

e-Culture Development for Greater Mekong Sub-region

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ABSTRACT

This research is implementation of an integrated system, which performs distributed, collaborative and service oriented in several platforms for cultural heritage management, called e-culture for Greater Mekong Sub-region (GMS) (Thailand, Myanmar, Laos, Cambodia, Vietnam and China), which have related the culture and knowledge. The developed system consists of 4 parts. The first part is an information provider, which provides up-to-date database, Geo-informatics, map with multi-languages and multi-agents. The second part is virtual reality, multimedia and three-dimension modeling of the historical parks and museum. The third is e-culture portal system, which is multi-channel access, which provides Internet, wireless and mobile users to access the system. Visitors can use mobile devices with Global Positioning System (GPS) to identify current position and link to useful information. Finally, Service-Oriented Architecture (SOA), called data agent service registry, is used to integrate all facilities and applied to solve data and service interoperability problems in GMS countries.

Index Terms- e-Culture, Greater Mekong sub-region, Service Oriented Architecture, Virtual Reality, 3D-Modeling and Geo-informatics, Data Agent

1. INTRODUCTION

The Greater Mekong Sub-region (GMS) is consisting of several countries including Thailand, Myanmar, Laos, Cambodia, Vietnam and China. These countries are rich in culture and heritage sites. The civilization from these countries can be traced back for more than 1,000 years. In order to develop the economic and living condition of people in these countries, the utilization of their culture and heritage sites could be one of the solutions to improve the living condition of the people in GMS countries. The GMS culture and heritage sites information systems can be used as a tool to promote their civilization and link the related activities in the GMS countries. It can be used as tourism activities enhancement and can be used as a tourism tool, for example, the proposed developed information system can be

linked to tourism activities system, such as hotel reservation, advertising and etc [1].

Culture and heritage have moved rapidly from the world of traditional media [5]. The world has ushered in the wave of new media i.e. electronic media domain for documenting the cultural experiences of communities and providing a bigger and hopefully more sensitized community of viewers and appreciators. These have been possible due to rapid technological advancements. These things are required so that people from different parts of the world can visit the gallery from their homes and visitors can draw inspiration from them. Digitalization is both a technological and social development [2]. Facilitated by advances in computer technology and wireless networks, the true relevance of digitalization lies in the way therefore new media and information technology are practically incorporated and utilized in society. Digital technology also plays an important role in the development of networks between people and organizations, especially when it comes to the exchange of knowledge and information [6].

2. DESIGNS AND METHODOLOGY

The developed e-Culture system consists of four sub-systems as followings:

1. The development of Geo-informatics of cultural and heritage sites in the GMS countries
2. The development of multi-media and virtual reality of cultural and heritage sites in GMS countries
3. The development of e-culture portal system for the information from cultural and heritage sites information system in the GMS countries.
4. Data agent service registry which is applying Service Oriented Architecture (SOA) in each GMS country so that the information system can be maintained locally and exchange to other organizations, which can reduce the maintenances cost and benefit from cultural information.

The proposed development can be view as a technology development for the GMS region as well as cultural and heritage sites promotional tools and also information system for administration purposes.

2.1. Geo-Informatics Sub-System

Currently, there are research studies that demonstrate the usage of integrated technologies for cultural studies that made new discoveries around the world. In addition, Geo-informatics technology is utilized in the cultural heritage conservation, reservation, management, and research studies in various cases. For example, remote sensing and GIS was utilized as tools for archaeological analysis together with conventional archaeological analysis methods. There are various cases around the world that remote sensing and GIS was used to assist archaeologists to pin point and help to identify archaeological sites. For example, the discovery of the city of Ubar in Sahara desert from the analysis of remote sensing data, ground data and field survey data, or the case of missing China wall that was buried under the ground by analyzing SIR C radar data from space shuttle. The methodology was apply to identify the ancient water reservoir in the historical town of Phimai, Nakorn Rathchasi, Thailand [7]

By utilizing geo-informatics technologies and open source software development for GMS e-culture study, we will have a better vision of the relationship between cultures, people, between civilizations in the GMS countries. This understanding will be certainly important to the region, and to the people in the region [8].

