



“Homenu”: An Interactive Projection Cooking Assistant

Yahong Li, Shuyuan Zhang, and Zhanxun Dong^(✉)

School of Design, Shanghai Jiao Tong University, No. 800 Dongchuan Road,
Minhang District, Shanghai, China
dongzx@sjtu.edu.cn

Abstract. In recent years, people are increasingly concerned about the safety and health of their diet, which leads to more people preferring to cook for themselves. However, young people do not have complete cooking skills because of poor experience. This paper focuses on their cooking problems and applies user research approach to concluding the pain points of cooking behavior for this cohort of young-adult users. The purpose is to provide users with easy, intuitive, and interesting cooking instructions. Based on the interactive projection technology, we developed a cooking interactive projection system named “Homenu”, which has a lightweight and natural interaction.

Keywords: Smart kitchen · Interactive projection · Interactive design

1 Introduction

According to a study conducted by the United States Department of Agriculture (USDA), millennials spend a larger percentage of their grocery shopping budget on “prepared foods” and they cook “home-prepared food” less than any of the previous generations [1]. But with the improvement of living standards, people have higher requirements for the quality of life. The health, nutrition, and safety of diet have become a public concern [2]. People are more likely to cook for themselves rather than just settle for a takeaway.

With the continuous progress of science and technology, the kitchen has gradually become more intelligent, providing a lot of convenience for cooking. The ways of food purchase, delivery, and storage management have been developed. The smart kitchen has largely eased a lot of preliminary work, but young people still cook less frequently. Based on the previous study, the frequency of cooking is negatively associated with a sense of pleasure (hedonic motivation) [3]. This may occur because they face a lot of difficulties in the process of cooking, which are mainly reflected in the following aspects:

Poor Cooking Experience. Although many people are willing to cook for themselves, most of them are new cooks, especially young people born in the 1980s and 1990s who live and work in big cities. The skill has a positive impact on the likelihood to cook, and attempts to impart skills should also increase the incidence of cooking.

Inefficient Way to Learn Cooking. Currently, the main way people learn to cook is by checking recipe apps on their electronic devices. But this presentation of recipes is not intuitive enough. Users will be busy and get the wrong steps while browsing the tutorial, and the water stains on their hands will also prevent them from touching the electronic screen.

Boring Cooking Process. For many new cooks, the cooking process is boring, especially the cutting and processing of ingredients. The cooking process is perceived to require a considerable amount of manual labor and a need for precise measurements.

Taken together, the purpose of this study is to alleviate the problems encountered by young people who are willing to cook but not experienced in the actual cooking scene and encourage them to engage in healthy cooking habits.

After analyzing the previous research and determining the goals, we carried out the main design process. The stages and behaviors of the cooking process were summarized through observation, user interviews, and other research methods. Then, we analyzed the pain points of the cooking process and obtained the user experience map of the cooking process. In order to achieve the desired interaction effect, we studied the interactive projection technology and determined the development platform and development model. Finally, the cooking interactive projection system was designed and developed.

2 User Research

Firstly, we did field observation. The purpose of this observation is to understand the cooking process of different users, analyze the cooking behavior, and summarize the general process and rules of cooking. Through the observation of the cooking process, it was found that the preparation and production of dishes could be summarized in the following six steps: choose the recipe, prepare ingredients, cut ingredients, process ingredients, heat and cook, decorate and plate.

And then we did the user interviews. The purpose of this interview is to understand the target users' diet status, cooking status, as well as the pain points and needs encountered during cooking learning. And the selection criteria of interviewees in this interview are young people between 20 and 35 years old, with relatively good income and high requirements for quality of life. Six interviewees were selected for the survey, including three females and three males. Three respondents had some cooking experience, while the other three had no cooking experience.

The interview result shows that users cared about life quality and brand experience, and they had a strong sense of healthy diets. They generally believed that cooking at home was healthier than eating take-out food, although they often ate take-out food due to a tight schedule. They expressed a willingness to cook at home if conditions were right.

In terms of their access to culinary instruction, many respondents said they were still too inexperienced to cook independently. In the process of cooking, they often had to look at the recipes on mobile devices like phones, so the operation led to confusion. Also, water-stained and oil-stained on hands during cooking would affect the touch

screen, making the whole process terrible. Besides, some respondents said the process of cooking was too boring, especially when cleaning, cutting, and cleaning up afterward.

