickly scans snippets of comments that are highly relevant to this dish. Then he decides to choose it.

The screen shows dishes he has selected and the total price, which meets his budget. It is also helpful for Steven to learn how to pronounce the selected food in Chinese. Steven follows the instructions and reads them to the waitress.

When Steven is waiting for his food, Foodies suggests to him to play food games that are related to the Shanghai cuisine and the local culture to kill time. He is happy to try. Through the games, he learns some interesting information about the Shanghai food culture.

Soon, the dishes are placed on the table. He enjoys the Shanghainese food. Foodies helps make food experience more convenient for travelers like Steven while traveling abroad.

2.4 User Interface

I put designs and flows in traditional windows and screen-based interfaces within digital and spatial contexts (see Figures).

Learning About a Local Restaurant. Tourists can use Foodies to scan the name of the restaurant for primary information. Based on GPS detection, computer vision, and text recognition, the mobile phone screen shows the important information about the current restaurant, such as rating, specialties, and average cost, which are of concern to most tourists while choosing a restaurant (See Fig. 1).

Fig. 1. Learning about a local restaurant

Reading and Understanding a Local Menu. The tourists can use Foodies to scan a physical local menu for a digital translated menu shown on their mobile screen by utilizing computer vision and text recognition technologies. Therefore, tourists will understand the local food menu and easily know how much a dish costs in US dollars by real-time translation for language and currency. They also can see the most popular dishes highlighted on the digital menu by data being extracted from the Internet (See Fig. 2).

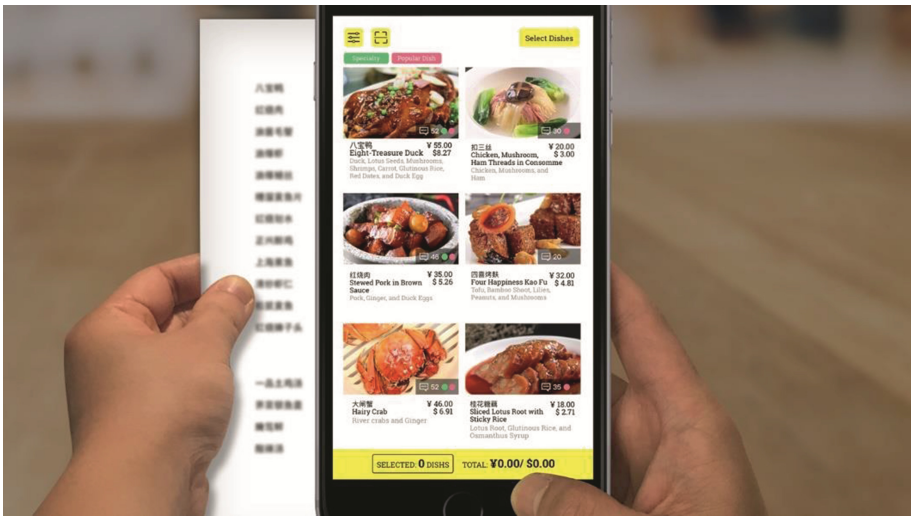

Fig. 2. Reading and understanding a local menu

Filtering Dishes. The tourists can tap filter function to further look for what to order in the digital menu. They can filter the dishes by multiple criteria, like price range, category and taste to best match the individual's preference (See Fig. 3).

Viewing Highly Relevant Reviews About a Dish. The tourists can see a summary of other customers' opinions about the current dish by using data mining and extracting technologies [3]. The customer reviews include positive and negative [4]. The comments aggregating in the detail page mainly are from the Dianping app, which is a local food app, Yelp, and Foursquare. Thus, the users are able to scan with ease what previous customers thought with a snippet that is highly relevant to the dish [6] (See Fig. 4).

