Advanced Material and Vendor Information System - AMVI

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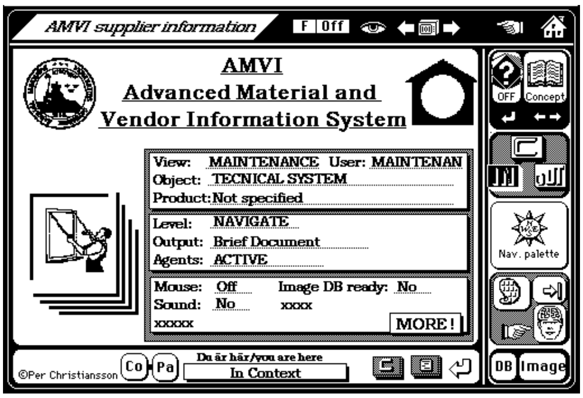
ABSTRACT

In the existing KBS-MEDIA (knowledgebased systems - media) environment demonstration systems (demonstrators) are built to support different phases in the building process - City Advisor, Material and Vendor Information, Building Maintenance etc. In this environment new concepts and tools are defined and tried out in connection with using, building and maintaining the systems formed by advanced software and new media.
The report describes a demonstration system for 'Advanced Material and Vendor Information'. The work has been carried through as a joint project between the department of Structural Engineering at Lund University and the Swedish Building Centre in Stockholm. The users have on application level access to the underlying facts bases as relational databases, audio/visual image banks on videodisk and hard disk and tool boxes through a context dependent interface. Existing databases are also transferred to the system. Background agents are created to help users/system-builders to control the access and growth of the system during use. Different representations are used (analogical, hypertext, relational databases, decision trees, neural nets, objectoriented, etc.) which are loosely linked and more or less formalizing our real world. Great emphasis is on the user interface which has multimedia properties. The system forms a demonstration environment used to capture, test and communicate ideas thus admitting fast prototyping of the next generation integrated material and vendor information systems for the building industry.



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INTRODUCTION

This report [1] was published in a preliminary version when the project was demonstrated in August 30 1989 at a board meeting of the Swedish Building Centre.

The preliminary report was written to support the project demonstration at the board meeting. The report [1] also contains a short summary in Swedish.

The project was sponsored by the Swedish Building Centre and the Swedish Building Research Council.

1. PROJECT BACKGROUND

In September 1987 a joint project between the Swedish Building Centre in Stockholm and the department of Structural Engineering at Lund University was formulated after idea discussions between Technical director Henry Karlsson and Dr. Per Christiansson. The project was named AMVI, Advanced Material and Vendor Information. A joint Nordic application within the area was forwarded to the Nordic Council of Ministers in June 1988. The AMVI project has served as a pre-project to that collaboration.

The existing KBS-MEDIA environment (knowledgebased system - Media) at the department of Structural Engineering has formed the basis for the project. A demonstration system has been developed which also has acted as a vehicle and communication tool during the project work.

The main work has been carried through by Per Christiansson who has also been project leader. Per Christiansson has been responsible for concept formulation and development of the HyperCard program including the interfaces between HyperCard and Oracle in the MacII environment as well as programs based on induction systems and neural nets (see also '6.2 Software and hardware platforms'). Alberto Herrera has transferred part of the Building Product Register/BVR Byggvaruregistret (database) at the Swedish Building Centre and price information from from Prisinfo AB in Växjö to the relational database Oracle in a PC environment. A group under Henry Karlsson at the Swedish Building Centre has also worked in the project: Henry Karlsson, Håkan Andersson, Anders Lundbladh, Ragnar Lönn and Lars Häggström (Lars Häggström from October 1988).

2. PROJECT OBJECTIVES

A so called demonstrator (demonstration system) has been developed in the project. This system has been and will be used to capture, test and communicate ideas. The project had the following objectives:

* to test ideas
* to clarify problem areas
* to propose and test different problem solutions
* to contribute to the formulation of concepts for future material supplier/vendor systems
* to study the possibilities and limitations with new information technology in material vendor systems (such as optical media, knowledgebased systems, tools to build and use the system, relational databases, object oriented systems, etc.)
* to point out and exemplify new application areas for electronic product information
* to develop a demonstrator
* to support knowledge transfer within the area both nationally and internationally
* to increase the knowledge about new media and advanced man/machine interface as well as computerized application models and modelling tools.

3. REPORTS OF RESULTS

The work has been 'documented' in different ways.

(1) through the developed demonstrator which has been shown at various occasions in Sweden and abroad,
(2) output to related projects,
(3) at meetings in Sweden and internationally mainly by Per Christiansson and Henry Karlsson,
(4) through this report and other articles

Several working group meetings have been held during the period 1988-1989, in Lund and Stockholm. The following persons have participated

Håkan Andersson	The Swedish Building Centre
Per Christiansson	Lund University
Alberto Herrera	Lund University
Henry Karlsson	The Swedish Building Centre
Anders Lundblad	The Swedish Building Centre
Ragnar Lönn and	The Swedish Building Centre
Lars Häggström	The Swedish Building Centre (since October 1989)
Lena Rosén	from the KBS-MEDIA project. Practising architect

1] Christiansson P, 1990, "Advanced Material and Vendor Information System - AMVI". Report SE-LUTVDG/TVBK-90/3027. Lund University. May 1990. (This report also includes a short summary in Swedish).

Henry Karlsson, Håkan Karlsson and Per Christiansson demonstrated the system and carried through discussions with the Schweizer Baudokumentation at the SWISSBAU 89, January 1989, Basel, Switzerland.

