# **IT-enabled Donation Boxes to Promote Donation**

Kohei Tanaka, Murao Kazuya, Shojiro Nishio Graduate School of Information Science and Technology, Osaka University {tanaka.kohei, murao.kazuya, nishio}@ist.osaka-u.ac.jp

Satoshi Tanaka, Kohei Kinoshita, Yasuhiko Minami, Tsutomu Terada, Masahiko Tsukamoto Graduate School of Engineering, Kobe University {tanaka@stu., kinoshita@stu., minami@stu., tsutomu@eedept., tuka@}kobe-u.ac.jp

# ABSTRACT

Electronics and information technology have great potential to attract people's attention. In this paper, we describe our use of IT (Information Technology)-enabled donation boxes to promote donations. We implemented four donation boxes, including a colorfully illuminated box and a sensorenabled interactive box. We put them into actual use in a fundraising activity at Kobe Luminarie and evaluated their effect. Through this activity, we found that IT-enabled donation boxes have the potential to increase donations.

# **Categories and Subject Descriptors**

J.5 [ARTS AND HUMANITIES]: Arts, fine and performing

#### **General Terms**

Experimentation

## Keywords

Donation box, Experimental study

## 1. INTRODUCTION

Expansions of electronic and information technologies (IT) can enrich our lives. The technologies used at various amusement spots and shops are especially appealing since they are effective in getting people's attention. Conventionally, such kinds of technologies have been used at museums to help users understand the exhibits [3, 4]. They made new forms of interaction, such as rotating the displayed item in virtual space and explaining the exhibited works by using animation and sound.

In fundraising activities, it is important to attract the attention of people passing by. To get their attention, we typically explain the purpose of the activity and the benefits of donating. Therefore, we can improve the result of the fundraising activity by utilizing electronic and information technologies. Currently, these technologies are not used at all in fundraising activities.

Thus, we created several donation boxes utilizing electronic and information technologies to promote donations. We created four kinds of donation boxes such as a colorfully illuminated box and a sensor-enabled interactive box. We used them at Kobe Luminarie, which is a winter festival. We evaluated the results of using the boxes based on the amount of money raised and a questionnaire given to the volunteers in this activity. We call the volunteers *donation collector*.

## 2. KOBE LUMINARIE

Kobe Luminarie [1] is a winter festival held in Kobe, Japan. At this festival, people enjoy brightly illuminated gates and arches displayed along major streets and a park. The gates and arches make a spectacular corridor of light, which people can walk through. The event was designed to give the residents "hope" and "light" in reconstructing their city, which was severely damaged in the Great Hanshin Earthquake. Since it was first held in 1995, the same year as the earthquake, the Kobe Luminarie has become one of the major winter events in the region. However, it has faced funding problems due to rising costs for security staff and reduced aid from campanies because of the economic slump. From 2007, the steering body of Kobe Luminarie has raised the idea of collecting 100 ven per visitor as a donation to promote visitor cooperation to ensure a steady income. However, it is not easy to achieve this every year.

Therefore, our research group proposed that we coorporate in fundraising activities by making different kinds of donation boxes to collect sufficient donations. Some restrictions apply to the donation boxes for Kobe Luminarie, as follows.

- They should not have a negative influence on for the atmosphere of Luminarie, since Kobe Luminarie is held to mourn the earthquake victims.
- They should be portable. In the fundraising activities for Kobe Luminarie, donation collectors stand at the side of a street with a portable donation box.

## 3. IT-ENABLED DONATION BOX

We call a donation box utilizing electronic and information technologies an *IT-enabled donation box*. Our group made one IT-enabled donation box for the 13th Kobe Luminarie held in 2007 and three boxes for the 14th Kobe Luminarie in 2008. In the following section, we describe them in detail.

## 3.1 Donation box made in 2007

To promote donations for Kobe Luminarie in 2007, we made an interactive donation box, which is called the *dona*tion box to grab happiness. Visitors can play an easy game with this box. Depending on the user's timing in pulling out their hand that they insert into the box when making a donation, the result of the game changes. The hardware structure of the donation box is shown in Figure 1. There is a tablet PC in front of the box and a USB camera inside the box to capture an image of the inserted hand. The box is decorated all over with light-emitting diodes (LEDs) and the illumination is programmed by a control device on the bottom of the box. When a visitor inserts his/her hand into the box to donate, the display shows an animation of a hand inserting a ten thousand yen bill, which is the highest value banknote in Japan. When they pull out their hand, the system detects it, and if the timing is right, the display shows an animation of a hand grabbing a heart, which symbolizes happiness.

