

16 Networked CAD System For Designer Group

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1. INTRODUCTION

Open Design Environment(ODE), the concept of which was proposed in 1991, is a platform on computers to support synthetin to proceed design. We have applied ODE in practical use of design, design review and presentation to make collaboration by using CG in design participants.

Recent linkage between LAN and Wide Area Network, just as the Internet, gave ODE a new progress to make wide area collaboration. It leads to generate the concept of Network ODE(NODE). However, we have found some problems on system to proceed the wide area collaboration by using ODE's Design Tools. Since they are developed on the specific computer system, they can not correspond to the wide area collaboration on various network environments. As a result, the re-arrangement of design environment and the development of Design Tools are needed, which are rather flexible and general-purpose, i.e., independent of machine sort and network adaptive. In this paper, to proceed collaboration in a designer group, how to create the system of NODE is demonstrated with the new Key Technologies of network and CG.

2.NETWORK ODE

2.1. Concepts

- (1)NODE is a total software platform for environmental design. From the early stage of design planning to the final presentation, rather wide range of design process is covered by NODE.
- (2)NODE separates definition of objects completely from presentation of objects. 3-D models for standard definition and perspectives for standard presentation are used, respectively.
- (3)NODE proceeds design by direct manipulations of solid-type 3-D object models and by high quality perspectives. By this feature, a member of a design team can check designs and share ideas to other members on process of design at anytime. NODE makes design process open to all members of the design team.
- (4)By using the realistic digital perspective views as a standard design medium, NODE makes design process open to non professional people. They will easily understand design concepts and will be able to participate to the design process.
- (5)NODE is an aggregate of small independent programs. Each program runs under the control of GUI. This structure makes it easier to add new pieces of program from outside. NODE makes system developing process open.
- (6)GUI of NODE presents a user friendly interface. It makes everyone, whoare not so familiar with computer systems, easy to use it freely and friendly.
- (7)NODE uses the realistic digital perspective views as a basic design medium. There is no need of extra preparation for usual presentation.
- (8)NODE runs on distributed computing environment of powerful computers which conditions are wide variety of supported platforms and network adaptive on wide area networks.

2.2. Metaphors

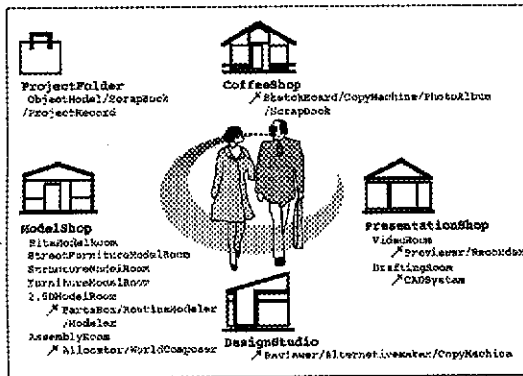


Figure 1: ODE's Metaphor

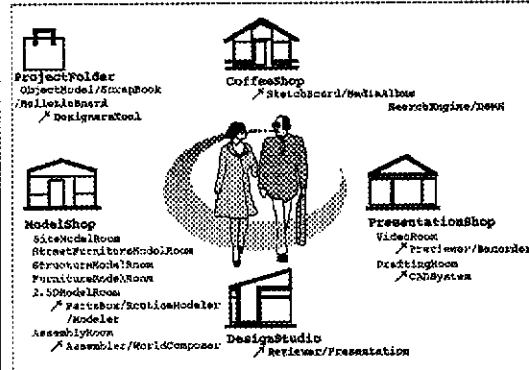


Figure 2: NODE's Metaphor

- (1) NODE has four virtual Shops.
Coffee Shop/Model Shop/Design Studio/Presentation Shop
- (2) Shops have Rooms, and Rooms have Tools.
- (3) A designer proceeds design with Project Folder, by visiting Shops and using tools.
People except designers can refer to Project Folder, Shops and Tools, if they need to do that.
- (4) NODE had a fifth Shop as concept, which is Cooperative Shop. However, NODE do not need it since Project Folder contains its function.