Per Christiansson and Henry Karlsson are members of the expert group connected to a Swedish project on "Databases for vendor information in heating, water and sanitation. Requirements analysis and development of working methods and adaption to CD-ROM technique". Per Christiansson demonstrated the AMVI-system for the expert group in Stockholm at the Swedish Building Centre in December 1989.

The Swedish Building Centre had the AMVI system at display at the NORDBYGG 90 exhibition in Stockholm, January 1990.

Relational database information was transferred to the Stockholm division of the National Building Information Technology Program, IT-BYGG. The system was also demonstrated at an IT-BYGG Stockholm meeting in march 1990.

The Swedish Building Centre also carries through several efforts within the area of Information services, Data Communications and Classification relevant to supplier, material and vendor information.

4. RELATIONS TO NON MERCHANDISE INFORMATION.

In (Christiansson 1990a) future information systems are discussed. The development of the next generation merchandise information systems will probably constitute a very strong driving force for the formulation of computerized product models of buildings and their parts. The merchandise information system may be regarded as an electronic catalogue or as a library of goods which are described in a suitable way (geometry and attributes) to be transferred on line to the computerized product models.

In figure 1 it is shown how building product related information may be structured. Ongoing efforts are now focused on developing product models. (PDES/STEP, Product Data Exchange Specification/Standard for Exchange of Product Model Data) but also for documents (invoices, orders) exchange standards as EDIFACT, Electronic Data Interchange for Administration, Commerce and Transport.

Another project with close coupling to the AMVI project is also carried through in the KBS-MEDIA environment, namely the "Advanced Information Technology in Building Maintenance"/"DELPHI" project. Other KBS-MEDIA based projects are reported in (Christiansson 1988a, 1989b).

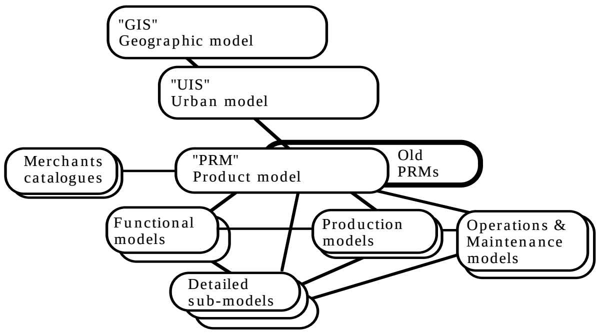

Figure 1. To be able to cooperate separate models must have known vocabularies/semantics (eventually class hierarchy definitions down to certain levels). Building process models (reproductions) will forward partly be fragmented. From (Christiansson 1990a).

5. BUILDING INFORMATION FOR THE FUTURE

From (Christiansson, 1989a) (translated into English)

"During the last years development has to a high extent been driven by available technique. We have tried out different solutions to our problems and are now ready for an even more accelerated development as the computer tools have become very "user friendly" and the systems more "susceptible" to new information.

Of course there will be both possibilities and difficulties ahead. We must understand and accept that we now are located in a turbulent phase of development where we are shifting paradigm from what we can call the industrial capitalism to something new. We try to see possibilities and risks in the new technique. New concepts are constantly formulated and "agreements" slowly radiated from new patterns of thinking and acting.

How can we proceed? Through education and knowledge transfer the economical basis for R&D ought to be improved leading to qualitative and extensive activities concerning the formulation and testing of tomorrows systems based on modern IT. Some more ingredients: establishment of non-traditional groups, industry involvement, comparative evaluations, creative environments and (hopefully) open minds.

It is again meaningful to resume work on existing ideas about how to represent and make knowledge accessible. As an example we can combine multimedia technique with the hypertext concept thereby allowing us to create very powerful and suitable systems partly with completely new properties.

We must onward perform some tests. How can we in different situations by using computer support enhance our intellect and enrich communication between people? How do we communicate our experiences? It was easier before. We then often formulated isolated models (reproductions) in different problem domains. After that we put these often rather static models into the computer systems using available software. And so we will continue to do. The news is that we have (or will have) to formulate the <u>rules</u> which governs the <u>growth</u> of the systems. Yesterdays programmer will become tomorrows toolmakers. It is thus of great importance that we really strain ourselves as we formulate problems and describe the properties of the intended systems. This is best done if we have some knowledge about the potentialities and limitations of information technology."

In (Christiansson, 1990a) examples and views are given on the long term development in the building sector with respect to possible and expected progress of information technology, IT. Possible scenarios are described for enhanced communication between people in the building process, our ability to create computerized models, fill them with information and search and use that information.

Part of that future is described in this report.

6. THE KBS-MEDIA ENVIRONMENT

Since the autumn 1987 the work on building a KBS-MEDIA (knowledgebased systems-media) environment has been carried through at the department of Structural engineering at Lund University.

The environment hosts the development of <u>demonstration</u> systems which are used to capture, test and transfer ideas among system end users in the building process and the system builders/tool makers.

6.1 Characteristics of the KBS-MEDIA environment

The most powerful features of the KBS-MEDIA environment are:

* clearer and more obvious connection between <u>application</u> and computer stored <u>model</u>
* <u>integration of advanced software</u> tools as knowledgebased systems, neural nets, HyperCard and relational databases
* simplified <u>knowledge elicitation</u> and <u>dynamic</u> growth, change and validation of models
* use of different <u>knowledge representations</u> in cooperation (object oriented, decision trees, neural nets, relational databases, frames, analogical, symbolic, procedures, hypertext, rules, etc.) and <u>search strategies</u> (map analogies, pattern recognition, tracking, etc.)
* offer of <u>adapted tools for problem solving</u> (decision support, information browsing and search, model building and maintenance tools, background agents, navigation palettes)
* design of powerful <u>man/machine</u> interface
* tools to <u>access</u>, <u>collect</u> and <u>handle</u> very large <u>information</u> volumes
* computerized models supported by <u>real life pictures</u> and sound as well as <u>computer generated</u> pictures, drawings, animations and sound.
* <u>integration of optical distribution and storage media</u> to support different computer stored models
* <u>tools for acquisition</u> and <u>handling</u> of <u>great picture volumes</u>
* powerful tool for <u>knowledge transfer</u> (training, education, communication and spread of information)
* fast and simple <u>prototyping</u>
* <u>Demonstrator</u> for capture, test and communication of ideas.

