2 NETWORK OF ART RESEARCH COMPUTER IMAGE SYSTEMS IN EUROPE (NARCISSE)

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NARCISSE (Network of Art Research Computer Image SystemS in Europe) is a European research and development project, the main aim of which is to create a very high digitised image bank, organised under the responsibility of the Direction des Musées de France as part of the European Community (Direction Générale Télécommunications Industries de l'Information et Innovation, IMPACT 1, Luxembourg). It is part of an action plan to achieve a European market of information services. This image bank is administered from a multilingual text database (currently in German, French, Italian and Portuguese).

European consortium

Founded in March 1990, as a result of three years of working meetings with the main research laboratories of cultural institutes in Europe, the European consortium NARCISSE presently consists of four partners, internationally renowned research bodies. The Direction des Musées de France is the leading organisation.

The four partners are currently:

- Arquivos Nacionais/Torre do Tombo (Lisbon, Portugal)
- Banque de Données des Biens Culturels Suisse (Berne, Switzerland)
- Laboratoire de Recherche des Musées de France (Paris, France)
- Rathgen ForschungsLaboratorium (Berlin, Germany).

Two Italian institutions: the Istituto Centrale per il Catalogo e la Documentazione (Rome) and the Istituto Centrale per il Restauro (Rome) have made a considerable contribution to this project but had to withdraw their support during the first quarter of 1992. The Banque de Données des Biens Culturels Suisse, a new partner, expressed a wish to join the consortium from May 1992 via the Franco-Swiss bilateral cooperation commission.

Project aims

Several million scientific iconographical documents (photographs and x-rays) of paintings are stored in cultural institutions in Europe. It is difficult to consult them and access means are inadequate for current requirements of curators, art historians, researchers, restorers and also students, teachers and editors. NARCISSE was created to meet a growing need for consultation of these unique, fragile documents of limited life.

Consequently, the general aims of the NARCISSE project are to establish the technical and practical feasibility of:

- safeguarding information contained in the films (long term conservation)
- disseminating of the laboratory image bank (training, consulting, printing)
- processing and analysis of the documents content (image processing).

To achieve these objectives, it was necessary to make certain technological choices and develop the appropriate hardware and software to meet these requirements.

Technical objectives

This new approach necessitated the choice of the high quality, high-definition digital image.

The digitising scanner

The fixed image scanner dedicated to the NARCISSE project, built by Thomson-Broadcast, has been installed in the Musées de France Research Laboratory since the beginning of May 1993. This equipment is used to enter X-rays of 35cm x 43cm with a resolution of 16 dots/mm film in 9 seconds over 12 dynamic bits without heating or deforming the film which would prevent putting together x-ray films from the same work. Digital entry comprises 6000 dots (from the CCD connection) on 8000 radiography lines when it is passed in front of the scanner i.e. 72 megabytes of data. The x-ray image of a painting, in real-scale size, comprises as many 35 x 43 cm X-rays as its dimensions have required enough sensitive films to expose to X-rays to cover the area. The global digital image is composed of the same number of 72 megabyte files. For instance, the radiographic image of a painting composed of 12 films will result in a digital image equal to 864 megabytes.

The scanner also enables input of photographic film with a resolution of 60 dots/mm by bringing the detector near the sensitive film surface. The digitised area is then limited to 10.4 x 13.8 cm which enables entry of a whole photographic film of the LRMF 18x 24 cm format using four digitisations of separate ranges. A monochrome photographic film will therefore produce a digital image of a volume equal to 288 megabytes.

The scientific file of a reduced size painting comprises about five, large-size photographic films (taken in direct light, oblique light from two positions, a fluorescent print in ultraviolet and a close-range infrared print) and the set of X-rays. The volume of a painting is equal to about 2.3 gigabytes.

Initial tests conducted on this very high resolution scanner show that the expected performances are obtained. A few additional developments, which are to be made by August 1993, should meet data entry requirements.

Compression

Compression tests undertaken in October 1990 in the laboratories of Thomson-Broadcast using the digital images, both non-compressed and compressed at growing rates, then displayed together on the same very high definition screen, demonstrated in the presence of about thirty international experts that both for monochrome (radiographic) images and for colour photographs, a compression rate of 16 is acceptable as there is no notable difference in the images displayed. This conclusion, now adopted by other experts, means that the display time of digitised image can be reduced by a factor of 16 and also the storage volume to the same extent. Therefore, two compression levels will be made on each image: one without loss (2) the other with loss for consultation (16).

