5-1-1984

EMAS

Elton Pride

ROCHESTER INSTITUTE OF TECHNOLOGY

A thesis submitted to the faculty of the College of Fine and Applied Arts in candidacy for the degree of Master of Fine Arts.

EMAS

Elton A. Pride
May,1984

APPROVALS

Chief Advisor: James Ver Hague

Date: 5/19/84

Associate Advisor: Mahai Nadin

Date: May, 19, 1984

Associate Advisor: Rodger Remington

Date: 5/23/84

Associate Advisor: Malcom Spualt

Date: 5/23/84

Graduate Academic Council Representative: Fred Meyer

Date: 5/25/84

Dean College of Fine and Applied Arts: Robert H. Johnston Ph. D

Date: 5/29/1984

I, Elton A. Pride, prefer to be contacted each time a request for production is made. I can be reached at the following address:

Elton A. Pride
1411 West Gadsden st.
Pensacola, Florida 32501

Elton A. Pride

5/23/84

ACKNOWLEDGEMENTS

This thesis is dedicated to the memory of my Grandmother, for her devotion and spiritual guidance.

I would like to thank Wayne Wylupshi for his support, and for writing the program for EMAS. And finally, thanks to my committee members: Jim Ver Hague, Roger Remington, Malcolm Spaull, and Dr. Mihai Nadin.

THESIS COMMITTEE

Jim Ver Hague, Chief Advisor
Roger Remington
Malcolm Spaull
Dr. Mihai Nadin

TABLE OF CONTENTS

Not long ago the Graphic Designer was seen as a person who conceived and designed posters, book covers, corporate identities, and advertisements. With the technology information revolution at hand, the Graphic Designer has the opportunity to get involved in the development of the technology. However, the technology industry has neglected a profession that has a great deal to say about consumer needs, information organization, aesthetic quality, and overall design.

Graphic Designers down through the centuries have studied a discipline that demands logical organization of information, and also aesthetic quality in the presentation of that information. Therefore, graphic design can play a very important role in the development of this technological information society. Graphic Design has always been used to simplify and transmit large amounts of complex information to interpreters. With this in mind, it should only be natural that graphic design be implemented in research and development of technology that deals with the presentation and interpretation of information, consumer needs, aesthetics and quality of design in general.

Videotex is one such technology that has failed to involve the Graphic Designer from the research end. Regardless of today's concerns, the future of videotex and its database structure belongs to the combination of Graphic Designers, Engineers and Programmers. With these professions working hand in hand to create and design, the user can perform the task the device is suppose to support in the easiest, most convenient, and least stressful manner possible in the most efficient way.

Combining graphic design and the technology explosion can unify two different kinds of systems that have the same means in the end — organization of information. This unification can very well be the amalgam needed to create that special world of harmony that the technology information society can make possible.

The purpose of this thesis is to design a database for videotex from the view point of a Graphic Designer without ignoring technological aspects. I am dealing with a problem that has been overlooked and needs to be addressed — the problem of database structure, search procedure, and retrieval of information for videotex. The goal is to design a database for videotex that will give the user ease of manipulation of information and better retrieval of that information with high interactivity and massive random access.

VIDEOTEX

Videotex is a two-way communications link between the consumer and a database. This database should permit the user ease of access, quick search procedures, minimal waiting time, and high quality display of information. Videotex allows one to send and receive information via a telephone line and computer. The information received is information that has been requested by the user. Therefore, the information should be received as soon as possible with all due consideration going to the user. Videotex is a system that is easily understood by untrained users. With the above in mind, videotex should be as easy to manipulate as every other device we currently use.

DATABASE

A database is a configuration for storage and retrieval of information. It is a system whose overall purpose is to record and maintain information. A database, then, is a repository for stored data. In general, it is both integrated and shared. A database should allow the consumer to have massive random access to information. The database must possess qualities that gives the interpreter the ability to manipulate information, have better retrieval of that information and high resolution of given information. The most important arrays in a database are storage and retrieval. Therefore, any database design must take into account how information will be stored and how that stored information would be retrieved.

Integrated - To have a database that is thought of as a unification of several otherwise distinct data files.

Shared — Individual pieces of data in the database may be shared among several different users.

Node — Source and location of information in a database.

Inner Environment — That environment that deals with inner parts of a system.

Outer Environment — The character of the surroundings one may be in.

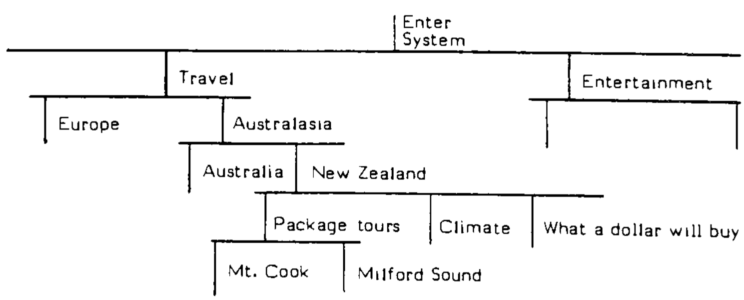
DML — Data Manipulation Language

Tuples — Generally known as rows or tables in relational database structures

There are three main types of database structures for videotex systems: hierarchical, network, and relational.