6.2 Software and hardware platforms

The main software is HyperCard from Apple Computer Inc., Cupertino, SuperExpert (induction system) from Intelligent Terminals Ltd., Glasgow/ Novacast AB, Ronneby, see also (Christiansson, 1986b), MacBrain (neural nets) from Neuronics Inc., Boston (Chait and Jensen, 1988), Oracle (relational databases) from Oracle Corporation, Belmont (Oracle, 1989), Swivel 3D (3D modelling) from Paracomp Inc., San Francisco (Paracomp, 1988) and MacroMind Director/VideoWorks II (to animate Swivel models) from MacroMind Inc., San Francisco (MacroMind, 1987).

Per Christiansson has written some extension to the HyperCard environment. These extensions are written in Pascal to control the videodisk.

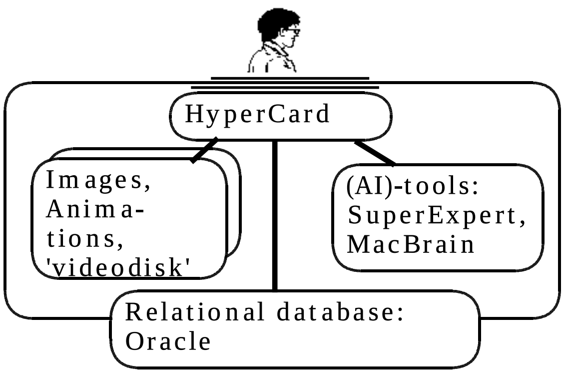

Figure 2. The main software components in the KBS-MEDIA environment

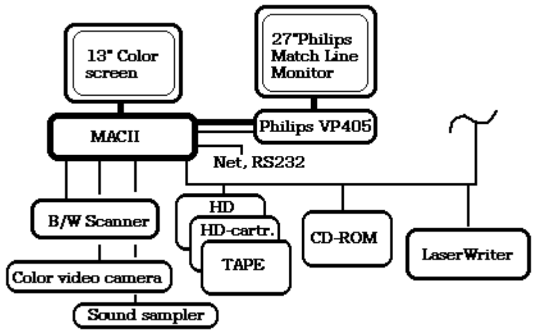

Figure 3. Hardware components in the KBS-MEDIA environment. MacII computers from Apple Computer. Scanning by B/W scanner, sound sampler and digitizing from Super-VHS camera. 45 Mbyte hard disk cartridge are extensively used for storage. The Videodisk player may also display its output on the computer screen making the image and video films touch sensitive.

These procedures are compiled to so called XCMDs (External commands) which are integrated into HyperCard. Other programs have been written in HyperTalk which is a local script language in HyperCard. The interface to the Oracle database is written in HyperTalk using XCMDs delivered with the database. In the same way the communication and control of the integrated neural nets are implemented. The hardware environment is shown in figure 3.

7. SYSTEM CONCEPT

7.1 User in control

Figure 4 shows the logical layout of a demonstrator in the KBS-MEDIA environment. The main control of and communication with the system is performed by the user through a context container. The in-context (see figure 6) holds information about for example user descriptions, building process phase, additional specification of views to the model, special access conditions (learn/navigate modes, filters), and tool settings (active/passive agents etc.). The context is view dependent and stored in a HyperCard program (see below).

Separate facts bases belonging to the application are connected; (a) alpha-numerical information in relational databases, (b) images, film, sound on optical videodiscs, (c) text, sketches, speech, animations in HyperCard and MacroMind Director and (d) images and drawings on hard disk or CD ROM. The tool box contains context dependent tools as image browse palettes, navigation palettes, special advisory agents, application specific procedures, model building agents, vocabularies etc. Background agents possess knowledge about applications or computer tools (sometimes the border is not sharp). See also (Christiansson, 1990b).

The KBS-MEDIA environment forms a powerful concept for further system development also under use in its final application environments.

The user is in control and will get the degree of help she/he needs in solving different problems. She/he is travelling in a huge space of information from an initial state through goals/problem solutions. At her/his disposal there are adequate help and more or less formalized processes and information landscapes. Often we can presuppose that the problems are not very well defined.

The KBS-MEDIA concept offers a platform for development and access of loosely coupled models stored in computer systems. The systems which are developed have first passed a stage of conceptual modelling which to a great extent is manually done, see also (Christiansson, 1989b).

In the future we must be prepared to handle loosely coupled models which contains partly redundant information, that is the same data about real objects can be found in different places in the system. Depending on what part of the real world we represent in the models and how we want to access it, we will end up with different formal representations and thus actual "physical" storage in the systems - analogical representations of images, object representations, procedural representations etc.

