

A GROUP WARE FOR ASYNCHRONOUS DESIGN COMMUNICATION AND PROJECT MANAGEMENT

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Abstract. The number of Virtual Design Studio experiment that used WWW (Digital Pin-up Board) and e-mail for a synchronous communication, is rapidly increasing. There is no doubt that those media are quite helpful, but it also became clear that writing and managing pages of DPB require extra work for designers and technical staff to proceed with collaborative design. To make VDS a popular approach of collaborative design, developing convenient tools to support writing and managing pages of DPB has become inevitable. This paper discusses a prototype of group ware that supports asynchronous design communication with DPB: GW-Notebook that can be used with common web browsers on net-PCs.

1. Background and Objectives

How to refine and upgrade the environment of both synchronous and asynchronous communication among the members of a geographically dispersed collaborative design team, has long been an important technical issue. Even when a team works in one office space, asynchronous working style and the use of digital tools that are operated on a individual display often prevented timely sharing of specific information, or achieving a general understanding of project progress, among members.

Various experiments of Virtual Design Studio have suggested an appealing solution to those questions that applied to network information technologies, such as WWW (Digital Pin-up Board), e-mail, or video conferencing system (Wojtcwicz 1995; Maher 1995; Yee 1998). However, it also became clear that designers needed a convenient support system before they could make full use of those technological advantages (Morozumi 1997; Schmitt 1998). Use of Phase(X) for collaborative design, that followed a case based design approach, is a suggestive example (Schmitt 1998, Kolarevic 1998). This paper discusses necessary features of group-ware to support asynchronous design communication with DPB and its prototype, which the authors have developed: GW-Notebook.

2. Problems Observed in VDS Experiments

2.1. TWO EXPERIMENTS

Kumamoto University, Kyoto Institute of Technology, and Massachusetts Institute of Technology conducted a five-week long VDS experiment in the summer of 1996 (Morozumi 1997; Yee 1998). Three teams were formed with one member from each university to compete a design of a monument for an exhibition built in a vacant lot of CBD, Kumamoto City. In this project, DPB became a central place of design communication, as there were no other means of displaying and exchanging design information among team members.

In the fall semester of 1996, and 1997, Kumamoto University introduced a DPB based communication technique into a collaborative design project of a studio to enhance design communication in the class. In a conventional studio, even though it was conducted in one space, they were unable to exchange ideas among each other, or to share advisers' comments in the class. This was true partly because the working schedules after the class were, different from students to students, and partly because they hesitated in asking others which interrupted their work. Sketches and design data posted on a DPB for a 2-week cycle, clearly stimulated students to explore more variations and also benefited the staff by being able to make timely and specific advise to students. (Morozumi 1998)

2.2. TECHNICAL PROBLEMS FACED DURING THE EXPERIMENT

- 1) Students who wanted to work up to the final minutes of presentation, writing web pages and uploading them to DPB, felt it was a barrier of communication.
- 2) Building and maintaining links required members to make much effort. Though most of the team nominated someone to the special task of webmaster to avoid confusion in web construction, enthusiastic assistance of the technical staff was frequently needed.
- 3) In the first experiments, web pages of each team were located in servers at different locations. Such web structure made DPB handling much more difficult. Soon after the project ended, many parts of DPB were lost because it was difficult to back-up whole parts.
- 4) Rasterized images of CAD drawings on the web, lost detail when they showed large and complicated buildings.
- 5) The bulletin board was quite convenient to develop asynchronous discussions, but discussion without graphic image prevented easy understanding.
- 6) Participants, especially in the first experiment, had to spend time in

exchanging e-mail to collect information necessary for project management, such as coordinating schedules, questioning, and reporting project progress.

3. Overview of GW-Notebook

To solve problems listed above authors have started a project to develop a prototype of DPB that has various utilities to support data handling and asynchronous communication: GW-Notebook.

3.1. GOALS FOR THE SYSTEM DEVELOPMENT

- 1) Use simple web-structure with minimum pages necessary for collaborative design, both in studio education and practical work in a design office.
- 2) Handle all web pages of DPB in one web server, allowing designers to upload and share information from Internet PCs of remote locations with a popular web browser and plug-in software.
- 3) Provide easy utility to upload and to visually present various types of data on web pages; graphic files, CAD files, or document files.
- 4) Support designers copying data from one page to another without being troubled with link structure.
- 5) Provide pages in which comments can be exchanged beside design documents.
- 6) Provide pages to support project management activities to reduce unnecessary communication among members.

