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Memorabilia of Suan Sunandha through Interactive User Interface

Nalinee Sophatsathit

***Abstract*—**The objectives of memorabilia of Suan Sunandha are to develop a general knowledge presentation about the historical royal garden through interactive graphic simulation technique and to employ high-functionality context in enhancing interactive user navigation. The approach infers non-intrusive display of relevant history in response to situational context. User's navigation runs through the virtual reality campus, consisting of new and restored buildings. A flash back presentation of information pertaining to the history in the form of photos, paintings, and textual descriptions are displayed along each passing-by building. To keep the presentation lively, graphical simulation is created in a serendipity game play so that the user can both learn and enjoy the educational tour. The benefits of this human-computer interaction development are two folds. First, lively presentation technique and situational context modeling are developed that entail a usable paradigm of knowledge and information presentation combinations. Second, cost effective training and promotion for both internal personnel and public visitors to learn and keep informed of this historical royal garden can be furnished without the need for a dedicated public relations service. Future improvement on graphic simulation and ability based display can extend this work to be more realistic, user-friendly, and informative for all.

***Keywords*—**Interactive user navigation, high-functionality context, situational context, human-computer interaction.

I. Introduction

INFORMATION of a historical site is vital for historians to explore, study, and research for everyone to learn, educate, and enjoy about the origin and what has transpired at that site. To publicize such information, relevant history must be gathered, edited, compiled, and formatted to present the information in the best concise, precise, educational, informative, and user-friendly fashion. The state-of-the-practice employs static image and textual contents for output display. Some techniques incorporate dynamic features as part of the presentation to make it livelier than typical static text and still images. All in all, the presentation is predetermined by the developer wherein users must follow the links to read the contents and see the images.

Numerous researches and development in various disciplines have been attempted over the years to devise lively interactive presentation techniques. Virtual Reality (VR), game, graphic simulation, animation, multimedia, and augmented reality (AR) are typical techniques in use. Thus, this research will exploit the available theoretical principles, models, and development paradigms to devise a novice interactive presentation on memorabilia history telling. The work selected Suan Sunandha Rajabhat University (SSRU) as the case study site owing to its historical importance. The campus was formerly a royal garden (or suan in Thai) of King Rama the V that was named after the Queen Sunandha, hence Suan Sunandha. Consequently, numerous counts of history are tied to all the buildings. To keep current personnel and public informed of such valuable history and whereabouts of the campus, this work proposes an interactive memorabilia information system to inform and educate personnel and interest parties. The system utilizes graphic simulation in the form of game that presents situational context information to the user. As such, no public relations service or organized tour is needed. Users can replay the presentation or "game" repeatedly at their own discretion, thereby considerable time, resources, and expenses can be saved.

This paper is organized as follows. Section II recounts some related works that are pertinent to this research. The proposed methodology is elaborated in Section III. Performance of the proposed system is evaluated by a group of representative users in Section IV. Some final thoughts and future work are discussed in the last section.

Nalinee Sophatsathit is with Department of Computer Science, Faculty of Science and Technology, Suan Sunandha Rajabhat University (phone: +6681-644-6225; e-mail: tnalinee@gmail.com).

II. Related Work

The main principle employed in this research is human-computer interaction (HCI). One of the fundamental components of HCI architecture is help system. Chiu et al. [2] identified two key aspects of an intelligent help system that encompassed the user and activation timing. They aims were to provide problem solving and task learning helps. This called for a strategy map that determined user knowledge level (UKL) in relation to observed performance pattern (OPP). Schmidt [1] defined the implicit HCI interaction based on two main concepts, namely, perception and interpretation. The basic building blocks of applications were analyzed according to the context people used, trending events search with social media [5]. Wobbrock et al. [4] introduced the formulation and principles of ability-based design for the disables, where device and environmental factors were prime consideration. Fischer [3] emphasized how proper modeling based on high-functionality applications (HFA) could be made to present the right information in the right way at the right time. One important aspect of this work is collaborative writing in storytelling interface pointed out by Cheng et al. [6]. This research will exploit the above guidelines and principles to arrive at a suitable approach for interactive user interface presentation of the memorabilia royal garden.

III. Proposed Methodology

This study proceeds as follows: (1) analysis of historical milestones, (2) data collection, (3) interactive user interface analysis and design, (4) graphic simulation game, (5) model analysis and design, (6) implementation, and (7) performance evaluation.

The first step gathers history of the royal garden on buildings, royal family relatives, milestone ceremonies, and various artifacts. The information is sorted and compiled to set up a strategy map that defines the relationship between UKL and OPP. Each action of the map taken by the user is tied to the designated context that expresses historical information of the specific building or location. This portion reflects the memorabilia of the place in relation to present setting. Graphic simulation commences at this point as the tour or "game" begins. Each passing-by location, particularly building, can be visited by the user's choice to explore its function and history. The relevant information is displayed according to individual situational context. Such design is implemented in the serendipity exquisite game play to assess user's knowledge after the tour. The interaction of the proposed system is shown in Fig. 1.