2.3. Project Folder

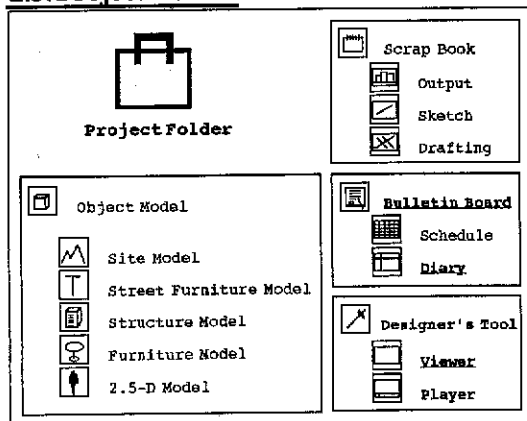


Figure 3: Project Folder

- (1) Project Folder is a case including documents, plans and tools to proceed project.
- (2) Each project of NODE has each Project Folder which is created automatically when a new project starts.
- (3) Project Folder structurizes the information of various media and makes those link each other to be able to access smoothly.
- (4) Project Folder has the following Documents.(Fig.3.)
Object Model/Scrap Book/Bulletin Board
- (5) Object Model are 3-D and 2.5-D models of design objects and their surrounding areas.
Site Model
Street Furniture Model
Structure Model
Furniture Model
2.5-D Model:natural objects like as human figures and trees
- (6) Scrap Book contains the following materials which are created by designer in design

process.

Output:images, animations,QTVR etc.

Sketch:handmade drawings

Drafting:traditional drawings

- (7)Bulletin Board consists of Documents to manage time schedule and usefully communicate ideas of designers in order to proceed design.

Schedule:schedule calendar of project

Diary:daily memorandum for problems occurring in the running project

- (8) Project Folder contains simple Designer's Tools like Viewer and Player to see existing design examples and consider design plans.

2.4. Coffee Shop

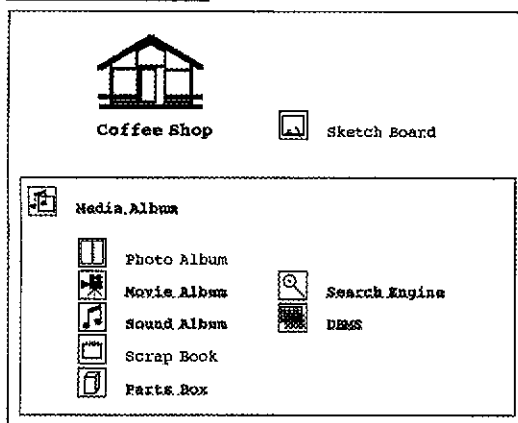


Figure 4: Coffee Shop

- (1)Coffee Shop is a place for a designer to be relaxed, and to think deeply and freely about design.
- (2)Coffee Shop has no Room.
- (3)Coffee Shop contains the following Tools.
Media Album/Sketch Board
- (4)Media Album contains Multimedia of existing design examples, images and so on with respect to the running project.
- (5)Media Album is composed by WWW which plays a role of interface and its data are taken out through Common Gate Interface(CGI).
- (6)Media Album is classified into the followings.
Photo Album:2-D images, photos
Movie Album:motion pictures
Sound Album:sounds ,voices
Scrap Book:numerical values, letters and memorandum
Parts Box:3-D Parts Data
- (7)Each Album of Media Album has two Tools.
Search Engine
Data Base Management System(DBMS)
- (8)Search Engine is a system to search the needed information in each Album.
- (9)DBMS is a system to produce, manage and control database.
- (10)Sketch Board, with which a designer can use Tools of Tracing Paper, Pencil, Brush, Red Marker and Drawing Instruments, is used for sketch drawing and simple drafting.

