

DESIGNING THE VIRTUAL DESIGN STUDIO SYSTEM FOR COLLABORATIVE WORK ON PDA

Collaborative works Anytime, Anywhere

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Abstract. This research presents the collaboration in the VDS system through a microcomputer technology- a PDA (Personal Digital Assistants). Architect can collaborate anytime anyplace via VDS, a substitution to an old system that requires a specific location to work on. This research has studied and analyzed the format and the limitation of collaboration between PDA and Personal Computer, the wireless communication technology, and the Web Service technology, which enable different devices to share information through the Internet Network. The work process and the studied information have been used to develop a Web Application, a collaboration tool for a team of architect and designer. This Web Application has been tested in a renovation project, a clubhouse for a scuba diving place. The objective of this research is to become a guideline of collaboration in architectural design work through Smart Object in order to serve the coming Ubiquitous era (Weiser, 1998)

1. Introduction

VDS is a collaborative system for an architect team that works in a separate area. The system deploys the Internet Network as a medium to share information and understand the project in design (Mitchell and McCullough 1995). There is a limitation in working environment, which has to be a certain location where your personal computer is located and it has to be a place where you work on a regular basis. This forbids mobility and collaboration in a remote area. For Notebook Computer, there is still a limitation in term of size, weight, and convenience when user works outside the office and change location all the time. In the future, the city life and the working life of an individual will change along with the rapid changing of computer and communication invention (Mitchell, 1999). In the 21st century,

computer will pace into an Ubiquitous era where everyone can have an access to information and the use of computer anytime, anyplace. We need an electronic device, which is easy to carry on, to do basic tasks like “sending” and “receiving” digital information. These devices can be carried around to connect to the system, display the result. They are controlled via a wireless system, connected to the network in order to generate result and work together (Mitchell, 1999) Recently, there is a computer invention, PDA Personal Digital Assistants, which has been receiving much interest regarding its mobility due to its small size. The recent development of Hardware and Software has made a PDA almost as functional as a Personal Computer (Zorkia, 2002). However, there is still some limitations when PDA is used to collaborate with the work in office computer especially the collaboration in architectural design. The difficulty comes from a device property, hardware, software, user interface, usage behavior, presentation format, and technology that allow two different devices to work and share information. This research uses a Pocket PC in the test since its architectural standard: software, hardware and device application, is similar to those of a regular Personal Computer.

2. The Concept of VDS on PDA

“Collaborative works Anytime, Anywhere” is the main idea of this research. Imagine one weekend that you want to hang out on a beach or read some good books in a park without having to carry around many gadgets or notebook with weight at least 1 kilogram, simply one good book, a cell phone and a PDA in your pocket. While you are enjoying your resting moment, a colleague who you help working on a sketch of one project calls from aboard. He tells you that there might be some problems since he cannot understand the sketch. Suddenly you tell your colleague to open his computer and connect to the Internet just to save long distant call cost. Then you bring out your PDA, hook up the slot into your mobile phone and get an automatic access to the Internet via GPRS. You will then open the program that has been developed for the collaboration between PDA and PC in the design work. You will see your friend waiting online in the Cyber Space world and then you will start to make a conversation and Representation until your friend gets an idea of what you have designed. You can log out of this virtual office and get back to the real world where deep blue sea or maybe large tree in the city park lie in front of you. The present technology can make this happen if we understand the principle and process and use system and Digital media device to support the lifestyle you want.

3. The Limit to share Environment between Pocket PC & PC

3.1 User Interface

The major limitation is the difference between the screen size of a PC and a PDA. While a PC has a resolution of 1024*768 with 32 Colors bit, a PDA has only a resolution of 240*320 with Colors 65,536. This is a major problem faced in the collaboration especially in the Representation which requires more space to display information, both content and media, for the decision-making analysis. In comparison, it is as though we have an A3 sketch, but we have to present and display all the information in many pieces of small paper instead. In such case, it is necessary that content be prioritized before the presentation. Usually, when we look at a regular computer screen, we can see the information displayed on different templates which may include the combination of title, text message, picture and other media that allow viewers to understand a complete information through the screen. The display space of a PDA is very limited. Viewers will see only a portion of information designed to be displayed on a regular screen which makes it difficult to understand since viewers will have to scroll without a sense of direction of how one part of information relates to another. When there is collaboration between a PDA and a PC in the presentation, a template should be designed in such a way that information is presented in series and the message used must also help articulating the information. This will make it easy for a viewer to scroll through the presentation without losing the direction. (Figure 1)