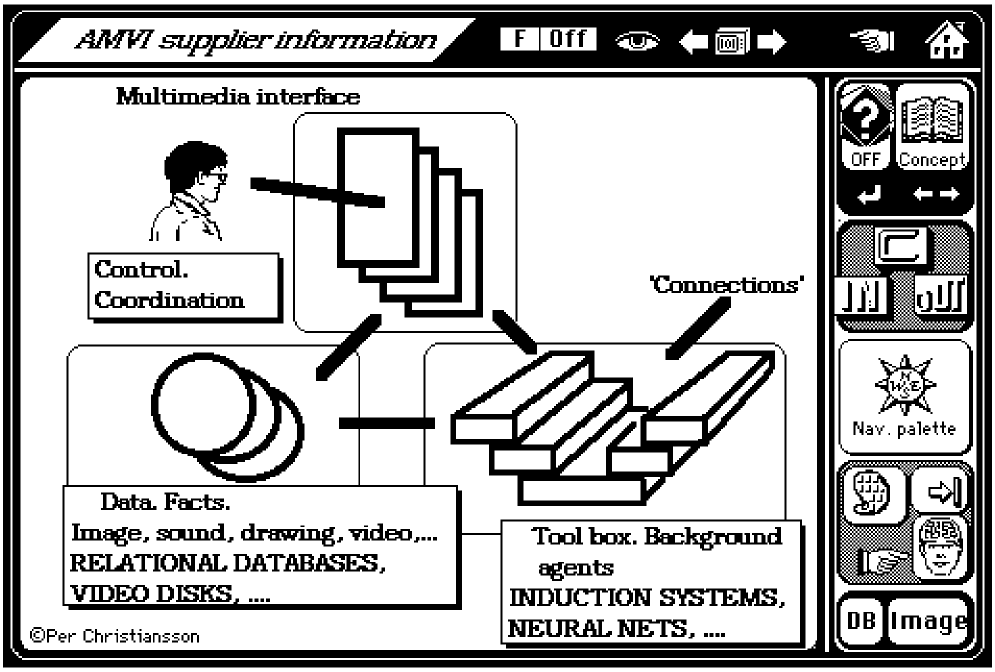

Figure 4. Logical layout of a demonstrator of the material vendor information system. Ideas are captured, tested and communicated between end-users, researchers and "tool makers" in a demonstrator.

New concepts for storing and handling information will be formed. As stated in (Christiansson, 1988a) the computerized model and interface also may be regarded as a hyperdocument with dynamic properties.

The end user will be provided with predefined structures and tools to augment the model content. Many basic operations and structures will be provided in the future "operating systems" of the computers. This means that not only text but also sound, images, film sequences etc. will be naturally handled in the systems (cut, paste, scan, link, etc.).

When the window to the user is big enough to be displayed to many persons, see also the communication room concept in (Christiansson, 1990) (or smaller windows in a distributed environment) the prerequisites for cooperative working environment and experience acquisition are present.

7.2 Structure of the system

The logical structure of the AMVI, the material vendor information system is shown in figure 5.

Three levels are distinguished; the context level with different views (design, installation etc.) to the system, the facts bases and tools/background agents and the intermediate notebook or short term memory. The parts will be described

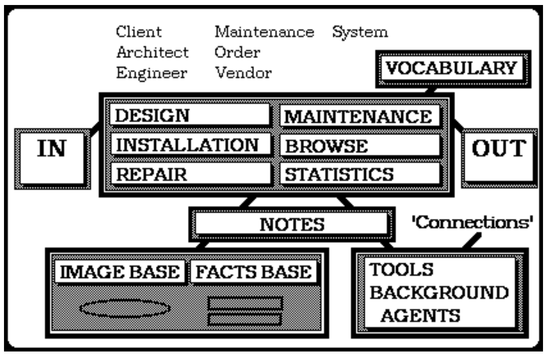

Figure 5. Logical layout of a demonstrator of the material vendor information system. Three levels are distinguished: The context level with different views (design, installation etc.) to the system, the facts bases and tools/background agents and the intermediate notebook or short term memory.

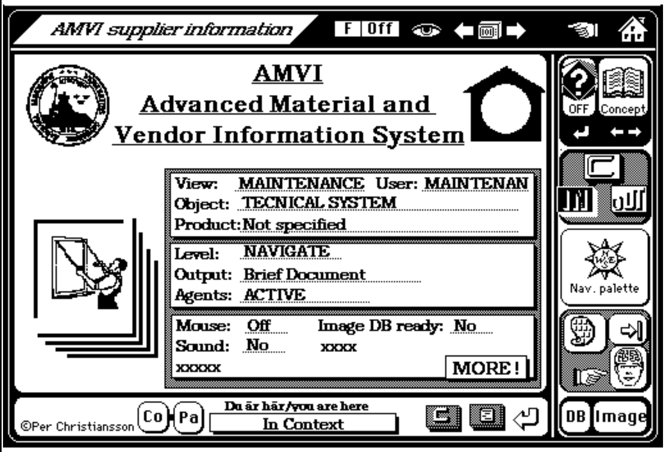

Figure 6. The in-context describing the user, view to the system, type of vendor target product (if any) as well as settings about access levels, output specifications and system performance. The screen display corresponds to the "IN" box of figure 5.

in more detail below.

7.3 Context descriptions

Figure 6 shows what the user see when she/he enters the system. This is the IN-context which describes (1) the user (see also the listing on top in figure 5) view to the system (see figure 7), type of vendor target product (if any) as well as settings about access levels (dependent on user and view), output specifications (brief document, full report or send to other model). Settings are also made which relate more to the actual performance of the system like, should the mouse be touch sensitive or do I have to click during mouse controlled navigation, shall certain agents be active, etc.

The user reaches the preset context (view) simply by dragging the mouse to the "C" above the navigation palette. He can also make excursions to other views by activating a pull down menu by pressing the "C" button in the lower part of the screen (next to the NOTE BOOK/SHORT TERM MEMORY button.

