Telling the Local Story: An Intelligent Interactive Tour for Pagoda Tourism using 360 Degree Panorama

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Abstract—**The "Kuu" is the pagoda located in Mahasarakham province, Thailand. This pagoda is the cultural travel place. The most well-known pagoda named "Santaluk" is located in Nadun district, Mahasarakham province Thailand built with the laterite stone in Cambodia art for collecting the image of Buddha and functioning as the hospital. The interactive tour representation system for pagoda is the database together with the reality application based on Web application that is able to represent the in novel way. User is able to feel like at in the physical travel place. This system is divided into 2 parts that are 1) Pagoda database developed with PHP, HTML together with MYSQL database, and 2) Interactive tour representation system that is collected the 360 degrees picture with in one shot from camera and special lens. The image processing technique is used for transform the picture to the 360 degrees dome where the user located in the center of the dome feels like in the physical travel place. Moreover, the map of the physical place must mimic to generate the map of the Interactive representation system using Google Street View Image API. The user is able to walk along the map, truthfully. Moreover, this system is able to manage via Web application, easily. This research tested the performance form the questionnaire for tested the usage and interactive with user. The average results are 3.88 and 3.81 that the website is more satisfied. The users are able to access the interactive system anywhere, anytime, and anyplace. Additionally, all of the data will collect in the digital format that can easily be stored and searched.**

Keywords—**Travel place, Interactive representation system.**

I. Introduction

Cultural heritage is the legacy of physical artifacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations. Cultural heritage includes tangible culture (such as buildings, monuments, landscapes, books, works of art, and artifacts), intangible culture (such as folklore, traditions, language, and knowledge), and natural heritage (including culturally significant landscapes, and biodiversity). The history, Human' life , culture of each country is able to explore from this. Many cultural heritage places such as monuments and landscape become the tourist attraction, but some place is not considering and interesting that the tourist is never seen or known it before.

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From [9], this research studied the method of supporting for management of the culture tourism. The cultural tourism is not interested in tourist especially in pagoda. From the contentment, the tourists imagine the Pagoda in wreckage. The main consideration of the pagoda culture tourism divided into 3 mains that are 1) Create the activity for attracting of the student and tourist 2) Create the booklet or brochure of knowledge for understanding, and 3) Create the public relations and all guide posts for promoting. From [1], Many public relations such as TV, friend, book and magazine, Web, newspaper, and social network are promotable for increasing the number of tourist. This research found that the active media (two-way communication) such as Web, social network is effected than the passive media (one-way communication). The novel communication is divided into 3 groups that are 1) Social network group such as facebook, and Blogger 2) Information Technology from infrastructure such as SMS, MMS ,and 3) Innovative idea such as augmented reality.

This paper proposed the concept and system which consists of knowledge of the story of the pagoda and the virtual walk through the pagoda. The virtual walk allows the tourist to explore the pagoda via 360 degree virtual panoramas, in which the tourist can click on the arrow that is the walk way direction.

This paper is now organized as follows. Section 2 will cover the background and story of travelling information web. Section 3 will propose the design and method. Section 4 is the experimental and result and Section 5 is the conclusion and future work.

II. Background

A. Telling a Pagoda story

From the 10-12 century, the Cambodia art spread out to Thailand as seen from the most pagada in North-east of Thailand. The pagoda is made from rock and divided into 3 classes: 1) The group of 3 or 5 pagodas in the same place such as the Sikhoraphum Pagoda as shown in Figure 1(a) 2) The one pagada with the small monastery such as the Sataluk Pagoda and made by laterite as shown in Figure 1(b) and 3) The one pagoda with the colonnade such as the Phimai pagoda as shown in Figure 1(c) and the well-known Temple of Preah Vihear.