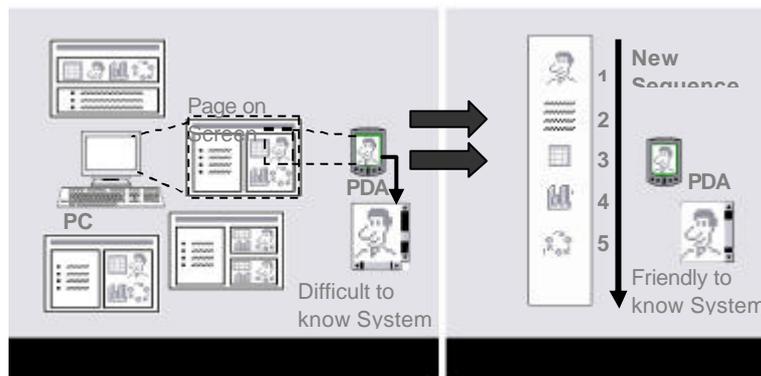


Figure 1. The method for a presentation order through a PDA screen

3.2 Hardware and Software Environment

The limitation of the efficiency in the collaboration between PDA and PC (Table 1) in the VDS system requires a centralized environment. The design

application and information must be stored in a central server because of the difference in storage memory between PDA and PC. This will reduce the complication and time period in the development of a program that compatible with both PDA and PC. The data storage and the use of an application in the form of centralized environment through Internet web-based is a more suitable alternative. User can have an access to the application and information through a Web Browser, which has been pre-installed in the operating system of both PDA and PC. The pros and cons are:

Pros

- Minimize the memory usage on a PDA by allowing the application and information to be stored in a central server
- Information is updated on a regular basis, informing team members about the progress
- Ability to work at a different time

Cons

- Require a very stable Web Server since every relevant process and information has to be accessed through this system
- Unable to collaborate and view information when Web Server down

TABLE 1. The comparison between PDA and PC

| Type | PC | Pocket PC |
|-----------------|------------------------|-----------------------|
| Processor Speed | 800 MHz | 206 MHz |
| Memory | 20 GB Harddisk | 32 Rom |
| Ram | 256 MB | 64 MB |
| Display | 1024*768 32 Colors bit | 240*320 Colors 65,536 |
| Connection | Modem, Lan base100 | GPRS Mobile |
| Action | Keyboard, Mouse | Stylus |

3.3 Integration Software and file type

At the beginning, PDA has been designed to memorize daily information such as phone number, schedule, and to-do list. This information can be backed up in a Personal Computer. Later on, PDA has been developed to a more functional device that allows us to transfer information from a PC frequent-used application to a PDA (Table 2). The problem does not exist if the work is only on the Text Mode, but it is not the case for an architectural work that

deploys 2-3 dimensional information, both Bitmap Image and Vector Image File. It is necessary that we set up the standard and guideline for the use of information in accordance to the collaboration between PDA and PC. Although the graphic or images helps portray the meaning, elaborate the message and create much usefulness, in reality it takes much longer time to download graphic than to download text through the Internet especially when we work with VDS system via a PDA. The limitation of hardware and wireless connection requires a careful consideration when graphic is used in the presentation.

TABLE 2. The comparison Application between PDA and PC

| Type | PC | Pocket PC |
|---------------|-------------------------------|-------------------------------|
| Word,Text | Ms Word | Pocket Word |
| Spreadsheet | Ms Excel | Pocket Excel |
| Database | Webbase | Webbase |
| CAD drawings | Autocad 2002 | Pocket CAD PRO |
| Email | Outlook Express,mail form web | Pocket outlook, mail form web |
| Chat, Meeting | MSN messenger | MSN messenger |
| Web Browser | Internet Explorer | Internet Explorer |
| Media | Windows Media Player | Windows Media Player |
| Graphics | Photoshop | Microsoft Render |

3.4 Image

Collaborative worker has to be careful about times used in downloading and the display area due to the problem about speed of the system and the limitation of a PDA's screen. Image file should be optimized to the smallest size. Since Web Browser displays image with 1 to 1 pixel according to computer screen resolution, the size of images used under this system should be less than 240x320 Pixel with resolution less than 72 Pixels per inch. This will allow those who view the presentation from a PDA to see an image information within one screen. This makes it convenient to work and speedy to download the information.

