How to make a real product using Kansei design approach?

A Development of safety device for keeping children and the old from the lost

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Abstract: This study introduces a development of a practical product which was based on an approach using Kansei simulation of children's behavior. It has been started since 2006 for children under 6 years old who have few experiences of accidents or events, and less ability of communication with their parents. We tested to know the efficient of heart rates while they feel fear and anxiety to face to events then it could be one of the functions on our device. We analyzed their heart rates and behaviors while they were watching simulated movies showing dangerous situations. By a support of the Ministry of internal affairs and communications, we develop a device named "Onigiri Machine" to keep the children in safe while their parents are working in daytime. It was highly evaluated by scientist not only in Japan but also in the world through the conferences papers, newspapers and magazines after the project. Now, it became an issue to keep the children and the old in shopping malls or in the hospitals in Tsukuba. We refined the device to update the functions and qualities to produce for practical uses in a public service. Finally, this study shows how the device to be used for children and the old in a public spaces to keep them safe and how it delivers the data which is based on personal situation in a easy interface for their accompanies.

Key words: Children, The old, Device, Safety

1. Introduction

Since 2005, when my little child was one year old, we have started this study to keep her personal safety while the author works at school from nine to six a day. It was quite hard to find a nursery for under one year old baby in our town. Many of working mothers had to

survey and apply for the nurseries as soon as they delivered babies even before the birth specially where registered officially in the city. So that some places have so many children to take care.

Generally, regular working mothers should let their children stay at least for 8 hours a day at minimum and they can communicate with their children face to face for 4-5 hours a day in average. It is hardly said that it is enough to know what is happening to their children's growths in both physical and mental way. Furthermore, from 0 to 6 year children, before the elementary school, their ability of communication by language is not enough to communicate with people correctly. The author had some frustration of communicating and getting information on her child but the only way was to keep watching her behavior and reactions during limited moments. Under 6 year children got the most influences with people around them and imitate their behaviors naturally. Isn't there any more clever way for working parents to know and feel their children?

This study introduces how we had fulfilled the whole process from the stage of research on children's behavior and emotional reactions, to the final stage to make a practical system for real users in a public places. The development of "Onigiri Machine", now supports to share information of children or the old who cannot communicate enough well with people.

Concerning to develop a device which can detect children's conditions in anxious or emergence situation, we planed to set up some important functions, such as heart rates, GPS, camera, 3D accelerator, XB network and micro computer for communicating and controlling the sensors. The most outstanding progress of this study was done in 2009-2011, while the SCOPE (Strategic Information and Communications R& D Promotion Program) project funded by Ministry of Internal Affairs and Communications. Based on the children's heart rates experiments in 2006.

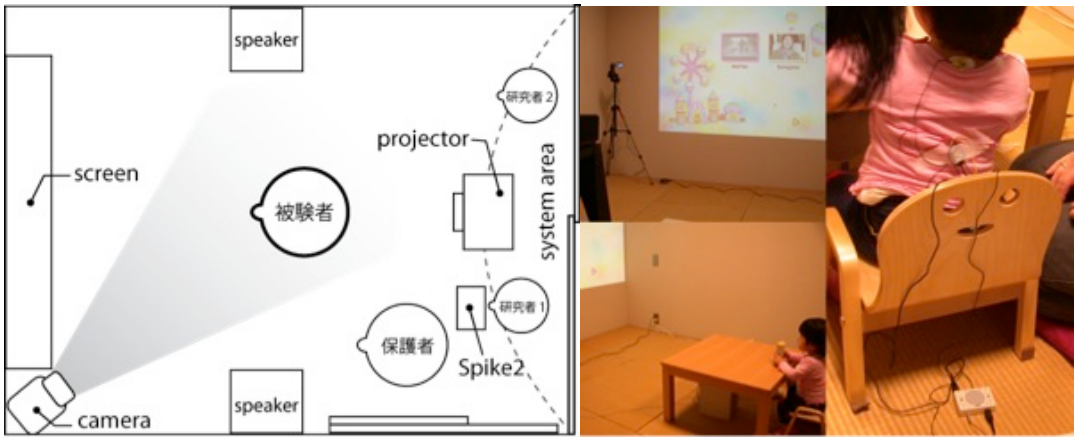
2. Process

2.1 Heart Rate Experiments

Heart rate is one of the important elements to know the conditions of children when they feel anxiety facing to new experiences or any uncomfortable situations. The purpose of the experiment was to know how the heart rates are efficient for children to predict and show their emotion out while the device detect children's conditions in any situations.

