

SOME KEY ISSUES IN DRAWING ARCHIVING AND COMMUNICATION SYSTEM¹

Gao Juan, Bao Jie, Huang Ling

(Lab on Image Information Processing, Hefei University of Tech. , Hefei, Anhui, China 230009)

(jun_gao@mail.hf.ah.cn, imageinfolab_bob@263.net)

ABSTRACT In this paper, we proposed the “drawing archiving and communication system”(DACS) and its some key issues. 1. Position of DACS .We should reserve information interface between DACS and the whole system of CIMS or CSCW, and let design departments are not “isolated islands” any more. 2. Construction Policy of DACS. DACS is not simple CAD system but the requirement of collaborative design. DACS is also a system need for vast investment. A practical developing policy is component system and cooperative developing. 3. Data sources and processing methods. Raster drawings and vector drawings can be uniformly encapsulated in storage, but are different in processing methods. 4. Storage and transfer. We should choose to build a centralized archiving system according to work demand. It should be took mass storage and burst high bandwidth transmission demands into account when choosing transmission the rate of network and the storage devices.

Key words: engineering drawing, Drawing Archiving and Communication System, DACS

1. SUMMARY

With the development of CAD, Internet and

Intranet, it's very necessary to manage mass drawings and correlated document to be accommodated to the progress of “no-paper factory” and remote technology service. Many different kinds of drawings and corresponding information need archiving with database. While their characters make themselves possess special demand of analysis and processing. For example, the vectorization and optimizing processing of scanning drawings, the explosion of object's attribute and analysis of object's construction. Moreover with the development of synergetic work supported by computer, the transmission task of drawings and documents become heavier and heavier. So the traditional drawing management and processing system cannot meet the need of reality any more, which faced with singular data sources and served as local or incomprehensive internet.

Therefore, we propose the concept of drawing archiving and communication system, in short DACS. (The blockdiagram is shown as picture 1.)^[1] It cannot only uniformly archive many drawings and documents produced in engineering design, but also support the drawing's local or remote transmission. Hence the center of engineering design will change from singular drawing or CAD document to database based on Internet. Vector diagram and traditional drawing are

¹ Project supported by National Natural Science Foundation of China (69805001) and Natural Science Foundation of Anhui Province(99043416)

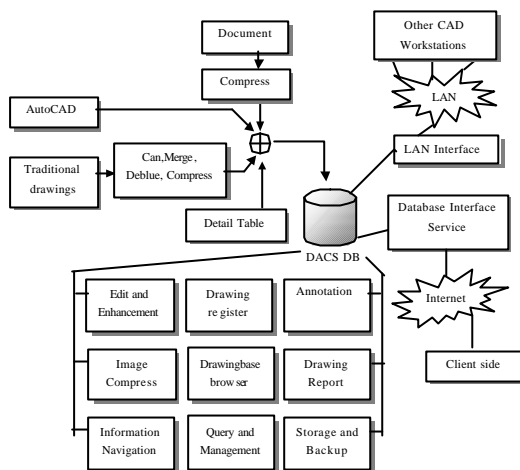


Fig 1: System Structure

packed into one form, and for database they are differently archived. When user requires, it can hand in special drawing's document. DACS system can draw out correlated information from the detail tabular of all kinds of CAD vector diagram, then separate traditional drawings. After recognized, the theory of detail tabular will be archived. By contracting, districting and previewing drawings, DACS system can resolve the contrary resulted from amount of drawing and narrowness of bandwidth.

In the former articles, we have discussed of such key issues as database application construction design, the consolidated package of raster and vector diagram, the combination between drawings and documents, the effect of drawing embody. Here we shall discuss other key issues about DACS design further.