In the hierarchical structure which is used in most existing videotex systems, pages of data are stored in a simple tree format, each page being linked to all others in a strictly hierarchical arrangement. The upper levels of the tree are used for indexing purposes to guide users who are interested in particular subject matter to the information they require. The number of selections at each branch in the tree is usually less than 10. Hierarchical database structures have been popular in early videotex systems designs because of their simplicity for use by untrained users. Further, recent experience with tree searches has suggested that users quickly find the simple step by step procedures too cumbersome and tend to prefer more direct access methods.

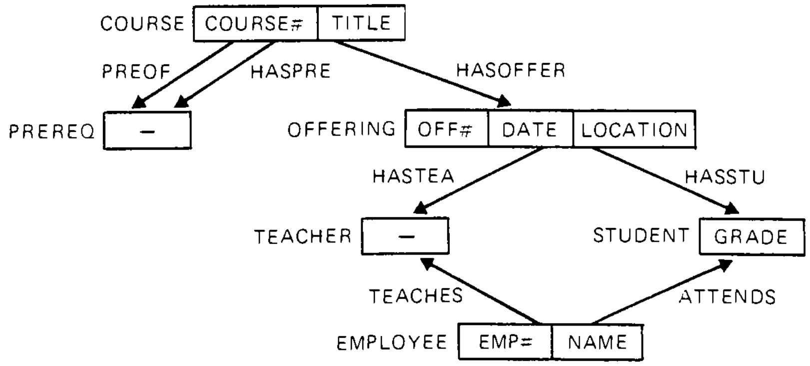
Asymmetry is a major drawback of the hierarchical approach, because it leads to unnecessary complications for the user. Specifically, the user is forced to devote time and effort to solving problems that are introduced by the hierarchical data structure and are not intrinsic to the questions being asked. It is clear that matters will rapidly become worse as more types of records are introduced into the structure and the hierarchy becomes more complex. This is not a trivial matter. It means that algorithms used for a hierarchical structure are more complicated than they need be.



Hierarchical Structure (4:93).

In network database structures, the data is represented by records and multiple links. Any data entry may have any number of links to other entries and is not constrained by a fixed hierarchical association. However, a network is a more general structure than a hierarchy because a given record occurrence may have any number of immediate superiors, as well as any number of immediate dependents.

Although network structures provide greater flexibility in data handling, they suffer complexity in creating a cross-referencing mechanism. As such they are difficult to update and require complete knowledge of the various links for videotex applications. The prime disadvantage of the network approach is undue complexity, both in the data structure itself and in the associated DML. The source of the complexity lies in the range of information - bearing constraints supported in the network structure. For videotex applications, network database structures fall-in between the simplicity of hierarchical structures and the flexibility of the relational structures.



Network Structure (1:452).

The relational approach to data is based on the realization that files that obey certain constraints may be considered as mathematical relations, and hence that elementary relation theory may be brought to bear on various practical problems of dealing with data in such files.A relational database can best be described as a system in which the user views the database as a number of interrelated files or tables. In relational database structures, data are stored in a set of interrelated tables. These tables are typically two-dimensional, in which the rows are the data records and the columns are the data fields. The records are related through fields having matching data.

A relational database actually has two components, an extension and an intension. The extension of a given relation is the set of tuples appearing in that relation at any given instant. The extension thus varies with time (that is, it changes as tuples are created, destroyed, and updated). It is generally assumed that the user's perception of a relation is an entity over which functions and/or predicates can be evaluated. It is also possible to visualize a relation as a table in which the tuples constitute the rows and the attributes constitute the columns. Duplicate tuples are aways removed when relations are updated. One over-riding problem with the relational structure is functional dependency. This leads to several problems when the data dependency theory is used in the actual relational database design. Given the problems experienced by consumers there seems to be a need, to match the logical flow of data, giving the user the ability to move in any direction s/he desires.

Customer name	**Address**	**City**	**Zip**
Smith J. R.	1624 First St. #201	San Francisco	94114
Brown H. L.	193 Jessop Ave.	Palo Alto	94303
Jones M. N.	41 Nancy Ave.	Mountain View	94040

Account #	**Names**	**Balance**
100046	Jones M. N.	$ 164.00
100047	Brown H. L.	$ 2.03
100048	Smith J. T.	$4,610.00

Relational Structure (4:94).

The idea of EMAS (Environmental Massive Access Structure) branched from research that was done over a period of 6 months. This research took me to such places as Young & Rubicom Advertising, Ogilvy & Mather Advertising, Time Teletex Video Service all of New York City, and Viewtron of Miami Beach, which was the first full-scale consumer videotex system in the United States. Also included in the research, were books on the subject and interviews with authorities in the area.

After much of this research was completed, I concluded that the technology of videotex suffered from problems relating to research and development. My concern in this thesis will deal with database design, which I feel is the root of the problem with this technology.

As was stated in the purpose of the thesis a database is desired that gives the users ease of manipulation of information, and better retrieval of that information with high interactivity, and massive random access. These goals were basically determined by the needs of the users. I strongly believe the above actions can be accomplished through the use of semiotics.

In this phase of the development of EMAS, a number of elements had to be taken into consideration, and these elements were: functions of the system, who would be the interpreters, content and value of database (how it would be used) and common elements in outer environment and inner environment.