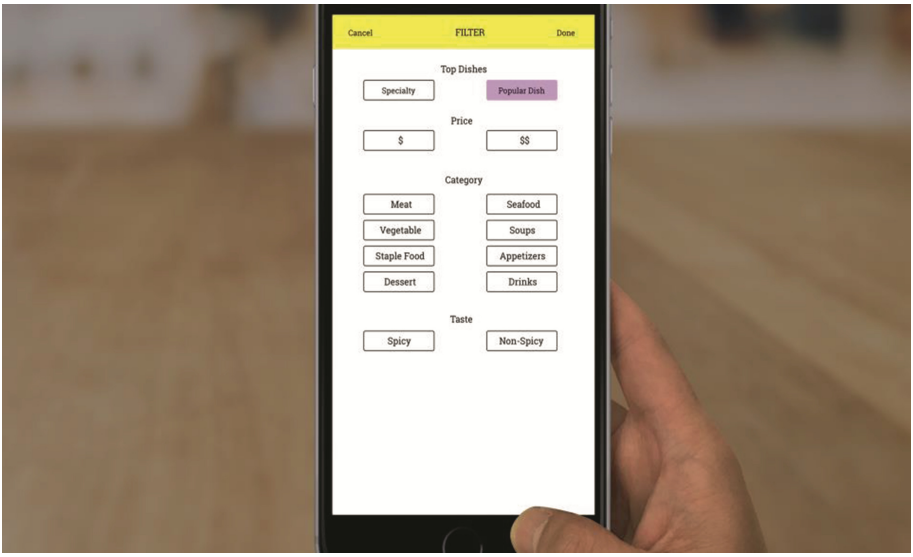

Fig. 3. Filtering dishes

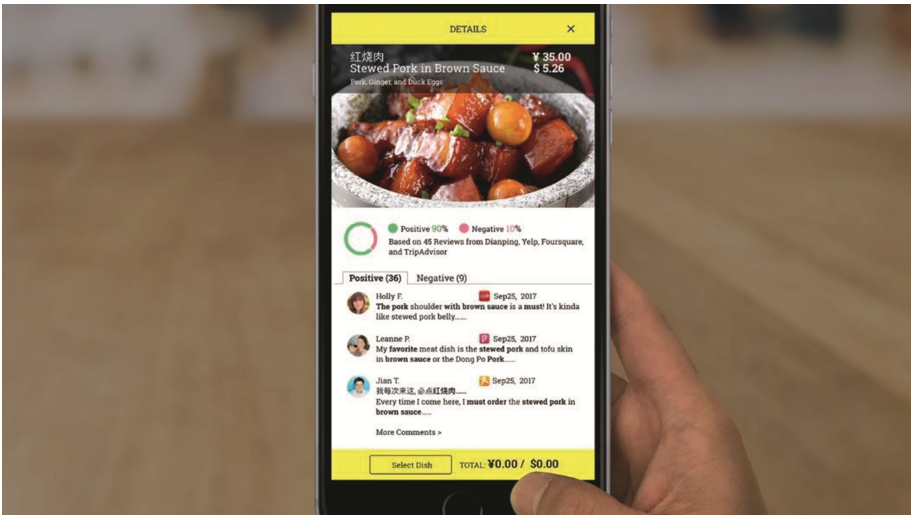

Fig. 4. Viewing highly relevant reviews about a dish

Ordering Food. The screen shows dishes the users have selected and total price. As a result, users can know if the total price meets their personal budget. Foodies also displays how to pronounce the selected dishes and frequent phrases used in ordering the dishes in the local language. Thus, the users can follow the instructions, read, or directly show the screen to a waiter/waitress while ordering the food (See Fig. 5).

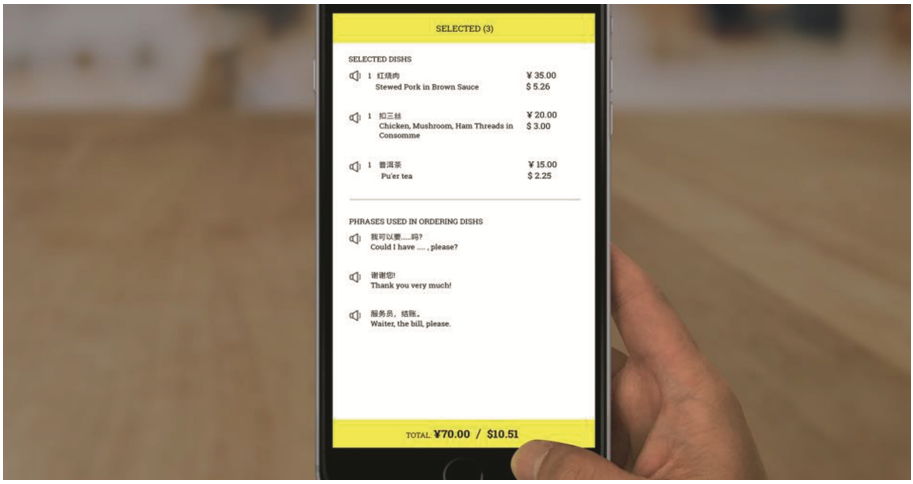

Fig. 5. Ordering food.

Learning Local Food Culture by Playing Games. When the tourists are waiting for food preparation, the app suggests food games that are about the local food culture. Hence, the tourists can learn the local food and culture through an engaging way (See Fig. 6).

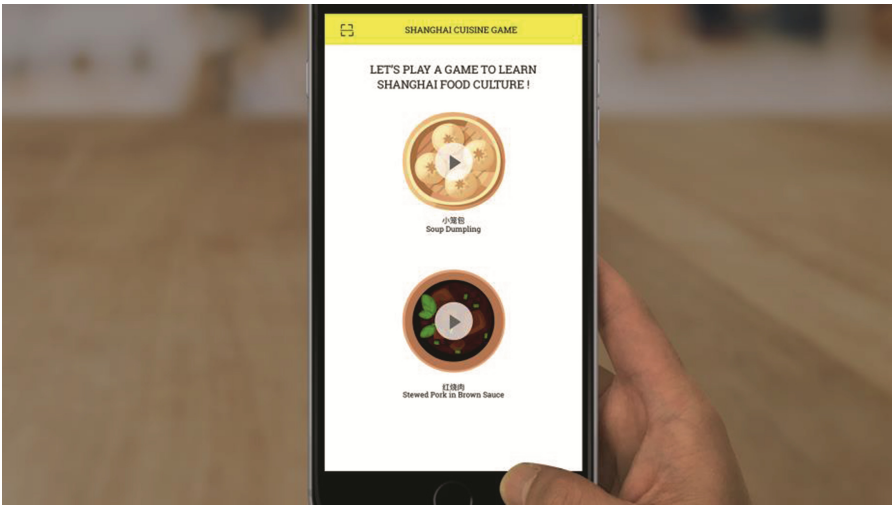

Fig. 6. Learning local food culture by playing games

3 Evaluation

In order to learn if the solution can enhance food experience for travelers when they travel abroad, that is if information contributes to making easily a decision about