2. POSITION of DACS

As a drawing management and system in project design, DACS is a sub-system of CIMS and CSCW. We should reserve information interface between DACS and system of CIMS or CSCW and let design departments are not "isolated islands" any more. The content (for example, the design task's coming, implementation and fulfillment, planning, resource share and finance etc.) should be specified, which changed during design and manufacture

Project drawing documents have such characters as

following^[2]: first, they strongly actual, not out of use, and will play an important part in future. Second, high efficiency of reuse. There are plenty of reproducing resources and advanced technology designs in many project design drawings. Usually, if we modify several papers, even directly use it, we can get a new excellent product. Wuzhou sheep-works produce cabin barge of

2000t and 800 m^3 mud barge which cost 4,000,000

Yuan totally. Users require to use in 100 days. If they give the design task to design institute, it will take half a year, and the cost needs 200,000 Yuan. Then the factory decides to design by themselves. In terms of the previous drawing, they do some modifying and designing, then use directly. Finally, it proves that the reused drawings add up to 85%, and enhance the efficiency by six times. Not only save, but also ensure everything in time. Thirdly: great number. If a design department plan a project, beginning with practicable research, through engineering design stage, until complement stage, the number of drawings is very great. By statistics, in Qinghai irrigation works reconnoiter design institute the preserved drawings add up to 4205 pieces. Guangxi electric industry reconnoiter design institute reserve 21,000 pieces of papers from 1958 till now.

From above, project drawing management and transferring system has great significance on the whole enterprises. In the construction of CIMS and CSCW system, We must prevent the design department from 'isolating'. The relation and information exchange between drawing system and the whole system appear very important. Such drawings, documents as the records of whole engineer must proceed under regulations. It is also related with project database technology and produce data management to some degree.

Besides, DACS is also related to GIS. As a special drawing, map is faced with digitizing, vector, transfer and etc. An excellent DACS system usually has GIS processing function, for example VPSelect system^[3].

3. CONSTRUCTION DOCTRINES OF DACS

DACS isn't simple CAD. It cannot exit out of management patterns. Only concerted with the need of design, the unit's workflow and data flow, DACS can exist. At the same time, DACS is a system need for vase investment, and should be implemented by stages.

There are three methods by which we can construct DACS system. First, depend on the design units themselves; organize people to exploit their own system. Second, ask special DACS factory to do, take the form of "hand-in-key project". Third, look for suitable cooperator and finish it together. Now only some big research institutes abroad take the first form. In fact, the second form is to buy all kinds of ready-made sections, then install according to the requirement of design unit. We think the third is best for big domestic institutes. But cooperative should have enough experience and could cooperate for a long time.

The design institute should organize people pursuing in management and technology to join in design, selection of components and engineering.

Firstly, in terms of different sections and engineering, DACS is determined. As DACS spreads step by step, the plan ought to be finished gradually. Component technology can realize such large-scale and periodic systems.

Secondly, by the work load and management pattern of design section, the work flow of DACS and data flow can be determined. Because DACS cannot be separated from management pattern, different design institutes' data flow and work flow are different. The DACS' distribution should be determined by the work and data flow in different design institute.

Thirdly, by burst data flow, we can decide the data transmission rate of network's arterial or branch, then decide the technical quality of corresponding unit, and conclude detail data tabular of different CAD devices. Finally, in terms of the tabular, mass drawings and section's concrete requirement, we can decide the

storage needed and transmission rate of network.

Fourthly, selection, engineering constitution and supervision, all cannot depend on cooperator simply.

4. DATA SOURCES AND PROCESSING METHOD

Raster drawings and vector drawings can be uniformly encapsulated in storage, but are different in processing. A complete DACS should include functions such as enhancing scanning interface, automatic refining, index, and intelligent object selection etc. In the long run, CAD drawings will be the main data sources in the DACS. DACS will gradually decrease its support for scan drawings after a period of time. The concrete interpretations of all functions are as following:

Enhanced scan interface: The system should have a build-in scanner interface supports popular large format b&w and color scanners (TIWAN scanner). It'll take full direct control of the scanning process to produce the optimal raster data from the scanned image. In addition, it may also have the ability of automatic jointing of scanned large drawings (i.e. File Merge, including "Smart Stitching", Calibration, Adjustment.) and debluing with nonuniform background.

