Stamp-On: A Mobile Game for Museum Visitors

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Abstract: This paper proposes Stamp-On, a mobile guidance aid for museum visitors. Stamp-On equips a tangible interface in the form of a stamp, which is used as an input-device for visitors to show explanations on a mobile device such as an iPad. The explanations will give the corresponding information about exhibiting items with additional questions. By touching the screen of the mobile device with the Stamp-On near the corresponding item, she or he will get visual information. We have conducted a preliminary experiment with participants of school teachers in order to evaluate the effectiveness as an exhibition guidance system. The results have suggested that Stamp-On system is an attractive and effective learning aid for elementary school children visitors of a museum.

1 INTRODUCTION

Conventional mobile guidance systems in a museum consist of tailored sound- or video-based equipments. Therefore, their maintenance effort costs much. Once they have been set up, it was difficult to deal with the visitor diversity in terms of ages, knowledge, and/or interests. To resolve these difficulties, there have been an increasing number of studies in recent years on mobile guidance systems, which aims at flexible responses to various kinds of visitors. Such systems usually combine location sensors and mobile devices such as cell phones, smart phones, or iPads (Cahill et al., 2011; Kusunoki et al., 2005; Raptis et al., 2005; Rose et al., 2009; Suzuki et al., 2009; Yamaguchi et al., 2010; Yatani et al., 2004).

The interfaces of those existing mobile devices are, however, hard to be used by every visitor, in particular, young children. For instance, although their operation methods look simple, most of the operations require multiple steps to display the contents. Furthermore, operating and maintenance costs of such conventional guidance systems will cause severe issues from the management of the museums. To cope with these these issues, in this paper, we propose Stamp-On system, a learning game which has a tangible interface that emphasizes the physical form as a novel design of an input device for a mobile guidance aid in a museum. Stamp-On is able to handle visitors' diversity using contents made up of videos and photographs. Stamp-On system also contains an interface in a stamp form, inspired by actual stamps. The paper provides principles and overview of Stamp-On system, and gives a preliminary experimental results of the usability of the stamp form interface.

2 OVERVIEW OF Stamp-On

Stamp-on is a stand alone system run on an iPad with the newly developed stamp-shaped interface. The stamp equips plural small metal chips as are used in stylus pens. The metal patterns represent coded information related to the object to be explained. Compared with the exhibition support system in the literature in the references, Stamp-on is characterized by the following unique features:

1) As all the information is held in the iPad appl ications, it is not necessary to use any wireless networks.
2) To identify the exhibited object, they are only required to push the corresponding stamp on

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iPAD. If we would use wireless networks, to distinguish different objects, the distances among them would keep more than one meter.

3) It is easy to set up at any exhibited space without special IT equipments.

Furthermore, compared with the research by Suga, et al., in which they utilize pipe shaped devices in order to move 3-d objects, the stamp interface in this paper is very easy to make. Stamp-on is the first system for such exhibition support task domains.

2.1 The Stamp Shape Interface

Figure 1 gives an overview of Stamp-On system. A tangible object in the shape of a stamp is physically attached to an exhibit (the rocks in Figure 1). By pressing this stamp on the iPad mini screen, the iPad mini acquires an ID, then the contents corresponding to this ID are displayed. The contents are installed on the iPad mini. The most important and unique feature of Stamp-On is its exceedingly simple content-matching by the attached stamp. Moreover, there will be no misidentification of exhibits as the stamp is physically attached to the exhibit.

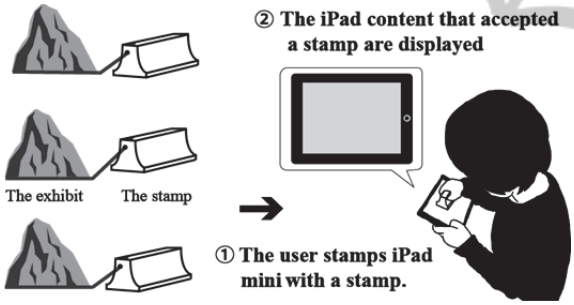

Figure 1: The overview of the Stamp-On system.

The stamp uses multi-touch technology used by the iPad and/or Android devices. For this study, 10 electrification patterns are configured on the bottom of the stamps to represent the corresponding IDs. When a user take the stamp and presses it on the iPad mini screen, the iPad mini detects the pattern, thus displays the contents associated with the exhibit (Figure. 2). As illustrated in Figure 3, the stamp is 30 mm high with a 40 mm * 100 mm rectangular base. To distinguish the top and bottom of the stamp, the top has engraved lettering. As an electric current runs through the stamp, aluminium tape has been used to the bottom as well as on the sides, as they come in contact with human skin.