The system that has been developed is in the form of internet map server containing the cultural heritage information together with the basic datasets such as cultural heritage point, city point, road, railway and etc. as shown in Fig 1 and 2. The system was developed over the open source software.

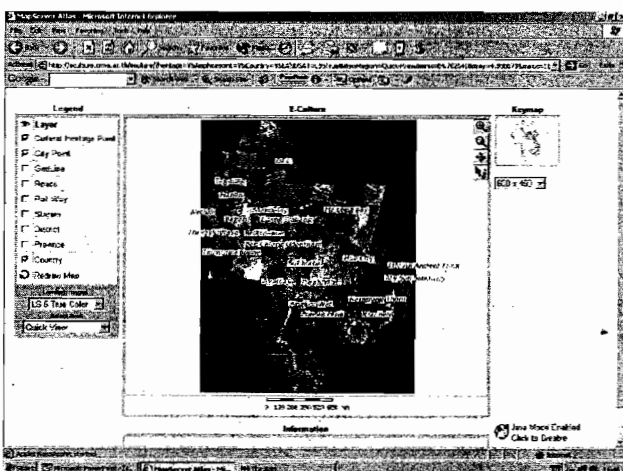


Fig. 1. Layers of datasets from E-Culture Mapserver

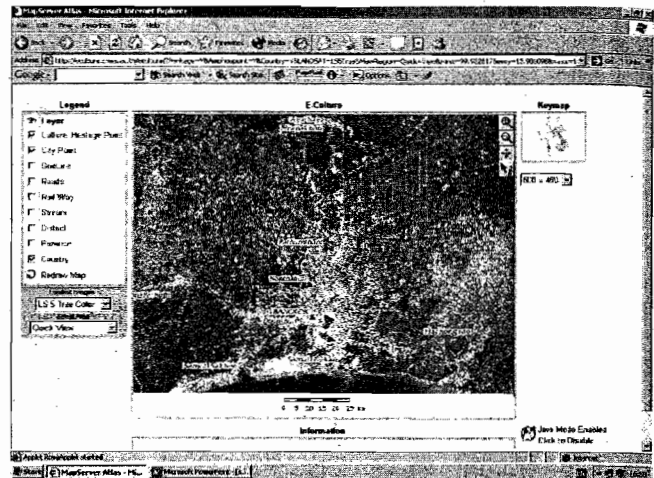


Fig. 2. Sample output from E-Culture Mapserver

The detailed system consists of the Mapserver Application Software Component which is consisted of:

- Linux Mandrake 10 RC1
- Minnesota mapserver Version 4.01
- Gd version 2.0.20
- Gdal version 1.1.9
- Php version 4.3.4
- Proj4 version 4.4.7
- Ming version 0.2a
- Curl version 7.10.5
- Png library version 1.2.5-10
- Tiff library version 3.5.7-11
- Pdf Library version 4.0.1-1
- Zlib version 1.2.1-2
- Freetype6 library version 2.1.7-4

2.2. Multi-Media and Virtual Reality Sub-Systems

Virtual reality (VR) is an environment that is simulated by a computer [5], [9]. The virtual reality in this research can be displayed on a screen of several kinds of computer including personal computer, laptop and mobile device such as mobile phone or PDA. Visitors can often interact with a VR using standard input devices such as a keyboard mouse or joystick. The advantages of developed system are the following:

- Make site more interesting for the visitors, the simulated environment can be similar to the real world.
- Low bandwidth consumption: There is a process to optimize size of image files; therefore, it can be use in low bandwidth connection such as GPRS.
- Security: This system uses J2ME MIDlet which packaged program code and data together.
- Working both online and offline for mobile devices: after the application is downloaded to the client, it will disconnect all connection and can work standalone.

Panorama-Images are used in this research for the virtual reality [9]. In order to use panorama camera, the first step is to prepare a location for taking photograph in 360 degree. Each picture uses 20 degree increment. The second step is to adjust all photos using general graphics software. This adjustment is called retouching and stitching. The last step is to upload panorama image to the server as shown in Fig.3.