2.5. Model Shop

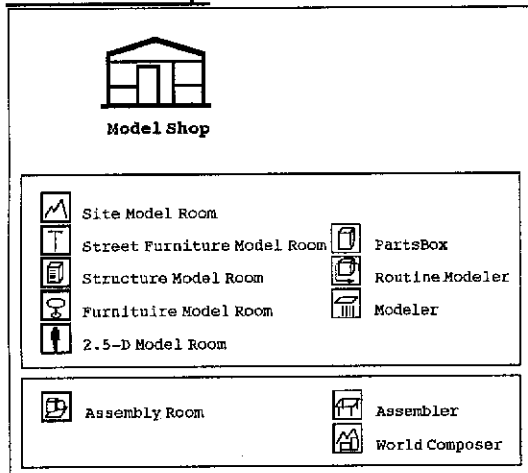


Figure 5: Model Shop

- (1) Model Shop is a place for a designer to have a hard time of making models.
- (2) Model Shop has the following rooms. (Fig.5.)
 - Site Model Room
 - Street Furniture Model Room
 - Structure Model Room
 - Furniture Model Room
 - 2.5-D Model Room
 - Assembly Room
- (3) Each Room from Site Model Room through 2.5-D Model Room contains the following Tools.
 - Parts Box
 - Routine Modeler
 - Modeler
- (4) Parts Box is a storage space for existing models. A designer has no needs to create a new model if Parts Box has a suitable one, which are copied into Project Folder at need.
- (5) If a designer can find particular Routine Modeler for his object, he can make a model just by giving parameters to Routine Modeler interactively.
- (6) If a designer can not find a model in both Parts Box and particular Routine Modeler, he should create a model of the object from scratch by using Modeler. However, the creating process is recorded as history automatically, and by editing the history, new Routine Modeler for the object will be generated.
- (7) Assembly Room contains the following Tools.
 - Assembler
 - World Composer
- (8) Assembler gathers models made by Modeler to transform parts which are easily movable.
- (9) World Composer establishes the reference design world in Project Folder with using the free location parts made by Assembler and the registered parts in Parts Box. A part of the world is get out to generate Sub Project Folder at need.

2.6. Design Studio

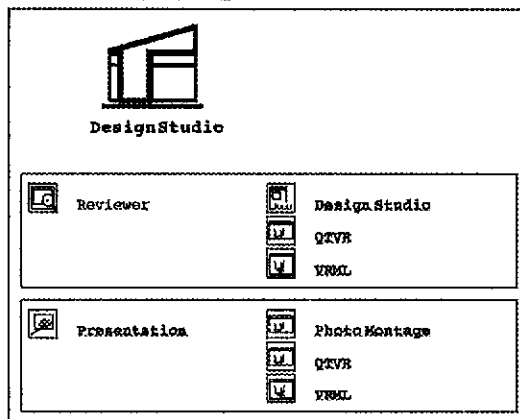


Figure 6: Design Studio

- (1) Design Studio is a place for a designer to spend exciting times of reviewing his design and of making alternatives.
- (2) Design Studio has no Room.
- (3) Design Studio contains the following Tools.
 - Reviewer
 - Presentation
- (4) With Reviewer, designer can review his design dynamically by doing Walk Through and freely by changing eye-point, reference-point and object-parts.
- (5) Reviewer has the following options.
 - Design Studio, QTVR, VRML
- (6) Design Studio is a system which makes the interface of WWW link to Radiance as Renderer through CGI.
- (7) QTVR can smoothly browse in realtime the pseudo-3D-Space generated by 2-D images .
- (8) VRML creates the virtual 3-D World with 3-D objects, and reviews one by doing Walk Through.
- (9) Presentation is a Tool utilized for presentation at design review, and has the following options.
 - Photo Montage
 - QTVR
 - VRML

