國立交通大學

資訊管理研究所

碩 士 論 文

運用網站日誌探勘與可用性測試於數位典藏網站評估

Digital Archives Evaluation by Web Log Mining and Usability Testing

研 究 生：池筑婷

指導教授：柯皓仁 博士;林妙聰 博士

中華民國 九十九年 六月

運用網站日誌探勘與可用性測試於數位典藏網站評估

Digital Archives Evaluation by Web Log Mining and Usability Testing

研 究 生：池筑婷　　**Student: Chu-Ting Chih**

指導教授：柯皓仁、林妙聰　　**Advisor: Dr. Hao-Ren Ke,**

Dr. B.M.T. Lin

國 立 交 通 大 學

資 訊 管 理 研 究 所

碩 士 論 文

A Thesis
Submitted to Institute of Information Management
College of Management
National Chiao Tung University
in Partial Fulfillment of the Requirements
for the Degree of
Master of Science
In
Information Management

June 2010

Hsinchu, Taiwan, the Republic of China

中華民國　九十九 年 六 月

Digital Archives Evaluation by Web Log Mining and Usability Testing

Advisor: Dr. Hao-Ren Ke, Dr. B.M.T. Lin Student: Chu-Ting Chih

Institute of Information Management

National Chiao Tung University

ABSTRACT

With the great quantity of data in a website, it will attract more users to stay for a long time if there is desirable and useful information architecture. In this paper, we try to explore how the *YuYu Yang Digital Museum* works by the web mining technology. The approaches will mainly focus on web log mining by the usability testing based on the concept of information architecture. By the results of these evaluations, we hope to realize that utilizing the web logs analysis to compare the organization system in the information architecture of the *Yu-Yu Yang Digital Museum* website and applying the usability testing to our website by the technique, Heuristic Walkthroughs, which we adopt.

Keywords: Web log mining, Information Architecture, Usability testing

運用網站日誌探勘與可用性測試於數位典藏網站評估

指導教授：柯皓仁、林妙聰　　研 究 生：池筑婷

國 立 交 通 大 學 資 訊 管 理 研 究 所

摘要

對於一個擁有大量資料的網站，如果有一個適合的或是有用的資訊架構，它會吸引更多的用戶在此停留。在本論文中，我們試圖藉由網站探勘的方式，探討楊英風數位美術館是如何運作的。本論文的方法主要基於資訊架構的概念，專注於挖掘網站日誌的可用性測試。藉由這些評估的結果，本研究期望達到利用網站日誌分析，與楊英風數位美術館其資訊架構的組織系統作對照，也將可用性測試，其中的啟發式演練，應用到該網站。

關鍵字：網站日誌分析、資訊架構、可用性測試

誌謝

在這裡的階段，似乎該告一段落了。交大，我停留了六年的時間…

身為資財系在資管所的第一屆畢業生，真心的感謝一路上關心扶持我們的老師們，謝謝您們這些年來對我們的教導及幫助，或許我不是其中表現太優異的學生，但一定是向您們獻上最誠摯的感謝。謝謝您們給予我鼓勵和機會，使我有這段學習成長的空間。謝謝所長林妙聰老師，在畢業論文程序上的幫助。

身為我最年輕有勁的指導老師—柯皓仁老師在交大目前最後的門生，真的很感激老師在這兩年的包容和幫助，從您一路看我如何在這條路上跌跌撞撞的學習，卻仍願意不嫌棄我的「憨慢」，以因材施教的方式指導我，到最後也很幫忙的使我順利進入人生的下一階段，謝謝您！

兩年，或是說六年的時間過的真的很快，沒有想到竟然就這麼以誌謝作為這段學習歷程的句點了。感謝我親愛的父母親，在我這段時間無條件、不計代價的支持，成為我學習的動力；感謝我親愛的姊姊、弟弟也一同陪我經過這一切；謝謝我在交大這裡的同學以及學長姐們，有你們這些學習上的同伴同在的日子真的令我很難忘；感謝主耶穌，在這裡預備了一班的弟兄姊妹，使我常常喜樂的活在你們當中，享受你們的豐富；謝謝我生命中最親愛的另一半，陪伴我在這裡度過了好些關口，到最後的完成學業。

感謝交大，給予我的培育以及資源！要離開了，為著下一階段的學習…

Contents

List of Figures

List of Tables

1. Introduction

1.1 Background

Information architecture plays an increasingly important role in Website design. Morville and Rosenfeld defined information architecture as the structural design of shared information environments [14]. In the book, *Information Architecture for the World Wide Web*, they deem that it is also the art and science of shaping information products and experiences to support usability and findability. A building and a website with bad architecture share the same roots. On one hand, the architects usually don't know the real needs of user. On the other hand, it is really difficult to create a structure that can stand the test of time. Therefore, we need information architecture to help us. For example, some websites provide good structures that help us to find the answers we need. However, others without good organization frustrate us when we navigate through them. These sites remind us of buildings with miss: the flat roofs leak in houses, and no counter space in kitchens. In addition, a website with desirable information architecture will attracts more users to linger for a long time, and the website owners will be able to use this advantage to enhance the value and impact of itself. Information architecture will affect the cost to pay and the value received.

1.2 Motivation

In the product development process, usability is a long-neglected subject.

Usability also plays a more and more essential role in website development. According to Jakob Nielsen [10], "Studies of user behavior on the Web find a low tolerance for difficult designs or slow sites. People don't want to wait. And they don't want to learn how to use a home page. There's no such thing as a training class or a manual for a Website. People have to be able to grasp the functioning of the site immediately after scanning the home page—for a few seconds at most."

There were some opportunities to deal with several problems in the Yu-Yu Yang digital art museum, and through this some usability issues are found. Therefore, this thesis tried to investigate the website in the light of the two portions of the information architecture, organization system and labeling system.

1.3 Methods and Goals

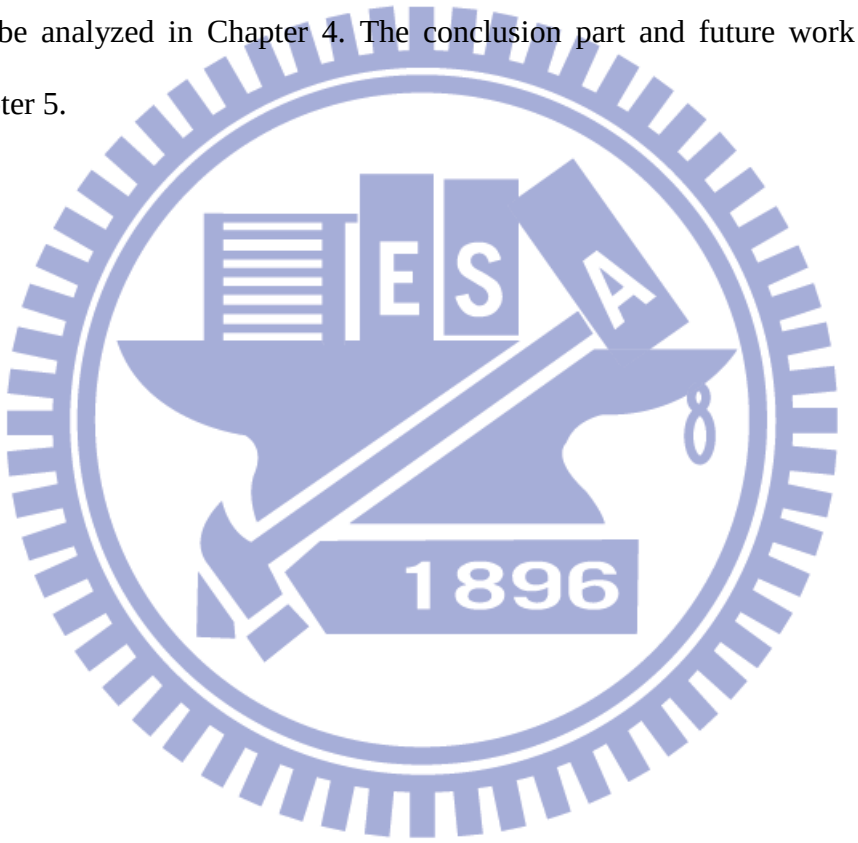
In this thesis, we aim at investigating how the YuYu Yang Digital Museum works. The approaches will mainly focus on the usability testing based on the concept of information architecture. First, we analyze the users' browsing paths by the recorded web logs. Next, we choose cognitive walkthrough and the questionnaires as the techniques in usability testing. After going through these methods we mentioned, we expect to find the problems in the *YuYu Yang Digital Museum* website so that it can be redesigned.

By the results of these evaluations, the goals of the research are as follow:

1. Utilizing the web logs analysis to compare the organization system in the information architecture of the Yu-Yu Yang Digital Museum website.

2. Applying the usability testing to our website by the technique, Heuristic Walkthroughs, which we adopt.

In the following chapters, we will discuss more related works in Chapter 2 that includes web usage mining, information architecture, and usability testing sequentially. In Chapter 3, we will introduce the methodology in detail. Next, the experiments and evaluation by using questionnaires and cognitive walkthrough will be analyzed in Chapter 4. The conclusion part and future work will be in Chapter 5.



2. Related Works

2.1 Information Architecture

Information architecture is essential for website organization in the stage of the site planning. Websites with a flock of various users would be designed with different kinds of information architectures. For example, we can say that the users and the website information architecture of the Amazon.com and the books.com.tw are quite similar, but the users and the website information architecture of the Amazon.com and the ezTravel (a travel store) structure of information may be entirely different.

Morville and Rosenfeld [14] think that websites which provide logical structures assist us in finding answers we want and achieving tasks. On the contrary, others may lack intelligible organization and frustrate our attempts to navigate through them. Information architecture involves the organization, labeling, guidance and search system, designed to help people be more successful in finding and managing information. Information architecture can be defined as a systematic, problem-based process that aims to create an architecture that can improve the performance of communication products. Morville and Rosenfeld [14] think it is difficult to know exactly of which components information architecture is made up, and demonstrate the meaning of each component. In this research, we use web usage mining and heuristic walkthrough to analyze especially organization system and labeling system

respectively. The following section will introduce the four elements one by one.