7.4 Note books/short term memory

The user and background agents have access to a short term memory or note book where intermediate data are stored, see figure 8. While traversing the information space the user may at any time mark (highlight) and copy text he wants to be remembered temporarily. Each time a text

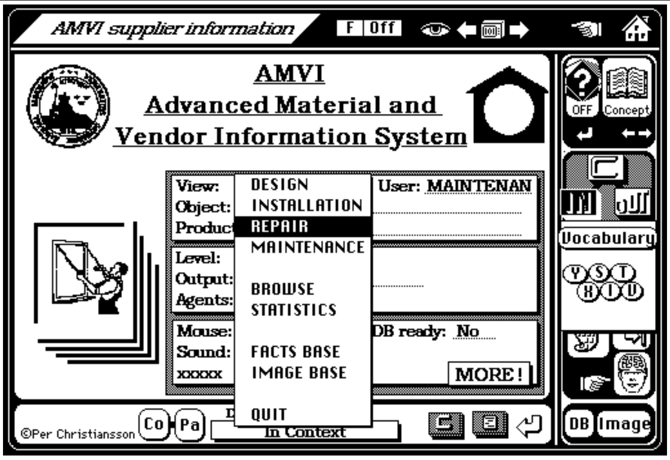

Figure 7. The user choose to work in in the REPAIR context (view). He has also activated the navigation palette to the right.

is copied (the "Co" button) a new line in text stack in the note book is added. The latest line may be pasted (the "Pa" button) or is automatically used when the "Finger" button is pressed. In the latter case an agent searches the image descriptions in figure 13 for the occurrence of the text.

Figure 9 shows that part of the note book which handles communication between the 'context' and the relational database Oracle. The top registers are filled from the context and read when the "execsql" button is pressed (usually by the system). The register information is translated to a

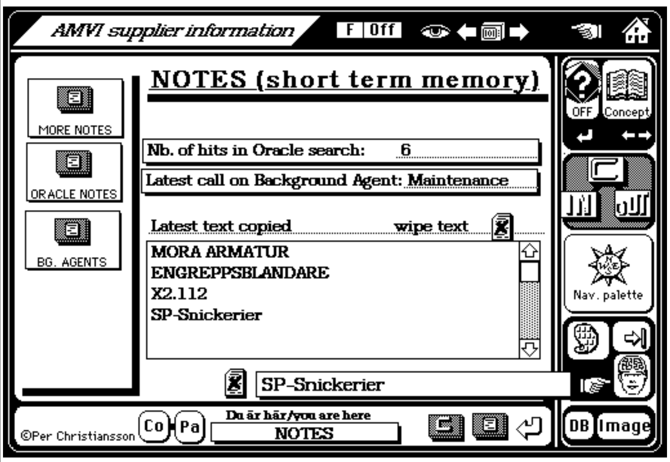

Figure 8. The user and background agents have access to a short term memory or note book where intermediate data are stored.

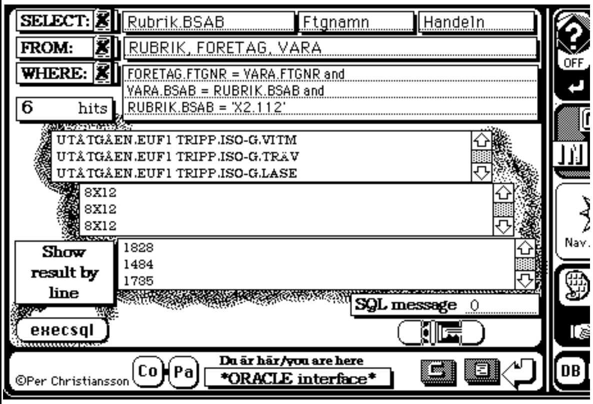

Figure 9. Note book part to handle communication with the relational database Oracle. Normally not seen by the user.

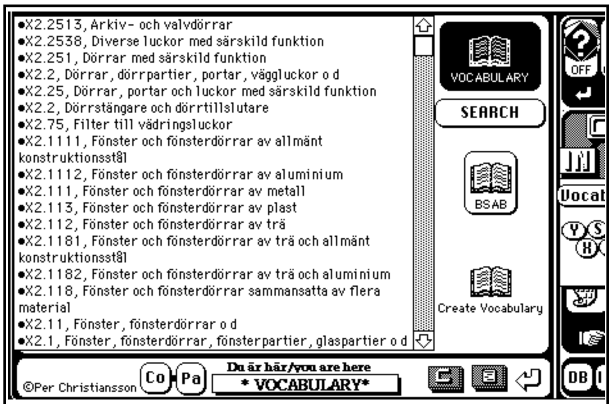

Figure 10. The user has access to vocabularies and can also make his own.

SQL sequence (that is the language that Oracle understands) and sent to the database. The result is returned and sent back to the context.

The background agents also use the note book as well as the context parameters which describes the status of the system.

7.5 Vocabulary

The user has to her/his disposal a vocabulary containing product types classified according the Swedish BSAB system.

The vocabulary in figure 10 is created directly in the system through the call (see also '8. FACTS BASES')

Select: BSAB Rubrik
From: Rubrik
Order by rubrik asc

The user may create his own vocabularies.

7.6 Background agents, palettes and tools

The background agent concept and some of the available tools are described below.

The right side of the computer screen contains tools of different kinds. The image palettes (in the middle of figure 11) can be used to browse images which are stored on the videodisk. If the system is in learn mode a tool is available to create a reference to that image. This reference or button is placed in a context by a user if she/he is allowed to augment the model (see for example the arrows near the window in figure 15).

The "right arrow" button above the "agent" button (see figure 8) is used to locate references to different images in the context (for example the arrow near the window in figure 15 will start flashing when it is found). The image bank can be searched for a text occurrence by pressing the "finger" button.

The navigation palettes are context sensitive and provides a fast way to browse the context space and images, (see figure 11).