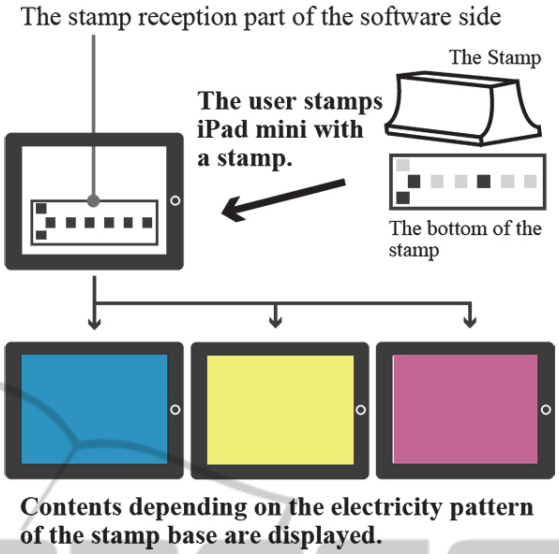

Figure 2: Relation among Stamp-on tags and iPad contents.

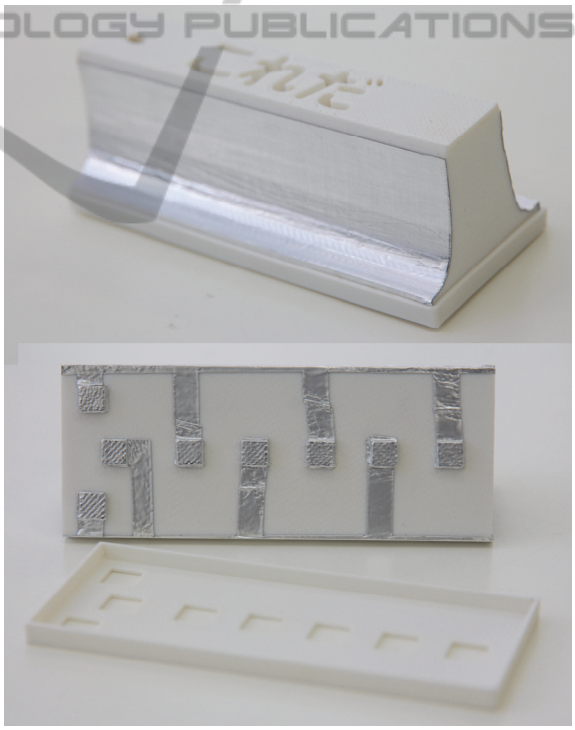

Figure 3: The shape of the stamp interface (upper photo) and patterns embedded in the bottom of the stamp (lower photo).

2.2 Explanation Contents

Figure 4 shows examples of the explanation contents incorporated in Stamp-On system. The contents consist of interactive explanations as

quizzes. The quizzes are developed to identify nine typical types of rocks found around the Hyogo Prefecture, Japan. We are currently making contents good for school children. As shown in Figure 4, the touchable area with the same size of the bottom of the stamp is displayed on the iPad mini screen. By pressing the stamp on the touchable area, its ID is recognized, then corresponding contents depending on the ID are displayed. Specifically, the name of a rock the visitor observes and its characteristics are shown on the screen of the mobile device, then, the visitor is requested to find the rock among the exhibited items.

When the visitor presses the stamp on the rectangular 'reply' box on the content displayed, the answer is judged to be either right or wrong. If the answer is correct, further detailed information on that rock is displayed. Pressing the stamps and answering the quizzes encourages the visitor to have a look around and examine the rocks in more detail.

The questions have predetermined points and corresponding hints. When a user refers to the hint, however, her/his points are decreasing by the points. After answering each question, a user are requested whether she/he would like to add the stone information to her/his collections, if she/he would have enough points to get. Accordingly, let her/him observe the exibit better to avoid to decrease her/his points.

The software running on the iPad mini was implemented with Adobe Flash CS6.

3 PRELIMINARY EXPERIMENT

We have conducted a preliminary experiment on the usability of the Stamp-On system through questionnaires and interviews with elementary school teachers. We asked teachers to evaluate the system by imagining an educational trip to the museum for school children.

3.1 Questionnaire-based Evaluation

3.1.1 Purpose

The Stamp-On system evaluation specifically focused on the stamp usages.

*Picture of the Start

*1 The name of the Stone
*2 Show Hint on Touching the Button
*3 Area of the Stamp

*Picture of the Content answer

*1Hints
*2Area of the Stamp

Figure 4: Parts of iPad Contents.

