

WEB-BASED COLLABORATIVE DESIGN STUDIO: TOOLS AND PROGRAMS

MITSUO MOROZUMI AND RIKEN HOMMA

Kumamoto University

Japan

AND

YASUHIRO SHOUNAI, SHIGEYUKI YAMAGUCHI AND NORIHIRO
KAWASUMI

Kyoto Institute of Technology

Japan

Abstract. Since 1996, Kumamoto University has repeated several experiments to apply web-based collaborative design techniques to a junior design studio aiming to stimulate students' interaction in the class and to enhance their design abilities. When it became clear after a two-year experiment that writing web pages and uploading them to a web server was a barrier of communication for students, the authors developed a web-based groupware called GW-Notebook, and started using it in 1998. In the fall semester of 2000, the authors introduced a new design studio program, and tested the revised version of the groupware, GW-Notebook III. This paper discusses the features of the system, and gives an outline of the studio program and some of the findings in the studio as well as the use of the revised system.

1. Background and Objectives

There are many reports on various attractive experiments for a virtual design studio that used various network communication tools such as WWW and video conferencing systems: (Chiu, 1998; Hirschberg, 1999; Kawasumi, 1999; Koraevic, 1998; Schmitt, 1998; Yee, 1998; Wojtowicz, 1995), etc. Since 1996, Kumamoto University has also repeated several experiments (Morozumi, 1999a), conducted in one studio space for applying web-based, collaborative design techniques to a junior design studio.

Some of the reasons for such experiments are the following:

1. A conventional design studio consists of asynchronous works of students or student groups, individual consulting of their projects by advisers, and critiques in a class. Insufficient communications among students, as well as the advisor's failures in following the progress of student projects, tend

to prevent a class from stimulating performances and design activities. The authors assumed that an application of web-based communication technology could eliminate or relieve such problems.

2. The use of a groupware which is specially designed for design collaboration would be able to provide an attractive environment for productive or creative design communication among students and teaching staff in a way that the conventional studio cannot realize.
3. It is better if students could receive timely comments and suggestions from advisers both inside and outside of the studio through networking, which otherwise would be difficult to achieve. Students could learn a lot from documents, sketches, and records of discussions held during the process of design developments in a past studio.

It became clear, after the two-year experiment, that students who want to work up to the final minutes of presentation felt that writing web pages and uploading to a web server was a barrier of communication. So the authors developed a web-based groupware called GW-Notebook and started using in 1998 (Morozumi, 1999b). The Revised Version was introduced to the junior studio in the fall semester of 2000, in which a new instruction program that applied various utilities of the groupware was also tested aiming to stimulate students' interaction in a class.

It is the objective of this paper to discuss functional features of the revised groupware, a model of communication, a tested program of collaborative design project, and some of the findings in the studio.

2. Features of GW-Notebook

2.1. PAGE STRUCTURE

The latest version of GW-Notebook is re-written with VB script, as a special web working in an ASP environment linked to Microsoft Access. It can be used from Windows 95/98/NT PCs by just accessing the designated URL with a popular web browser such as Internet Explorer 4.0¹.

The system provides three different types of Notebooks to handle design communication of different levels: Project-Notebook, Team-Notebook, and Personal Notebook (Figure 1). Once a project name, a team name or a member name is registered, the system automatically generates the pages or indexes necessary for each. It is possible to register as many Notebooks as needed.