Functions of database:
— storage of information
— retrieval of information
— easy access to information
— high interactivity
— massive random access

Interpreters:
— blue collar workers
— white collar workers
— house wives
— designers
— lawyers
— doctors
— travel agents
— teachers etc.
The database would be used by a very wide range of people with diverse backgrounds.

Content and value:

The information in the database should be as diverse as the interpreters of the system. The information would be for individuals or groups of individuals that would have a need for information found in the database.

In order to find the common elements in the outer environment it was apparent that it had to be decided where the system would be used. I decided to use my apartment as one such environment and the airport as the other. The reason for this is, my apartment is one such place a videotex system could be used and the airport would provide information for that system. In trying to find the common elements in these two places a list had to be compiled to perform such a task. This list would consist of the following:

Environment
  physical space
  lighting
  human interactivity

Controlled Environment

Tools
  furniture
  machines
  supplies
  activities
  decorative objects

To show how this list was used I will use three examples. The living room of my apartment, the airport in general, and the common elements in both places.

Example 1

LIVING ROOM

Environment
Physical space
— architecture
— interior

Lighting
— natural
— artificial

Human Interactivity
— with apartment mate
— with friends
— self

Space filled with objects
— carpet, rug, furniture, plants, pictures, tools

Controlled Environment
— with specific areas

Tools
Furniture
— sofa
— chair
— coffee table
— table lamp
— end table

Machines
— television
— stereo
— heating system

Supplies

Activities
— listening to stereo
— watching tv
— relaxing
— talking to others
— reading, writing
— entertaining
— exercising
— living

Decorative Objects
— pictures
— plants
— rug

Example 2

AIRPORT

Environment
Physical Space
— architecture
— interior

Lighting
— natural
— artificial

Human Interactivity
— with security
— with friends
— self
— other

Space filled with objects
— carpet, furnture, plants, pictures, tools

Controlled enviornment
— with specific areas

Tools
Furniture
— chairs
— tables

Machines
— televisions
— telephones
— detector devices
— conveyer belts
— heating system

Supplies

Activities
— sitting relaxing
— eating
— talking to other
— watching tv
— walking
— reading
— talking on the phone
— buying tickets

Decorative Objects
— pictures
— plants
— display cases
— advertising

Example 3

Common Elements Found in Living Room and Airport

Environment
Physical Space
— architeture
— interior

Lighting
— artificial
— natural

Human Interactivity
— with friends
— others
— self

Controlled Environment
— with specific areas

Space filled with objects
— carpet, furniture, pictures, plants

Tools
Furniture
— chairs
— tables

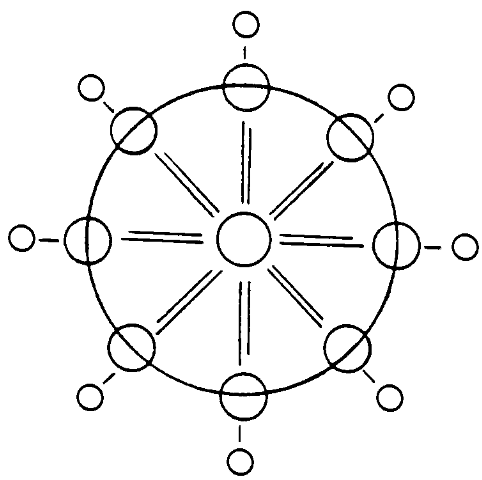
Machines
— television
— heating system

Activities
— sitting relaxing
— talking to others
— watching tv
— reading

Decorative Objects
— pictures
— plants

By using this method of evaluation and applying the list to every room in my apartment and the airport, I found that both environments surround individuals with physical space, architecture, interior, artifical and natural light, and both had controlled specific areas.

After studying the common elements in both areas I discovered that individuals who used these two environments were always surrounded by information. With all data compiled about the outer environment, which showed the conditions for goal attainment, it was decided that the inner environment (database structure) should be applicable to the outer environment. By doing this an invariant relationship would be maintained in both environments.