Information architecture components

2.1.1 Organization system

In the design of websites, organization structure plays an invisible but essential role. The structure of information defines the key ways of users' navigation. Morville and Rosenfeld [14] clarified major organization structures applying to website and intranet architectures include the hierarchy, the database-oriented model, and hypertext. Each type of organization structure possesses unique strengths and weaknesses. In some cases, it makes sense to use one or the other. In several cases, it is reasonable to use all three structures in a complementary manner.

2.1.2 Labeling system

Labeling is a kind to expressions. The main goal of labeling is to communicate messages efficiently. That is, labeling expresses communication without engaging too much space of pages or users' cognitive space.

Morville and Rosenfeld [14] think that labels are generally the most significant method to obviously demonstrate the user our organization and navigation system. A single page may include several groups of labels, and each group might represent another organization or navigation system.

2.1.3 Navigation system

In the book Information Architecture for the WWW, Morville and Rosenfeld [14] took navigation system and search system as two individual sections. Navigation system is composed of many basic components or subsystems. Typically, there are the global, local, and contextual navigation systems. As shown in Fig 2.1, in general the three main subsystems are necessary but not adequate by themselves.

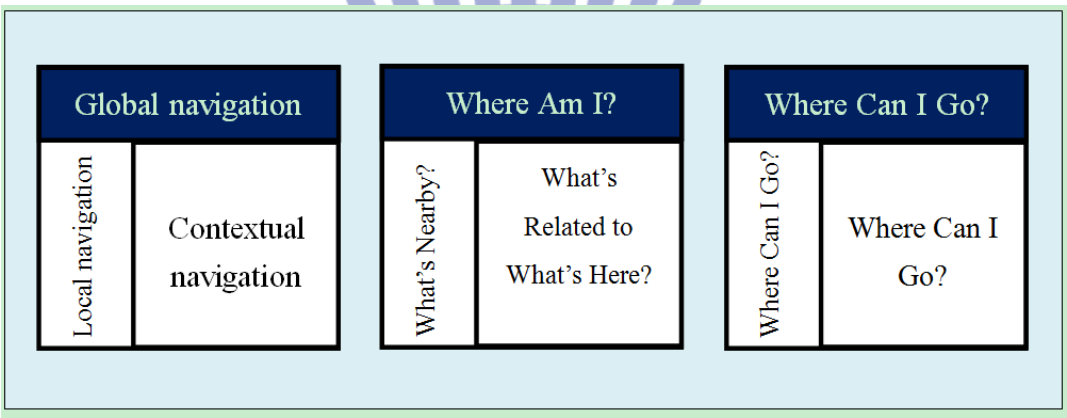


Fig 2.1 Global, local and contextual embedded navigation systems

2.1.4 Searching system

By the definition of Morville and Rosenfeld [14], searching is an expansive, challenging, and well established field. In the Fig 2.2, we can see a portion of the path when we explore in a search system. From this we can know that searching is regularly iterative, and also we have to try a few more to query and find the correct one.

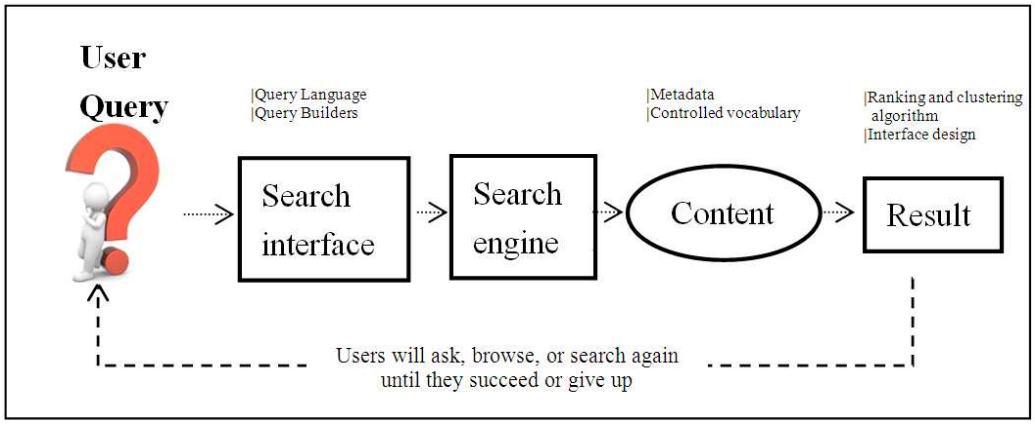


Fig 2.2 The basic anatomy of a search system
(*Image from "In Defense of Search," Semantic Studios, http://www.semanticstudios.com/publications/semantics/search.html*)

After we decide to build a search engine in our website, the next issue which we are interested in is when we should implement search systems. The following four principles help us know the point of needing a search system of our site.

Search helps when you have too much information to browse

When the volume of resources was increasing day by day, information architecture was not well designed and couldn't keep up with it. We might try to install a search system as an alternative way for helping user find information in their site. Therefore, once the users of our site feel mad with aiming to locate the goal line from the large amount of category pages that might be an appropriate timing to set a search system in our site.

Search is a learning tool

By analyzing the search log, we can collect some useful data, which is about what users virtually want to acquire from our site, and how they describe their needs (by the form of search queries). We can analyze these pieces of data collected over time, and try to judge and adjust the search system of our site, and many other aspects like information architecture, or the performance of its content.

Search should be there because users expect it to be there

One website deserves a search engine if it is an authentic site. Some users search even when they don't know what to look for, but actually they might get better results by browsing. The little search box should be there when users expect.

Search can tame dynamism

When the site comprises extremely dynamic matters, we possibly don't have much time to maintain these data update by ourselves. It will be helpful to create a search engine which can automatically classify these contents.

2.2 Web Usage Mining

Web usage mining is one category of web mining, which includes web content mining, web usage mining, and web structure mining. The term web mining was first proposed by Etzioni [9], and he defined web mining as the use of data mining techniques to automatically discover and extract information

from World Wide Web documents and services. Later in 1997, Cooley etc. [6] consider that web mining has been used in two distinct ways, web content mining and web usage mining. The third way, web structure mining, was last proposed by Kosala and Blockeel [12] who suggested three kinds based on the structure of the hyperlinks within the Web itself (inter-document structure). Therefore, Web mining can be categorized as shown in Fig 2.3:

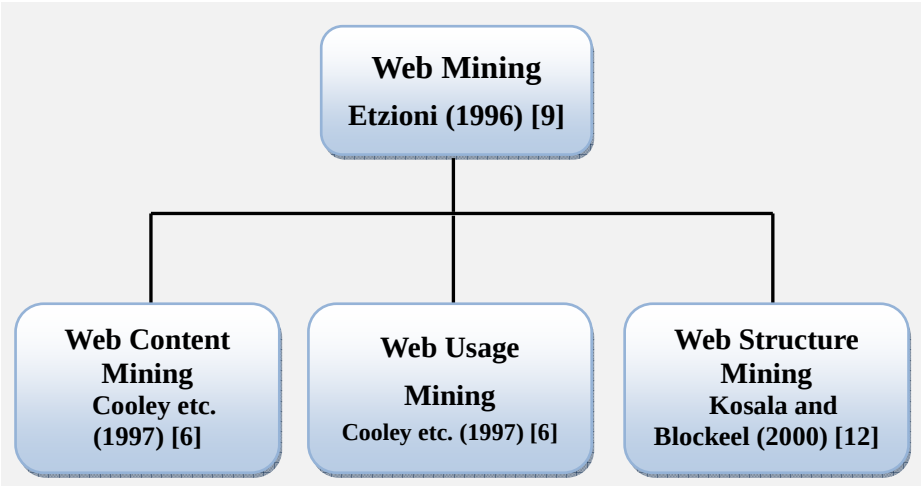


Fig 2.3 Categories of Web Mining

In this research we focus on web usage mining; hence, later we will introduce most about it.

Web usage mining is the application of data mining techniques to discover usage patterns form Web data, in order to understand and better serve the needs of Web-based applications. [18] Web usage mining comprise three phases, namely *preprocessing*, *pattern discovery*, and *pattern analysis*, which are also the essential steps in this research and shown as Fig 2.4. , The user's browsing patterns would be analyzed through the data which users left in pages browsing. Thus the website that fit in with the users' browsing patterns can be

provided, in addition, it can also enhance users' satisfaction. Dynamically designed websites for each user might create differentiated information space, and also improve the services to users.

