Realization of a FAX Database System for Virtual Office Syetem

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1. Introduction

Due to recent development of powerful micro-processors, networks of workstations are getting very popular. One of the new applications of such systems is to support cooperation of users and systems. We have been developing a system called Virtual office System" (*VOS* for short) to support office cooperative work. It consist of workstations, networks, databases, communication equipments such as telephone, FAX machines and e-mails), and video systems. One major feature is that it is not required to users to leave his workstation to accomplish most given work, such as meetings and cooperative projects. One required function is integration of communication equipments e-mail, telephone, and FAX). Since e-mail contains information such as sender names, sender's e-mail addresses, subjects, and its contents are computer reliable, it is rather easy to build a system which semi-automatically classify e-mails to store the database systems, and combine with various data. FAX, on the other hand, contains only sender's addresses, telephone numbers and the time and date of send/receive. It is very difficult to realize semi-automatic classification.

In this paper we will discuss how to realize FAX database system using such little information. We are planning to integrate the system with e-mail databases in order to realize integrated communication system.

2. An overview of a Virtual Office System

A *VOS* currently under development is realized on HyperCard system. For rapid prototyping we use Macintosh systems and the result will be transferred to GAIN on Solbourne computers to make use of its database functions and security mechanisms. Recently, groupware software is getting popular, which supports use cooperation. Electronic conference systems, structured e-mail systems and distributed editors are example of such systems. In these systems database functions are not fully utilized. *VOS* is realized by the combination of the following techniques.

Databases
Multi-media processing
Networks of high-performance work stations
Communication equipments such as telephones, Videophones, Fax, electronic mails.
Video equipments such as TVs, video recorders, optical disk.

One of the major objectives of *VOS* is to make use of both real office functions and computer functions.

For communication purpose we will develop a super telephone which can communicate with the destination by possible means. It will be realized by the following steps.

1) The receiver is specified by names, project names, response of a mail etc.
2) The address, telephone number and FAX number of the receiver will be found by the directory database
3) Depending on the communication equipments used by the destination and the requirement of the sender, a proper equipment is selected. As e-mail is the cheapest among the three, usually e-mail is selected. If rapid response is required, FAX is better. If the receiver has both FAX and e-mail equipments, e-mail can also send to make the communication more reliable. Voice synthesized telephone is also good for receivers without FAX and e-mail equipments.
4) The message sent to the receiver is also stored in the database. Semi-automatic classification is required
5) At the receiver's site also semi-automatic classification is required.

3. Current status of e-mail databases and FAX databases

Currently used e-mail databases such as EUDORA for Macintosh and MH for Unix can form hierarchical databases. It is easy to use and schema modification can be realized. Some problems are as follows.

1) Automatic classification of documents is not realized
2) Each document is stored in one location. For some documents two or more locations are required but it cannot be realized.
3) Only one tree index is realized. So search by senders (if there is no such file), dates etc. are not possible without searching all the documents.
4) Automatic selection of important mails is not realized.
5) Automatic maintenance of e-mail address directory is not realized.

In our system we need to handle these problems.

InterFax for Macintosh has the following capability.

. Scanner can be used to store data to be sent by FAX
. Computer ganerated graphic images can be sent as well
. Display and print Fax documents (to be sent or received) is possible.
. Fax documents can be stored in disks.
. As Fax documents have little computer readable information, many functions realized by EUDORA are missing. In order to realize an integrated FAX e-mail system we need to extend the functions of InterFax.

Virtual Office SystemのためのＦＡＸデータベースの実現
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4. Design and Implementation of a FAX Database System

Fig.1 shows the essential part of the prototype system. InterFax, a scanner and a rewritable optical disk system are connected to macintosh. Major functions as follows

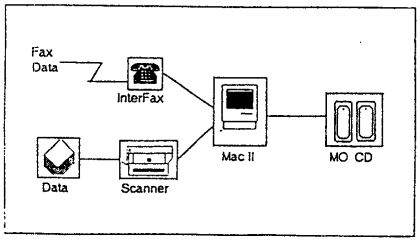

Fig .1. System Configuration

1) Automatic classification
If FAX document is received, date and sender's telephone number are automatically stored with the document. By the number, the sender's name may be identified. Furthermore, by checking recent correspondences with the sender, possible classification can be determined. After checked by the user the document will be stored. To send a Fax the user is required to determine the keywords for the document, which can be used for classification.
2) Importance ranking of Fax documents
Importance of each Fax document is determined by keywords, the number of responses, user defined importance, the number of read operations, whether it is printed or not, whether it is enciphered or not, etc.
3) Generation of message-response relationships
The system will try to generate a directed graph, in which each edge directs from a document to its response. It is semi-automatically determined by the sender/receiver number.
4) Automatic quality check
If a sheet is fed to a Fax machine up-side-down, only white sheet will be sent/received. In some cases the sheet may go to left or right side. The system automatically check such situations and make request for re-send. Furthermore, a function to detect bad quality received documents is required.
5) Fax directory maintenance
If new number is used to send Fax, it is automatically registered to the directory. If a Fax document is received from new number, the number will be registered and the system requests the user to fill necessary information.
6) Flexible retrieval function
Fax documents can be retrieved by
a. information supplied by Fax such as
date-time
sender's(or receiver's) name
the length of the document
b. semi-automatically determined values
keywords
importance
chains of message and its responses
c. current documents
the part of the index which include the documents sent or received in recent few days can be shown to the user.
In order to realize retrieval using multiple keys, more than one index tree can be formed. Each document can be stored at more than one location logically.
7) Modification of stored documents
Like e-mail systems, it is possible to edit stored Fax documents to generate a new documents. In this case history edge similar to message-response edge is automatically generated.
8) Schema modification
Keyword and other attached data can be modified.
Index structure can be changed.
9) Selection of documents to be stored by archival file
Documents not related to currently active documents, are candidates to be sent to the backup tape systems.
10) Security mechanisms
Some secret documents(usually enciphered) must be stored safely. These function should be realized by a user friendly interface based on multi-window.

5. Remarks

The current system has the following problems due to the problems of component systems.
. Security mechanism cannot be realized(due to the limitation of HyperCard).
. The number of pages stored in the main memory is limited
(each scanned document requires about 100kb/page and due to the memory size of the system long documents cannot be sent or received).
. Resolution of graphic data supplied by scanner is not good.
We need to solve these problems in order to develop a nonprototype system. Integration with e-mail database and realization of a super telephone are future research topic.

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References

[1] Yahiko Kambayashi, et al, "Basic Design and Implementation of Basic Function of Virtual Office ", Human-Interface 41-17, pp125 - 132, March 1992.
[2] Kyu-Young. Whang et al, "Office-by Example: An Integrated Office System and Database Manager ", ACM Trans. on Office Information Systems, 5, 4, pp393 - 427, October 1987.
[3] C.A. Ellis, S.J. Gibbs, G.L. Rein, "GROUPWARE: Some Issues and Experiences", ACM Comm., 34, 1, pp 39 - 58, January, 1991.
[4] Abaton, "InterFax Fax Software Manual", A Subsidiary of Everex Systems, Inc.