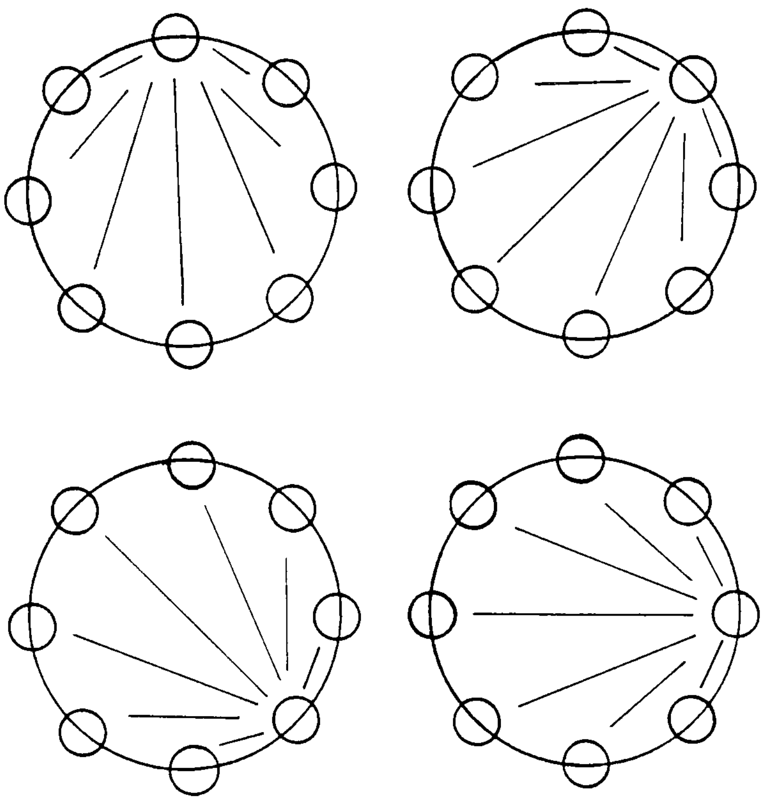
Database Structure and User Connections

EMAS (Environmental Massive Access Structure) visual reality was realized from the fact that people are always surrounded by information. Therefore, the database structure took on a circular form that would encompass the user, who is stationed in the center of the structure. See example. Data files in EMAS have six characteristics that distinguishes it from the hierarchical, network, and relational - based structures:

— Each node maintains the same address
— User always knows his/her location
— User needs no knowledge of structure
— User is always located at center point
— User has no concerns for modes
— EMAS allows massive random access
— EMAS is highly interactive

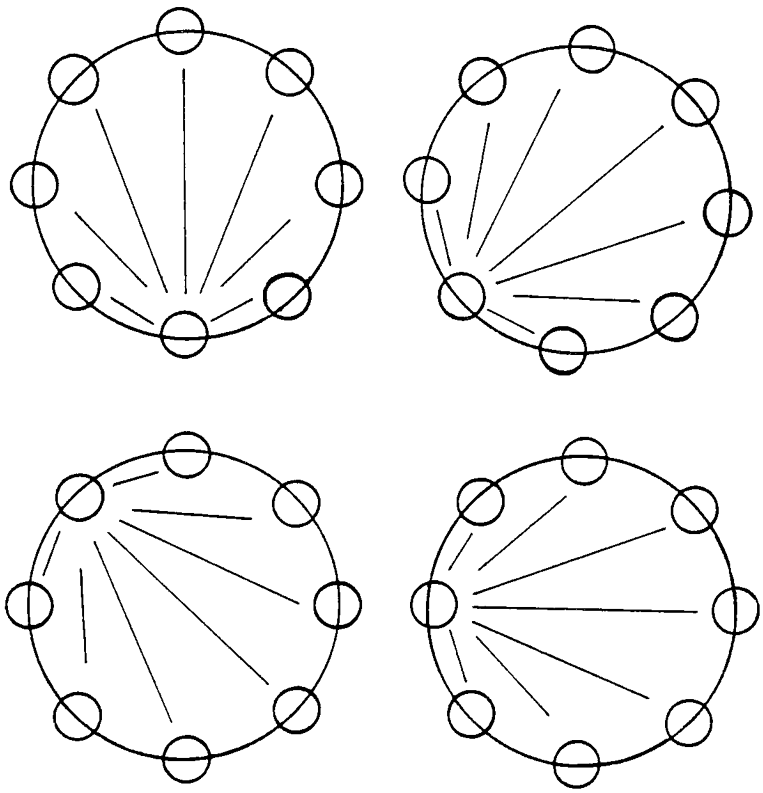
With all facts present from the three environments, it was found that the representamen in all cases related in each case. All that is offered as a sign is the representamen. The interpretants of both the airport and the apartment relate to the new interpretant of EMAS. See examples for node connections.