From 1-6 year children in nursery was invited to the experiments. We prepared simulation films those show dangerous and anxious situations normally evaluated by adults.

All the participants' parents agreed with the IRB of University of Tsukuba and we fully checked with the safety of the experiments for testing the heart rates of the children. The simulation films were originally made or edited with copy free films. It brought a result that children's Kansei was generally represented around 2-3 years old through the practical experiences and learning by their parents or people around so that their emotional reaction is getting similar to adult people (Fig.1).



simulated events of movies

Nature	Storm, wind, heavy rain
People	Barking dog, strangers
Traffic	Truck, train, motorbike
Entertainment	Fire work, jet coaster

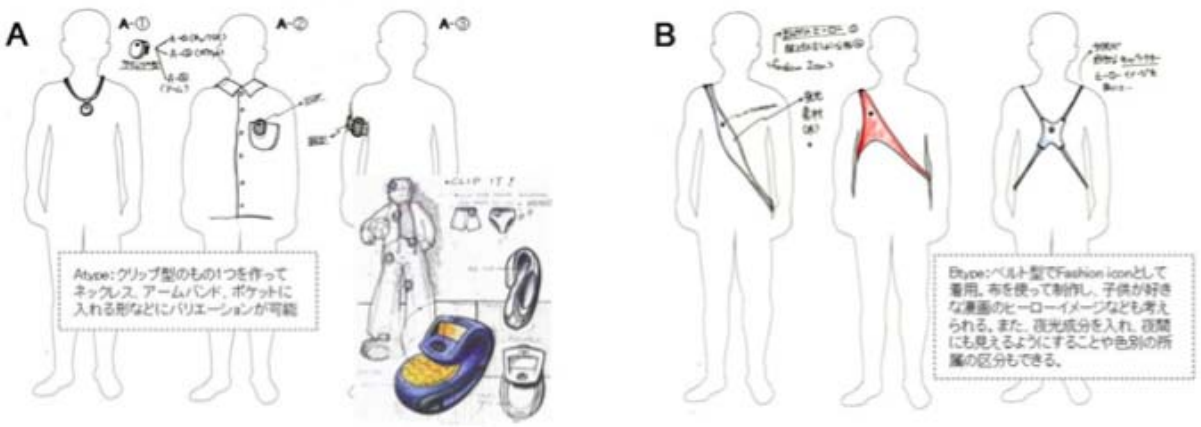
Fig. 1. About the Experiment, the facilitation and stimulations

2.2 Design Development

Kid's Friendly Design

For the development of the Onigiri Machine, it was very important issue that we proposed a very unique approach for Onigiri Machine, such as designing first and put the advanced technology in a box later. The reason why designing first than the technology is, to make children wear the device as their own willing to be fascinating by attractive form giving and ease to wear. We call it, 'Kids Friendly Design'.

For 'Kid's Friendly Design', we should first concern the weight and size of the device, and secondly about how and where to wear on child's body. Concerning preferred graphical design or decoration for children would be the last step.



Weight and size of the device

To fix the size of the device, we surveyed children's body scale based on Research institute of Human Engineering for quality life in Japan. They've reported all the sizes of average body scale of ages from 0 to 12 from Japanese children since 2005 every year. The width of chest size for 3 year old children is 164mm and 5 year is 176mm. Based on the width of chest, the device should not be exceeded 100mm in any direction which can be attached on child's neck, most of them are between 30 to 50 grams and which can be attached on their waist, are less than 100 grams. And we also surveyed about the weight to mothers in the kindergarten, 75 percent of them answered under 100 grams can be applied to their children. For references, the alarm buzzer has 45~60 grams and mobile phones for children have 130~150 grams.

How and where to wear the device

To attach on an appropriate position on children's body, we should concern that it should not to bother children's active movements and at the same time the camera on the device should be keep well focused even on the movements.

Fig. 2. The Onigiri Machine and how to wear

Design development of the wearable device

Build-in a prototype

From the shoulder sac types of design, we finally build the sensors based on the idea B-3. The total weight of the sensors which should be built in, would be at least 90 grams, the necklace type was rejected from the candidates, otherwise it will be a big burden on their neck. Among four ideas of shoulder types, it offers relatively high position of camera and merit of ease to wear. In detail, to decide the size of device, we made updated sketch of B-3 and made a 3D prototype by 3D printer. To put the sensors safe in a box, the layout of positions were tested. On figure 3. Solving the way to fix on the body, small connection parts were created on the corners. We named it ‘Omusbi’ (=Onigiri), meaning of ‘Rice ball’ or ‘Connection’ in Japanese. ‘Rice ball’ is traditional in between lunch and supper snack for children and any ages of people in Japan. ‘Connection’ is also meaningful function with this study to share information not only between children and parents but also with local supports.