(a) Sikhoraphum pagoda

(b) Santalak pagoda

(c) Phimai pagoda

Figure 1. Simple three groups of pagoda

The Combodia pagoda art is found in many times and types for example Preah Ko art, Bakheng art, Koh Ker art, Banteay Srey art, Bapuan art, Angkor Wat art , and Bayon art. The Pagoda in Mahasarakham province is classified into Bapuan art. The Bapuan art explains about the people, monster, and angle. The pagoda must consist of the main pagoda, the wall, and the arch. The pagoda usually surrounds with pool in the various shapes such as square, and horseshoe. Difference from the other pagada, the pagoda in Mahsarakham province is not only made for collecting the image of Buddha, but also functioning as the hospital as shown in Figure 2.

(a) Santalak pagoda

(b) Mithila pagoda

(c) Mahatad pagoda

Figure 2. Simple pagoda in Mahasarakham province, Thailand

(d) Noy pagoda

(e) BanDang pagoda

From the short story, the pagoda has the interested history story, and able to make the experience together with the history. Moreover, the pagoda will expend the concept, story, tradition, behavior of that time. However, the pagoda is not attract with the tourist. The proposed interactive system will create for making the interactive with the visitor or user that is possible to happen the experience.

B. Literature review

The literature review of cultural heritage is divided into 2 sections that are web and concept of cultural heritage, and interactive cultural heritage.

The information via web is usually used for public relations. Franca and et al. proposed framework and system called MEDINA [1]. This research focuses on two crucial aspects of cultural web applications comprising quality content and quality of access. The quality of content means to provide comprehensive cross-national cultural information, and quality of access means that the user is able to access the information with any media, at any time, from anywhere called ubiquitous. Wei and et al. proposed the symbolic value and commemorative value of tourism souvenir based on culture regionalism [2]. This research proposed that the tourist attraction is made from natural culture, and humanistic culture. Beatriz and et al. proposed the interactive design of personalize tourism routes. The Tourist Support System (TSS) based on a multi-criteria method provides for different planning objectives such as minimizing distance or/and cost, maximizing travelled distance or/and time spent on [3]. Those researches develop on the web with specifying on the travelling target such as travelling planning, travelling souvenir, and cultural content conception.

Apart from the web content development, the interactive content is made for user attraction. Daniel and et al. proposed the prototype of interactive storytelling that user allows to virtual walk through virtual panoramas village town, and click the old home to see the history [4]. Oliviero and Massimo proposed the concept to use the technology in the cultural museum that combines the two technology mainstreams that are natural interactivity and micro-sensory systems such as ultrasounds, GPS [5]. The visitor is able to use the PDA simple and not much interactive interface to access the information. Qiu studied the designs for cultural heritage protection and tourism from interactive and 3D display technology [6]. This research proposed the design on dynamic display sand table system and augmented reality technology; tourist is able to understand the architectural concept in short time. Moreover, the project is used to display 3 D virtual scene and interactive tracking system to interact with user. H.Chand Lane and et al. proposed the virtual staff member called Coach Mike which is able to track the visitor interactions, display the animation, gestures and synthesized speech [7]. From that experiment, the duration time is increasing.

From all literature reviews, the interactive system becomes to attract the user. However, this reliable content had better to access and see the place by self. The user can walk, interact, and see the virtual place of cultural heritage with any media,

anywhere, anytime and anyplace that is the concept of the proposed design and method.

III. Our proposed design and method

Our proposed design and method is considering in 2 sections that are local story content and interactive tour. The local story content designed from pagoda must contain the information as follow:

- Name
- Location such as location information and GPS (Latitude and Longitude)
- Size
- the build time such as 10th - 11th Century
- Architecture type such as Baphuon, Cambodia
- Registration date at Fine Arts Department or World Heritage Site
- Other detail such as comment