Automatic refining: Auto Cleanup provides intelligent automatic despeckling and alignment (deskew). Selective speckle removal and hole filling function with an immediate correction option. Window Cut/Crop, Rotation, Mirroring, Inversion.

Index: Automatically get the relation among layers according to object, then get index.

Selection and Procession of intelligent object and OCR: Raster snap includes snap mode selection; intelligent object selection modes for raster structure with full selection control; raster and vector entitles (objects) can be moved, copied, scaled, rotated, and merged; OCR driven editing of raster text; rasterization (V2R) of CAD entities (objects) or even whole CAD drawings.

AutoCAD support: Support all kinds of drawing forms of Auto CAD, and possess database link

enhanced in Auto CAD.

Raster-to-vector conversion (Vectorization):

- Recognition for long straight lines and arcs, circles, line types, text (OCR), hatch patterns, and arrowheads. Easy to set parameter files for multiple re-use with similar drawings/images.

- Integrated Vector Editors and CAD Tools for corrections.

- On-screen dynamic line weight (line width) classification.

- Window and polygon area selection.

- Automatic layering assigned to line weight and CAD entity.

Symbol Search: Automatic search of symbols in the legacy drawing and replacement with true blocks (AutoCAD blocks) or with imported symbols (blocks) from a library, also recognized text strings associated with the symbol are assigned as attributes.

Batch processing: Unattended automatic raster file editing, format conversion, distortion correction, and/or raster-to-vector conversion processing of multiple drawing(imaging):auto cleanup, raster file and format conversion function , rubber sheeting, raster-to-vector conversion.

5. STORAGE AND TRANSMISSION POLICY

Usually CAD documents are vast enough even to tens trillion. According to the flow and storage of data, DACS can be divided into three sorts:(1) concentrated archiving system: concentratedly store and manage data. Every user can get a drawing anytime and anywhere. Such a structure requires system of high transmission rate (2) Dispersal archiving system: Separately store and manage drawings. Different work units have their own local data storage device, and send image to the units who need by automatic Pre Fetch algorithm. Such structure is safe but complex, it's difficult to achieve (3) the character of multi-service structure are between the previous two. It use two communication networks, one is common local network that transmit common data.

The other is high-speed broad-bandwidth network that transmit mass image data. In term of practice, we select the suitable schema.

The optimizing technology, which preserves caches at client side, is also named after Pre-Fetch. The fulfillment of Cache and security of corresponding data should be taking into account.

In selecting network's rate and storage device, for example, electing cable fiber, or optical disk tower, zone we should take the need of broad data storage and burst broad-bound transmission into account. On the view of computer, DACS should be as following: when server find the situation of drawing data, DACS can abandon server, directly get drawing data from mass storage, The characters of such system are "mass data storage" and "burst broad bandwidth transmission". Because engineer want to get information in a very short time, then spend much time doing its research. While Network will be free in a long-term.

Uniformly, in designing DACS, network's transmission rate should keep enough surpluses. But we can only think of the lower-threshold of need. DACS system should be decided by burst data transmission and should leave enough room to ensure data burst with the development of resign section. If not, there will be a waste. For example, select the transmission rate of 10 Mbps, pave the rough cable, but after some time, the rate won't enough, and we wish to improve, so we must change it into fiber, correspondingly change the network, so there'll be quite a waste.

REFERENCES

- [1] Bao Jie, Pu Lin, Gao Juan, Hong Guojun. Study on engineering drawing archiving and communication system. Transaction of Computer Aided Design and Graphics (accepted, to be appeared) (in Chinese)
- [2] Tang Lijuan. Elementary discussion on characteristics and functions of the engineering drawing files. Guangxi Water Resources & Hydropower Engineering , 1999 No.3.

<http://chinainfo.gov.cn/periodical/gxslsd/gxslsd99/gxslsd9903/990324.htm> (in Chinese)

[3] <http://www.softelec.com>

[4] Bao Jie, Gao Juan *etal.*. Component PACS system Design Orient to Internet. Computer Engineering, 2000,26(7):9-10.(in Chinese)