3.2. ENVIRONMENT OF THE SYSTEM USE

GW-Notebook is written with Visual C, as a special web working in an ASP environment. It can be used by just accessing designated URL with a popular web browser such as Internet Explorer 4.0, in addition to digital design applications for producing design documents. It has necessary utilities to upload JPEG or GIF formatted graphic files, DWG or DWF formatted CAD files, and DOC formatted document files as well as to type in texts for respective pages. It requires one to plug-in "AutoDesk View" to view and manipulate DWG or DWF files on a web page. It is possible to browse any GW-Notebook site with Netscape Navigator 4.0, but some of the utilities cannot be used.

When a browser is shared with Microsoft NetMeeting and a video conferencing system such as CU-SeeMe together, the GW-Notebook will also become a base of synchronous communication.

3.3. PAGE STRUCTURE OF GW-NOTEBOOK

GW-Notebook consists of three hierarchical groups of link pages and folders: Project Notebook, Team Notebook and Personal Notebook. The system assumes that all members have a respective Personal Notebook as a start point of collaborative work. After uploading work documents to a Personal Notebook, a team member can send some copies of those works to a Team Notebook for team discussion, and after some collaboration, a team can present some of their documents to a Team Presentation page. For educational purpose, Personal Notebook becomes an important media for teaching staff to give individual advise to students, as well as to evaluate individual contribution to the team.

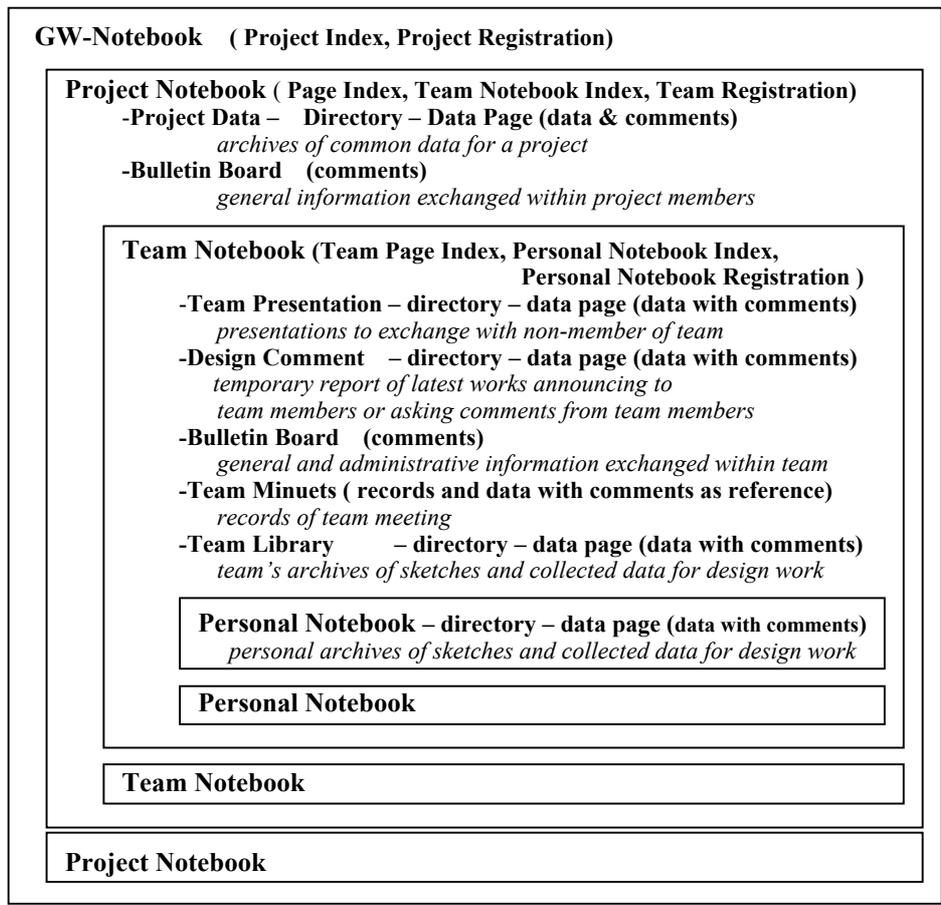


Figure 1. Page Structure of GW-Notebook

An index page of GW-Notebook, Project Notebook and Team Notebook has

a box to register, respectively, the Project Notebooks, the Team Notebook and the Personal Notebook (Figure-2). Once a project name, a team name or a member name is registered, the system automatically generates necessary pages that have links to the respective index page.