Main Database Connections

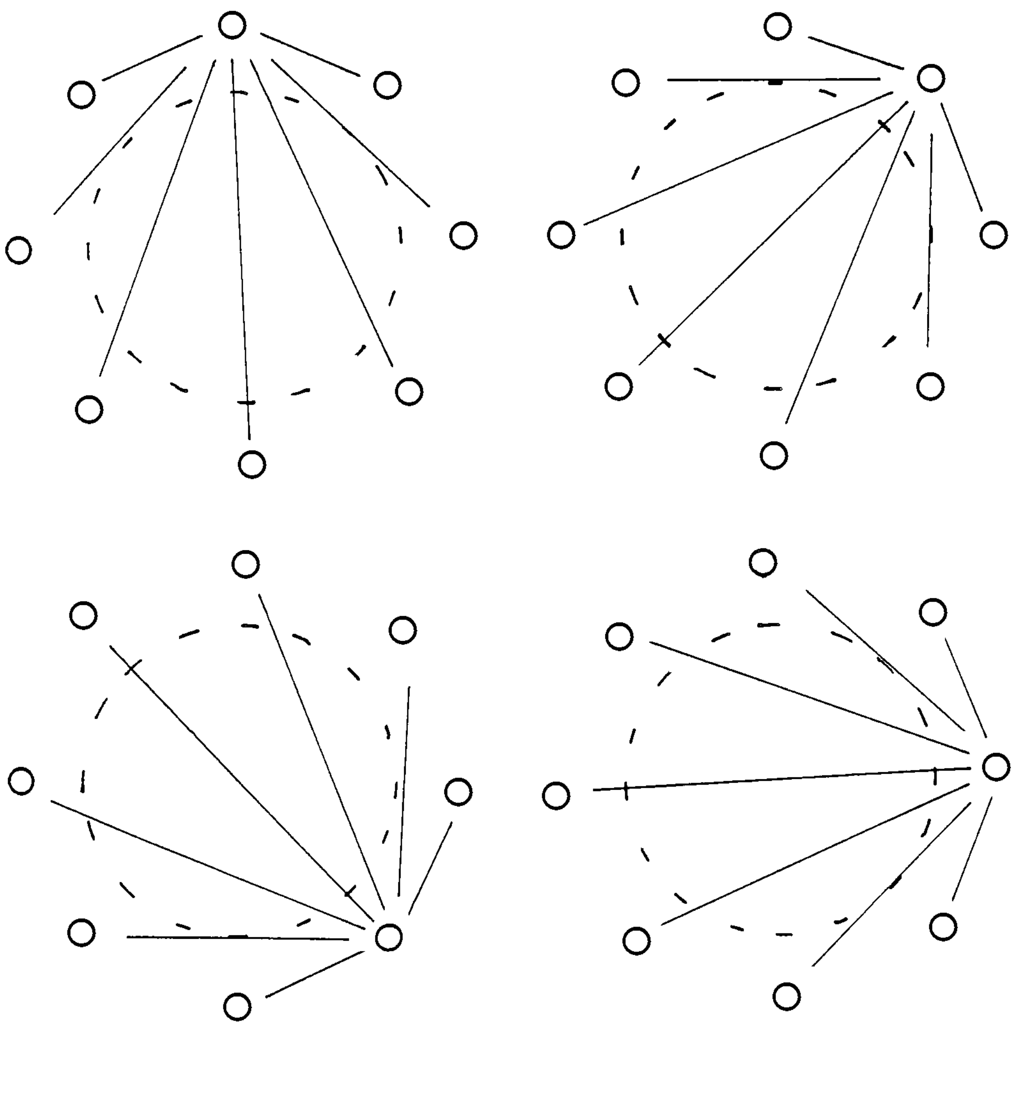


EMAS is a database that was designed to give users ease of manipulation of information and better retrieval of that information with high interactivity and also allow massive random access. EMAS serves the above demands and many more. This structure directly relates to one's everyday environment of being surrounded by information. With this in mind, the interpreters of the system should have no problem relating to the database structure of EMAS and its ease of use.