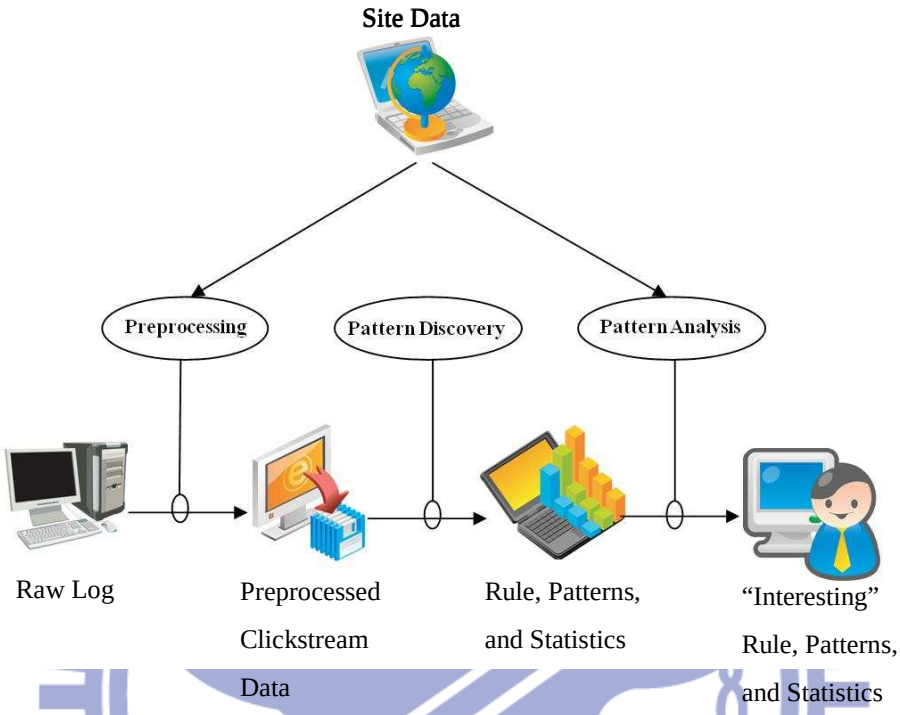


Fig 2.4 High Level *Web Usage Mining* Process(1997) [6]

The Web usage mining process could be grouped into two usually used approaches [2]. The first approach converts the usage data of the Web server into relational tables before an appropriate data mining technique is carried out. The second one, which we executed in this research, uses the log data directly by utilizing special pre-processing techniques. The topics of data quality and data pre-processing are also very significant here for classic data mining application. About the detail steps and contract between some data preprocessing methods [7].

Recently, the second approach, web log mining, we mentioned is implemented in many research areas. There is much great commercial valuable

information can be mined from the web log data. Some applications are used in E-commerce or in E-business. By the data customers visited, they can be grouped, find the user-needed information quickly and exactly, and gain customized services. [5][8] However, in E-commerce for web log mining there are still numbers of difficulties to be solved, such as dealing with the storage of different countries in different regions of the Semantic Web data inconsistency, or providing more secure, and efficient service. [4] Besides, another area web log mining could be applied in is in distance learning or distance education. Through the application of web log mining technology in distance education website, some research investigates the different favorites and interest of students' visiting. Based on the web log mining, website designers can personalize the modules of the websites, and also provide personalized service for the bulk of students. [13]

2.3 Association Rule Mining

Association rule mining is usually used to discover the item association and users association. It is also a popular and well researched method to discover interesting relations between variables in large databases. With the base of the concept of strong rules, Agrawal et al. [1] defined association rules for "discovering regularities between products in large scale transaction data recorded by point-of-sale (POS) systems in supermarkets". For example, the rule $\{milk, sugar\} \Rightarrow \{coffee\}$ found in the sales data of a supermarket would show that if a customer buys both milk and sugar together, he or she is likely to also buy coffee. And refer to [16], Piatetsky-Shapiro describes analyzing and presenting strong rules discovered in databases using different measures of

interestingness. Such information can be used as the basis for decisions about marketing activities such as, promotional pricing or product placements. In addition to the above example from market basket analysis, association rules are employed today in many areas including Web usage mining, intrusion detection and bioinformatics.

For Microsoft, data mining is a special data aggregate form, which aggregate original data into special rules and knowledge. In the book Microsoft SQL Server 2005 data mining reference [19], the author thinks the data mining in SQL Server 2005 is:

1. Building organization of data mining model: Create definition of aggregated table.
2. Training data mining model: The process of inserting the history data into aggregated table.
3. Data mining algorithm: Special aggregate function.
4. Conduct the result of prediction: Join the input table and the aggregated table.
5. Following processing: Permit user to create, query, and delete, and be able to exchange data by utilizing XML.

2.4 Usability Inspection Method : Heuristic Walkthroughs

Usability inspection is the generic names for a set of methods that are all based on having evaluators inspect a user interface [11]. In general, usability

inspection is intended to find usability problems in the design, though some methods and also propose topics like the severity of the usability problems and the overall usability of a whole organization.

The method we use in this paper is Heuristic walkthroughs [17], which were built up by combining the benefits of heuristic evaluations, cognitive walkthroughs, and usability walkthroughs. [17] believes that it is more comprehensive than cognitive walkthroughs and also more valid than heuristic evaluations when we use heuristic walkthroughs. In other words, there are more problems inspired by heuristic walkthroughs than by cognitive walkthroughs, and fewer false positives caused by heuristic walkthroughs than heuristic evaluations.

Heuristic Evaluation and Cognitive Walkthrough is two ways of usability inspection methods that we usually use. They are easy to apply that it is possible to have regular developers serve as evaluators, and have the interface inspected by a single evaluator at a time. Following sections introduce the heuristic walkthroughs method and the two portions: cognitive walkthroughs and heuristic evaluations.

2.4.1 Heuristic Walkthroughs

The technique heuristic walkthroughs (HW) mainly integrates heuristic evaluation (HE) and cognitive walkthroughs (CW) to make up

the lack of depth of using heuristic evaluation and the shortage of scope of using cognitive walkthroughs.

2.4.2 Cognitive Walkthroughs

A cognitive walkthrough starts with a task analysis that specifies the sequences of steps or actions required by a user to accomplish a task, and the system responses to those actions. The designers and developers of the software walk through the steps as a group, asking themselves a set of questions at each step. Data is gathered during the walkthrough, and afterwards a report of potential issues is compiled. Finally the software is redesigned to address the issues identified.

It is hard to measure in practical setting by using the effectiveness of method like cognitive walkthroughs, because of the limited opportunity of controlled experiments when we develop a website. Usually measurements involve comparing the number of usability problems found by applying different methods. However, the consensus in the usability community is that the cognitive walkthrough method works well in a variety of settings and applications.

- **Will the user try to achieve the effect that the subtask has?** E.g. Does the user realize that this subtask is needed to reach the user's goal?
- **Will the user notice that the correct action is available?** E.g. Is the button visible?
- **Will the user understand that the wanted subtask can be achieved by the action?** E.g. The right button is visible but the user does not understand the text and will therefore not click on it.
- **Does the user get feedback?** E.g. Will the user know that they have done the right thing after performing the action?

Fig. 2.5 Four questions of Cognitive walkthroughs [15]

2.4.3 Heuristic Evaluation

Nielsen and Molich [15] first formalized the idea of a heuristic evaluation. In [17], Sears thinks HE is certainly the most popular of the inspection-based evaluation techniques. It is also easy to understand and apply. Evaluators begin with a description of the interface and a list of usability heuristics. They are free to inspect any part of the interface but are instructed to use the usability heuristics to guide their evaluations. They can survey whether there is any violation to the ten guidelines depicted in Fig 2.5. In this way, we can find out the possible problems in man-machine interface.

The advantages of this method are its simple, fast and low cost. Based on the experiment of Nielsen [15], five experts can discovery over

75% problems of usability. If there are five general evaluators, about 50% problems of usability can be found. Besides, the economical benefit would be the number of evaluators

- *Visibility of system status*: The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
- *Match between system and the real world*: The system should speak the users' language, with words, phrases, and concept familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
- *User control and freedom*: Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
- *Consistency and standards*: Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
- *Error prevention*: Even better than good error messages is a careful design which prevents a problem from occurring in the first place.
- *Recognition rather than recall*: Make objects, actions and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
- *Flexibility and efficiency of use*: Accelerators—unseen by the novice user—may often speed up the interaction for the expert user to such an extent that the system can cater to both inexpert and experienced users. Allow users to tailor frequent actions.
- *Aesthetic and minimalist design*: Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
- *Help users recognize, diagnose, and recover from errors*: Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
- *Help and documentation:* Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

Fig 2.6 Ten guidelines of heuristic evaluation

3. Methodology

The methods proposed in this research will be discussed next. The purpose of this research is to build the information architecture of the *YuYu Yang Digital Museum* website and use web usage mining to detect if the website users followed this architecture. This section will include the concept of this research and the system architecture. Next, for the data from the *YuYu Yang Digital Museum* website we have collected, the preprocessing portion will be interpreted in detail. After collecting the data, the most significant step is to preprocess these log files. This thesis uses SQL server 2005 to analyze the web log data. At the same time, the website information architecture should be established thorough the structure of the website designers.

3.1 Core Concept and System Architecture

This research expects to use web usage mining to discover whether the website's information architecture fit in with the manners of users' usage.

Fig 3.1 illustrates the research architecture and procedures of our system. As we mentioned, web log files will be collected and the association rules will be retrieved by using the SQL server analyzer. After this, a walkthrough procedure would be implemented by the NCTU students. Moreover, this research also uses two additional analyzers for assisting us with evaluation the Yu-Yu Yang website. The following sections will discuss the procedures in detail.

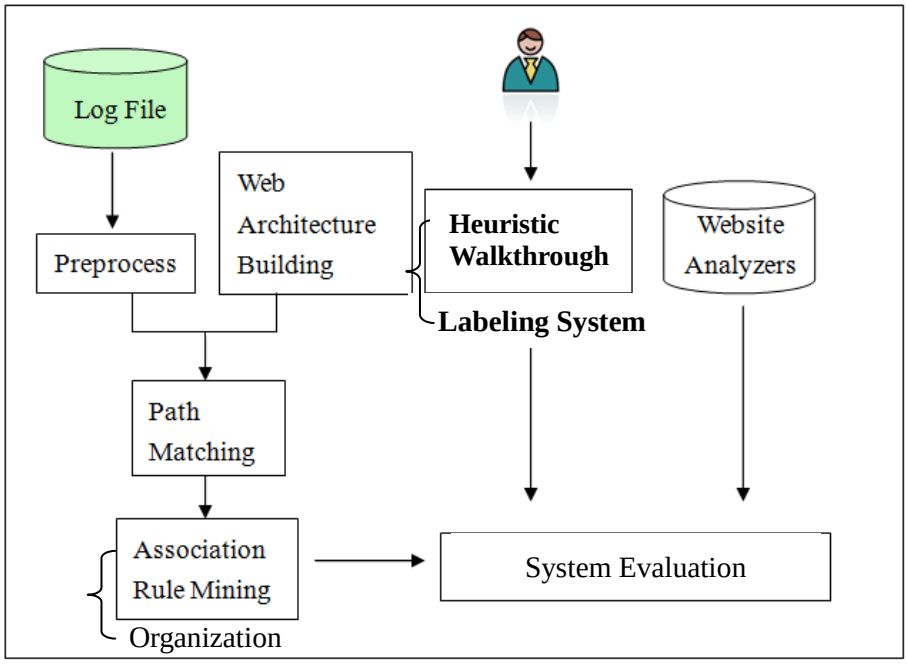


Fig3.1 System Architecture

3.2 Website Architecture Building

Before analyzing the web log data, the organization system of the IA of our determine website has to be established in advance. Fig 3.2 shows the architecture of our website, and it is organized and definite. To start from the front page and we can obviously see the hierarchical relationship in the figure. The critical portion of this website is the masterpieces of Mr. Yang who is also the protagonist of this site.