Excursions to other contexts (views) can always be made by pressing the "C" (context) button at the bottom and after that make a choice from a pull down menu. Next to the "C" button is the "NOTE BOOK" button.

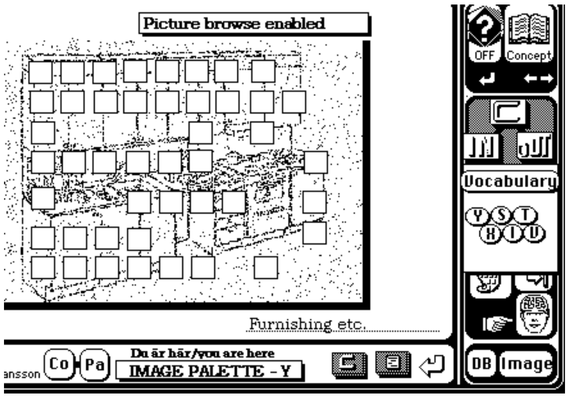

Figure 11. Manual access to background agents. Image and navigation palettes and tools to search text occurrences and find references to images.

The background agents use induction systems, neural nets and HyperCard stored procedures. Background agents possess knowledge about applications or computer tools (sometimes the border is not sharp). Examples on application advisory agents are shown later in chapter '9. Building and using the system'.

Agents help the user during model building activities. For example during browsing with the image palette, when also short information about images are displayed in a separate window. This latter information is picked from the image descriptions if they exists and the display function is active. The user is asked if he wants to create a description during browse if the description does not exist. She/he must though be allowed to augment the model (i.e. the system must be in LEARN mode). The agents signal to the user either visually or vocally.

Other examples on agents are those which duty it is to run and get data from the facts bases (as in figure 16) or to help you create slide shows (see figure 15).

Neural net based agents are especially interesting as they for example can recognize partially described "patterns"/states etc. and rather easily can be taught their skills. The field is open for us to develop tools and concepts with completely new and for us beneficial characteristics. The neural nets use different learning strategies, activation functions and topology (also hidden layers) in the KBS-MEDIA environment. The nets (as well as the relational database) are on system level controlled via the HyperCard script language and specially linked in procedures (so called external commands, XCMD).

7.7 Facts bases content

The facts bases are the long term memory of the applications. Data stored in a relational database is of course more easily changed and expanded than the images on a videodisk or a CD ROM. The facts bases provide data (together with the user input) to build up context descriptions during use of the system. The AMVI system contains facts of different format and content:

(a) alpha-numerical information in relational databases
(b) images, film, sound on optical videodiscs,
(c) text, sketches/drawings, speech, animations in HyperCard (or animations in Micro Mind Director/VideoWorks II and Swivel 3D)
(d) images and drawings on hard disk (or CD ROM).

8. FACTS BASES

8.1 Relational database

Part of the Byggvaruregistret (Building Product register), BVR, at the Swedish Building Centre

Relation	Attribute (type/length)	
FORETAG	(Company register),406 records	
FTGNR	Char(7)	
FTGNAMN	Char(50)	
ADRESS	Char(30)	
POSTNR	Char(5)	
POSTAD	Char(20	
KOMM	Char(33)	(Contact person)
VARA	(Product register), 26 records	
VARANR	Char(3)	(Internal AMVI nb.)
BSAB	Char(9)	
VGRUPP	Char(80)	(Product group)
HANDELN	Char(75)	(Trade name)
KORTINFO	Char(80)	
LONGINFO	Char(240)	(Technical description)
FTGNR	Char(7)	
MONTERING	Char(100)	(Install. instruction or reference)
UNDERH	Char(100)	(Maintenance instruction or reference.)
RUBRIK	(BSAB register), (from Diskett reda 83 Hus 2/86, Svensk Byggtjänst), 92 records	
BSAB	Char(9)	(classification code)
RUBRIK	Char(100)	
BESKRIV	Long	
ARTIKEL	(Article register. Window price list from SP-snickerier), 2524 records	
ARTNR	Char(4)	(Unique article number)
FTYP	Char(31)	(Window type)
DIMENSION	Char(8)	(Width/height)
PRIS		Number
DATUM	Char(8)	
VARANR	Char(3)	

TABLE 1. Relation specifications and content in the alpha-numerical facts base of the AMVI system. A graphical view is found in figure 12.

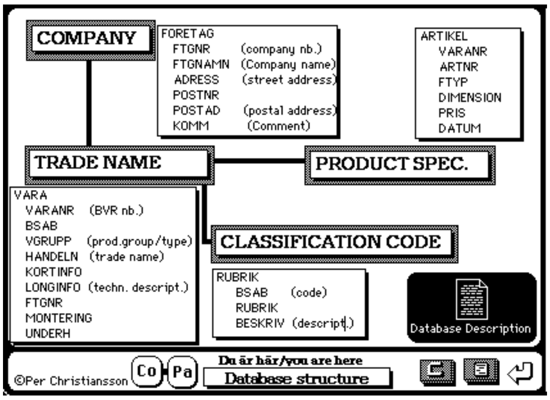

Figure 12. Relational database structure of the facts base in the AMVI system. A detailed record description is found in table 1.

