Foodie: Play with Your Food

Extend social cooking game with novel edible interface

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Abstract—we present *Foodie,* a novel approach that extends digital cooking games to the real edible food, connecting digital playfulness with active participation in food preparation and eating experience. Through this system, people can not only create their special pattern for food and share with remote family members or friends in the digital environment, but also serve them with the emulated real edible food. Taking one step beyond the current digital cooking games, this system adds another natural dimension-the edible food with smell and taste, to enhance the lifelike feeling of virtual cooking, even remotely. The intuitive but engaging interface also provides an attractive channel for kids to creatively learn about cooking in a safe, realistic and playful way.

I. INTRODUCTION

Digital games have emerged as a significant sector of the media and cultural economy [1]. The digital game play is a significant direct means towards social connectedness. Various social games are often played with family, friends, and even strangers, either locally or remotely, to establish or enhance friendships [2]. In recent years, as digital games on both PC and mobile phones became increasingly popular among people, especially teenagers, social games are becoming the mainstream media for communication, entertainment, and even education. Entertainment with interactivity and sociality are becoming important as reflected in the growing popularity of online games [3].

Meanwhile, it is noticed that FOOD activity has also been a popular theme in the game industry. Among the numerous games, a large amount of games have been designed around food, cooking and eating, for cook learning, social sharing, entertainment, or even nutrition education for kids. Games like *CookingMama* [4] and other similar ones about cake decoration contest, pizza making games, etc, allow people to creatively design and compose their own food in a virtual environment. These games entertain people through the designing and creation of digital recipe for social sharing, or resembling the realistic experience of cooking in the virtual environment.

In the academic realm, relevant research on food games has also been carried out. For example, [5] explores the designing of a mobile learning game about food for young people with diabetes, Grocery Hunter [6] is another fun mobile game for children to combat obesity. "Mamagoto" [7] is an interactive and context-aware system which encourages small children to "play" with food, using their curiosity towards food to expand their sensory experience while eating. However, none of them allows the self-creation of edible food for entertainment experience.

As online social games are dragging people into the digitized lifestyle, entertainment ecosystem needs to have more social and physical interactions. Online games do not address actual physical movement or social interaction in the physical world which was found to be essential for human enjoyment of life [8].

Although digital games provide lots of fun by engaging visual, aural and tactile effects, they miss out some potential aspects towards the enriched social experience. Specifically for cooking games, the fundamental features of food, such as smell and taste are missing in the virtual environment, which greatly decreases the realistic feeling. On the other hand, these digital games exclude an important group from the social entertainment circle – the elderly – who always have a strong desire to engage in, but are inevitably isolated for being unfamiliar with the digital game devices.

Therefore, as a new approach to enrich the social gaming experience through incorporating more compelling modalities like smell and taste interactions, we propose this new interface to combine the real-life food experience with current digital gaming, using real edible food as the output for virtual cooking game. People can easily design their own pattern and messages on the touch screen interface, and have it reproduced with edible food materials. This system is expected to entertain families and friends both locally and remotely within transmitted multi-sensory experience, through the creation, sharing and transmitting of self-designed food, not only in the virtual world, but in reality as well.

II. SYSTEM DESCRIPTION

A. System Overview

To achieve the real-time design, transmission, and crafting of virtual food recipe, the system consists of input interface and output food crafting mechanism. Through wireless communication with portable devices like mobile phone or tablet PC, various patterns and messages can be composed by the user freely and sent to the mechanism. Then the synchronous crafting is done in 3 dimensions with multiple types of edible materials, through a layer-by-layer printing process. The crafting process, including the motor movements and food materials changing, is controlled precisely in

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accordance with the user's input design. Figure 1 illustrates the overall structure design of the system.

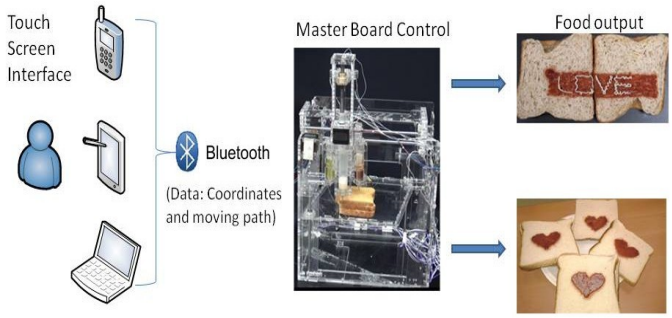

Figure 1: Overall design of the system

B. *Food Design Interface*

The Input Interface is designed as an intuitive mobile application that allows users to create their preferred food patterns virtually. Using the touch screen devices like mobile phone and mini tablet PC, user can compose their unique recipe easily by scrawling and writing on screen using finger, changing the shapes, colors, text, and even taste as well, by tapping on different food materials during the design. Moreover, user can compose different patterns for different layers, thus to construct the 3-dimensional food with changed food in each layer. Figure 2 shows the step-by-step design of one multilayered food pattern.