The content is collecting in the database created by MySQL. Additionally, the simple management of the content and friendly display created by PHP together with HTML5 are appear via the website. The website allows the visitor or user to access the media in anytime and anywhere. The concept interface design is based on the map and the located of the pagoda is represent by the small pagoda symbols. The user or visitor is easy to understand without reading the manual as shown in Figure 3 and 4.
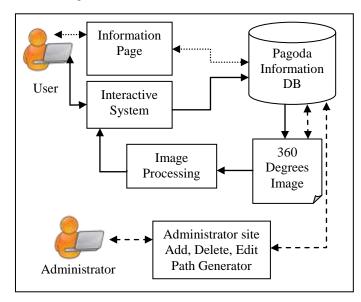

Figure 3. Interactive Pagoda Main Page

The interactive tour is developed using Google Street View Image API [8]. The Google Street View Image API is the free of charge, but the developer must be register the Google account. The Google Street View API is able to display in panoramic 360-degree view. However, the developer must consider in the location and relation between frame and set the right markers within Street view. The markers is the arrow or other sign that is the direction between frame.

However, the difference between other street views is that the Pagoda is not allowing driving the car within the place, then this research using the human to collect the frame and draw the map of connection between frames. The interactive representation system is shown in Figure 5.

Figure 3. Interactive Pagoda diagram.

Figure 5. The interactive representation system of Pagoda

IV. **Experimental and result**

The result of the proposed design and method is divided into 2 parts that are output and human contentment tested. The web is available to access at http://polar.it.msu.ac.th/vreality/. The human contentment is divided into 3 sections that are personal detail, Information performance, and Designed and Interactive performance as shown in Table I to Table III.

TABLE I.   PERSONAL DETAIL

Topics	Number
Number of Contentment	28
Male	23 (82.41%)
Female	2 (17.86%)
Age Under 20 year olds	11 (39.28%)
Age 21-30 year olds	13 (46.42%)
Age 31-40 year olds	1 (3.57%)
Age 41-50 year olds	3 (10.7%)
Age Up to 51 year olds	- (0%)

TABLE II.   INFORMATION PERFORMANCE CONTENTMENT

Information Performance Topics	1 Min	2	3	4	5 Max	Mean
Covers the Information.	0	2	6	17	3	3.78
The information is helpful.	0	1	4	19	4	3.96
The accuracy of the information.	0	0	4	18	16	4.01
The attractiveness of the information.	1	3	2	17	5	3.82
Information needs.	0	0	9	15	4	3.85
Update of the information.	0	0	7	14	7	4.03
The speed of access to information.	0	3	3	16	6	3.92
Simple and Easy to find the information and data.	0	0	5	17	6	4.07

TABLE III.   DESIGNED PERFORMANCE CONTENTMENT

Designed performance topics	1 Min	2	3	4	5 Max	Mean
The web page is beautiful, appropriated and attractive	1	4	5	11	7	3.71
This format is easy to read and use.	1	1	5	15	6	3.89
The appropriateness of colors used.	0	1	4	20	3	3.92
The right of the font used.	0	1	4	20	3	3.92
Feel like in the physical place	0	1	8	16	3	3.78
Fast display and no twitch	0	3	7	16	3	3.78
Resolution of the display picture	2	1	6	14	5	3.71
Attractive going the physical place	0	1	5	15	7	4.03
Content and fun more than normal web	1	4	1	17	5	3.78
New and Modern	1	2	4	16	8	3.92

TABLE IV.   SUMMARIZE OF THE BOTH RESULTS

Summarize	1 Min	2	3	4	5 Max	Mean
Summation of both results	7	28	89	288	92	3.88
Interpretation of results	**This web site are more satisfied.**					

V. **Conclusion and Future work**

This research is divided into 2 parts: web history content and the interactive system. The web history content is developed by MySQL, PHP together with HTML5. It is easy to manage and clearly display.

From the contentment result table, the visitor is easy to use, and clearly understand the content. Additionally, this web is attractive user to go to the physical place. User is able to access the interactive system anywhere, anyplace, and anytime.

This concept is able to use in the other type of cultural tourism such as temple.

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