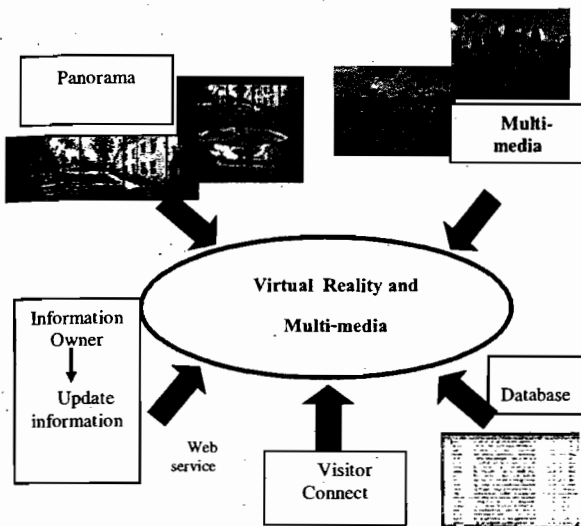


Fig. 3. Cultural database's virtual reality and multi-media is integrated into the system which provides information owner in each country updates and exchange to others using service oriented architecture.

This application is available to visitors who wish to explore the interesting place. Such application can help the visitor to learn in more efficient way [4]. It provides site interpretation of cultural heritage virtually, especially for historical and difficult learning issues. In more detail, the development of this application has involved: capturing a real set of application requirements, investigating the properties of wireless communication technologies in a built-up environment, designing and populating an information model to represent attractions and key buildings within the specified city.

This application has sufficient flexibility to enable visitors to explore and learn the landscape in their own way. The information presented to learners by the system like a virtual tour. The learners can survey and study the place before they would travel. This system allows visitors to reality walk around using their computers as shown in Fig 4.

The visitors can get all the relevant information on the move, anywhere while traveling. So this application can be act as a virtual guide for that tourist or visitor. Another advantage is that the visitor can use this application previously visit to the certain place too. This might help him to explore the selection of the place that visitor want to visit. This developed system can use either online or offline. If

visitors use mobile devices, they can download information to the phone to save the connection expense. After they select the place or objects which they want to know the history, multi-media information will be presented to visitors such as sound, video 3D-modeling and animation which related to the selected objects as shown in Figs 6 and 7.

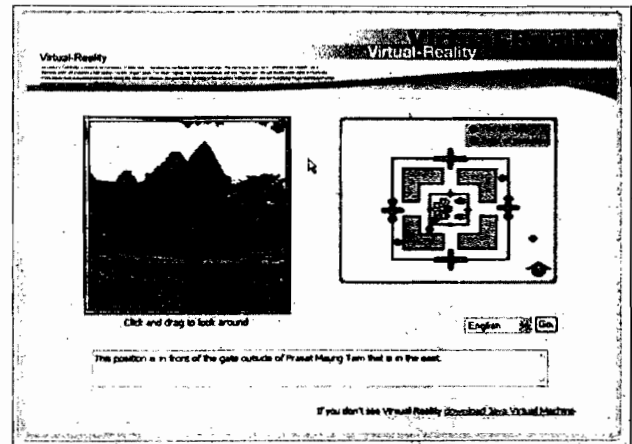


Fig. 4. Sample of virtual reality of interesting place

For the mobile devices [10], all photographs have to resize to 100x144 pixels. Such resize may vary from mobile to mobile screen resolution. This scale is optimized for mobile phone screen. Each panorama-image consumes 10 pictures (36 degree angle) as shown in Fig 6. The selection of the angel is depending on the location. The 36 degree should be used for the wide area and less than 36 degree for the narrow area. Since mobile device has no accessories such as stereoscopic display, glass or wired glove. Therefore keypad is the only way to control the direction of the panorama view. It can be displayed on a simple screen display on mobile device. In general the processing power for mobile devices, which support Java, is enough to run this application. It can be used any-where any-time, due to it is running on mobile environment. Visitors can use mobile devices with a global positioning system (GPS) to identify current position and link to related and useful information such as interesting places, accommodations and etc. as shown in Fig 5.