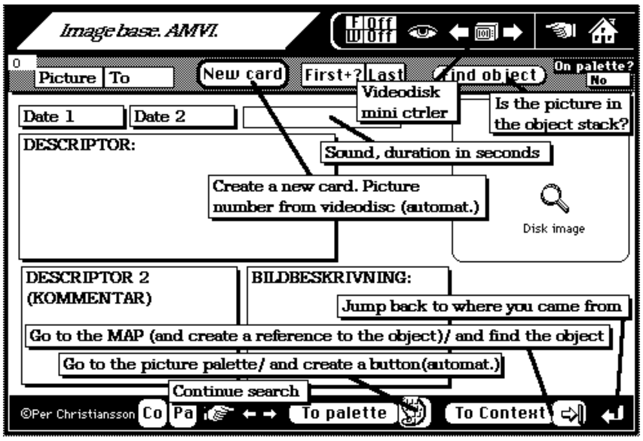

Figure 13. The image bank is stored in the HyperCard environment. Each image (either stored on video disk or in digital form) or video sequence has a description attached to it. This description may also contain sampled sounds (instructions etc.) accompanying the image.

was transferred to the AMVI system. The BVR contains roughly 50 Mbytes of data today (no images).

The original BVR contains information about

(1) Companies (roughly 10000 records)
(2) Products (roughly 60000 records: name, standard approval data, etc.)
(3) BSAB captions (roughly 4000 records)

The relational database Oracle is used in the AMVI project. Oracle may be used in different computer environments. Relations according to table 1 were defined, see also the structure in figure 12.

The Company register was transferred from a computer at Programator AB, Stockholm, the Artikel (Article) register from Prisinfo AB, Växjö, and the Rubrik (BSAB) register direct from the Swedish Building Centre in Stockholm. All data were delivered on tape and transferred to an IBM PC where the new relations were created. Data conversions were made before the database were transmitted (on line) to the MacII environment. The Varuregistret (Product register) were manually fed into the system.

8.2 Images and video film

In the early stages of the project a videodisk was used which was produced in collaboration with the Finnish research institute VTT in 1986. This videodisk is used in other applications, see for example (Christiansson 1988a, 1989b).

In June 1989 a test series of a videodisk produced at Lund University was ready. 150 colour slides delivered from the Swedish Building Centre were put on this disk.

A short descriptor is tied to each image (not stored on the videodisk itself)

(1) Source
(2) BSAB-code
(3) Type of product
(4) General agent/manufacturer
(5) Trade name
(6) Comment field

Images from the following product groups are included; furnishing, sanitary fittings, air treatment, windows, plumbing, and electrical equipment. The products are also shown in their natural surroundings (kitchens, etc.). Images are also stored on hard disk. These are scanned through a B/W scanner or video camera (Super-VHS).

The question about which storage medium to use was not in itself a vital issue in the project. From (Christiansson, 1989b) - "The optical media possess different qualities which influence which one(s) should be chosen for a certain application. (1) Type of information (stills, film, sound, ...), (2) size of edition, (3) validity in time for stored information, (4) multi usage of the disk (many applications, (5) how will information be maintained, (6) how do we collect and transfer information to the optical medium."

To each image or video film sequence an extended description is created by users who have that access to the system (system in LEARN mode). These descriptions may also contain a <u>sound</u> sequence.

8.3 Drawings, sketches, sound and animations

Drawings are stored either as separate entities on hard disk or as drawings on cards in HyperCard. Drawings are scanned in through a B/W scanner or produced direct in the system (in HyperCard or a drawing/Cad program). Drawings may be in colour format if stored outside HyperCard.

Direct links to Cad systems have not yet been established. If the Cad-system shall form an integrated part of the environment it can be more or less loosely coupled.

Simple animations can be made direct in HyperCard. Though the animation program Macro Mind Director is much more potent in animation/film making activities. Such animations are direct called from HyperCard. See figure 14.

9. BUILDING AND USING THE SYSTEM

Different users have different access rules to the system. If the system is in LEARN mode they have access to model building tools otherwise it is only possible to navigate in the information space and extract information.

Navigation and search mechanism is reinforced by among other things: (1) the multi media interface, (2) multiple search paths, (3) associative search and information maps, (4) navigation/im-

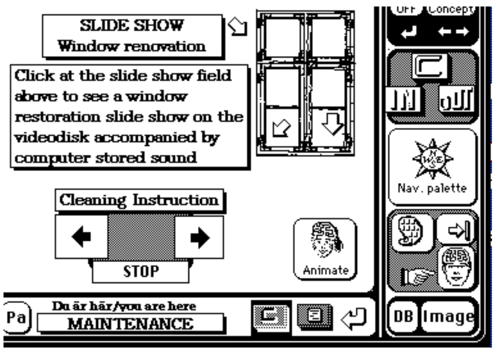

Figure 15. By clicking on the window a window restoration slide show is shown. Tools are also available for in depth study of for example cleaning instructions stored as film on the videodisk.

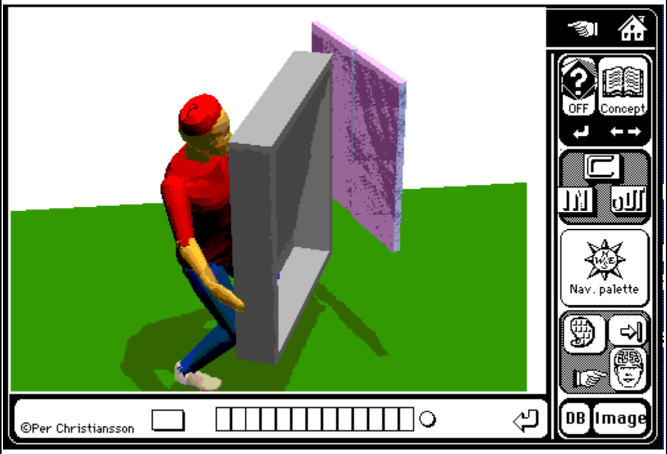

Figure 14. Animations and video sequences gives instruction on how to install and repair windows (see also figure 15). The animations are created outside HyperCard (in Swivel 3D and MacroMind Director) and controlled from inside HyperCard.

age palettes and browse tools and (5) help from background agents and guided tours.