4. Adopted Technology in the Collaboration

4.1 Technology used in tool development

The main point in this research is to allow different devices to collaborate and share information through the Internet Network by using XML (eXtensive Markup Language), a new language that breaks the limitation of HTML, with Web Service property. The language structure of XML allows developer to freely assign tag to the information and define the meaning of text messages in the document, giving the software more freedom to generate result. The XML property in Web Services allows every kind of information to be accessed, interchanged, and used from any device-anytime, anyplace.

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All Web Service will run on Internet Protocol in other word they will run on HTML, TCP/IP by using XML language as an encoder and decoder of data transfer between client and server. The request sent will be transformed into XML and the real-time response will be XML as well.

4.2 Communication Technology

This test has set the PC to adopt wired communication technology through Base 100 Network connected via host. It is as if working in the office where computers are connected like a network. PDA is connected through a wireless communication technology using a mobile phone as a transmitter through GPRS system (General Packet Radio Service), which is a data transmitting technology between mobile phone and the Internet Network with the maximum speed of 40 Kbps. The “Always On” property of GPRS allows user to connect to the Internet all the time even while using a mobile phone. It is the fastest technology in Thailand at the moment. One drawback of the GPRS is its usage fee that charges according to the size of information sent. If VDO Conference, which required a large amount of data sent and received, is used via VDS system, the usage fee will be very high.

When we combine every limitation and technology mentioned above, it will bring about the development of VDS infrastructure for the collaboration between PC and PDA in the Representation process of an architect team as shown in Figure 2.

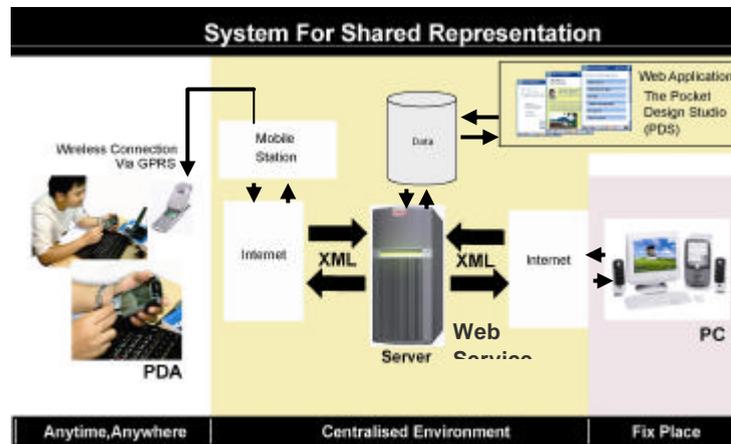


Figure2. VDS infrastructure between PDA and PC in the Centralized Environment with Web Service Technology

5. Design Project For Study

The renovation of an old building to a Clubhouse of Royal Thai Navy scuba has been used in this research. The site is located 200 Kilometers away from the office. In the VDS system test, designers have carried PDA and Mobile Phone to collect data from the site. They have photographed the site by using a digital camera that hooked into a PDA, recorded site information by using Notes program, then saved information both text, sketch and sound and sent them to the office via GPRS. The information sent includes infrastructure size of the building, topography site, and perspectives. Office designers then created a sketch and tried the Representation about sketch and comment on the renovation area via VDS system that has been designed to support the collaboration between PDA and PC Fig

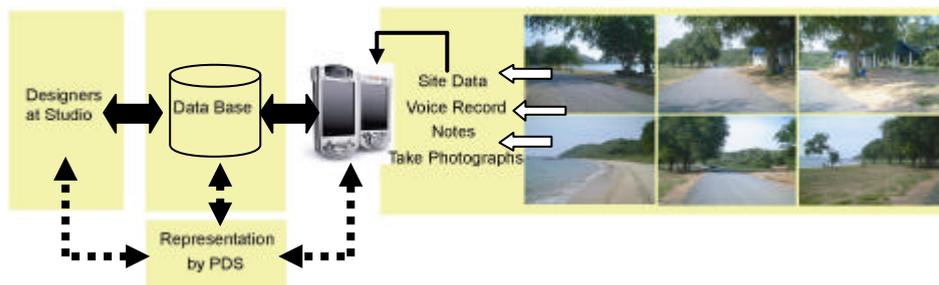


Figure3. shows the process of using VDS on PDA in the project starting from site data collection

The Pocket Design Studio PDS

The Pocket Design Studio is a web application that has been developed for the VDS system test in the Share Representation process between PDA and PC. It uses Web Service property that used XML as the standard language to support data interchange between different devices. PDS has support tool for both Synchronous and Asynchronous called Work Place. Moreover, there are necessary databases to support decision-making about the design of the project such as Digital Library, Project Data, Task Management, and information from team member (Figure 4 and 5). Synchronous will consist of 2D Sketch Comment tool and Chat tool to exchange idea about the sketch on real-time basis (Figure 6). The Asynchronous Tool will consist of Web Board with page layout that prioritizes the messages to be displayed and size of images in accordance to the usage on PDA, which has a small screen. This makes it easy for a viewer to understand the message being posted in order (Figure 7).