choosing restaurants and local foods. I conducted user testing with twenty-six American travelers, 22 to 49 years old, with average annual income of $74,000. Every interviewee had travel experience in countries where locals did not speak English or spoke other languages that travelers were unable to speak and understand.

Most of the interviewees thought key information about a local restaurant such as average price, special dishes, rating and service were helpful for them to make a decision for choosing a local restaurant while they stood in the front of the restaurant and used Foodies to scan the restaurant for overall impression. Some of them mentioned that they wanted to see the full menu in order to better decide if walking into or not. Because specialties were recommended by the local restaurant. They might not be interested in that. If they could view the full menu, they would have better ideas if they wanted to choose the local restaurant.

Scanning the local menu and auto-translating local language into English were favorable to all interviewees. They thought they could well understand the local menu without other's help or they did not need to input local language to Google Translator one by one, which could save them time and effort. The interviewees also believed that two prices displayed along with each dish were a creative good idea. Since the local price for a dish has been translated into US dollar based on current rate of exchange and the translated currency was displayed on the individual mobile phone screen. They did not need to spend time in doing the math on their own in order to see if the price of a dish was too high or acceptable.

When viewing details of a specific dish for more information, most interviewees stated that aggregating reviews from different applications that are about user-generated reviews were an easy and useful way for them to obtain important feedback from other customers about the quality of the food provided. Therefore, they did not need to separately open different food applications such as Yelp or Foursquare to look for reviews. It saved their time. From the perspective of the tourists, consumer experiences shared by other customers could facilitate their decision-making for food choices.

After reviewing the prototype of showing total price for selected dishes that included local price and US dollar, and phrases used in ordering the local dishes, interviewees thought the functions were pretty helpful. Most of the interviewees wanted to order the food by using local language because it was a learning process for the local food to them. Few of them wanted to know extra phrases, like how to say delicious or grateful in the local language. Since they wanted to praise if the ordered food was really great. Some interviewees said if they could not pronounce the local language clearly, they would like to directly show what they have chosen on the mobile phone to the waitress. They also suggested showing how much to tip in a foreign country. Therefore, they could better control budget.

However, it was debatable if using food games was good for the travelers to learn local food and relevant food culture. Because most interviewees stated that they did not want to play a game even if they were waiting for food. Some interviewees thought if they were children, they would be more likely to play a food game. Some of them said they preferred to directly read the simple paragraph about the introduction of local food and culture, because the paragraph was straightforward. Therefore, I redesigned the

experience about how to make travelers easily discover iconic local food and good restaurants where they can eat that food and related food culture.

4 Conclusion

Based on the feedback from the interviewees, I updated the design for learning local food and culture while waiting for ordered dishes. Instead of the games, Foodies shows information about other traditional local foods and which best local restaurants to eat them. The users can tap "Add Food to Notes" to add to their mobile phone as a to-do list and try entries later (See Fig. 7).

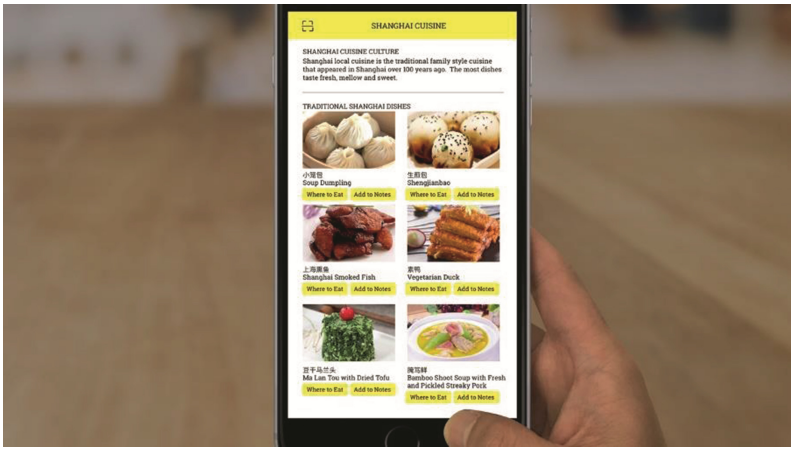

Fig. 7. Learning local foods by auto recommendation

Overall, I have received positive feedback from the travelers during user testing. Over 85% interviewees said they would download Foodies to assist them to more easily choose good local restaurants and local foods while traveling abroad. They believed that Foodies could simplify the process of from choosing where to eat, what to order to learn how to order and what to try on their next tours.

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