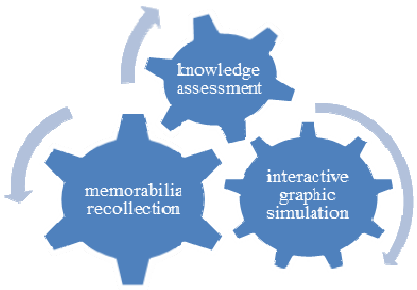

Fig. 1 Evaluation of interaction among system components

Fig. 2 Opening screen depicting the university main entrance

The game begins from the main entrance where the user must enter his user's name and password as shown in Fig. 2. The inset on the left shows present location on campus map. Navigation continues on campus. The following illustrations show how the system components are executed. Fig. 3 shows the historical building (along with the royal relatives) being replaced by Faculty of Management Science as the user passes along the building. Figs. 4 and 5 show the similar story. Figs. 6 and 7 illustrate how any newly elected buildings will only contain their functionality and occupancy to keep the user informed.

Fig. 3 Illustration of historical building THEN (upper left) and Faculty of Management Science NOW (lower right)

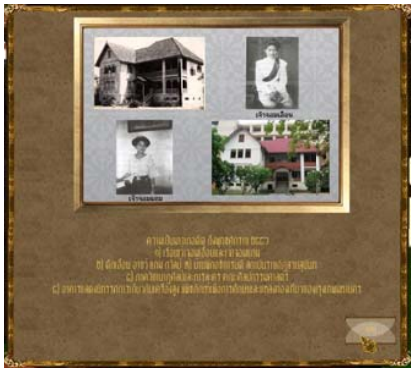

Fig. 4 Illustration of historical building THEN (upper left) and Exhibition Museum NOW (lower right)

Fig. 5 Illustration of historical building THEN (upper left) and Center of Art and Culture NOW (lower right)

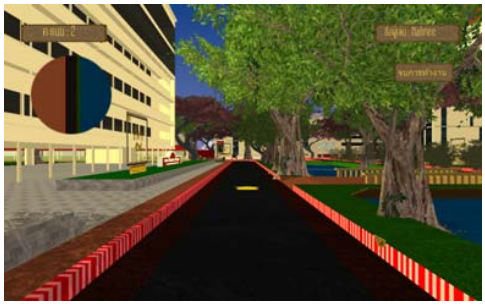

Fig. 6 Campus Avenue depicting building #54 (left)

Fig. 7 Covered walkway on the bank of central pond

Fig. 8 illustrates a situational context where the user chooses to stop at Building #25 to learn about its history. The box on upper left corner depicts the cumulative score on user knowledge of campus. The inset shows present location on campus map. User's name is displayed in the box on upper right corner, while the box underneath is end-game button.

Fig. 8 Faculty of Home Economics Building #25

Figs. 9 and 10 compare the closeness of graphic simulation with the actual buildings. Users will therefore not be surprised by the inaccuracies of the graphic presentation and physical establishment. Some minor landscape discrepancies were resulted from on-going building refurbishment and pavement repair.

Fig. 9 Center of Art and Culture Building #27 (left front) and Faculty of Science and Technology, Building #26 (far back)

Fig. 10 Comparison of Fig. 9 and the actual shot

IV. Performance Evaluation

Evaluation of the proposed system was carried out in two stages, (1) knowledge presentation technique and (2) user satisfaction. The former was performed in a straightforward manner as various measures were readily established by the above related work. Three aspects of measures [3], namely, shared context, initiative and intrusiveness, and relevance were adopted as the principal framework of measurement. The latter, on the other hand, was performed to gauge the user level of satisfaction after playing the game. Evaluation was carried out with the users by a set of post-assessment questionnaire. The response was then assessed quantitatively to infer the effectiveness of the proposed system. One hundred users were randomly invited and equally divided into 5 groups of 20 persons each to participate in the experiment. They represented current students, staff, alumni, former staff, and general public. Evaluation was measured by arithmetic mean (1) and standard deviation (2) as follows:

$$\bar{x} = \frac{\sum x}{n} \quad (1)$$

$$\mathbf{SD} = \sqrt{\frac{n\sum x^2 - (\sum x)^2}{n(n-1)}} \quad (2)$$

Details on evaluation process are described below.

A. Knowledge Presentation Technique

A graphic simulation game was developed to be "toured" or played by the user. Information was designed to non-intrusively presented so that the user could selectively browse,

learn, or skip over. In addition, situational context presented pertinent information so that the user could act accordingly, depending on the present location. As such, the user could see the usefulness of the information at a time when they were most receptive. In the meantime, as the user learned the history of each location, they were tested to determine how much they knew about that place in the form of Q&A score. The objectives were to keep them entertained and to evaluate their performance (knowledge). There are 26 places to learn that account for 26 possible points each user can achieve. Scoring is ranked according to user's knowledge level in five HFA aspects, namely, picture/photo, textual description, functionality, historical content, and physical location as shown in Fig. 11. Scorings are classified in Table I.

