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TamaPeeler: An Interactive Cooking Tool for Children's Dietary Education

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Abstract. With the change in our diet, importance was placed on dietary education, and various systems for dietary education have been proposed. However, there has been no system that deals cooking tools. This article, therefore, proposes a peeler-type device, 'TamaPeeler', in the hypothesis that touching the food directly and being involved in cooking would raise their interest in food. TamaPeeler detects motions of peeling vegetables, and simultaneously makes various peeling sounds from the wirelessly connected smart phone. As we observed children during its exhibit, we have observed them proactively peeling vegetables, or showing interests in peeling other vegetables, and it was suggested that using an interactive cooking tool can raise the interests of children in food and diet.

Keywords: Dietary education, Children, Cooking tool.

1 Introduction

As our diet keeps changing, dietary education was considered important in Japan, and in 2005, Basic Act on Food Education that stipulated the basic concepts and items of the measures for food education was established. Its foreword defined food education as an effort to "cultivate knowledge on food and abilities to select them through various experiences, and foster individuals who can practice healthy diet", and importance was placed on the dietary education of children particularly.

Although some systems have been proposed related to food and diet such as a fork-type device [1] that makes sounds while eating, and as a system for food education, a fork-type device [2] linked with an application, and a tray-type device [3], as well as projection system [4] have been proposed, but all of these are systems that can be used after food is laid out on the table.

This article proposes "TamaPeeler" – a cooking tool that would motivate children to help in cooking voluntarily (Fig. 1) – in the hypothesis that touching the food directly and being involved in cooking would raise their interest in food. TamaPeeler is a peeler-type device that detects motions of peeling vegetables, and coupled with the wirelessly linked smart phone, it makes various sounds.



Fig. 1. Overview of TamaPeeler: Left) TamaPeeler, Right) Appearance in experience

2 System Design

TamaPeeler is a peeler that has an eye-catching aesthetics for children, and system that makes various sounds in response to the motions of peeling as an entertainment factor so it raises children's interests in cooking itself. It detects: 1) when the peeler touches the vegetable, and 2) the motions of peeling, both of which are called 'sound-creating conditions', and when both conditions were fulfilled simultaneously; the sound will be played on the smart phone.

For judgement of the sound creating conditions, a touch sensor and an acceleration sensor are used in consideration of children's safety. An acceleration sensor alone can be adequate to detect the motions of peeling, but by coupling with a touch sensor, it can prevent from making sounds when children swing the device around with a playful manner.

The peeler also has a function to change some of the sound effects according to the number of times of peeling motions. It counts the number of times that fulfilled sound-creating conditions and after $3n$ -th time ($n=1, 2, 3\dots$), it will make another kind of sound. As the sound changes after certain times of peeling motions, children could be motivated to keep peeling to hear different sounds.

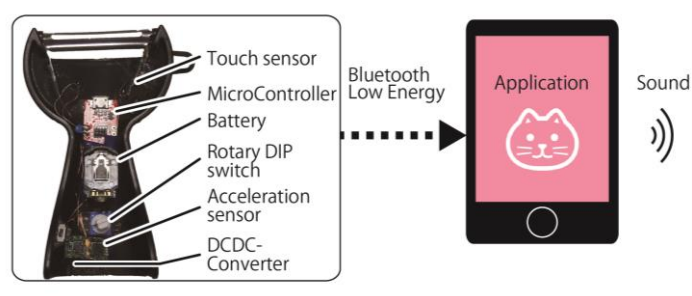


Fig. 2. System Configuration

3 Implementation

System configuration is shown in Fig. 2. To simplify the implementation, the prototype has a rotary DIP switch on the peeler to select kinds of sound, and the sound is played on the wirelessly connected smart phone.

3.1 Detection of Contact between the Blade and a Vegetable

Electrodes are attached to the both ends of the blade of the peeler, and they work as a touch sensor mounted. Then, it detects the blade contacts with a vegetable by the change of the electric voltage. As there normally is an allowance for the angle of the blade of a peeler, the terminal of the touch sensor was aligned so it connects at the proper angle when the blade touches the vegetable.

3.2 Detection of Peeling Motions

An acceleration sensor is used to detect the peeling motions. In the prototype, based on the most basic peeling motion, the shift of an axis by time are measured and processed with threshold value. The threshold value are tested and set at the value so that it did not make sound when adults swing the peeler around in the air.

3.3 Playing the Sound

The sound is played via the specific application on the smart phone's speakers. It has 14 different kinds of sound and part of them is shown in the Table 1. The electric circuit of the peeler and the smart phone are connected wirelessly by an energy-saving close range transmitter, 'Bluetooth Low Energy. The variations of the sounds according to the times of peeling motions are such as, when it is set to play the meows of a cat as in Table 1, No. 1, after 3n-th time, it switches to bow-wows of a dog.

Table 1. Some sound examples

No.	Name	Onomatopoeia
1	Cat	meow
2	Dog	bowwow
3	Jack-in-the-Box	boing

4 Evaluation

To verify the applicability of the prototype, we exhibited it, and observed children peeling vegetables with it. The exhibit and the observation were conducted at the Hardware Contest, GUGEN, held in December 2015 in Akihabara.

5-year old girl was observed to be absorbed in peeling vegetables for long time. When the sound effect is played, she smiled, and looked amused, and she was willing to continue peeling vegetables until the sound changed to a new one. This girl finished her

'peeling' and went off to see other exhibits, but came back afterwards and wanted to do it again. She was once again absorbed in peeling until her father finally suggested that they should go home. Also, a boy was observed to keep peeling until he could hear all the different kinds of sound. Moreover, it was observed that multiple children wanted to peel other kinds of vegetables voluntarily for the sounds from the smart phone.

The fact that children kept peeling vegetables, and wanted to hear other sounds suggests a possibility that, being able to make sounds by their own motions raised their interests in cooking and positively influenced their voluntary actions. And from their remarks that they wanted to peel other vegetables, it is thought that it raised their interests in other vegetables as well. This suggests that the peeling work they were motivated to try by TamaPeeler triggered their interests, not only in the vegetable they actually touched, but also other related food as well.

5 Conclusion

We experimentally created a peeler-type device, TamaPeeler, to promote voluntary participations of children in cooking, and to help food education at home. And at the exhibit of the device, it was observed that, from their motivation to play sounds, children repeatedly peeled the vegetables, and wished to peel other vegetables, wanting to touch many vegetables proactively. From this, it was suggested possible that TamaPeeler can raise children's interests in food through the cooking activities at a kitchen.

In the future, it is our hope that we can compare, by conducting a mid-to-long term experiment, the difference in their interests with or without this device, and study the effects of the sounds as well as the modification of the system and application to other cooking tools besides a peeler.

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