GW-Notebook



-Project Index and Project Registration Box

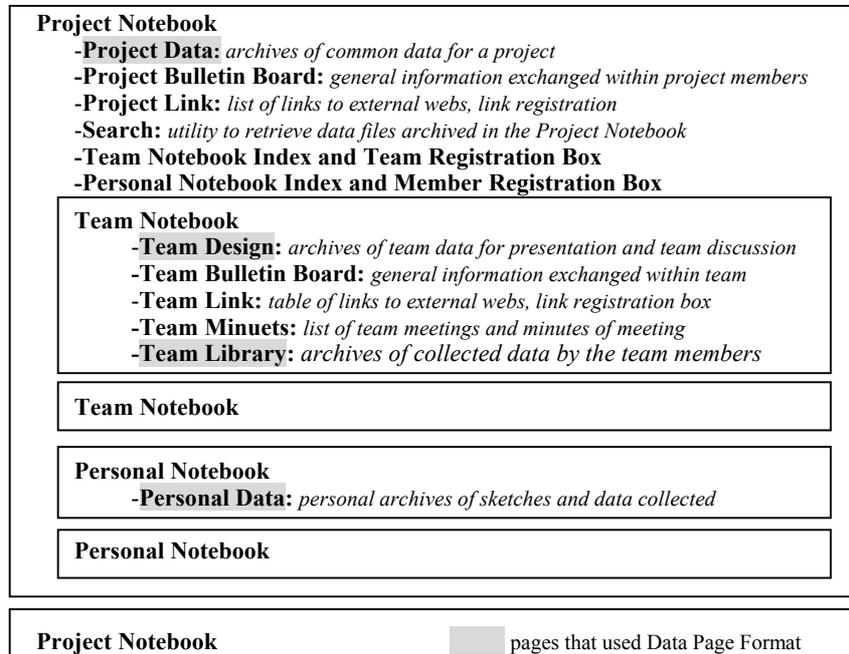


Figure 1. Page structure of GW-Notebook

2.2. FORMAT OF DATA-PAGES

There are three different types of formats for these web pages, such as a Data Page format, a Bulletin Board format, and Team Minutes format. The upper section of pages that use a Data-Page format shows a directory of user-defined folders (Figure 2 left). The lower part shows a list of data that the user has uploaded in a current folder; with reduced graphic images of data and comments and memos typed in for each group of data. Touching a Make New Directory Button activates a utility to create a new folder under a current folder.

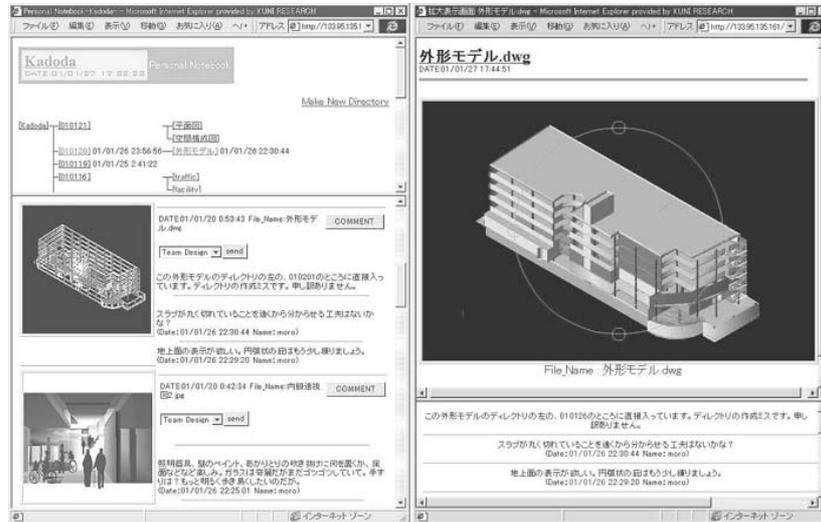


Figure 2. Example of data page

2.3. FILE UPLOAD TO PERSONAL PAGES

The Upload File window helps the user upload files to a current folder. When one uses the system with Internet Explorer, touching a Reference Button will produce the Explorer window, in which one can select a file to upload. In the latest version, the system allows the user to upload JPEG, GIF or BMP formatted graphic files, DOC, or TXT formatted document files, XLS formatted spreadsheet files, DWG or DXF formatted 3-D models and DWF formatted 2-D models.

2.4. DATA OBSERVATION

A View Enlarge Button brings up a new window (Figure 2 right) that shows a visual image of corresponding data in its original size, the Comment Box, and lines of memos and comments already typed in by some members of the team. Once some comments or memos are typed in, the latest time-stamp will be attached at the corresponding folder name in the directory section. With the help of plug-ins, the image of DWG, DXF, and DWF files will be displayed in the windowⁱⁱ. It is possible to use layer control utility and viewing utilities such as zoom, or pans, and it is even possible to rotate 3-D models in a simple shaded image with mouse-drag actionsⁱⁱⁱ.

2.5. FILE UPLOAD TO TEAM PAGES

The system has a utility to copy data on a Personal Notebook to a page in a Team Notebook designating the destination folder^{iv}. Memos attached to that data could also be copied, while the comments do not accompany it. To download files on a web page, one simply touches the right mouse button to activate a download utility of a web browser, after pointing with the cursor to a graphic area of corresponding files^v.