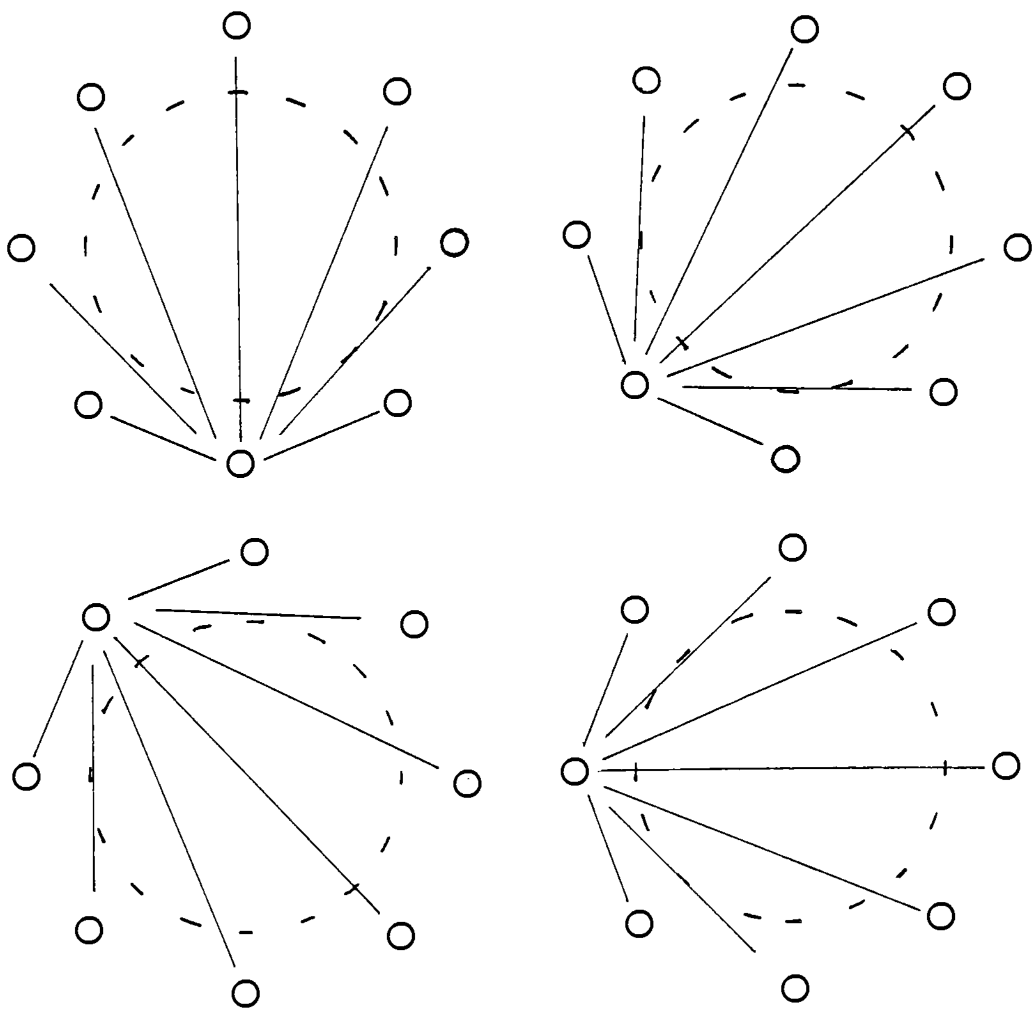
Main Database Connections Continued



Sub Database Connections



Sub Database Connections Continued



After the concept and process interface of EMAS was complete, something had to be done to make it possible for the system to be interacted with. At this point a programmer was brought in to write a program for the structure. However, due to time constraints the 16 node database structure was cut down from 16 nodes to 3 nodes. Nevertheless, it must be pointed out that a 3 node structure would function basically in the same manner as a 16 node structure.

The program for EMAS was done in Pascal. The program had to reflect the needs of EMAS and make it possible for the users to move back and forth between nodes, which is one main function of the database structure.

Once the program was complete, questions could be asked that dealt with flights from Rochester and flights to Rochester (from and to the following cities):

Atlanta, Georgia
Baton Rouge, La.
Boston, Mass.
Houston, Texas
Miami, Fla.
New York, NY
Los Angeles, Cal.

Questions could also be asked about the following travel agents, that dealt with phone numbers and addresses:

All-Around Travel Inc.
Globe Travel
Josh Travel Service
Red Carpet Travel
Liberty travel

The following are questions that could be asked of EMAS:

1. List all flights to Rochester from Atlanta.
2. Is there a 6:55pm flight to Rochester from Atlanta.
3. List all flights from Rochester to Atlanta.
4. List all travel agents.
5. List phone number of .... travel agent.
6. List address of .... travel agent.
7. List all information on travel agents.

The above questions are only sample questions for the 3 node structure. Nevertheless, the question could have read; display all flights to Houston from Rochester, and so on.

When EMAS is compared to other database structures, the hierarchical structure, for example, one will see that the user has the option to go from point 1 to point 10 if s/he desires. This is unlike the hierarchical structure where the number of selections are less than 10. With EMAS, the user simply types in the question, not having to be concerned with step by step procedures or level of importance of information. The reason for the typing interface instead of having to select options from the screen basically deals with demands for interactivity with the system. This goes back to the Process Interface of EMAS, where it was discovered people deal very directly with their surroundings. Therefore, what ever interactivity can be placed within the system should be.

The keyboard interface of EMAS is one that will allow the user to misspell words and use short sentences to cut down on syntax errors. For example, one could ask, list all information on 6:55pm flight to Rochester from Atlanta, Ga. or the sentence could be phrased, display info on 6:55pm flight to roch from atl. The latter sentence allows more direct interaction in way of cutting down on content within the sentence.

However, with EMAS there would be an expressive function problem that veries from user to user. This means if 10 people ask the same question, that question could be asked in 10 different ways. Therefore, the message many of the users convey would not maintain the phatic function of the system, meaning the interface with the system would be broken from the stand point of the language problem. In addition to the these problems, there is a time sensitive problem, which means language changes from day to day. One may ask a question today, and then ask that same question tomorrow in a different way. Nevertheless, the system is able to recognize the variations mentioned earlier.

EMAS's page design approach is not fully developed. However, the overall concept can be mentioned. This portion of the interface of the system was also designed with the user in mind. To achieve what users demand, careful attention was paid to a number of matters: text, punctuation, spacing, use of color and graphics.