To detect their hands, the system applys a background differencing technique for the upper half of the captured image. First the system captures a background image in the donation box. When 30% of the image is changed, the system recognizes that a hand has been inserted . Since the brightness and background of the image in the box are static, the recognition rate is more than 95%.

This box was used practically for four days during Kobe Luminarie in 2007. Figure 3(a) shows a snapshot of practical use. Through the activity, we obtained the following information.

- Few people actually inserted their hand into the donation box. Thus, it was difficult to use the donor's action as a trigger to start the visual content.
- When donors did insert their hand into the box, they were not able to not see the display since it was set at the front of the box.
- It was very important to promote the presence of the donation box.
- The visual content should be sufficiently short since only one person can activate the content at one time.

We developed three donation boxes in 2008 considering this feedback.

## **3.2** Donation boxes made in 2008

Our group made three donation boxes for Kobe Luminarie in 2008.

#### 3.2.1 Courteous donation box

First, we made shows a *courteous donation box*. An animated character displayed on this box shows appreciation to donors for their donations. Typically, people make donations, the colloectors ordinarily bow their head in appreciation. In the same way, a displayed dog character also bowed his head to express appreciation for the donation. The appearance of the donation box was almost the same as the one used the previous year.

In view of the information that was obtained last year, we addressed the following issues.



Figure 1: Structure of donation box in 2007



(a) Idle screen (b) Inserting (c) Grabbing

Figure 2: Snapshot of the screen on the donation box to grab happiness

- The action of a collector should trigger the content. Because the content that was triggered by the donor's action did not work well, we had the box holder control the timing of the content. For example, we can start the content at a timing when the donor can see the display, such as right after making the donation.
- The box should have colorful illumination. We found that bright and colorful illumination was important to promote the presence of the donation box the previous year. Therefore, we used the same illumination.
- The content should be simple. Because content that takes too much time does not appeal to alot of people, we developed very simple content; a character performs the same action as the collector.

The system recognizes the collector's motion with a matching algorithm using dynamic programming and a 3-axis acceleration sensor that is set on the collector's head. To implement the software easily, we used *WearableToolkit*[2]. The content recognizes two actions: bowing and inclining his/her head. The dog character also performs the two actions according to the recognition. Although the recognition rate was approximately 80% on average, when the angle and direction of the attached sensor was completely consistent, the rate was approximately 100%. In addition, the displayed character sometimes promoted further donations.

#### 3.2.2 Blinking donation box

The second donation box was a *blinking donation box*. This box has an illuminated pumpkin design, and it blinks



(a) Luminarie 2007(b) Luminarie 2008Figure 3: Snapshot of practical use



(a) Idle Screen (b) Bowing its head Figure 4: Content of the courteous donation box

in synchrony with music as shown in Figure 5. Because the design is illuminated by many LEDs and there is a speaker inside the box, the box appeals to people with light and sound. Synchronizing the blinking pattern to music further enhances the mood of Luminarie. The synchronization is achieved by programming the pattern to blink for the same length as the music.

#### 3.2.3 Virtual LEDs donation box

The third donation box was a virtual LED donation box. It has virtual LEDs on the top of it. Actual LEDs are embedded in the box, and we utilized the shape of a concave mirror to show the virtual ones. Figure 6(a) shows the entire of the donation box and Figure 6(b) shows the virtual LEDs by concave mirrors. When a visitor donates a coin, the system detects the coin, and the virtual LEDs blink. This donation box attracts attention casually. To detect the inserted coin, we used an infrared LED and a phototransistor that detects infrared rays (IR). When a coin passes between them, the IR is blocked, and the system can detect the inserted coins.

# 4. EVALUATION

We evaluated the three donation boxes used in 2008 based on the amount of collected donations, and the answers to the questionnaire.

## 4.1 Results

Table 1 lists the amount of money collected using our boxes in 2008. Note that the activity time of the courte-



Figure 5: Over veiw of Blinking donation box



(a) Entire image (b) Virtual LED Figure 6: Donation box that shows virtual LEDs

ous donation box includes a rest period of 1 hour per day that was necessary to charge the battery of the tablet PC on the box. Although we also used a normal donation box that did not utilize IT, we did not count the amount of donations correctly since the money should be collected at an intermediate stage of the activity. For reference, we raised approximately 8,000 yen per hour with the normal box.

Table 1 indicates that the courteous donation box raised the most money. One reason for this is that the box was featured on several TV programs and thus, it attracted interest. The virtual LED donation box was clearly the worst. The reasons are likely that it was difficult for donors to recognize the hole for inserting money and that the presence of the box was not very noticeable. Those were reasons were reiterated in the questionnaire. Furthermore, the courteous donation box and the blinking donation box collected approximately 10,000 yen per hour, while the IT-enabled box in 2007 raised approximately 8,000 yen each hour. The result shows the new boxes work more efficiently.