2.7. Presentation Shop

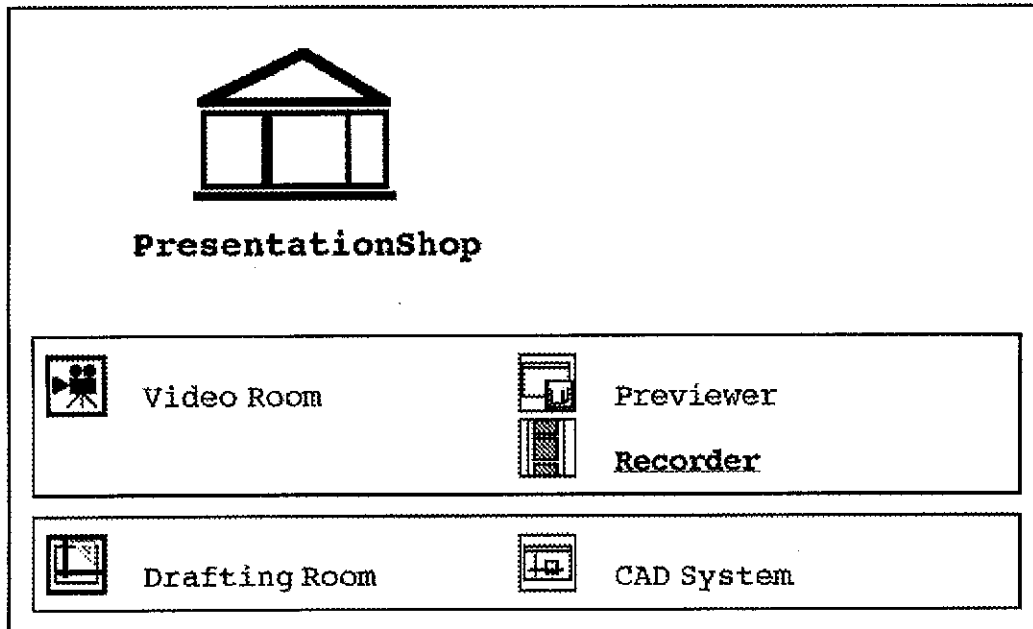


Figure 7: Presentation Shop

- (1) Presentation Shop is a place for a designer to create presentation media.
- (2) Presentation Shop has the following Rooms. (Fig.7.)
 Video Room
 Drafting Room
- (3) Video Room is a Room to create Computer Graphics.
- (4) Drafting Room is a Room to create traditional 2-D plans.
- (5) Video Room contains two Tools.
 Previewer
 Recorder
- (6) Typical Keyframes are made in order to create animations, and eye-point paths are obtained by smoothly curve fitting and interpolating for these frames. The eye-point paths and movements of animations are checked by Previewer.
- (7) Depending on the eye-point paths, Recorder records the frames by one-by- one mode to complete digital movie animations.
- (8) Drafting Room has CAD System as a Tool.
- (9) CAD System makes traditional 2-D plans from 3-D models.

3. CASE STUDY

3.1. Purpose

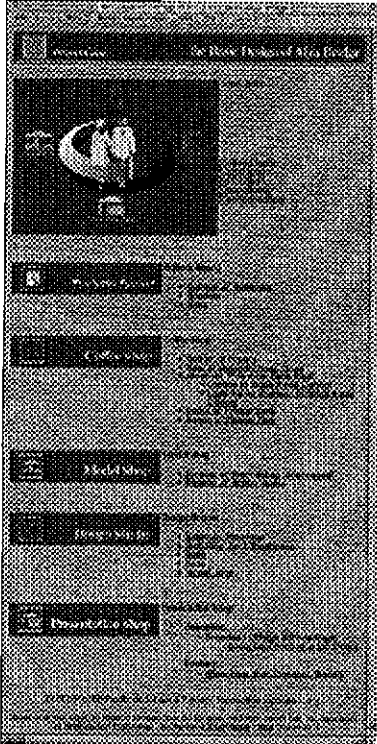


Figure 8: Home Page of Basic Design of Aiya Bridge

The system of NODE is applied to a practical design project named Basic Design of Aiya Bridge. Project Folder and Shops subject to the concept of NODE are created on WWW to proceed collaboration between designers in our laboratory. Though it is able to proceed the collaboration in the range of ODE because of the design working just in a laboratory, the system of NODE is utilized to investigate the basic function for the Wide Area Collaboration.