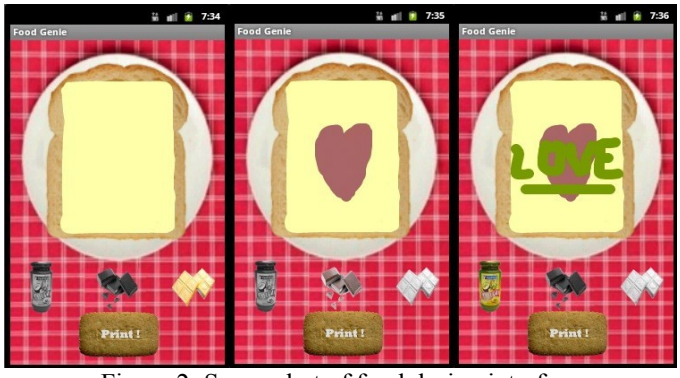

Figure 2: Screenshot of food design interface

C. *Food Crafting Mechanism*

This mechanism functions as the output of the input food design. For accurate food crafting, we employ the motor-controlled syringe injection on a 3-axis moving mechanism. Through balancing the coordinate movement of syringe position and food extrusion, the mechanism is able to form any designed shape using different food materials.

The mechanical structure is a custom-built 3-axis model. Basically, the model is designed to use 3-degree freedom robotic carriage to move the food depositing component along the x and y axis and the platform up and down to form the z coordinate of the system. The accurate and smooth movement of each axis is achieved through lead-screw coupling powered by step motor, controlled by microchip PIC32MX340F256H from the master board.

Through the wireless communication with the mobile device using Bluetooth module, user's design is interpreted and sent to the master board controller, to indicate the coordination of the starting point and the continuous moving path of food crafting. Then the step motors would start accordingly to move the robotic carriage. Simultaneously, the robotic carriage moves the attached food depositing component along the x and y axis to complete one layer. When finishing crafting the top layer, the platform will move down a certain distance to continue with the next layer. Material change is achieved by rotation of depositing syringe to a certain degree. Through this layer-by-layer crafting, a piece of 3-dimensional physical food can be constructed. Figure 3 illustrates the working flow of the food crafting mechanism.

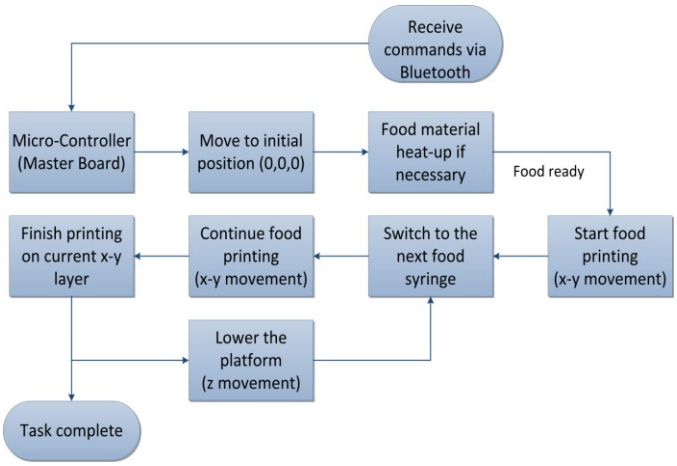

Figure 3: Flowchart of food crafting mechanism

Different kinds of food are available for this application, such as chocolate cream (pure black chocolate, white chocolate and milk chocolate), sugar-water mixture, Kaya jam, peanut cream, tomato sauce, etc, according to their suitable characteristics like density, fluidity and viscosity. The attempt of using multiple food materials is not only to make the food more colorful visually and more tasty, but also embed it with contextual expressions, through changed smell and flavor to represent different emotions or feelings.

Integrated with the touch-screen design interface, this system allows the user to creatively compose their unique recipe in digital format through a gaming process, and transform it into real edible food synchronously. The playful creation can be achieved either by users themselves or cooperate with others for shared social entertainment. For example, young kids and their parents can join together to design a funny-looking cake, and teleport it to the grandparents in a remote location. In this way, the elderly can be involved into the game without the trouble handling the digital devices. Friends at a party can gather around to play the game, come out with their own special-designed recipe, and enjoy the food output together excitingly. From this point, this

system increases the enjoyment experience by extending the virtual fun of digital cooking game to the realistic and physical experience, allowing the personalized food preparation in an easy, playful, and interactive way.

D. Scenario

This system can be regarded as a tangible and expressive extending of the digital cooking games, which allows people to physically taste and enjoy their game results: their self-created food. They can also share the game results with their friends and family members, or present to them physically as personalized greetings or special gifts. Compared with virtual cooking games, this realistic experience embedded with actual smell and taste would potentially contribute to enhance the social gaming engagement.

Particularly, we envision this edible interface can be applied in various scenarios for increased enjoyment and multi-sensory experience. Besides what have been discussed above, this system also provides a novel platform for young kids to experience the culinary realistically, in a much safer and playful manner. Rather than the purely digital cooking games or specially-designed fake kitchenware, this edible interface enables them to learn about simple cooking skills like pizza making, cupcake topping, and chocolate decoration in both virtual and realistic environment, while being exempted from the potential danger of real cooking.

What's more, not only for kids, teenagers can use this system to print out the digitally designed cute-looking cupcake with different food materials in each layer, to show off their fantastic cooking skills to their best friend; housewives can also derive social entertainment from this system, by sharing their new dessert recipes to their neighborhoods for actual tasting.

III. CONCLUSION

Foodie is a revolutionary, interactive and physical medium for social gaming around cooking and recipe sharing, which combines the virtual fantasy of digital cooking games with real-life edible food. It provides another dimension to the current digital cooking games, allowing people not only to create their exclusive recipe virtually, but share and present to their remote partner physically. Besides making the gaming experience more compelling, the physical and user-friendly food interface also bridge the intergenerational gap brought by advanced digital technologies, and contributes to the enriched social entertainment through multisensory gaming experience.

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