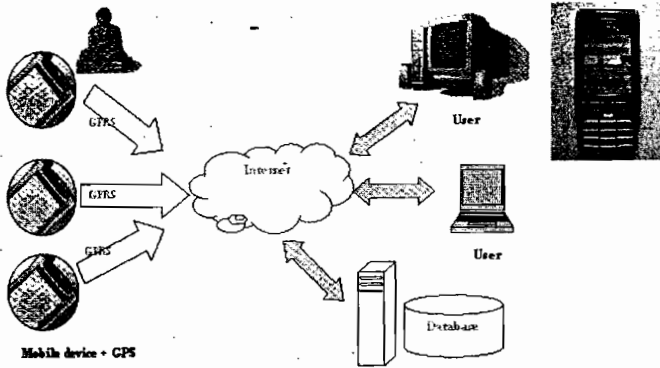


Fig. 5. Multi-channels access to e-culture portal system and sample of information displaying in a mobile device with GPS



Fig. 6. Samples of information displaying in a mobile device.

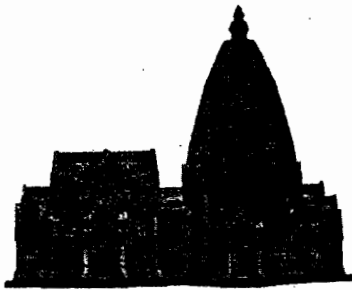


Fig. 7. Sample of three-Dimension model of the interest object in multimedia information

2.3. e-Culture Portal System

The e-Culture portal is one of sub-system aiming at the development of interdisciplinary activities in research and knowledge management. It promotes information exchange, dialog and communication among cultural persons from

different country in the GMS, to develop their own approaches and practices in various disciplines and update of knowledge connected to the e-culture system as shown in Fig 8. It supports multiple languages such as Thai, English and will support all language in the GMS such as Chinese, Khmer (Cambodian), Lao and Vietnamese in future. Fig 9 shows collaboration by an interdisciplinary group of cultural professionals from different countries in the GMS. It features in the following sentences:

- Contents and document management which support cultural content and document creation and provide mechanisms for authoring, approval and scheduled publishing.
- Collaboration which provides members to communicate and discussion for exchanging their knowledge.
- Search and Navigation using keywords, types, period and region of cultures from e-culture repositories.
- Entitlement: the ability for administrators to limit specific types of contents and services users has access to the e-culture database system.
- Integration: all functions and data from multiple systems can connect to new components by using cultural metadata which organized by members in this project.
- Single sign-on: e-culture portal can provide single sign-on capabilities between users and various systems; this requires a user to authenticate only once. Access control lists manage the mapping between portal content and services over the e-culture user database.
- Multiple-devices access: e-culture portal can provide multiple devices such as personal computers, laptops, PDA and mobile phones connect to the e-culture portal system.

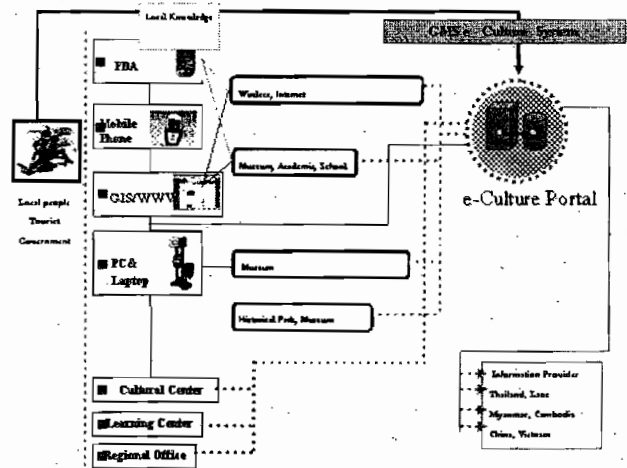


Fig. 8. shows the conceptual model for e-culture portal system



Fig. 9. Sample of e-culture portal system.

2.4. Information Exchange using service oriented architecture (SOA)

Recently, the managing and exchanging cultural data between various organizations has limitations of different standard format, for instance the differences of data schema specification, operating systems and database system or engine. These are resulted in difficulty and mistaking of exchanging the cultural record information shared between culture organizations.

Service oriented architecture (SOA) is a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains [3]. It provides a uniform means to offer, discover, interact with and use capabilities to the producer and desired effects consistency with measurable preconditions and expectations. SOA can create benefits for cultural information management in GMS.

For the developing this system, there will be building and exchanging the culture metadata of each cultural organization as shown in Fig 10. In order to share information on the e-culture system, data Agent will be in charge of managing and exchanging information under the standard agreement of metadata.