3.2. Project Folder

Since Project Folder links to Shops on WWW, designers can access the information in Shops for the design project without actual walking around.

3.3. Billetin Board

- (1) Billetin Board has contents of Home Page. Documents made by HTML are 45 pages for the project mentioned above, which are linked to the files of images, animations and QTVR. These files are composed by tree structure of Home Page. However, it is hard to select the reference file since the structure contains a part of story board. As a result, we need contents of the file structure of the project.
- (2) Project schedule is managed on Mac.PC by using current software. The schedule file is linked to Home Page to make total management of WWW a platform. MIME type of MacHTTP.config. in server site and Helper Application in client site are set up, respectively, for File format.
- (3) Diary is a program to take data input by Form, to add them into existing diary, to create their HTML and to indicate on viewer.
- (4) WWW Browser needs the function to show images on it and to have Form Function.
- (5) WWW server is a HTTP server for UNIX and make Diary program start.

3.4. Coffee Shop

- (1) Into Media Album, design conditions, documents, plans and so on are put in media of these sorts to establish Bridge Data Base. The search and the management system for the Data Base are developed at the same time.
- (2) Digital photo data to show the present state of project site and to refer the existing various bridges are put into Photo Album.
- (3) 3-D data of bridge parts, for example, balustrades, streetlights and etc. are transformed into VRML and 3DMF format data to put into Parts Box..
- (4) Bridge Data Base are classified by 4 filter of use way, material, deck location and structure on EWS.
- (5) Using the Form function of WWW as a interface and inputting search terms, the Search Engine makes the search program run through CGI, and indicates the output data with HTML, and links to the pages of the corresponding images and bridge dimensions.

3.5. Model Shop

- (1) The surrounding data of bridge site, landform and neighboring structures are created in Site Model Room to investigate the harmony of the bridge model and the surroundings.
- (2) Various bridge models are created in Structure Room by using software FormE&Z.
- (3) The images of models created in Model Shop are arranged on WWW to make the modeling situation understand to designers.

3.6. Design Studio

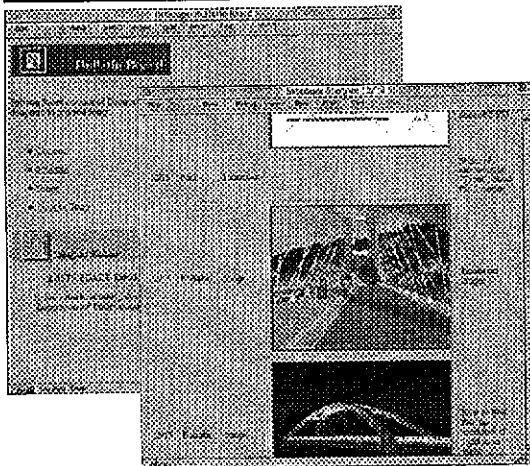


Figure 9: Model Shop and Bridge Model

- (1) Each bridge model is put on the surrounding model and Photo Montages from the typical view-points are created to obtain the better space design.
- (2) QTVR is utilized for design review.
- (3) 3-D virtual space, which is browsed by VRML Browser just like Web Space , is established by using VRML Format Data.

3.7. Presentation Shop

- (1) Animation is produced by digital recording in Video Room.
- (2) Traditional 2-D plans is generated by using MiniCad+ in Drafting Room.

4. CONCLUSION REMARKS`NODE IS MODE'

In this paper, the concept of NODE and how to establish the system subject to it are explained, and, the system is applied to a practical design project. The treated theme is the collaboration between designers just in a laboratory. However, it becomes a initial step for the wide area collaboration. At present, we have started to use the NODE system to the wide area collaboration. Though NODE is the developed system from ODE, the discrepancy of both systems exists in fact. For example, a designer proceed design with Project Folder in his arm by visiting Shops in the range of ODE, but, he can do it by making linkage to Shops from Project Folder on WWW in front of computer. Designer can arrange and compose various media data on a powerful computer in NODE system. It means that NODE is Multimedia Oriented Design Environment.

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