3.1.2 Participants

The participants of the experiment are 15 elementary school teachers (45.4 years old on average) taking part in a workshop held by the Hyogo Prefecture Science Museum, Japan (Hyogo Prefecture Museum of Nature and Human Activities).

3.1.3 Task

The questionnaires are designed to evaluate the usability of the system. For all questions related to the usability, the participants are asked to grade five possible responses ranging from 'I completely agree' to 'I completely disagree.'

The questions use the term 'game', because the Stamp-On system is presented as a game, with which one has to find the rocks based on the provided hints. Six questions focused on the stamp as a tangible interface.

These questions include such ones as "Did you think this game was interesting?", "Do you consider the system of pressing a stamp tied to an exhibit onto an iPad mini a good one?", "Would you want to use this kind of system as a teaching resource?", "Did you find the way the stamp was used easy to understand?".

3.1.4 Procedure

The experiment is conducted as a game, by which participants are required to find nine types of rocks out of the twelves ones on a display (Figure 5). The time required was approximately 20 minutes. Participants are then asked to answer individual questions on the usability. This took approximately 3 minutes. The evaluation experiment was conducted on August 22, 2013.

Figure 5: Snapshot of the experiment.

3.1.5 Results

Table 1 shows the head-count distribution of the responses. Most participants respond a positive answers for all questions. We investigate response trends after separating the responses obtained from the questionnaire surveys into two groups: positive responses including "completely agree" and "agree" and negative responses including "somewhat disagree" and "completely disagree." Fisher's exact tests (1×2) showed statistical significance at a 1% level for the all items.

3.2 Post-Interview Evaluation

3.2.1 Purpose

The purpose is to obtain a qualitative results from participantts regarding the effectiveness of the stamp form interface of the Stamp-On system.

3.2.2 Participants and the Task

The participants were two randomly selected from respondents of the previously mentioned

Table 1: Stamp-On system usability test results.

	5	4	3	2	1
(1) Did you think this was an interesting game? **	11	3	0	1	0
(2) Do you think this game will be popular with children? **	7	5	2	1	0
(3) Did you think the system where you press a stamp tied to an exhibit onto an iPad mini is a good one? **	7	6	2	0	0
(4) Do you think you would want to use this kind of system where exhibits and device are linked as a teaching resource? **	7	6	2	0	0
(5) Did you find the way the stamp was used easy to understand? **	5	6	3	0	1
(6) Did you think pressing the stamp on the device was fun?**	10	5	0	0	0

**$p<.01$, 5= completely agree, 1= completely disagree

questionnaire. The evaluation task is to ask for opinions about the system's effectiveness. The question is given: "What impression do you receive after using the stamp?"

3.2.3 Procedure

We have conducted semi-structured one-on-one interviews, just after the Stamp-On system experiment. The interviews takes approximately 5 minutes per participant.

3.2.4 Results

Table 2 shows the results of the interview-based survey. Firstly, positive answers ('interesting', 'fun') are obtained from the participants. Some participan emphasizes the significance of the interface when they stand in front of the rocks, the exhibit, and pressing the stamp on the device. The following statements are given by them: "With the stamp, I always stand in front of the rocks," "Actually touching the rock and then pressing the stamp is easy to understand." They indicate the stamp's potential as an effective intermediary between a child and an exhibit.

Table 2: Participants' replies in the interviews.

Participant A:
Firstly, I thought the system was interesting and fun. Pressing a stamp on something, that kind of thing is enjoyable. I think it is great that there are movements involved, it will keep children interested and I thought that it was enjoyable.
The important thing is that you have to stand in front of the rocks to be able to do it, is it not? When you use a finger, you can just tap anything while looking at the rocks from afar, but this system has a definite advantage because with the stamp, you have to stand in front of the rocks and press it on the device.
Participant B:
Pressing a stamp on something is something children like, as well as me, so my impression of the stamp was that it was an interesting idea. Actually touching the rocks and pressing the stamp that is there is easy to understand, I thought.
Because you want to get the questions correct, something you would not be able to do unless you observe it in more detail, I think that the quiz allows for even more in-depth learning.

4 CONCLUSIONS

This paper has describes the design principle of Stamp-On system and its preliminary experiment. The Stamp-On system is characterized by a tangible interface in a stamp form, which is easy to use. Results of the experiment have shown that the Stamp-On system is an attractive and effective learning aid for school children at a museum.

Our future work include the improvement of the interface focussing on the stamp, further experiments with school children, and development of new contents and support functions for a variety of visitors.

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