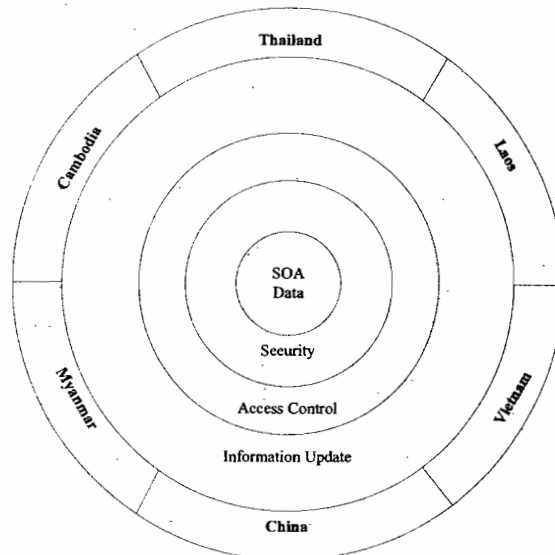


Fig. 10. Show GMS counties update their information, which already defined the same data models, security policies and access control in the e-culture service oriented architecture.

Web services interfaces are enabling multi-channel access including Web, Java, .net, mobile devices and so on. It provides methods to request services from e-culture service provider and sending data in XML format.

In Fig11, Service-oriented integration is applied for integration of web services because it can solve the interoperability problem among several culture information providers which have different architectures, platforms and data models. The existing data models were refined to accommodate this information integration. Formal service contracts were defined beyond web-service definition language (WSDL) definition to include rules, security and management policies. Data transformation was used to map data between different data models when the data cross service domain boundaries.

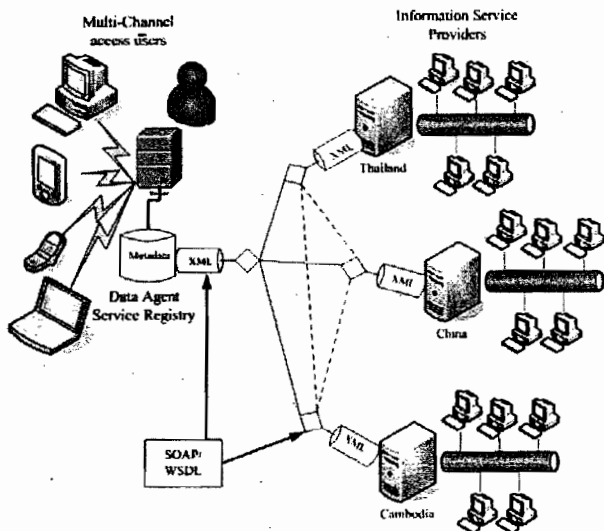


Fig. 11. Shows Service-oriented integration with store data service and process models for the service domain in each country in a metadata repository. Users from multi-channels can access to e-Culture system, which link to Data Agent Service registry for information integration.

3. CONCLUSIONS

The developed system, called e-Culture system, can work with both Intranet and Internet in Greater Mekong Sub-Region (GMS). For the Intranet case, the software supports management information system and Geo-informatics technology which assists the administration of historical sites and antiquities registration. It reduces the redundant work and enhances the efficient administrative work that is directly useful for historical parks and museums. It is also dissemination of knowledge and information to the public through the Internet. Moreover, it makes the people have motivation to visit the real places. Besides, the visitors can access information, which describes history, map, archeology, art history, linguistics, languages, literature and etc. through this virtual reality, multi-media and 3D-modeling systems. Therefore, this system is the good knowledge resource for education and research as well. The software can handle working level for both administrative part in the Intranet and accessible information part in the Internet with the authentication system and security system. A principle of design of this virtual reality (VR) system emphasizes on user-friendly design of the administrative and manageable data. The data are stored in multiple database systems and interoperability using service oriented architecture. The public can access information such as fine arts and culture through World Wide Web via the Internet. Up-to-date data is modified by the data owners who are historical parks and museum staffs. The portal system can be extended without limitation and it can be connected from multiple devices such as personal computers, laptops and

mobile devices which will enable knowledge based society in the future for all GMS country.

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