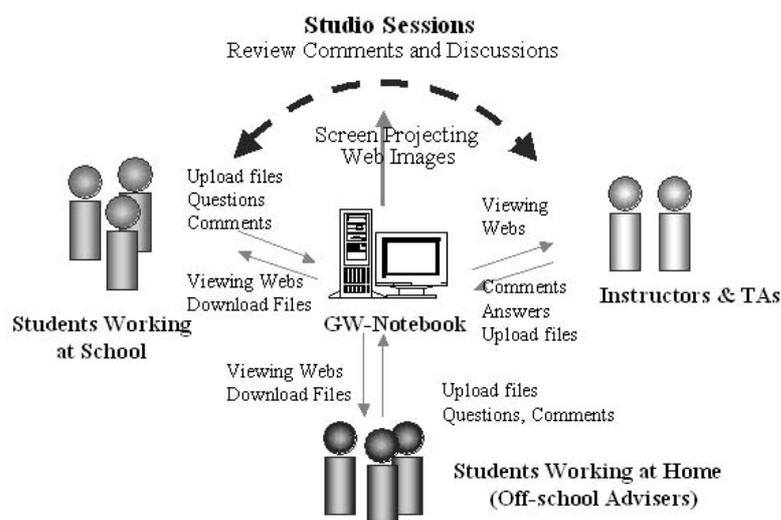


Figure 3. Design communication with GW-Notebook

3.A Model of Communication in a Class

- A Project-Notebook for the studio is used as a pin-up board for asynchronous communication: firstly to present and share design documents among class members and secondly to exchange comments, questions and answers among class members, instructors and teaching assistants (Figure 3). It is also used as a media of presentation and a reference for synchronous discussions during class hours by projecting its pages with a couple of projectors.
- Students access the system through Internet. Most of them work in the collaborative design studio (public computer space of the department). Though the bandwidth is not sufficient, several students still work with a PC at home. The instructors and teaching assistants work from computers in each office when they have time during off-studio hours.

- c) A Project Data Page is used to present common information for the class, such as schedules, reference material for the project, manuals and instructions of tool usage. A Bulletin Board on the Project Notebook supports ad-hoc communication among studio members, such as announcements, questions and answers. A Link Page on the Project Notebook is used to provide links to WWW that the instructors consider useful for the project.
- d) Students have their personal notebook as the start point of their work (Figure 2). They archive sketches, models and survey data, classifying all information in folders. When they need to discuss designs for the purpose of organizing a presentation as a team, or to share collected data in a team, they transfer documents from a Personal Notebook to a Team Design Page or a Team Library Page in the Team Notebook. Presentation documents and sketches will be identified by the folder name.
- e) To make asynchronous design discussion, students or instructors use a Bulletin Board in the Team Notebook, or write comments in the comment section of a Data-Page located beside each document. Students download data files from pages to their own PC to use them as basis for work in the next stage.
- f) When students organize an off-line meeting, they use a Team Minutes Page to keep records of discussions. This page also allows them to attach the same types of design documents the Data Pages accept for future reference.
- g) As the Project Notebook is connected to the Internet, once the instructor gives an external member access to the GW-Notebook, they could review and give comment in any pages.

4. Design Studio 2000

4.1. THEME OF THE DESIGN PROJECT^{vi}

Twenty students took part in four-month project in the fall semester in 2000, which included a three-week New Year's holiday. The theme was to revitalize a 200m x 500m old residential area that lies behind a downtown shopping street in Kumamoto City, which is zoned as a shopping district of FAR 400-600. Considering the recent increase of small but fashionable commercial developments in the area along narrow streets, the instructors asked each student to design a building on some vacant sites or to replace buildings they thought unsuitable for the area. They were also asked to redevelop pedestrian networks and traffic networks and to propose urban design guidelines for the area as the guides for the design proposal by each student. Students were asked to select building types after site studies and discussion in the class. As the study area was a little large, it was divided into two sections, and students were also divided into two groups of ten.

4.2. PROGRAM OF STUDIO INSTRUCTION

1. A group of three or four students studied the total area and uploaded reports on physical and social features of the area forming groups. They submitted the report in the form of a 1000 x 750 pixel-sized collage of photos, texts and other graphics. In addition to data common to planning analysis, they were asked to include, 1) maps that indicate locations of planning assets and problems in the area; 2) a list of urban design policies for the area, and; 3) a proposal plan for pedestrian and traffic network system.