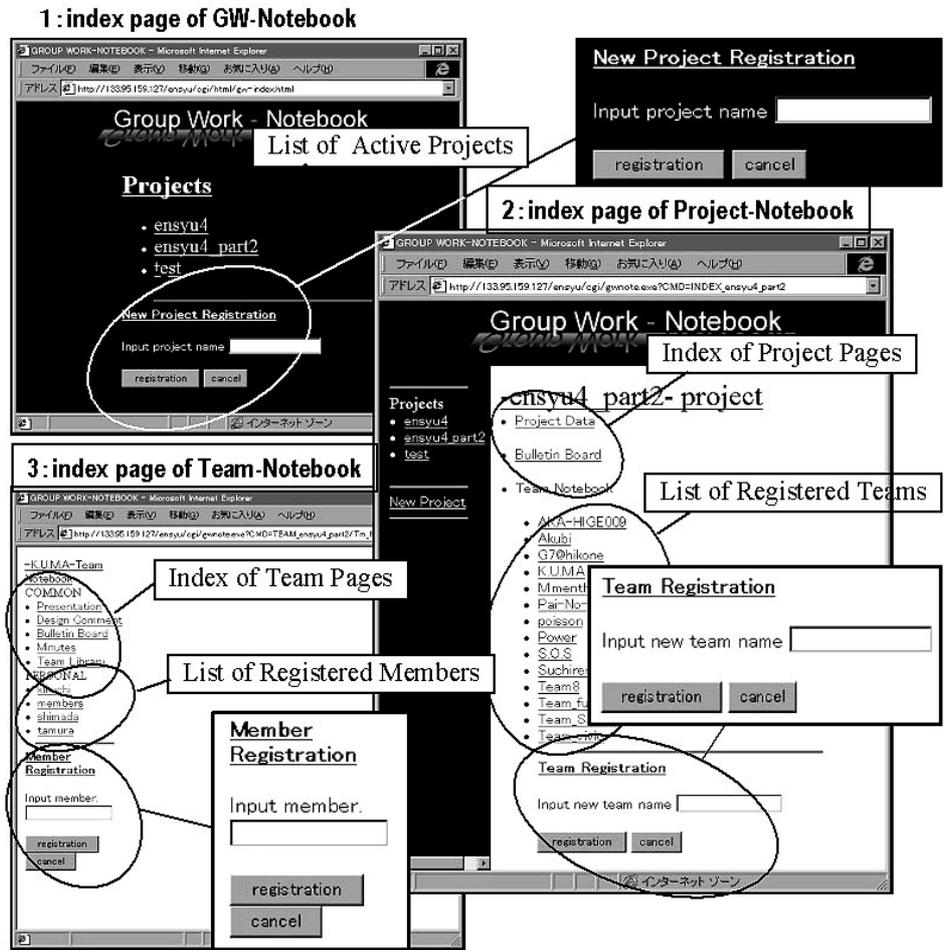


Figure 2. Layout of Index Pages

3.4. PHYSICAL STRUCTURE OF THE MAJOR PAGES

A Project Data, a Team Presentation, a Design Comment, a Team Library, and a Personal Notebook have the same physical page structure, though they are planned to archive information for a different purpose, as Figure-1 describes. The upper part of those pages shows a directory of user defined folders, and the

lower part shows a list of data that user have uploaded in a current folder; reduced graphic image of data and comments typed in for each data. A current folder, which is indicated with a dark box in Figure-3, can be changed by just touching the folder name on a directory. Touching an Directory Edit button activates a utility to create a new folder under a current folder, to change a name of a current folder, or even to delete a current folder.