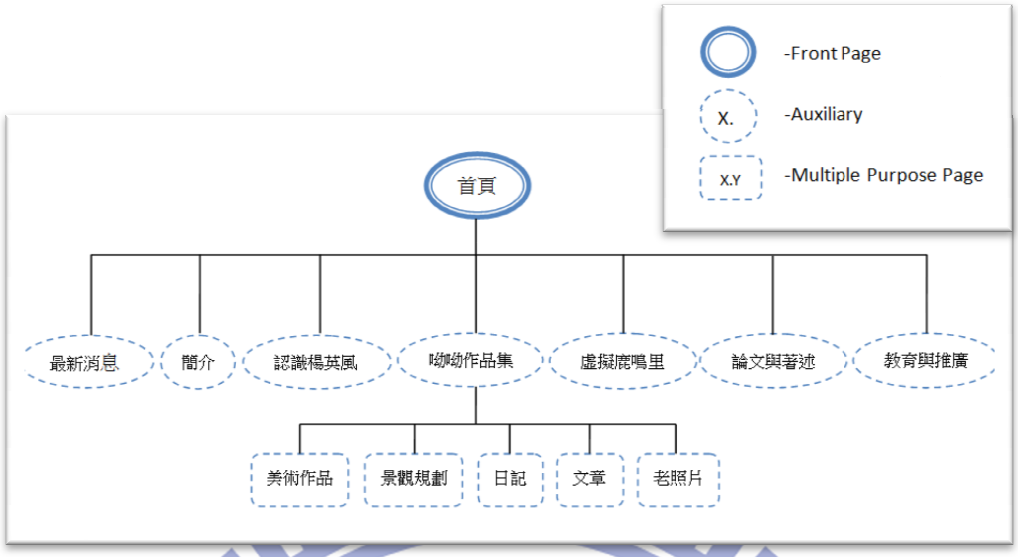


Fig 3.2 Main Information Architecture of the Website

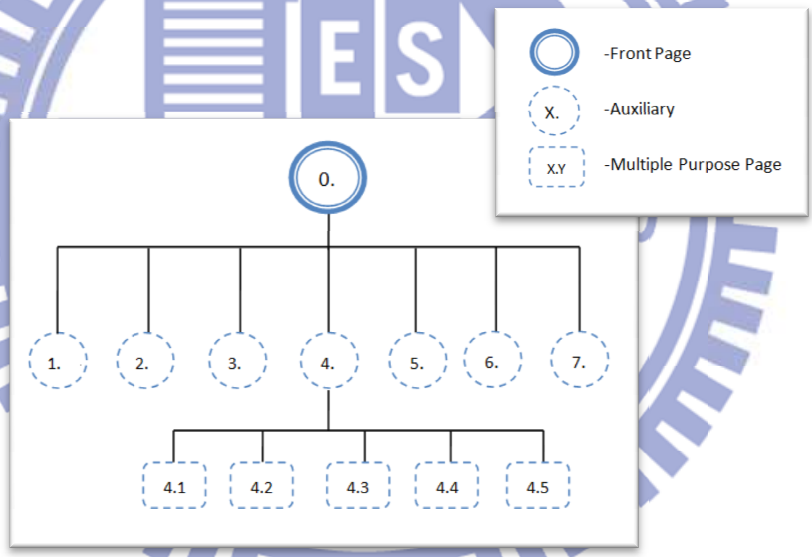


Fig 3.3 Main Information Architecture of the Website with Architecture ID number

Every page in the website will have a serial number, ID number which represents its hierarchical position in the website, the name, the real URL, and the parents of this page. Parents numbers denote the number of the preceding page before the determine page.

Building up the architecture, we import the architecture into the database, which is MSSQL in this research. The sample architecture is shown as Fig 3.4.

Serial No	ID	name	URL	Parent
0	0	首頁	http://yuyuyang.e-lib.nctu.edu.tw/	0
1	1	最新消息	http://yuyuyang.e-lib.nctu.edu.tw/bulletin/news_index.htm	1
2	1.1	最新消息	http://yuyuyang.e-lib.nctu.edu.tw/bulletin/default.aspx	1
3	1.2	最新消息	http://yuyuyang.e-lib.nctu.edu.tw/bulletin/bulletinDefault2.aspx	1
4	1.3	最新消息	http://yuyuyang.e-lib.nctu.edu.tw/bulletin/bulletinDefault3.aspx	1
5	2	簡介	http://yuyuyang.e-lib.nctu.edu.tw/overview/overview_index.htm	0
6	2.1	簡介	http://yuyuyang.e-lib.nctu.edu.tw/overview/introduction.html	2
7	2.2	簡介	http://yuyuyang.e-lib.nctu.edu.tw/overview/team.html	2
8	2.3	簡介	http://yuyuyang.e-lib.nctu.edu.tw/overview/addressbook.html	2
9	2.4	簡介	http://yuyuyang.e-lib.nctu.edu.tw/overview/copyright.html	2
10	3	認識	http://yuyuyang.e-lib.nctu.edu.tw/about_yuyuyang/about_yuyuyang_index.htm	0
11	3.1	認識	http://yuyuyang.e-lib.nctu.edu.tw/about_yuyuyang/intro.htm	3
12	3.2	認識	http://yuyuyang.e-lib.nctu.edu.tw/about_yuyuyang/transfer/index.html	3
13	3.3	認識	http://yuyuyang.e-lib.nctu.edu.tw/about_yuyuyang/final/era00_fina2.swf	3
14	4	作品集	http://yuyuyang.e-lib.nctu.edu.tw/collection/collection_index.htm	0
15	4.1	美術作品	http://yuyuyang.e-lib.nctu.edu.tw/collection/search.asp?view_db=artWorks&db_menu=all	4
16	4.1.0	Search	http://yuyuyang.e-lib.nctu.edu.tw/collection/search_view1.asp?keywords=&SelectItem=&db_menu=all&view_db=artWorks	4.1
17	4.1.1	版畫	http://yuyuyang.e-lib.nctu.edu.tw/collection/search_view2.asp?keywords=&SelectItem=&view_db=artWorks&db_menu=all&form=版畫&worksytpe=美術...	4.1

Fig 3.4 Sample of Information Architecture of Yu-Yu Yang Digital Museum website

3.3 Data Collection

The first step of this research is data preprocessing which would preprocess the data that collect from the website server. To enable IIS Logging, we have to preprocess the log files. First we click on "Start" → "Programs"→ "Administrative Tools" → "Internet Services Manager" (shown as Fig 3.5). From the IIS manager, we find the website that we want to keep record in the left pane (shown as Fig 3.6). Then choose it and right click on the website and select "Properties" (shown as Fig 3.7). Opening the properties of the chosen website, click on the "Enable Logging" checkbox, and then choose one of the “Active log formats” that we set the “W3C Extended Log files Format”. (Shown as Fig 3.8) By use of setting the IIS in the server, we can obtain the log files which record users’ usage data by every day.