The on-off switch on the rear side is in a tiny hole to be securely turned with an originally designed stick to prevent to be adjusted by somebody else.

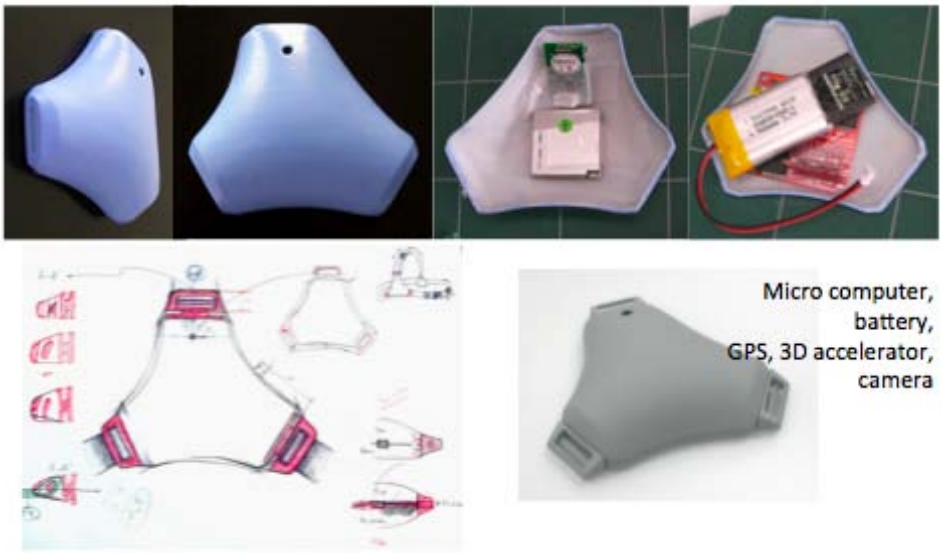


Fig. 3. Build-in a prototype of Onigiri Machine

3. Experiments at Kindergarten

We built up 12 hand-made devices, and set up over 30 relay sensors to chase the positioning the devices every 10 meter in the kindergarten. For the final user test, we collected about 50 children through ethical research pre-survey of the experiment by their parents. The subjects were average ten children in every age.

To observing the behavior of the children with the devices, there were over 5 staffs attended during the test to check both real physical movements anddigital data of positions.

Starting website for reviewing the events in the kindergarten by parents

The reviewing site was open to the subjects at the beginning of the experiment. It shows every move of children in the kindergarten, for example when they move to hall from the classroom, then the device takes a picture. So, there are number of pictures as they moved the places. However, if the device uses in ordinary life, it should be turn on the power of camera when a child got a big change of heart bit or fall down or jump down on the ground.

4. Experiments at Shopping mall for preventing the lost

4.1 Practical use of system for real users

In 2011, the development of Onigiri machine was treated as an important social issue through international science magazines, newspapers and TV shows in Japan. Many of working mothers eagerly wanted to have the Onigiri machine for their children.

But it was not easy to put it in a real production, so one of the functions of detecting the position, we apply it to a small device for professional guard men when they walk around for security check in the night in his duty area.

Co-author Dr. Hamanaka rebuilt the device to a smaller size to put it on the waist for the guard men. Figure 4 shows the new shape of device. It has only GPS and XBee to correspond with the network platforms in the building. So it is lighter and smaller and put inside of the pockets.

So, the system of detecting the positions, kept progressing better and accurate functions according to technology since the first development.

Fig. 4. Device for detecting position of guard men

4.2 Practical use for Children and the Old

After more than 6 years of SCOPE project, the biggest shopping mall in southern east Japan, asked us to apply this system for children preventing them from the lost while their parents are shopping in the mall. With the function of heart rates, not only for preventing the lost, but also the shops can get information when the children got excited in the shop, in detail they can use the information to promote their products or events.

4.3 Facilitation

For detecting the positioning of the lost children, we implemented the GPS in the device, but it does not work inside of the mall, so we had to put the XBee mobile network at the shopping mall every 30 meters of the flat as infrastructures for the network and controlling the device. Figure shows the positioning of XBee mobile network in the mall.

Fig. 5. XBee Network points in a shopping mall

The test for users, such as children and the old, we now preparing for a real production of Onigiri machine based on their behaviors and preferences and so that it will have more possibilities of use, not only preventng from the lost but also knowing user's Kansei in many situations.

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