The cooking behaviors and cooking operations at different stages were summarized in the observation and investigation, as well as the pain points, demands, and typical sayings of users learned in the user interviews. We combined them to create a user experience map (see Fig. 1).

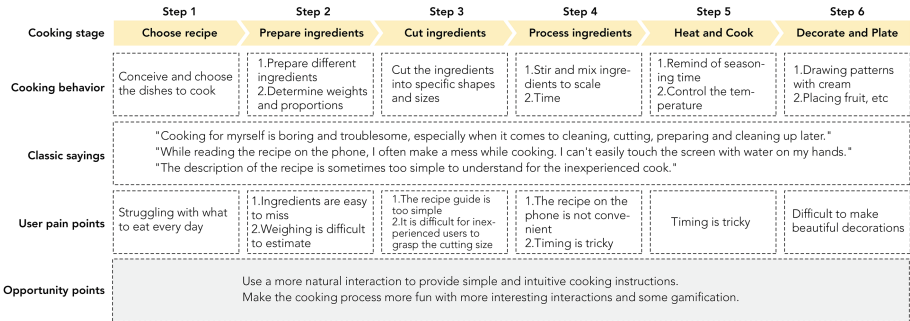


Fig. 1. User experience map and opportunity points

Through the user experience map, we get the opportunity points: Use a more natural interaction to provide simple and intuitive cooking instructions, and make the cooking process more fun with more interesting interactions and gamification.

3 Design and Development of the System

3.1 Hardware and System

Omojola et al. pointed out that with the continuous development of computer technology, we should no longer obtain information only through the old way like mouse, keyboard, and monitor [4]. With the rapid development of sensing technology, more new ways of interaction have emerged.

To demonstrate the design concept and develop the interactive projection system, the carrier used in this design is a technology named interactive projection. It can project information onto a desktop or wall. And it has been developed and widely used in recent years. People can interact by touch, click, and other means. At the same time, the form of projection is free from the constraints of the screen, and its operating environment becomes more diverse. Through interactive projection, ordinary ground, wall, desktop, and other realistic space can become our interactive space.

The interactive projection device we used is “Sony Xperia Touch”. It is an android-based interactive projection device. Placed on a desktop, it can project a 23-inch virtual screen. It’s agility, interactive, and colorful. Even in a brighter environment, the projected content can be displayed. Users can perform a series of interactive actions on the projection interface, such as playing videos, viewing pictures, downloading and using apps, etc.

Touch is the most basic interaction of “Sony Xperia touch”. And because it runs on android, it works just like a normal screen. Manipulation methods such as tapping, touching and holding, pinching in and out, swiping and scrolling, flicking (see Fig. 2).

Current interactive projection technologies can be divided into four types, which are based on trait imaging, infrared sensing, image recognition, and structured light principle [5]. For “Sony Xperia Touch”, the interaction is via an infrared sensor and cameras.

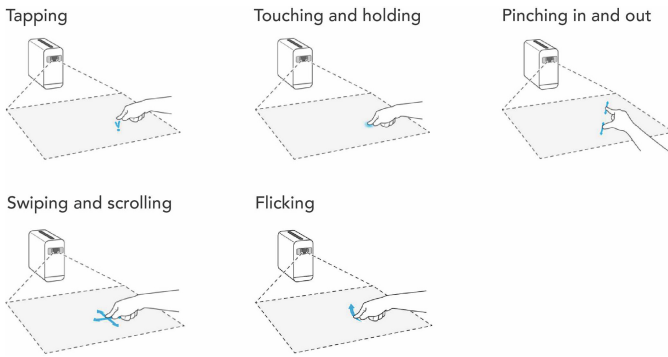


Fig. 2. Touch interaction with “Sony Xperia Touch”

3.2 System Architecture

According to user research and technology exploration, we developed an app called “Homenu”. It runs on “Sony Xperia Touch” based on android. “Homenu” has three main functions: personal information, recommended recipe and cooking assistant. Personal information includes personal culinary points, community rankings, and more. Recommended recipe includes today’s dishes. After selecting a recipe, users can view the recipe details. After clicking the start button, it will enter the cooking assistant phase. Figure 3 is the functional architecture of the interactive projection system.