Fig3.5 Select the **Internet Services Manager** from **Start** menu

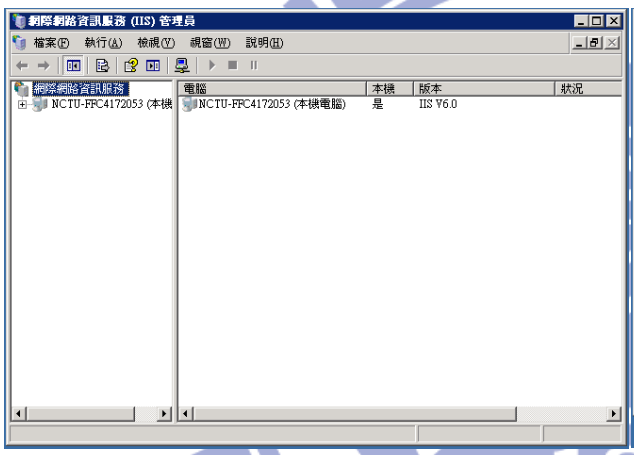


Fig3.6 IIS Manager

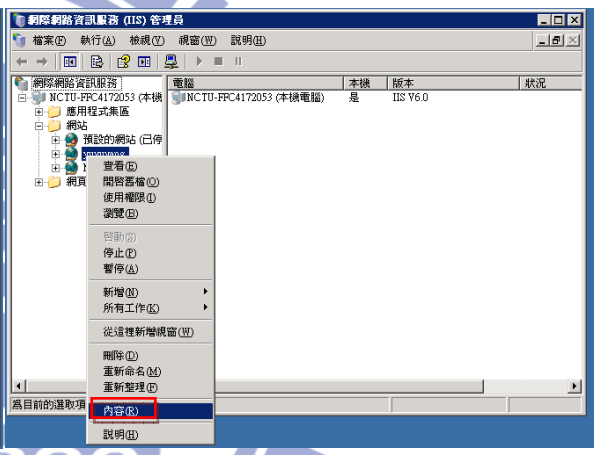


Fig 3.7 Set the Properties

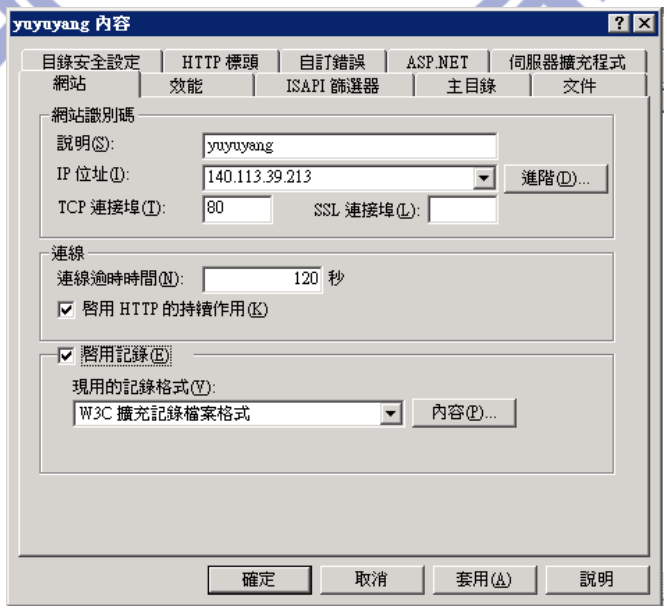


Fig 3.8 Enable Logging

3.4 Data Preprocessing

When the log files from our web server are collected, the data should be preprocessed step by step. First, for matching the data type of database system, in our research we use SQL server 2005 as mentioned before. The type of files has to be transformed from ".log" to ".txt." The original log files should be slightly modified, including the removal of the additional Header column with the outset of the "#" sign, and incidentally converting the time format from Greenwich Mean Time to the Taipei time. Each log file will be converted.

The last step before data cleaning is importing data in the log files. After establishing the corresponding schema in MSSQL, the log files can be imported. We use the **BULK INSERT** way to import data into the database table. Its operation instructions are as follows:

```
bulk insert [dbo]. [LogFiles0809] (table name) from ' D:\Log\Log Files\W3SVC87257621 \
ex080901.log.txt' (the full path of the log text file)
with (
fieldterminator = ' ',
rowterminator = '\ n',
maxerrors = 100
)
```

When we make sure the log files have been imported into the database system, we can proceed to do the following steps, data cleaning, user identification and session identification, path completion and path matching. The simple flow chart is shown as Fig 3.9.

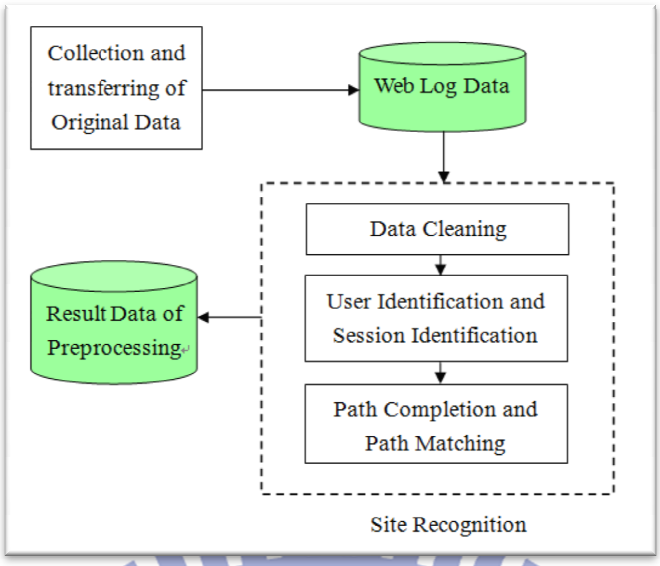


Fig 3.9 Data Preprocessing

3.4.1 Data Cleaning

In the data-cleaning step, some paths in the log files are irrelevant for our analysis. Those records which log the pictures when a user accesses our site are meaningless to the analysis. Therefore we have to find these paths and eliminate them. First we choose those URL of log records with filename suffixes such as, “.gif”, “. jpg”, “.css” which should be removed. Using the SQL language in database, we can easily filter the log files. Fig 3.10 shows the sample data of logged data after cleaning.

	date	time	s-sitename	s-ip	cs-method	cs-uri-stem	cs-uri-query
	2008-09-01	08:02:52	W3SVC87257621	140.113.39.213	GET	/collection/view5...	keywords=?%E5%89%9C%EF%8F%B7%E6%86%8C?SelectIte...
	2008-09-01	08:03:00	W3SVC87257621	140.113.39.213	GET	/collection/view2...	keywords=&SelectItem=&db_menu=all&view_db=historicalPhotos...
	2008-09-01	08:03:10	W3SVC87257621	140.113.39.213	GET	/index.html	-
	2008-09-01	08:03:45	W3SVC87257621	140.113.39.213	GET	/collection/view2...	keywords=&SelectItem=&db_menu=all&view_db=historicalPhotos...
	2008-09-01	08:04:33	W3SVC87257621	140.113.39.213	GET	/collection/view2...	keywords=&SelectItem=&db_menu=all&view_db=historicalPhotos...
	2008-09-01	08:06:16	W3SVC87257621	140.113.39.213	GET	/index.html	-
	2008-09-01	08:06:42	W3SVC87257621	140.113.39.213	GET	/collection/view1...	keywords=&SelectItem=&db_menu=artWorks&view_db=artWork...
	2008-09-01	08:07:28	W3SVC87257621	140.113.39.213	GET	/collection/view1...	keywords=&SelectItem=&db_menu=artWorks&view_db=artWork...
	2008-09-01	08:08:16	W3SVC87257621	140.113.39.213	GET	/collection/view1...	keywords=&SelectItem=&db_menu=artWorks&view_db=artWork...
	2008-09-01	08:09:08	W3SVC87257621	140.113.39.213	GET	/collection/view5...	keywords=?%EE%8E%95?%E6%92%A0?SelectItem=5&SelectIt...
	2008-09-01	08:11:43	W3SVC87257621	140.113.39.213	GET	/collection/view4...	keywords=?%EF%97%B9?%E6%86%8C??SelectItem=5&SelectI...
	2008-09-01	08:16:22	W3SVC87257621	140.113.39.213	GET	/collection/view5...	keywords=?%EE%8E%95?%E6%92%A0?SelectItem=5&SelectIt...
	2008-09-01	08:17:45	W3SVC87257621	140.113.39.213	GET	/collection/view5...	keywords=?%E5%89%9C%EF%8F%B7%E6%86%8C?SelectIte...
	2008-09-01	08:18:11	W3SVC87257621	140.113.39.213	GET	/collection/view2...	keywords=&SelectItem=&db_menu=historicalPhotos&view_db=hi...
	2008-09-01	08:19:08	W3SVC87257621	140.113.39.213	GET	/collection/view4...	keywords=?%E8%A5%BF??SelectItem=5&SelectItem=&db_men...
	2008-09-01	08:19:22	W3SVC87257621	140.113.39.213	HEAD	/virtual/vr/vr_ho...	-
	2008-09-01	08:20:33	W3SVC87257621	140.113.39.213	GET	/collection/view5...	keywords=?%EE%B8%81%EE%9C%9B%E5%84%AE?SelectIte...
	2008-09-01	08:22:01	W3SVC87257621	140.113.39.213	GET	/collection/view5...	keywords=?%E5%89%9C%EF%8F%B7%E6%86%8C?SelectIte...
	2008-09-01	08:23:30	W3SVC87257621	140.113.39.213	GET	/collection/view5...	keywords=?%EE%B8%81%EE%9C%9B%E5%84%AE?SelectIte...
	2008-09-01	08:24:42	W3SVC87257621	140.113.39.213	GET	/about_yuyuyan...	-
	2008-09-01	08:25:17	W3SVC87257621	140.113.39.213	GET	/collection/view5...	keywords=?%E8%B8%9D???SelectItem=5&SelectItem=&db_men...
	2008-09-01	08:27:33	W3SVC87257621	140.113.39.213	GET	/collection/view5...	keywords=?%E5%89%9C%EF%8F%B7%E6%86%8C?SelectIte...

Fig 3.10 Sample Information of Log File Data

3.4.2 User Identification and Session Identification

Each user should be identified first for the reason that aids us to recognize the session of each user's usage session. Normally, it doesn't mean the same users with the same IP addresses. The research regards those users with the same IP as one user.

Next, session should be identified. (Catledge, 1995) states all events that occurred over 25.5 minutes apart were delineated as a new session. Those consecutive transactions occurring within 25.5 minutes will be grouped into the same session. In the web log mining process, each transaction record has to be determined a session identity. Every user has a start-in time, and the transactions in 25.5 minutes will have the same session id number. For example, a user with IP address, "140.113.73.83", got in the site at 2009/01/01, at 8:00:00. If the next transaction occurs at 8:25:30, it would be set as next session id number.

Input: web log file with *visit_time*, *IP*, *url_stem*, and *url_query*
Output: log file with *session id*, *visit_time*, *IP*, *url_stem*, and *url_query*
Variables: *n* (the number of log record), *sid* (session id), *ip_array* (store the visiting IP address and sid), IP_i (the IP of ith log record)

```
1   sid = 1;
2   ip_array = NULL;
3   while (input_file!= EOF)
4      read one line from input_file and get the IP field
5      if   IP_i  is not existed in ip_array do
6         assign sid to this log record and write this record to output file;
7               create a new record with IP_i  and sid ,and insert it into the
8   ip_array;
9         sid++;
10          else
11             if   (the time of IP_i - the time of the same IP in ip_array) > 25.5
12  min. do
13                delete old IP record in ip_array;
14        assign sid to this log record and write this record to output file;
15          create a new record with IP_i  and sid ,and insert it into the
16  ip_array;
          sid++;
               else
                  assign the sid of the same IP record in ip_array to this log
          record and
                     write this record to output file;
```

Table 3.1 Algorithm of Session Identifier

Then we try to use a session identifier program by using C++, which is used to figure out the session ID number of every transaction. The table 3.1 illustrates the algorithm of the session ID identifier. Session ID numbers will be added after the log files data were processed by this program.