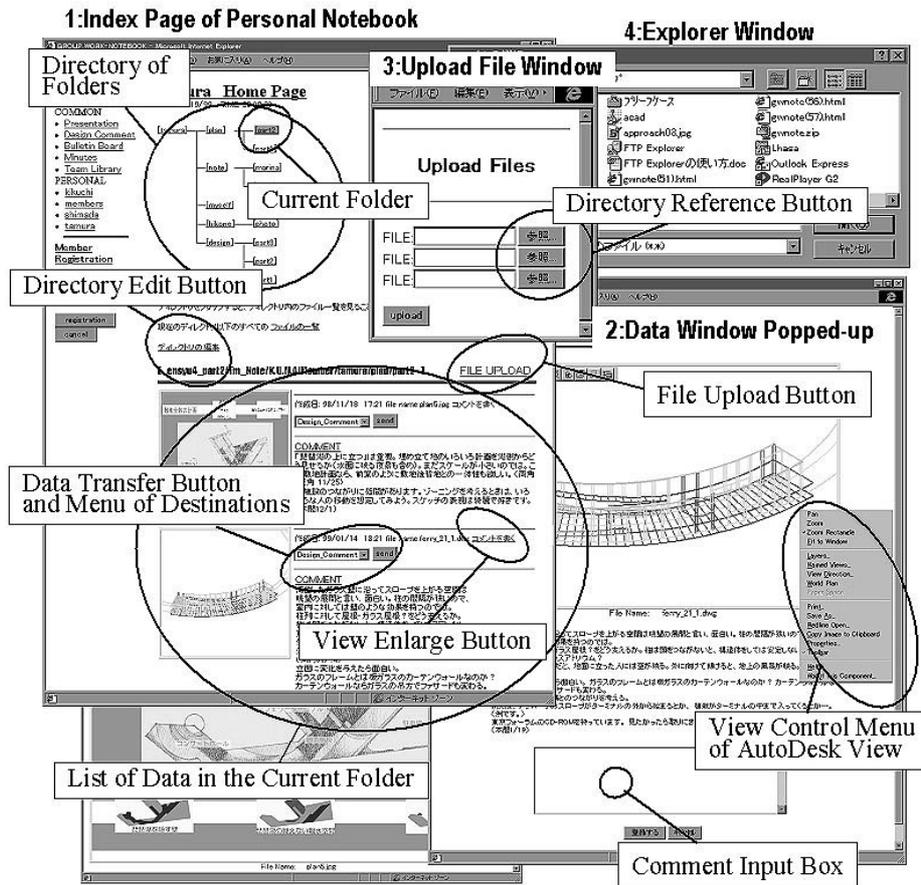


Figure 3. Layout of Personal Notebook and Data Window

Upload File Window, supports the user in uploading files to a current page. When one uses the system with the Internet Explorer, touching a Directory Reference Button will pop-up the Explorer Window, in which one can select a file to upload. Once file upload is completed and the window is renewed, a reduced graphic image of that data will appear at the top of the data list.

3.5. OTHER UTILITIES TO SUPPORT WEB CONSTRUCTION

A View Enlarge Button will pop-up a new window which shows a visual image of corresponding data at the original size, Comment Input Box, and lines of comments already typed in by other members between those. When the user types comment lines in a Comment Input Box and pushes the Send Button, they will be added after the last line. When a DOC formatted Microsoft Word file is referred, Microsoft Word will be activated to display a page layout image of the referring document. When a DWG file or DWF file is referred, it is possible to use viewing or the layer control utility on the current window with the help of the Auto-Desk View, plug-in software.

It is possible to send a copy of some data to other folders using devices at the data listing pages, described already. To download files on pages, one simply touches the right mouse button to activate a download utility of web browsers, after pointing a graphic area of corresponding files with the cursor. These are the same procedure, as one would do to download files from some web sites.

Figure 4 illustrates an example of the Team Minutes index page and its main page. When a user wants to quote some visual data used at the meeting, it can be uploaded following the same procedure as described previously.

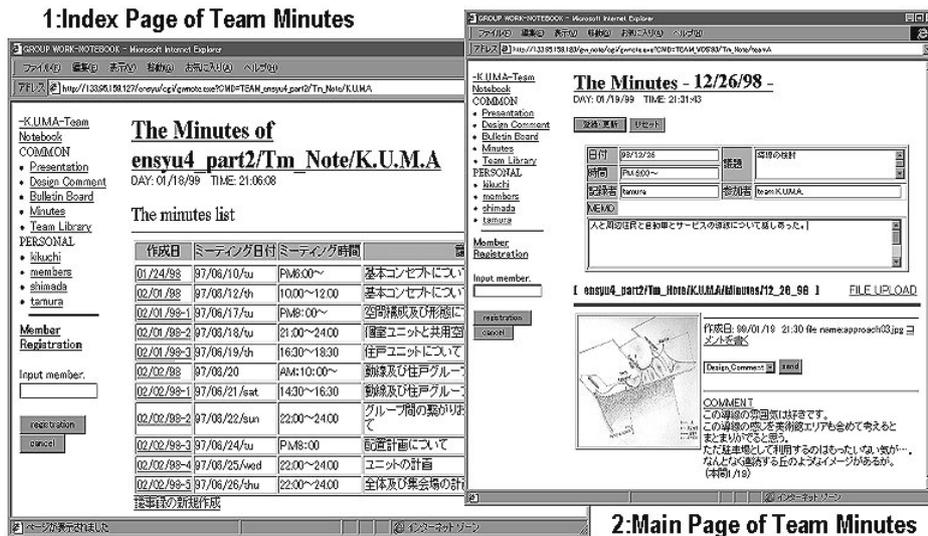


Figure 4. Layout of Pages for the Team Minutes

4. Experimental Use of the Prototype System

4.1. CONDITIONS AND OBJECTIVES OF EXPERIMENTS

To assess an applicability of the prototype to a collaborative design project, authors conducted two different experiments. The first experiment aimed to check the physical or technical condition of system use in both synchronous and asynchronous communication stages. The second experiment aimed to test a process procedure of collaborative design assumed in developing the system. In each case, GW-Notebook was located on a net server (HP LH2) in Kumamoto University.