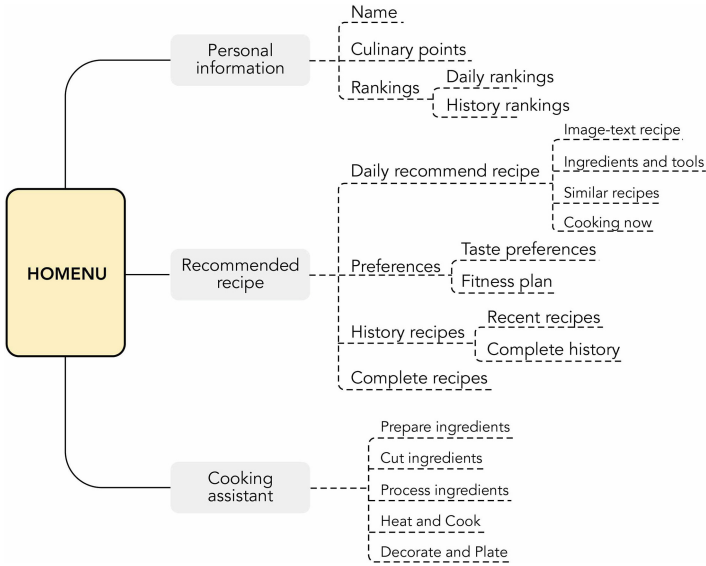


Fig. 3. System functional architecture

3.3 Usability Test

We invited six young people with little cooking experience to do an initial evaluation of the “Homenu” operating system. They were asked to follow the “Homenu” to make a potato cake. The ingredients were ready for them, and they were asked to cut potatoes, mix and stir the ingredients, roll out the dough, time the dough, decorate the cake with cream, and so on (see Fig. 4).



Fig. 4. Usability test

The six participants both thought that this interaction method was enjoyable, and they could feel easier during this cooking process. Owing to the visual guidance, it could help them improve cooking skills. In particular, the projection grid guided cutting of food materials, interactive animation guided decorative production and other functions received unanimous praise from the participants.

And they also expressed worries about long-term effects since cooking for the first time is still fresh and novel for users. Therefore, establishing good feedback is our future efforts to increase users’ reliance on interactive cooking assistance systems.

4 Conclusion

This paper focuses on the cooking scene, and conducts research and analysis for young people who are inexperienced in cooking. When cooking for themselves, they encounter many problems like poor cooking experience and the inefficient way to learn cooking. We designed the “Homenu” system based on interactive projection technology to assist young people in cooking. And with the help of Sony Xperia Touch, we completed the development and presentation of the system. The easy and natural interactive way provides users with intuitive and interesting cooking guidance to improve their enthusiasm and participation in cooking. Positive feedback makes cooking more gamified and increases their sense of accomplishment. In addition, the personalized customization of recipes is conducive to the healthy diet of users and can stimulate their creativity.

Smart kitchen is the development trend of future life. It should be a complete process from the garden to the table, involving ingredients recommendation, food purchase, and delivery, cooking guidance, feeling communication, etc. At present, this paper focuses on only one part of the smart kitchen process, the cooking stages. In the future research, we can pay attention to the whole process of smart kitchen, and make good use of the existing network platform data, so that the service of intelligent diet is perfectly integrated into the life of users.

Acknowledgment. This research is supported by Zhejiang Provincial Key Laboratory of Integration of Healthy Smart Kitchen System (Grant No: 2017F02).

References

1. Kuhns, A., Saksena, M.: Millennials devote larger shares of their grocery spending to prepared foods, pasta, and sugar and sweets than other generations. *Amber Waves*, pp. 1–10 (2017)
2. Wolfson, Julia A., Bleich, Sara N.: Is cooking at home associated with better diet quality or weight-loss intention? *Public Health Nutrition* **18**(8), 1397–1406 (2015)
3. Namin, A., et al.: Dine-in or take-out: Modeling millennials’ cooking motivation and choice. *J. Retailing Consum. Serv.* **53**, 101981 (2020)
4. Omojola, O., et al.: An installation of interactive furniture. *IBM Syst. J.* **39**(3.4), 861–879 (2000)
5. Pool, E., Brosch, T., Delplanque, S., et al.: Stress increases cue-triggered “wanting” for sweet reward in humans. *J. Exp. Psychol. Animal Learn. Cogn.* **41**(2), 128–136 (2015)