3.4.3 Path Completion and Path Matching

For those data have been cleaned and attached with session ID number, we propose to make these URL completed in order to match our site architecture in section 3.2. The items URL in the log data were scrambled with many kinds of noise data which came from user's query, different browser transferring, and other uncontrolled reasons. To complete these data, we intend to regulate them by using string processing. For example, some URL data from logged data was:

"/collection/view1.asp?keywords=京劇

&SelectItem=5&db_menu=all&view_db=artWorks&no=I0065&workstype=美術作品"

Obviously, we can see the query word, "京劇", keyed in by the user, and it will interfere with the path matching. Therefore, by using string processing these kinds of noise data could be eliminated.

When we make sure the log data are clear for matching step, we can easily use the MSSQL query to match up the log data and the site architecture. There would be two columns in the result table, the session ID number and the ID number of each matched transaction.

3.5 Association Rule Model Establishing

After All data preprocessing tasks are completed; it is time to import the data into the analyzer tool, SQL Server 2005. First we have to query the table from the

database that includes all the log files information. Next, transfer the table into the form of analysis and import the table which we need in association rule mining. After the analyzer process the data, there will be a graphic interface result given. The result will be discussed in Chapter 4.

4. Experiment and Evaluation

In this Chapter, we will focus on the results of the experiment mentioned before in Chapter 3. This Chapter particularly can be divided into three main sections, which is respectively the results of web log mining, user heuristic walkthroughs, and web analyzers.

4.1. Web Log Mining

4.1.1. Data Sets

The data applied to this paper is downloaded from the website server of *Yu-Yu Yang digital art museum* (which is located in http://yuyuyang.e-lib.nctu.edu.tw/ on the WWW). We select the data length for about six months in total. The date range we choose in this thesis is from *Sep. 2008* to *Feb. 2009*. The setting of IIS would produce a log file per day. That is, there are about 180 days amount of data in this research.

As mentioned in Chapter 3, after preprocessing the distinct data, we might import the ordered data into the database.

4.1.2. Analysis of Association Rule Mining

There are many ways in the area of web usage mining. Since the goal of this portion is to discover the rules which can reveal the relationship between organization of website information architecture. The analysis method this research use is association rule mining. By using the analysis tool

of SQL Server 2005, discover the interesting rules in the mining results.

Association rule mining provides the interactive graphic interface (shown as Fig4.1) to display the result of mining. It presents more directly perceived reference than a statistic table. As shown in Fig4.2, the green node means the node we select presently, and the blue one means the result predicted by the chosen node (green). The orange node means the analyzed results which predict the chosen node. The purple node implies the result that predicts the chosen node interactively.

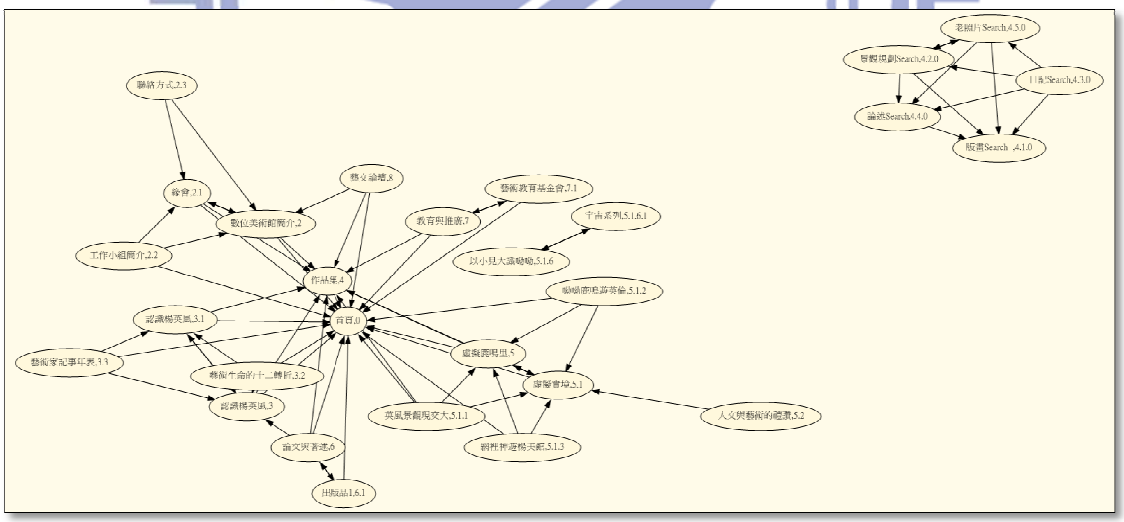


Fig4.1. Result of Association Rule Mining

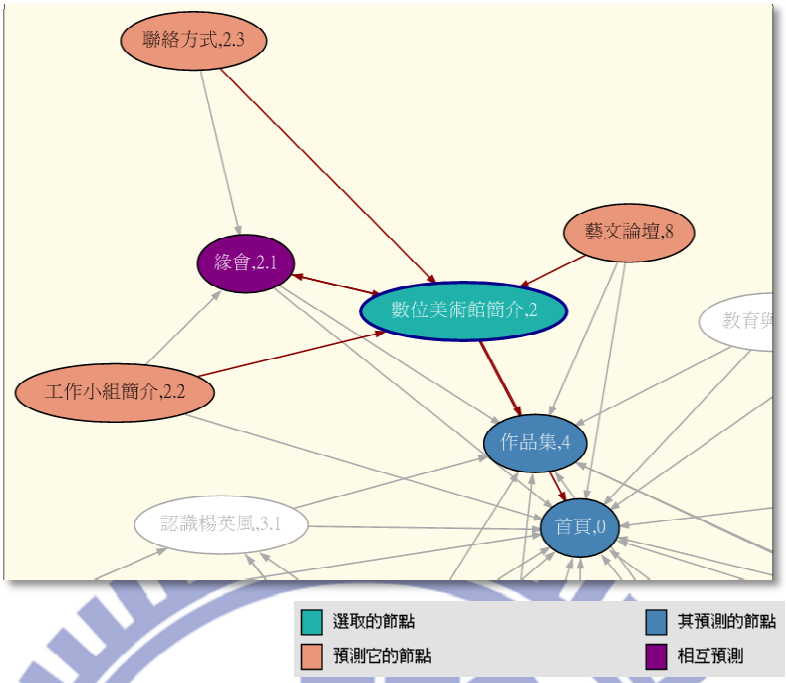


Fig4.2. Result in Microsoft SQL Server 2005 graphic interface

Following we'll pick out some rules in the result of this research.

Nodes predict mutually

There are eight main nodes in the website architecture, including news, introduction of digital art museum, recognition of Yu-Yu Yang, works of Yu-Yu, virtually reality, paper and publication, education and popularizing, and art forum. Almost every main node is the page of its first sub node. From the result of association rule mining (shown in Fig 4.3), we can easily node that except the node 4 and node 8, every main node from the mining result predict its first sub node mutually.

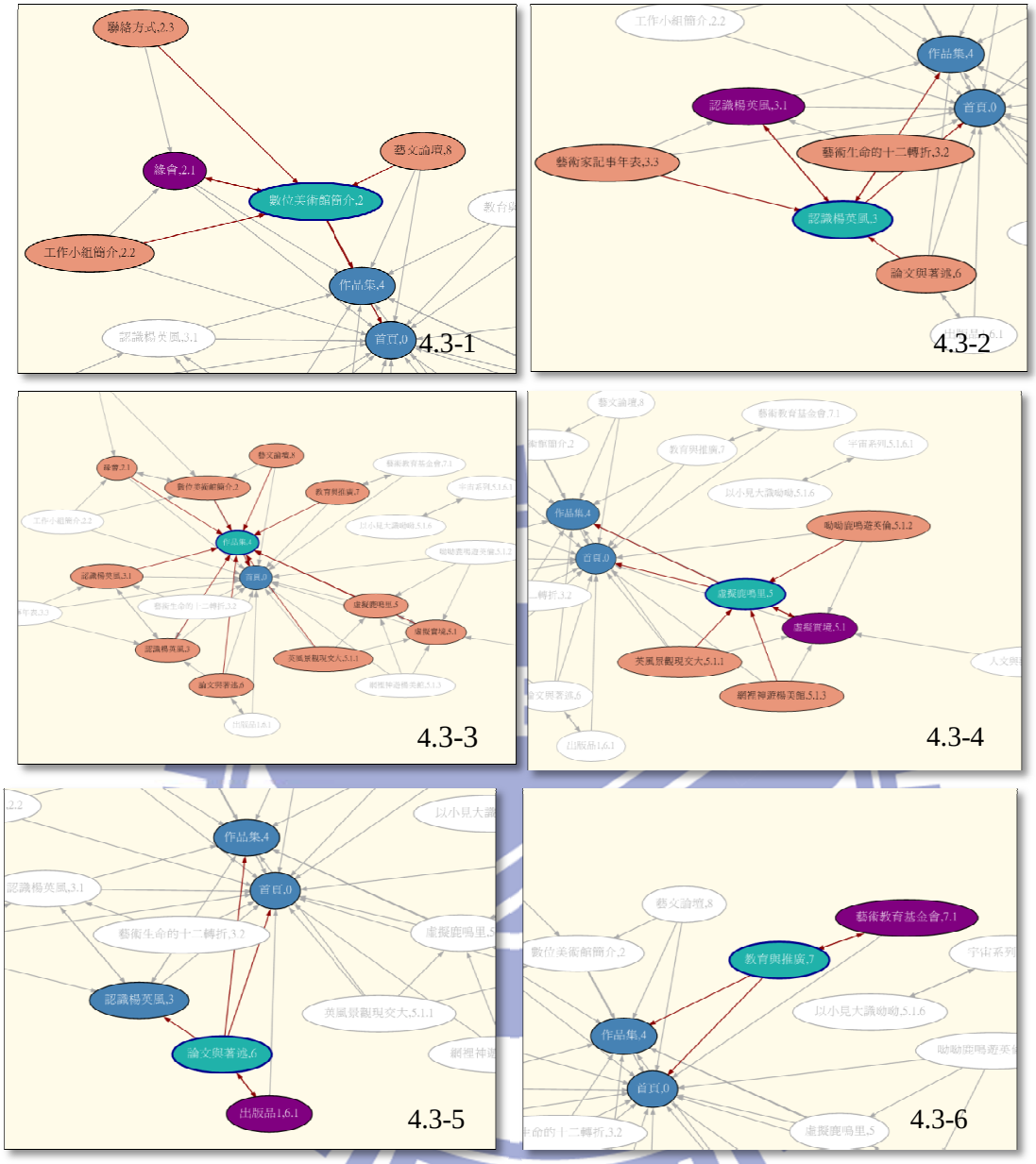


Fig 4.3 Main nodes predict its first sub nodes mutually

Relationship with node 4: works of Yu-Yu

It is obvious that the node 4 which involves most substantial contents would be a significant key node in the eight nodes. From the relationship between node 4 and other main nodes (shown in Fig4.4), every main nodes predict node 4; that is, the result presents user who peruses these other main nodes will highly possible click node 4.