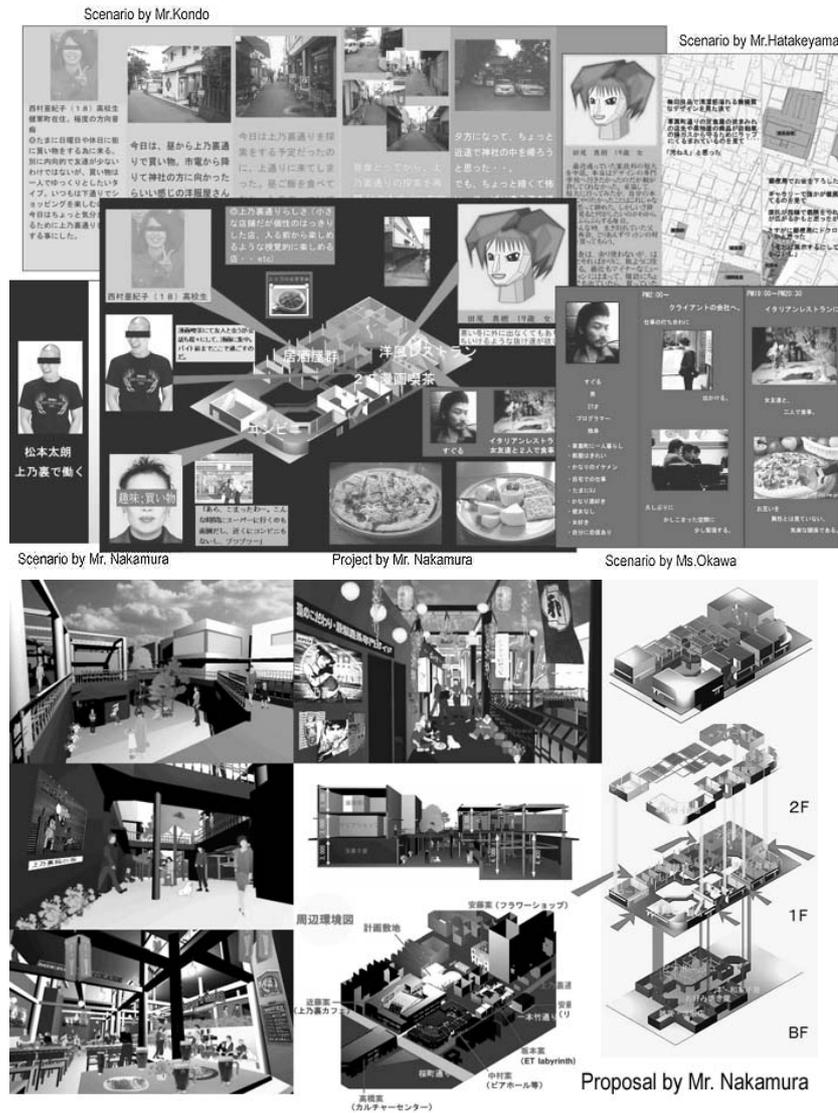


Figure 4. Exploring designs with scenario

5. Discussions

- a) At the end of January^{viii}, twenty students uploaded 1795 data files to the Personal Notebook, 187 of which were CAD files, and 1595 were graphic files. Total file size reached to 490 MB. Though it took 70 to 80 seconds for a 4.4-megabyte size CAD file to be displayed in a Data Page through LAN, the system was able to provide enough speed of communication in most cases, without giving students an impression of having to wait. The system has almost eliminated busy web maintenance work, and students could concentrate on their design projects. Considering the fact that students submitted attractive proposals, it is possible to conclude that GW-Notebook worked well as the center of design communication.
- b) It was common for students to upload their work less frequently than instructors expected, because they normally did not want to present unfinished work and they attempted to continue their sketch to the final minutes. In order to increase the chances for students to exchange sketches - in other words, to make them upload their sketches more frequently, the authors provided the condition that students use a Personal Notebook as the space to stock sketches while a Team Notebook was used as the presentation space. The latest version removed upload utilities from a Team Design Page and obliged students to transfer documents from a Personal Notebook when they wanted to make presentation documents. The instructors also made efforts to give short comments to the projects in a Personal Notebook as frequently as possible. As a result, one-third of students came to upload the results of daily works.
- c) Though students worked other than the studio-meeting day, they succeeded in exchanging necessary data through GW-Notebook pages. There were also cases where the Bulletin Board helped students to communicate with the instructors while waiting for the next studio meeting. They submitted interesting visual scenarios combining the scenarios of others. They also studied respective building designs integrating 3D models of neighboring sites, though they were often annoyed by the record size when analyzing data. Two committees needed a strong leadership of some members before it started functioning in guiding and integrating proposals by students.
- d) The authors did not have a chance, by the deadline of this paper, to ask students whether the approach of scenario writing helped them developing design idea, nor to analyze how the work of each student influenced to others. But it is possible to conclude that students had a chance to share ideas and methods of presentations through the process of carefully observing others' web pages.

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ⁱ AutoDesk-Volo-View, plug-in software to view 3-D models, cannot be used in the IE 5.0.

Netscape does not have plug-in software to view CAD models.

ⁱⁱ In the case of document files or spreadsheet files, only the file name appears in the graphic are. Clicking the file name will start up corresponding application if it would be installed in the working PC.

ⁱⁱⁱ AutoDesk-Volo-View is necessary to handle DWG, and DXF formatted 3D models, and Whip to view DWF formatted 2D files. *Figure 2 right* presents a window that user is operating view condition with mouse-drag actions.

^{iv} The system just adds links instead of copying a data file.

^v These are the same procedure, as one would do to download files from some web sites.

^{vi} Mr. Homma and Morozumi instructed the studio.

^{vii} AutoCAD R13J and Microsoft Image Composer were used in the studio space.

^{viii} The final jury was scheduled at the end of February, after the examination period.