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Temple Information Retrieval System using Quick Response Code via Mobile Application

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Abstract

Purpose of this research was to develop a searching technology application based on the Android operating system and the utilization of Quick Response Code (QR code) technology as main data storage. The scope of the information searching was limited to locating temples within the districts of Dusit and Phra Nakorn of the Bangkok Metropolitan Area. The developer considered the importance of communication through detailed data collection and gathering so that the users of this application could obtain concise and complete information. The result of this research project was that tourists could use the ability of smart devices to scan the QR code via the developed application that subsequently processed and rendered various information, including pictures, history and details of the requested temple inquiries on the displays. The assessment results on the viewpoints of two hundred tourist users in the average of the overall picture was at 4.20, which should be considered to be a good level. The researcher’s suggestion was to extend methods of information searching to increase speed, accuracy and correct information to produce maximum benefits and effectiveness that users of this application could expect to receive.

Keywords: information retrieval system; quick response code; mobile application, smartphone

1. Introduction

Nowadays, tourism is an important economic factor of the country. Sights do not only consist of the sea, the mountains, or the forests, but also the temples. Each temple can be presented with a variety of information. They have been presented using a variety of media such as print media or information technology media. Thus was born
the idea to produce media that conveys complete, accurate and up to date information to facilitate the presentation of tourism as well.

Due to demand, there is more than a brochure provided at each location. Most tourists need more information from the poster which was mounted in place. Therefore, the information presentation is limited in quantity and completely lacks on demand content.

For this reason, the researchers initiated the development of temple information retrieval systems using a camera on mobile capture QR code. The scope of the temple information was that of the Phra Nakhon and Dusit districts in Bangkok. Our focus was the storage and retrieval of temple information using QR code technology. As a result, visitors could use their android smart phones to search for any temple information and acquire the temple history even more that they could otherwise.

The remainder of this paper is organized as follows: Section 2 presents the research methodology of this work; Section 3 presents the results and discussions; finally, Section 4 presents the conclusions and suggestions for future work of this project.

2. Research Methodology

In this research study the researchers used the following methodology:

2.1. Data Collection

To develop this project, we studied and collected data from the user’s requirements. The information was used as a source of the mobile application, database management system (DBMS) & internet network technology which were applied to make the system fast and work efficiently. A study of related knowledge (Rattanatip, Piyachai, & Kunyanuth, 2014) and theories was conducted by dividing them into three parts:


Part 3: Temple history, location & related information (Culture, Sports and Tourism Department, 2014).

2.2. Tools Preparation

The preparation of tools for use in the system development were as follows:

1) QR-CODE Generator Tools: used to store the URL to the QR image code.

2) Camera on Smartphone: used the image ID of QR code to scan and decode data for retrieving required information which was stored in the image.

3) Photoshop: used to design and create brochure which contained of the data set of QR code and used to design the screen and the graphic user interface on the mobile phone.

4) SQLite database: used to collect and retrieve data which was stored in the database (Thaicreate, 2013).

5) Android SDK Manager: used for the program code and to create the user interface (UI).

6) Google Maps: used to search for the location of the temple and show the map.

2.3. Population

The population was comprised of two hundred tourists who were using smartphones and required temple information.

2.4. Hypothesis

The researchers set hypothesis as follow:

The overall satisfaction of the tourist users towards the mobile application of the temple retrieval information
system would be at a good level.

2.5. Information Extraction

Information extraction was necessary because there was much information after identifying sources such as websites, brochures and text; therefore, it was necessary in the system. The researchers would select only the dependable information to be extracted for the related information to be collected in the database so that the information could be searched out for later use.

2.6. System Analysis and Design

For the system analysis and design, the researchers chose modeling as a tool, UML (Unified Modeling Language), which was considered the standard language of the construction, which comprised the following diagrams:

1) Use Case Diagram: as a tool to define the scope of the system.
2) Class Diagram: as a tool to define the information base which was in the forms of relational tables by using class diagrams as a tool which aided the design to show class, attribute, method and relationship between related.
3) Activity Diagram: as a tool to define the system working processes and activities that occur in the system.

For example, see Fig. 1.

![Diagram](image)

After researcher completed the creation of the three UML diagrams, the next step was the graphics user interface (GUI) on this mobile application.

2.7. Application Design and Developing

This application was developed as a mobile application on the Android operating system. For the structure design of the applied program, the system was comprised of program structure in three modules: the first was searching for temple information by the temple image, temple name listing or by QR code scanning, the second was searching for the temple location and mapping by using Google Maps, the third was searching for source of temple information by using a credit button. The results of temple information could change from Thai to English language. The graphics user interface (GUI) on this mobile application was designed by the researcher (SR) primarily in the forms of menu lists and pushing buttons. The users could press menus and buttons on their mobile screen for access to a variety of
activities such as entering the application, exiting from the application, searching for temple information by selecting the temple name in menu listing, by selecting the temple image, or by scanning the QR code. The information results were shown in Thai language and could be changed from Thai to English, and English to Thai by pressing an ENG and THAI button. Users could search for locations and maps of each temple by pressing the button “แผนที่” (map button). The program could access data and show results on the mobile screen beautifully. For example, see the beginning of this application Fig.2 and the next screen for searching temple information by temple image and temple name listing in Fig.3.