4.1.1. Experiment-1

Two Dos/V PCs at MIT and one Dos/V PC at Kumamoto University were used for the experiment. After testing the asynchronous use of the various utilities from each PC in the same period, the authors tested the system assuming a remote review sessions. They used Microsoft Net-Meeting, where two PCs shared a desktop of the third one that was accessing GW-Notebook. CU-SeeMe was also used to proceed with the group discussion with a different set of network PCs.

4.1.2. Experiment-2

The Architecture Department of Kumamoto University (KU) and Shiga Prefectural University (SPU) conducted an experimental design studio in the fall semester of 1998 that used GW-Notebook as a base of communication. Eighteen students and two teaching staff from KU, as well as 30 Students and three teaching staff from SPU, most of whom had little knowledge on web production and web management, participated in the experiment. Students of both universities accessed GW-notebook through network PCs located in computer rooms in each university, which have been tied with the high-bandwidth network. One CU-SeeMe link was established all the time to allow students to have synchronous communication between two sites whenever they wanted. Application sharing utility and videoconference utilities of NetMeeting were also used at monthly joint review-sessions.

Revitalizing Hikone Port was the theme of the studio. As it seemed that the environment for synchronous communication between two universities was still weak and as the length of class hours was different between the two schools, they conducted a relatively loose relationship of collaboration. After organizing design teams at each university, advisers instructed students to establish a partnership among teams of different universities to collect design data, survey sites, exchange design ideas, and criticize design proposals mutually.

4.2. DISCOVERIES IN EXPERIMENTS

The design studio for the second experiment was still on the way of design development, when the authors were writing this paper. Discoveries by the time this paper was written are the following:

- 1) A prototype system will be able to provide enough speed of communication for both synchronous and asynchronous stages without giving an impression of having to wait. When three or more large DWG files that exceeds one mega-bite, are uploaded on one page, it may take more than 20 seconds before a link page appears. Use of DWF files for drawings and subdivision of folders will relieve such problem.
- 2) In the first one or two weeks, some students made mistakes in operations, but they soon became accustomed to their operations. The system has almost eliminated busy web maintenance work and students could concentrate on design work without using energy to construct and manage DPB.
- 3) Introduction of the directory utility gave users a convenient environment of archiving data.
- 4) In an early design stage, students used a 800 x 600 bites-sized presentation document, laying out various visual materials with paint software, which could almost satisfy their needs of presentation. Document file helped to make a report of long text, and a DWF file also showed useful ability to present drawing data. A rendered image of a 3-D model seems to be better for presentation than to upload a DWG file, because the AutoDesk View does not support rendering or hide operation on a web page.
- 5) The comment section, juxtaposed to a graphic image of data, gave students and teaching staff a convenient space of asynchronous discussion.
- 6) This utility can also be used to comment on some documents with graphic illustrations, but these comments will be uploaded on the top of the pages. It would be convenient if the order of the data list could be adjusted in the future so that this comment is posted next to section of referring data.
- 7) It is common to reorganize teams during a studio. In the second experiment, the new Project Notebook was activated to respond to these needs, which required the effort of technical staff to transfer contents of the old Personal Notebook to a new one. Locating the Personal Notebooks outside of the Team Notebook will increase flexibility of the system use.
- 8) Even though authors expected that the students would upload their work more frequently, because of the system allowing easy operation, their attitude to continue their sketch to the final minutes without uploading their work did not change. Few of them used the Design Comment Page. It became another proof of systems ability that once a teacher urged students to stop studying their sketch and to upload them at that stage, the class could start within 15 minutes using the GW-Notebook.

- 9) As teaching staff did not make appropriate introduction to write team minutes as an inevitable step of collaboration, no team used team minutes in the second experiment. It is necessary to wait until the result of next experiments to check their role in the process of collaboration.

5. Conclusions

It is possible to regard that the system could support asynchronous design communication and project management of collaborative design, to some extent. As the experiment allowed onsite off-line meeting, lack of utilities to support administrative communication such as scheduling, inquiry on work progress, work instruction, did not cause problems. It is the next goal of this study to develop such utilities as well as to revise some of the developed utilities.

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