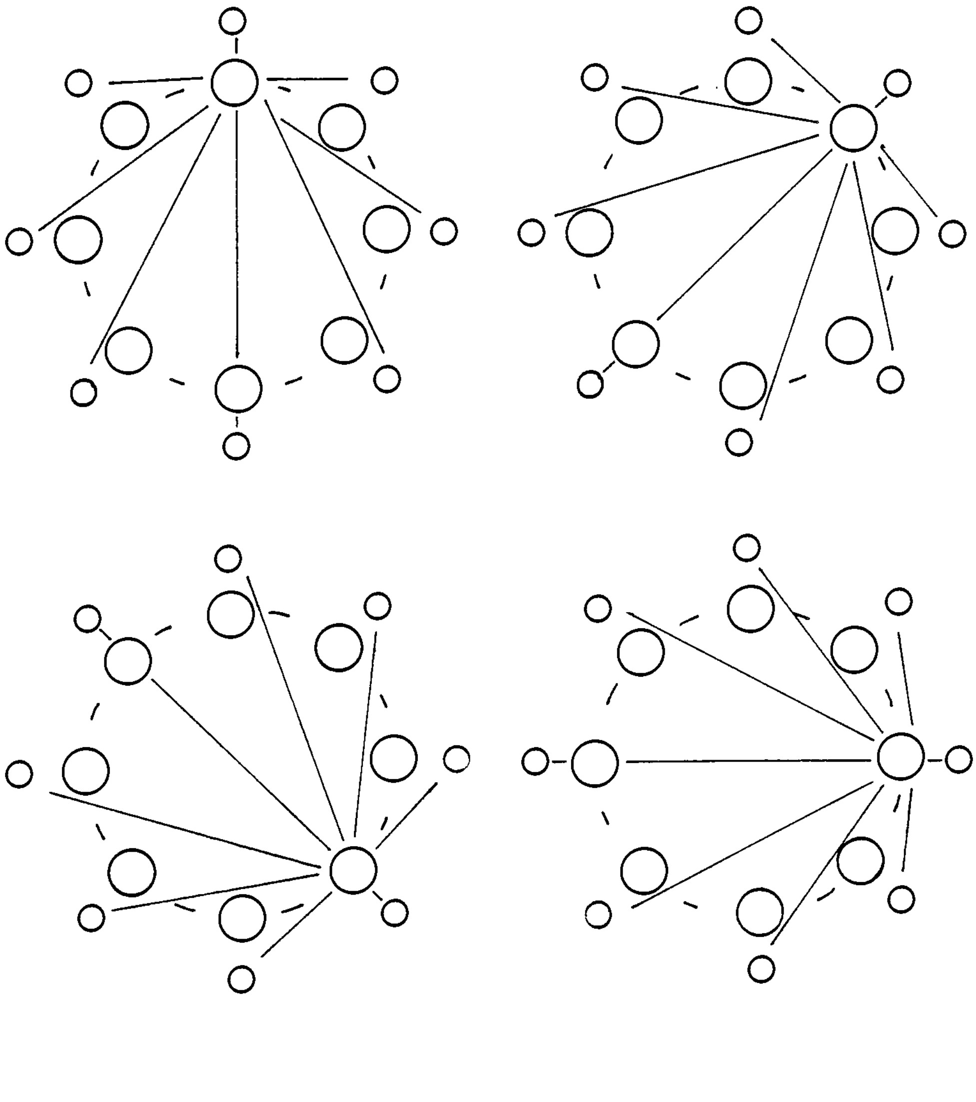
As with most exiting videotex systems today, information is presented with large bands of color, graphics that are not needed and a very bad use of space. When EMAS presents information to the user, the screen is divided into four parts: top, which is reserved for page headings, the bottom for messages to the system, left middle for requested information and the right middle for graphics if needed. However, if the right portion is not being used for graphics, text will flow in that area. This design started with the fact that information on a screen should be limited, clear and precise. Unnecessary information should be avoided. What ever information that appears on the screen should be unambiguous, complete and exclusive. Graphics should be used only when needed to convey information that calls for it. The relationship between EMAS and its page design is that , both offer what the user wants, precise information in a clear understandable fashion.

However, when refering to the user's interface of EMAS, I am talking about syntax, semantics, and pragmatics. The syntax of EMAS relates to how the database structure was put together, which refers to the representamen of the system. The semantics deals with what is represented, and what is said by the users interface. The function of EMAS is the pragmatics of the system, what will be accomplished by EMAS. The unity of the above are essential in the system approach to the user interface.

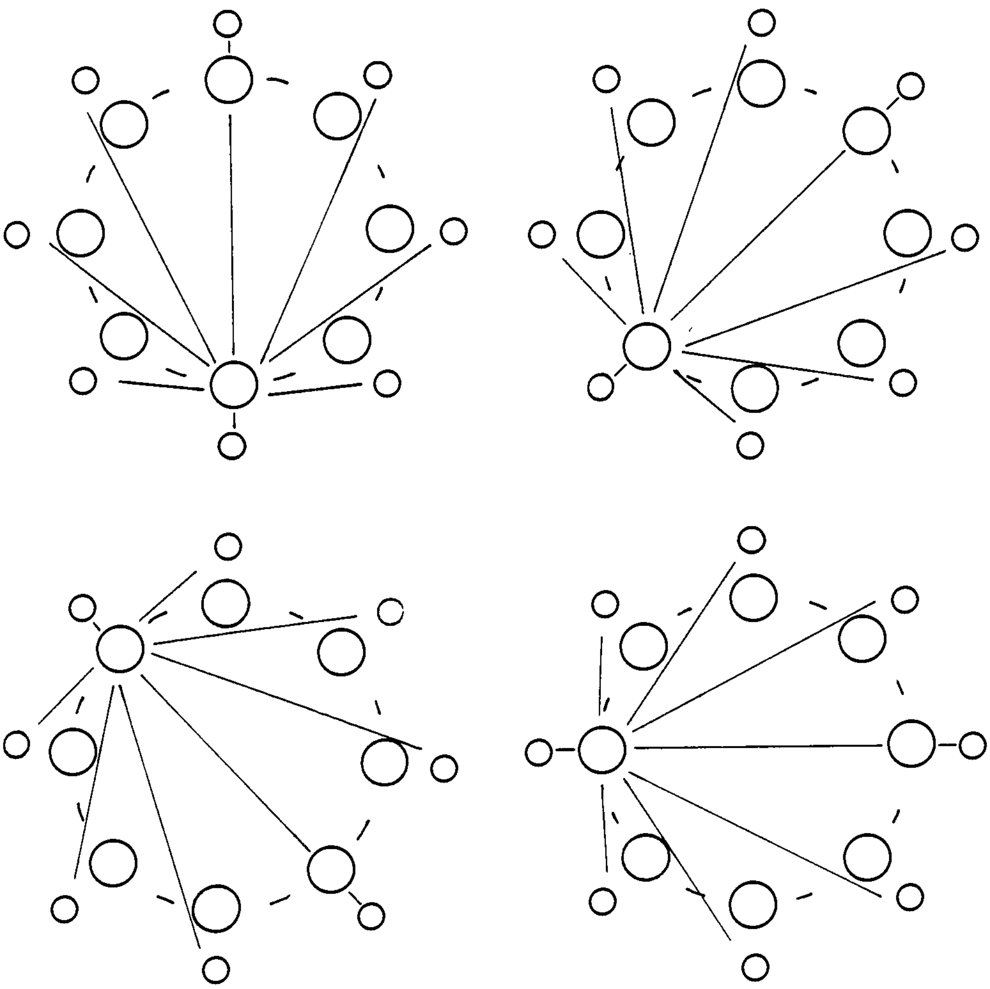
It must be brought out at this point that air travel data is not the only data EMAS is capable of handling. Moreover, EMAS was designed to function with a keyphrase that would allow one to type in, for example fashion. Once this is done all nodes encompassing the user would change to fashion data. With this ability of keyphrasing EMAS could be thought of as a universal turing system. This universal turing machine is able to accomplish different pragmatic functions.