Fig. 2. (a) The first page; (b) the second page; (c) the third page; (d) the result page

Fig. 3. (a) The first of searching menu; (b) searching by temple image; (c) searching by temple name

In the section of searching by scanning the QR code, brochures were prepared by displaying a graphic design and encoding the QR code. It was placed at the targeted temple. Tourists could use the camera of their smartphone to scan the QR code on the brochure to retrieve temple information which would show on their mobile screen.

Fig. 4. (a) The front of brochure; (b) The back of brochure
The first screen and other related screens were linked to each other on the mobile application: for example, the screen result of searching by temple name listing was linked with the result screen of searching location and map by pressing the map button, or the result screen could show the information of temple in Thai or English by pressing the language button.

2.8. Program Validity Checking

In order to check the validity of the applied program, there would be a validity checkup of two working parts as follows:

Part 1: The researchers operated the test themselves by the method of black box testing and created a test case for each condition which could occur by circling the testing until having confirmed the working of the program and the results having been correctly displayed.

Part 2: The researchers programmed the tested and modified information on the application, disseminated the already tested program to tourists at a variety of temples, and asked them fill out questionnaires on the satisfaction of the system in order to analyzed suggestions and the research results in order to be modified for future use.

2.9. System Assessment

The system assessment was the analysis of satisfaction using this application. The researchers defined users as tourists who were using smartphones. After the tourists used this application, they were asked to fill out the questionnaires in the form of a poll. The results were collected and analyzed in the principles of statistics. The assessment was defined by five levels: very good, good, average, low and needs improvement.

3. Results and Discussion

After the researchers had implemented the research study following the research methodology from step 2.1 to 2.9, the research results were categorized into three parts:

3.1. The Database Development

The database development was the collection and filing of the information for the history, buildings and other details of the temples, which could be retrieved to show pictures and information in Thai and English languages on the mobile screen.

It was shown that all the databases were perfectly implemented as designed.

3.2. The Applied Program Development

The applied program development on the application was divided into three parts:

Part 1: For the result of searching for pictures and details of required temple information, there was a collection of information in the database. The information in this module could be shown graphically and in text on the mobile screen, and could be selected in two languages: Thai and English.
Part 2: For the result of searching for location and map of the requested temple by Google Maps, it was shown in the illustration on the screen that both parts of the applied program development resulted in perfect implementation as designed.

Part 3: For the source of temple information in this application, the user can obtain the information by pressing the green credit button.

3.3. The System Assessment

The assessment results for the viewpoints of the tourist users towards the design of the mobile application and the searching methodology for the temple information was collected from two hundred tourists. The assessment was shown on Table 1.
Table 1. The assessment summary on the viewpoint of tourist.

<table>
<thead>
<tr>
<th>Item of Assessment</th>
<th>avg</th>
<th>level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Appropriate form of application</td>
<td>4.00</td>
<td>good</td>
</tr>
<tr>
<td>2. Easy usage of the program</td>
<td>4.50</td>
<td>v.good</td>
</tr>
<tr>
<td>3. Beautiful display of the screen results</td>
<td>4.25</td>
<td>good</td>
</tr>
<tr>
<td>4. Compatible match between pictures and information of temple</td>
<td>4.25</td>
<td>good</td>
</tr>
<tr>
<td>5. Practical application of knowledge from the web site</td>
<td>4.50</td>
<td>v.good</td>
</tr>
<tr>
<td>6. Easy to understand context in the web site</td>
<td>4.00</td>
<td>good</td>
</tr>
<tr>
<td>7. Appropriate grouping of context</td>
<td>4.00</td>
<td>good</td>
</tr>
<tr>
<td>8. Suitable size of context quantity on the screen.</td>
<td>4.25</td>
<td>good</td>
</tr>
<tr>
<td>9. Correct temple content in the application</td>
<td>4.00</td>
<td>good</td>
</tr>
</tbody>
</table>

In the overall picture of the assessment, the average value of the tourists’ viewpoints was at 4.20 which should be considered at a good level. It was accordant to the hypothesis set at the beginning of the research.

4. Conclusion and Discussion

This research study could make conclusions and suggestions to those who wanted to expand the research findings as follows:

4.1. Research Conclusions

From the research results, it was concluded that we could use QR code as a tool to facilitate searching for information stored in SQLite database on the Android operating system. It can be used practically through the mobile application to meet the demand for storing and retrieving temple tour information as well. This tool supplies the user with the information quickly and accurately.

For this reason, the development and use of QR code technology on the mobile application helps to make a positive impression on tourists, especially foreigners, visiting Thai temples.

4.2 Suggestions

The researchers suggest other researchers who wanted to study further on the same subject should extend these findings for the methods of information searching. They should apply new electronic equipment with the searching methods in order to provide the tourist users with remarkable effectiveness and maximum benefit.

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References