In the activity, collectors wore two different uniforms (Figure 7); one was an official white bench coat, and the other was an LED outfit with blinking LEDs in various colors. On Saturday, Dec. 6 and Sunday, Dec. 7, the collectors with the courteous donation box wore the white coats, and the collectors with the other boxes wore LED suit. On the other days, collectors wore both uniforms as evenly as possible. From the results of Dec. 6 and 7, we raised almost the same amount of money using the Courteous box and the blinking box. Compared to the other days, the difference was clearly small. Furthermore, the virtual LED box raised substantially more money than on the other days. Therefore, the LED suit was also very effective to raise money.

#### 4.2 **Results of questionnaires**

We gave questionnaires tp the collectors. In this survey, we asked Q1: Did it seem worthwhile to use IT-enabled do-

Table 1: Total amount of donated money

	Dec. 4	Dec. 6	Dec. 7	Dec. 10	Dec. 11
	(Thu)	(Sat)	(Sun)	(Wed)	(Thu)
А	35,080	96,020	64,721	80,000	100,610
В	28,686	84,360	80,000	41,930	31,400
С	8,846	43,690	47,500	21,345	15,020
D	_	-	-	_	$8,000^{\dagger}$
active	3:30	3:30	3:30	4:00	3:30
$\operatorname{time}$					† 1:00

A: Courteous donation box

B: Blinking donation box

C: Virtual LED donation box

D: Normal donation box (for reference)



(a) Official bench coat (b) LED outfit Figure 7: Collector's uniforms

nation boxes?; Q2: How about the visitors' reaction, when they saw the box or donated?; and Q3: What donation box is effective?. We obtained 13 valid responses.

From Q1, since all chuggers responded "It is worthwhile to use IT-enabled donation boxes," we found that the ITenabled boxes are effective for donations. For the reasons, many people answered "the IT-enabled donation box raised more money than the normal box (six people)," "the ITenabled donation box can generate added value for the Luminarie (6)." As new value, responses included "IT-enabled donation boxes add an interactive attribute to the box," "IT-enabled donation boxes can promote the meaning of the donation," and "The activity has the potential to be a new feature of Kobe Luminarie." For this question, we got one negative opinion. This was "the IT-enabled donation box may just be used for donations that visitors had planned to put into other boxes at Kobe Luminarie." Certainly, our activity was limited in scope, and the total amount of Luminarie did not increase. However, we had the potential to raise a lot of money since some visitors said "I donated to another box, but I will donate again because your donation boxes are nice." We should investigate this opinion in more detail.

Regarding Q2, responses included, "The visitors that saw a news program on TV were excited to see the donation box" (courteous: 7), "Children seemed to enjoy the box (courteous: 5, blinking: 1)," "Women approximately 40 years old had a fondness for the the character (courteous: 4)," "The technology was interesting (courteous: 3, blinking: 1, virtual LEDs: 1)," "Donors had trouble inserting money since it was difficult to find the hole (virtual LED: 2)," and "The ingenuity of the box was not understood (virtual LED: 1)." From these responses, the courteous box was especially popular with children and middle-aged women since the character is cute and it was easy to understand the ingenuity of the box. The effect of mass media was also powerful. In the same way, since it was easy to understand the ingenuity of the blinking box, it got positive rathing. On the other hand, the virtual LED box whose ingenuity was difficult to understand was not as popular. Thus, it is important to develop an easily understandable donation box. In addition, the IT-enabled donation boxes have the potential to bring collectors and donors closer since one response given was, "It is boring to have the normal donation box since the visitor did not react (2)."

To Q3, responses included "The box has a presence (4)," "Children loved the box (3)," "The ingenuity of the box was understandable (3)," and "The box was featured on TV (3)." We believe that a box that fulfills these opinions can be achived. Furthermore, it is important to continue our activity in creating new donation boxes in line with the changing illumination of Luminarie every year, since we obtained the an opinion, "We should create different donation boxes every year (2)."

One miscellaneous comment was "I felt sorry that the donation box did not work continuously because of the battery and the device's problems." Thus, it is important to make the boxes work for a long time. We should create boxes that require little maintenance.

### 5. CONCLUSION

We developed donation boxes utilizing information technology to promote donations, and we implemented them at Kobe Luminarie in 2007 and 2008. We found the potential to promote donation through the development of illuminated boxes and interactive boxes. Additionally, we improved the boxes through practical use. We also clarified important factors to improve the donation boxes from a questionnaire.

In the future, we will develop donation boxes that have the important factors and implement them practically in 2009. Moreover, we want to innovate developments not only of donation boxes but also systems that support donation collectors.

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