The stored models are augmented on different levels. On a high and general level the tools and the meta tools (tools to make tools) are made as well as the basic layouts, structure and system concepts. The KBS-MEDIA environment gives the users freedom to work in a demonstrator environment to capture, test and communicate ideas between users and toolmakers.

Different users approach the system with various intentions. The system will help the end users in many ways:

* define the problems/questions
* establish proper links to knowledge sources
* provide powerful search and reasoning mechanisms
* provide storage and documentation facilities
* provide tools for knowledge augmentation and system maintenance

9.1 Creating the image base

The image base is dynamically created during use of the system. It is possible to start building image browsing palettes according to figure 11 and then create image descriptions according to figure 13 as they are needed. But we can also work in the other direction if we are more sure on which images we want to incorporate into the system. In the latter case we start making descriptions which also automatically will be updated when palette entries according to figure 11 are created (with the "Palette" icon at the bottom of the image description of figure 13 which also causes the 'On palette?' text field top right to change value to 'yes').

9.2 Creating links to images and sounds

On a higher level we can augment a context/view in the system. In figure 15 a window restoration slide show is started when the SLIDE SHOW field is clicked at. The accompanying sound is stored in the image descriptions. The slide show is easily created and stored if the "slide show" agent is active.

9.3 Searching and browsing

(See also '7.6 Background agents, palettes and tools'.)

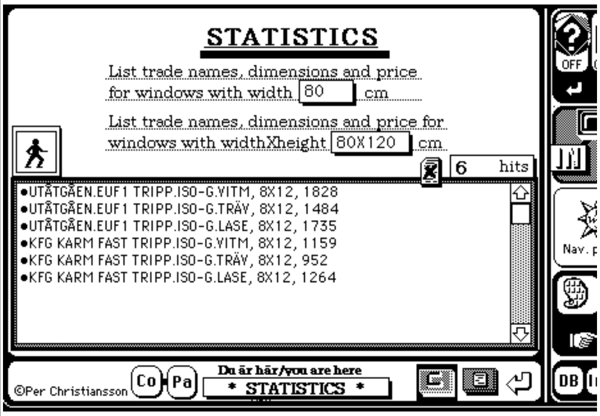

Figure 16. Press the background agent to the left to get information about who manufactures window of a specified size.

As users and system definers we create context descriptions which will make it easy for us to associate to existing or wanted working routines, habits and application environments. For example "maps" in the form of fill in sheets, or tools for free text search may be created.

Figure 16 shows a simple example on how a sheet like search can be performed. Of course we now have the possibility to invent/create any "hyper" sheet which hopefully will make work easier for us.

We may study the product/article in various environments through films, photos and 'soon' as photorealistic simulations or virtual realities. We can perform free text search today. There will come a time when even can perform 'free image' search.

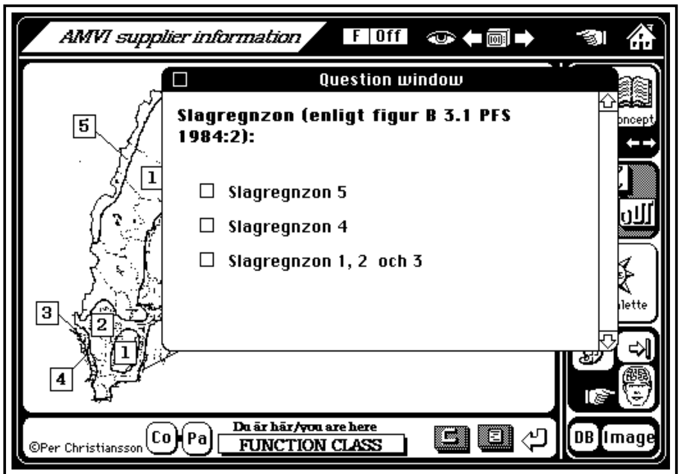

Figure 17. Background agent to give advice on window function class (environmental requirements). A HyperCard stored map in the background helps the user to determine rain zone input value.

9.4 Advisory agents

If you are in the process of selecting windows you might be imposed restrictions derived from the impact of weather conditions. Figure 17 shows how a background agent is called to give advice on function class for windows according to Swedish building regulations. The agent is in this case based on a decision tree generated from examples by induction. One of the factors that determines the so called function class is which rain zone we are building in. By HyperCard stored maps we get help to choose rain zone and can continue our consultation with the background agent.

9.5 From demonstration to production systems

When we scale up our demonstration systems to cooperating large production systems we may have to take into consideration some problems in more detail. For example:

* How are product catalogues distributed and maintained? On line/off line and combinations.
* Where do information reside? Distribution on

main frames and personal workstations.
* How can we for example build a company specific product base out of 20 CD-ROM based catalogues. New services required?
* Multi user access.
* Copyright issues.
* Security problems.
* Cost-capacity relations. Efficiency issues.

10. CONCLUDING REMARKS

A demonstrator has been and are under development where new ideas concerning vendor information systems are captured, tested and communicated.

A sequence of different views and situations which we call context has been defined and tried out. Some of them accounted for in this report.

Below some of the wanted and achieved properties of the system are listed:

- the system efficiently supports product selection
- the system can contain extended product information such as installation instructions, maintenance data, price information, material characteristics
- it is possible to extract drawing information for description documents
- tailored reports may be produced for ordering
- extension can be made to connect to EDI message handling
- user adapted interface
- greatly improved search possibilities and search strategies
- architectural considerations are well taken into account
- new tools are developed for the building and maintenance of the next generation merchandise systems
- enhanced possibilities for information distribution
- a vehicle to support ongoing development within the area of vendor/product/merchandise information system
- calls attention to the need for intensified concepts and definition development ("classification" issues and vocabulary agreements).

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