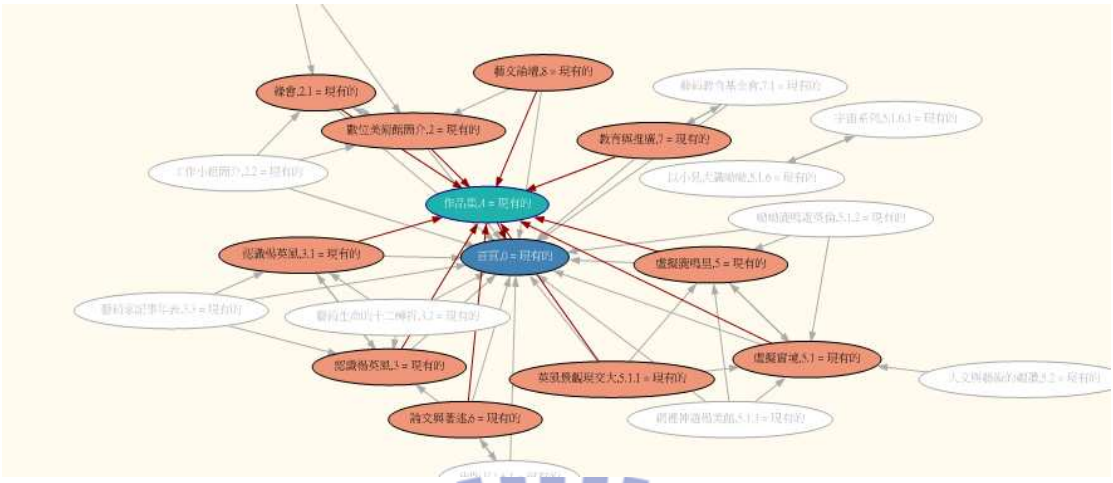


Fig 4.4 Relationship between node 4 and other nodes

Some relationship between two main nodes

There are two remarkable rules which connect two main nodes. One is between node 2 and node 8, and the other is between node 3 and node 6. Both of them are not connected directly. We discover the first one is the relation between node 2 and node 8 (shown as Fig4.5). The rule is shown as 藝文論壇 ,8, 緣會 ,2.1 ⇒ 數位美術館簡介 ,2 with certainly high probability 0.979 and importance 1.7404. It is possible that user who peruses the node 8 which can be left some comment in the message space will want to get more information in the section of introduction of digital art museum.

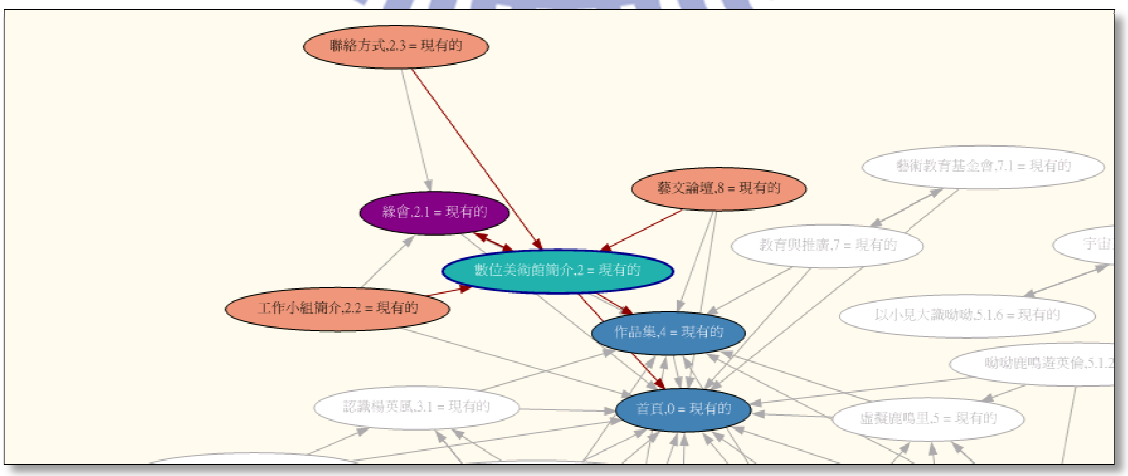


Fig 4.5 Relationship between node 2 and node 8

The other one we want to discuss is the relationship between node 3 and node 6 (shown as Fig4.6), which is relationship between recognition of Yu-Yu Yang and paper and publication. It might be less information in the section paper and publication. Therefore, users may want to know more about Yu-Yu Yang to repair the lack of introduction in the node 6.

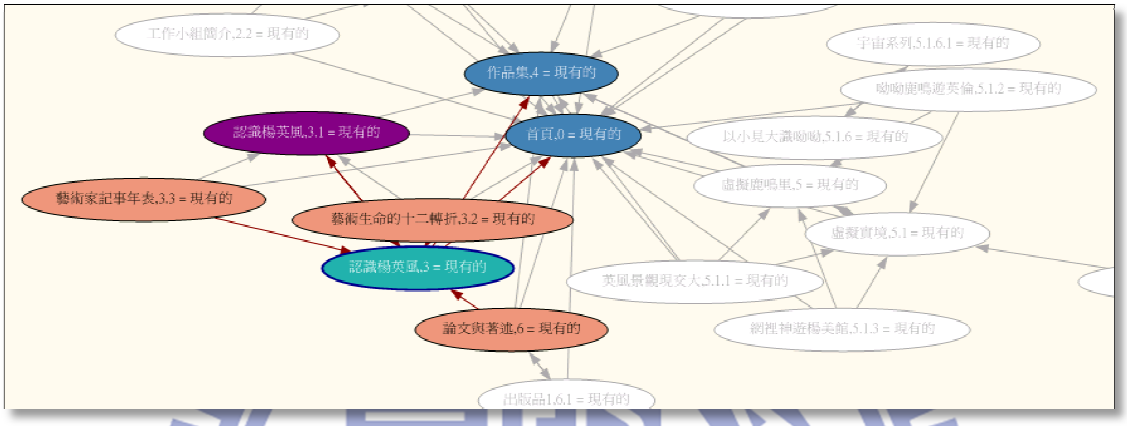


Fig 4.6 Relationship between node 3 and node 6

Indeed, there are still many interesting rules we can try to find out some principles when user browsed in our website. By probing into these rules, we can also realize what the lack in of website is.

4.2. User Heuristic Walkthroughs

4.2.1. Results of Cognitive Walkthroughs

In the cognitive walkthroughs testing, this research chose ten students in NCTU, who are all under graduated. We give them the tasks first and ask the four questions (shown as Fig2.5) in the cognitive walkthroughs. The tasks of this paper are based on the organization of the

Yu-Yu Yang digital art museum. (See the Appendix at the last of paper) We divided the website into eight subtasks. For each subtasks it should be applied and user should answer the four questions.

It is known that when using CW as testing method, there will be 50% problems found if the testees are not expert. The following table shows the result of cognitive walkthroughs.

The following Table 4.1 is the aggregate results of ten testees. From this result, we can find out the area with the most problems is the area about paper and publication. In that area, there are three main parts inside. However, there are only one part can be linked successfully. That is why testee might find most problems in this part.

The area with second more problems is the section 8 with one invalid link and a message space that doesn't work. Therefore, users may discovery some problems from this area.

In the part of recognition of Yu-Yu Yang and works of Yu-Yu, there are both only two problems inside. It can be said that the organizations of these two parts are more complete than others.

		Serial number of the site area									
		1	2	3	4.1	4.2	4.3	5	6	7	8
Serial number of the questions	Q0	2	0	0	1	0	3	1	2	0	0
	Q1	2	3	0	1	2	0	3	7	3	5
	Q2	3	2	1	0	5	1	5	7	1	7
	Q3	0	1	1	0	1	1	2	3	0	3
Total		7	6	2	2	8	5	11	19	4	15

Table 4.1 Result of cognitive walkthroughs

Suggestions of testee

In the process of testing, except answering the four fixed questions, testee still provide some opinions by themselves:

1. Ninety-percent of users have the experience of unsuccessful linking.
2. Sixty-percent of users find some pages without the icon for going back the last page or going forward the next page.
3. Sixty-percent of users think an illustration about clicking the small photo to see a bigger one should be added.
4. These problems are some common and most testees think that they should be improved.

4.2.2. Results of Heuristic Evaluation

In this research, we choose three experts to evaluate the website according to the ten guidelines as we mentioned in Chapter 2. Table 4.2 shows the aggregated result of heuristic evaluation by the guidelines. In the ten guidelines, the ninth guideline is the one with most violation problems. These problems come from that the system can't provide proper help when there were errors. Other guidelines with 4

problems are the third, fourth, and the eighth. The problems include improper layout, unclear labeling, and some inconsistence with general user of controlling design.