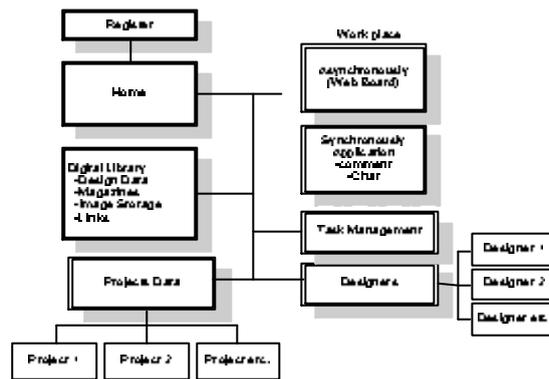


Figure 4.5. show the infrastructure and characteristic of PDS program

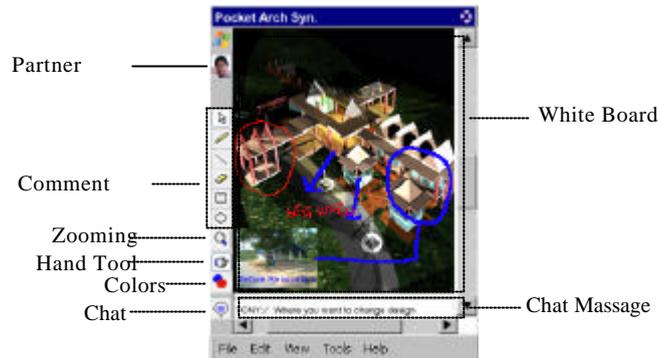


Figure 6. shows Work Place in Synchronous mode

6.1 Synchronous

Synchronous environment of PDS program consists of the following tools:

- Partner Image presents image of colleague who we do the Representation with by automatically extracting the image from the database. This serves as a substitution to the lack of tool for VDO Conference.
- Comment Tool consists of tool that use to comment the sketch including the Selector to select object, Highlighter to mark comment of the sketch, Line to draw line, Eraser, and the tool to build Rectangle and Ellipse
- Zooming is a tool to ZOOM IN and ZOOM OUT
- Color is used for selecting color for Highlighter, Line, Rectangle and Ellipse
- Chat is a command for text conversation
- Chat message displays interactive message
- White Board is a sketch presentation space. It supports only 2D-image presentation at the moment



Figure 7. presents Work Place in Asynchronous Mode

6.2 Asynchronous

Synchronous environment of PDS program consists of Web Board with page layout that prioritizes the messages to be displayed and size of images in accordance to the usage on PDA, which has a small screen. When someone posted a message, the information of that person, including name, date, time and contact address will be displayed after the system gets the information from the database. The rest of the message will be posted message and presentation image, making it easier to understand.

7. Summary of Project

After the use of VDS system has been tried with PDA in the test, team of designer can work more convenient and faster due to the mobility of the device they carry around to collect information from the site and send back the information to the office immediately. When the team need more information or do not understand the information they received, designer at site can then communicate and exchange the understanding or get more information to be sent to the office colleague immediately. However, there are still many problems that need to be solved such as the disconnection of phone signal, the unstable speed of data transmission through wireless system which results in relay when we work on Synchronously mode. The limitation of size when PC designer send information to PDA designer requires Data Optimization. Invariability of media used is also a limitation. At the moment, PDS can only use image media for the Representation. If other file such as DWG has been sent along, user will have to log out the program to view this information by Pocket CAD pro instead. The limitation in group-communication when many designers work together at the same time in Synchronous Environment has been extended to only a peer to peer basis.

Conclusion

The result from the research, the design of VDS System and the development of PDA-PC collaborative program will be the beginning of a substitution to the traditional VDS. The new system will create a new discipline and work process regardless of location and working environment. Team of architect and designer can use this system as a communication tool to exchange idea and information about the sketch in the collaborative environment. This will serve the lifestyle of the coming era, a society that combines computer, control and communication technology, enabling a team of designer to collaborate in creating the architectural work anytime, anyplace.

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