Nevertheless, the 3 node version of EMAS shows that it is possible to have high interactivity and massive random access. During EMAS's interface with interpreters, their reactions ranged from enthusiasm to the question, what does graphic design have to do with this. Well, it should be obvious at this point what role graphic design can play in videotex and database design.

Main and Sub Database Connections



EMAS Continued



My thesis proposes the unity of Graphic Designers, Engineers, and Programmers to bring about that harmonious link needed in this technology information society. What I am theorizing is that the above disciplines can begin to perceive the common creative activity in which we are all engaged. At this point, we can share our experiences of the creative, professional design process and design for the user the most convenient, and least stressful information providing machines.

During the design process of EMAS, I found that we live in a very complex and rich environment, and by realizing the importance of this outer environment I was able to design with more realism. In addition, we as Graphic Designers must become explicit as never before about what is involved in creating a design such as EMAS, and what takes place while the design process is going on.

EMAS's reality was possible because I found that connection between outer environment and inner environment through the use of semiotics. This heuristic approach provided a database (EMAS) that is flexible, has a great deal of interactivity, that allows the user to understand the connections of the structure. This interactivity eliminates concerns with, what mode am I in, because you can select to go back and forth according to needs. With this in mind, the interpreters of the system should have no problems with relating to the database structure of EMAS and its ease of use.

Vannevar Bush wrote of science as an " endless frontier. " The same can be said for the design process and the adaptability of change in human society. Our task as Designers is to make sure we challenge all the possiblities at hand and make a clear road for others to follow.

1. Date, C.J. An Introduction to Database Systems. Third Edition. Menlo Park,California: Addison - Wesley Publishing Company, 1982.

2. Schmidt, Joachim W., Brodie, Michael L. Relational Database Systems. BerlinHeidelberg, New York: Springer - Verleg, 1982.

3. Simon, Herbert, A., The Science of the Artifical. Cambridge, Massachusetts:The MIT Press, 1982

4. Tydeman, J., Lipinski, H., Adler, R., Nyhan, M., Zwimpfer, L. Teletex andVideotex in The United States. New York, NY: McGraw-Hill PublicationsCompany, 1982.

Boillot, Michael, H., Gleason, Gary, M., Horn, Wayne, L. Essentials of Flowcharting. Penascola, Florida. Dubuque,Iowa: WM.C. Brown Company Publishers, 1975.

Dreyfus, Hubert, L. What Computers Can't Do, The Limits of Artificial Intelligence. New York, Hagertown, San Francisco, London: Harper Colophon Books, 1979.

Farina, Mario, V. Flowcharting. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970.

Hartmanis, J., Goos, G. Data Base Design Technology I. Berlin Heidelberg, New York: Springer-Verlag, 1982.

Lenher, John, K. Flowcharting: An Introductory Text and Workbook. New York: Auerbach Publishers, 1972

Sigel, Efrem. Videotex: The Coming Revolution In Home/Office Information Services. London: Heyden & Son Ltd., 1980.

Wiederhold, Gio. Database Design Second Edition. New York: McGraw-Hill Book Company, 1983.

Woolfe, Roger. Videotex: The New Television/Telephone Information Services. London: Heyden & Son Ltd., 1980.

Computer Graphics World, " Broadcast Telesoftware," Raggett, Michael.
" Graphics In Videotex, " Latamore, Berton, September 1983.

"Dowline: The Magazine of Dow Jones News/Retrieval", Hopkins, Michael. Dow
Jones & Company, Inc. 1982.

Systems & Software, Marketviews, April 1983.

Management Information Systems Week," Videotex Test Continue at ChicagoHotel," Egan, Mike, Floravate, Janice, October 1983.

Norpak Corporation, Information Sheets, 1983

Viewtron Magazine & Guide, Viewtron Corporation of America, Inc. November 1983.

Viewtron Magazine & Guide, Viewtron Corporation of America, Inc. December 1983

Interview, Joel Azerrad. Art Director, Time Video Information Services, Inc. New York, NY: November 4, 1983.

Interview, Mark Rollins. Director Telesoftware, Time Video Information Services, Inc. New York: November 4, 1983.

Interview, Jay Leve. Design Supervisor, Viewtron Corporation of America, Inc. Miami Beach, Florida: December 28, 1983.