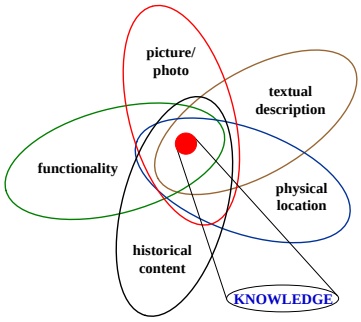

Fig. 11 Relevant aspects of user's knowledge

TABLE I
USER'S KNOWLEDGE RANKING

Score	Knowledge about SSRU
0-5	least
6-10	low
11-15	moderate
16-20	good
21-26	best

Table II summarizes the average score and standard deviation of each sample group's knowledge about campus history. The overall average of all groups is quite satisfactory. The corresponding plot is depicted in Fig. 12.

TABLE II
USER'S KNOWLEDGE ABOUT CAMPUS HISTORY

Sample	Arithmetic Mean	Standard Deviation
current student	16.50	3.22
staff	21.00	1.59
alumni	16.35	2.11
former staff	17.50	3.75
general public	14.65	2.16
Overall average	17.20	2.57

Notice that both staff and former staff have the best knowledge about places and history on campus. Students, by all account, are supposed to know best but turned out to know the campus just good enough to get by. This is because roughly one quarter of the students are freshman who have to spend some time before getting to know the campus, let alone the history behind those campus attractions. One potential prospect that the administration must heed is the alumni. They fall behind current students which portrays the missing ties with the university after graduation. General public exhibit moderately informed about the university.

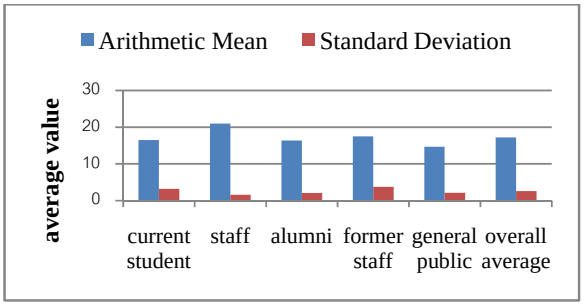

Fig. 12 User's knowledge statistics

B. User Satisfaction

The questionnaire was divided into two sections. The first section recorded users' profile, while the second section consisted of 20 questions on user evaluation using Likert's 5-point scale, where 1 denoted least satisfiable and 5 denoted most satisfiable opinion. Table III summarizes user evaluation statistics. Their overall opinion is positive. Both current students and alumni acknowledge history and information learned from the simulation. General public accept it equally well, while staff and former staff highly appreciate the presentation. The corresponding plot is depicted in Fig. 13.

TABLE III
USER EVALUATION STATISTICS

Sample	Arithmetic Mean	Standard Deviation
current student	67.45	10.04
staff	78.70	18.09
alumni	68.30	12.48
former staff	75.35	8.25
general public	69.10	12.75
Overall average	71.78	12.32

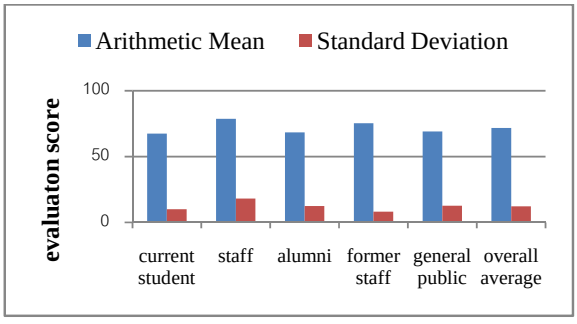

Fig. 13 User evaluation statistics

V. CONCLUSION

Memorabilia can take place in many forms, e.g., picture/photo, diary/textual description, video, artifacts, etc.

All serve the same purpose: to learn and cherish the history of an event, a person, a place, and so on. SSRU is particularly special from a historical standpoint as it was established on a former royal garden. Several departmental buildings were refurbished from old buildings where historical values still prevail. This research attempts to combine memorabilia tour and knowledge about organization in one graphic simulation implementation through interactive user interface. Various HCI design principles were exploited and adopted to devise a non-intrusive, sharable, and relevant to situational context presentation. The implementation was thus performed through an interactive game that furnished an entertaining knowledge presentation. The results were well measured and positively acknowledged by the users. The administration can make use of such information not only to keep the employees and students informed, but also to maintain good relationships with the alumni and general public as a whole.

It is envisioned that such an entertaining and educational memorabilia presentation can be offered in livelier manner than traditional picture, diary, or video. Advanced multimedia technology can enhance the presentation of historical information in a better manner that keeps the user informed and enjoy at the same time. As such, general public and new comers such as freshman students can learn about the organization in an innovative way at less expense to the organization.

ACKNOWLEDGMENT

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