Serial Number of Guidelines										
	1	2	3	4	5	6	7	8	9	10
Testee 1	0	0	1	1	0	0	1	0	2	1
Testee 2	2	1	3	3	0	1	0	4	1	0
Testee 3	0	1	0	0	1	0	1	0	2	1
Total	2	2	4	4	1	1	2	4	5	2

Table 4.2 Result of Heuristic Evaluation

5. Conclusion and Future Works

Conclusion

This thesis try to investigate the two inspects of the information architecture of a website, Yu-Yu Yang digital art museum. For one inspect organization system, this research has established a simple organization of the website. Utilizing the web usage mining method, association rule mining, to find out some interesting rules and compare with the organization of the website. Through the rules, some appearance of usage can be observed and discussed. To another inspect, labeling system, a method of usability testing is implemented. By Heuristic walkthroughs, some labeling problems but also organization problems are discovered.

Future Works

With the evaluation and analysis results of this website, it could be improved and enhanced for fitness of users' preferences based on web log mining. Users visiting data can also be helpful to group users and offer personalized services or customized circumstances. Furthermore, sequential pattern mining maybe can be added for another feature of web log mining in this website.

Reference

[1]Agrawal, R., Imieliński, T., and Swami, A. (1993). *Mining association rules between sets of items in large databases*. Paper presented at the In SIGMOD '93: Proceedings of the 1993 ACM SIGMOD international conference on Management of data.

[2]Borges, J., & Levene, M. (2000). Data Mining of User Navigation Patterns (pp. 92-112).

[3]Catledge, L. D., Pitkow, James Edward. (1995). *Characterizing Browsing Behaviors on the World-Wide Web* (Technical Report No. GIT-GVU-95-13).

[4]Cheng, Y. (2009). *Application of Data Mining Technology in E-Commerce.* Paper presented at the Computer Science-Technology and Applications, 2009. IFCSTA '09. International Forum on

[5]Chun-Ling, Z., Zun-Feng, L., & Jing-Rui, Y. (2010, 22-23 May 2010). *The Application Research on Web Log Mining in E-Marketing.* Paper presented at the e-Business and Information System Security (EBISS), 2010 2nd International Conference on.

[6]Cooley, R., Mobasher, B., & Srivastava, J. (1997, 3-8 Nov 1997). *Web mining: information and pattern discovery on the World Wide Web.* Paper presented at the Tools with Artificial Intelligence, IEEE International Conference on.

[7]Cooley, R., Mobasher, B., & Srivastava, J. (1999). Data Preparation for Mining World Wide Web Browsing Patterns. *Knowledge and Information Systems, 1*(1), 5-32.

[8]DONG Li-kai, Q. S.-n. (2008). Application of Web Log Mining Technology in E-business Website. *Journal of University of Jinan (Science and Technology)*(03).

[9]Etzioni, O. (1996). The World-Wide Web: quagmire or gold mine? *Commun. ACM, 39*(11), 65-68.

[10]Jakob Nielsen , D. A. N. (2000). Web-Site Usability:Usability On The Web Isn't A Luxury. *InformationWeek*(773), 65.

[11]Jakob Nielsen, R. L. M. (1994). *Usability Inspection Methods*: John Wiley and Sons Ltd.

[12]Kosala, R., & Blockeel, H. (2000). Web mining research: a survey. *SIGKDD Explor. Newsl., 2*(1), 1-15.

[13]Li, X.-q., Zeng, X.-j., & Liu, H.-f. (2009, 14-16 Aug. 2009). *The research of web log mining in distance education system.* Paper presented at the IT in Medicine & Education, 2009. ITIME '09. IEEE International Symposium on.

[14]Morville, P., & Rosenfeld, L. (2006). ***Information Architecture for the World Wide Web*** **(3 ed.): O'Reilly Media, Inc.**

[15]Nielsen, J., & Molich, R. (1990). ***Heuristic evaluation of user interfaces*****. Paper presented at the SIGCHI conference on Human factors in computing systems: Empowering people.**

[16]Piatetsky-Shapiro, G. (1991). Discovery, Analysis, and Presentation of Strong Rules. In G. Piatetsky-Shapiro & W. J. Frawley (Eds.), ***Knowledge Discovery in Databases*****: AAAI/MIT Press.**

[17]Sears, A. (1997). Heuristic Walkthroughs: Finding the Problems Without the Noise. ***International Journal of Human-Computer Interaction, 9*****(3), 213 - 234.**

[18]Srivastava, J., Cooley, R., Deshpande, M., & Tan, P.-N. (2000). Web Usage Mining: Discovery and Applications of Usage Patterns from Web Data. ***SIGKDD Explorations, 1*****(2), 12-23.**

[19]尹相志. (2006). ***SQL Server 2005 資料採礦聖經*****: 學貫行銷.**

Appendix

Cognitive Walkthrough Sheet

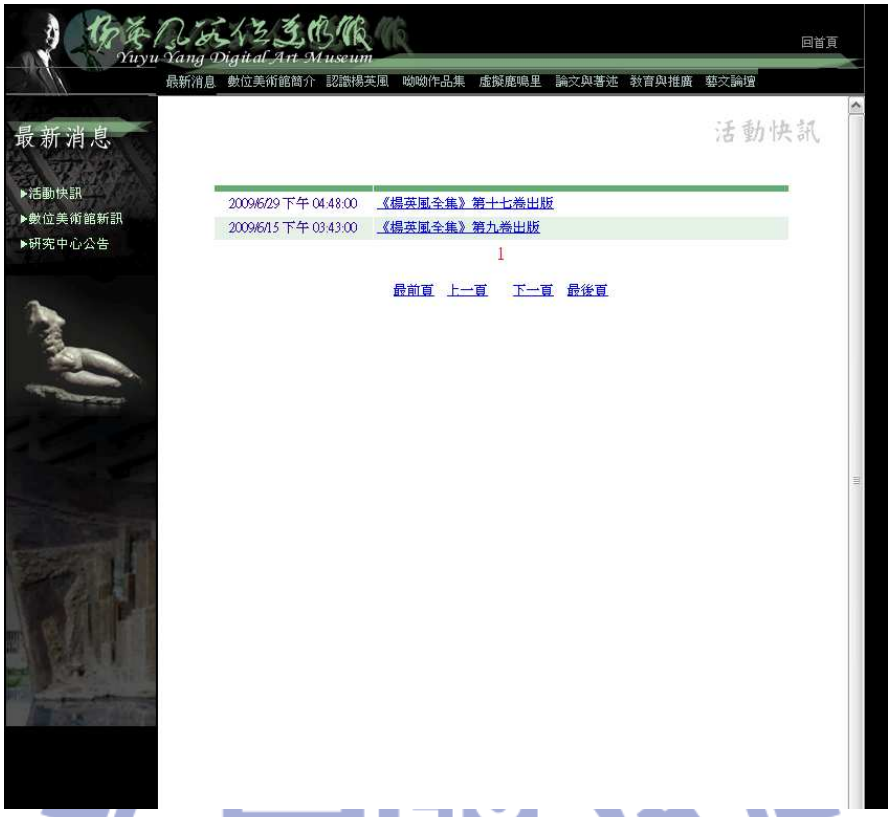
Interface _____
Task _____
Evaluator _____ Date _____

Task Description:

1. 瀏覽網頁：
   i. 最新消息
   ii. 數位美術館簡介
   iii. 認識楊英風
   iv. 虛擬鹿鳴里
   v. 論文與著述
   vi. 教育與推廣
   vii. 藝文論壇
2. 搜尋作品
   i. 利用搜尋的方式找到一個作品
   ii. 利用瀏覽目錄的方式找到一個作品

Action Sequence:
如下列各項目解說
Anticipated Users:
交通大學學生
User's Initial Goals:
使用楊英風數位美術館，瀏覽作品，認識楊英風及其作品。

1.



Task:
瀏覽頁面。

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?
Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？
Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？
Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？

2.

Task:
瀏覽頁面。

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?
Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？
Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？
Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？

3.

Task:
瀏覽頁面。

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?
Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？
Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？
Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？

4.

4.1 利用搜尋頁面進行搜尋

Task:

1. 請在”請輸入關鍵字”欄位輸入**[緣慧潤生]**，選擇**[作品名稱]**，按 Go 進行搜尋。
2. 瀏覽搜尋結果。

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?

Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？

Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？

Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？

4.2 利用搜尋頁面搜尋結果，檢視各分類搜尋結果。

Task:

1. 請在”請輸入關鍵字”欄位輸入[**楊英風美術館**]，選擇[**創作地點/內容地點/拍攝地點**]，按 Go 進行搜尋。
2. 瀏覽搜尋結果。

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?

Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？

Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？

Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？

4.3 利用瀏覽的方式搜尋作品

Task:

1. 點選[美術作品]。
2. 點選[景觀雕塑]。
3. 點選[梅花鹿]。
4. 點選圖片看放大圖以及其他圖片。

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?

Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？

Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？

Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？

5.

Task:
瀏覽頁面。

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?
Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？
Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？
Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？

6.

Task:
瀏覽頁面

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?
Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？
Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？
Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？

7.

Task:
瀏覽頁面

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?
Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？
Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？
Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？

8.

Task:
簡單留言或提問。

Q0: What does the user want to achieve? 使用者想要取得什麼資訊?
Ql: Will the correct action be made sufficiently evident to the user? 有提供正確的動作給使用者當作正確的訊息嗎？
Q2: Will the user connect the correct action's description with what he or she is trying to do? 使用者連接正確的動作有描述出他(或是她)試圖要做的事嗎？
Q3: Will the user interpret the system's response to the chosen action correctly, that is, will the user know if he or she has made a right or a wrong choice? 使用者能否正確地解釋出所選擇的動作所呈現出的系統回應,即使用者是否知道他(或是她)已經做了一個正確的還是錯誤的選擇？