Storage on DOD for consultation

Existing storage means, considered in April 1990 as insufficient, inexpensive and unreliable by experts, today prove to be suited to the experimental conditions used (resolution, dynamic, compression). Two ATG 9001 player-recorders have been acquired. They can run disks with a capacity of 10 Gigabytes (i.e. the capacity of 16 CD compressed 16 times for screen consultation, each digital optical disk is used to record 2,200 digitisations (6,000 dots x 8,000 lines on 12 bits) undertaken with the digitising scanner. A disk could thus contain 68 files of different paintings. The prototype which should comprise files on 300 paintings will be composed of 5 digital optical disks, whereby there is absolutely no need to have a juke box to manage them.

Storage volume per optical disk should increase even more, by a factor greater than 5 with the integration of short wavelength lasers.

Storage

The solution for bulk storage with a no loss compression equal to two or else without compression has not yet been determined. Current technology uses magnetic tape for data storage, the service life of which is estimated at ten years. The emergence of the optical tape is certainly the typical complement of the DOD (digital optical disk) but at a lower cost as the terra bytes on optical tape is estimated at 35,000 FF. This technique which appeared three years ago in the USA should shortly be introduced in Europe and consequently enable storage for applications working off-line, such as printing and image analysis.

The choice of the first 300 paintings to be temporarily recorded on magnetic tape or digital optical disk still remains to be made.

Methodology objective: the textual database

Management of an image bank only becomes feasible after development of an indexing system. The originality of the NARCISSE database, apart from its multilingual access aimed at "inter-institutional and trans-border communication" and its mulifile search mode, lies in the development of a thesaurus specifically for interpretation of photographic and radio films made of paintings in a laboratory.

The database is composed of three main files relative to the "work ", the "film" and the "state of the work". The sections in the first file concern indexing the "work" (artist, title, date, place kept, technique etc.) This index card model has been translated into eight languages, submitted to the CIDOC members for approval and adopted in 1991. The "film" file comprises the main items indicating type, size, exhibition and development

conditions and any general remarks. The "state of the work" file is sub-divided into three sub-files: original elements, alterations and interventions.

This standardisation of information can radically transform the nature of relationships between the laboratories and the restorers. Pooling of information using the same model means having access to consistent, remotely accessible results.

Two functions were developed by DATAWARE based on their INFLUX software program used in a UNIX environment and built around the relational database management system EMPRESS: a multilingual thesaurus and multilingual enquiries. Entries are made in the language of the associate country (German, French, Italian and Portuguese). Users then access all the bases, search criteria and functions in their own language. The multi-base access means that the context of a multi-criteria question can be conserved and the result displayed for each base. Lastly, INFLUX integrates digitisation data and manages real-time display of images corresponding to documentary requests.

Communication

The necessity of communication and information requirements within the scope of the NARCISSE program was under-estimated. Since 1992, the NARCISSE team has made efforts to bring out several products:

A colour brochure in four languages, explaining the project's European scope and the electronic image, its objectives and methods of scientific investigation, technological and industrial choices, partners, its distributed optical product to attract more co- operation - in the CD-ROM "Arts and Sciences". This document also includes illustrations from each of the associate countries showing the diverse technical approaches to the study of paintings, indicated in the CD-ROM.

2000 copies of the brochure were distributed on an international scale and it was associated with a sign-board at conferences, symposia, seminars, exhibitions. A second brochure is being prepares to complete the information already disseminated.

An electronic imager SHOW ROM, SVGA screen, combining image, text and sound using examples of painting files illustrating the terminology used to interpret the documents. Under our guidance, Norshow produced, in early 1992, an audio-visual support (SHOW ROM), a computerised mini-base presently comprising over 350 images and 200 pages of text on reduced size paintings and miniatures. This formatting of documents on computer encourages those associated with the project to cooperate more actively and provide image and text documents according to the illustration of the terminology jointly decided.

An original audio-visual support was used to explain the issues of the NARCISSE project to the general public.

This multi-media is the result of cooperation among several institutes:

- Collége de France, Mrs. Marie-Françoise Clergeau wrote the script of this audio-visual in two-versions: a short one of 15 minutes and one lasting over 30 minutes.
- AVELEM digitised all the photographic documents in very high definition (4,000 x 4,000) and true colours.
- The partners dealt with the translation of the French version into their own languages and recorded the text on an analog cassette in a studio at the Louvre Museum.
- Integration of the BELLEVUE card and digitisation of recordings have been undertaken by Olivetti in Italy

- Integration of images on the SPACE SYSTEM screen was accomplished by Thomson-Broadcast.

This multi-media product is a new idea as the display on the high definition television screen is by means of an application on compression/decompression card produced from 16/9 images in true colour. The view of laboratory images observed on a large- sized screen enables comparison of the work with scientific documents, for instance at an exhibition.

This multi-media was shown at the XVI general conference of ICOM which was held on September 28 in Quebec, then from October 15 to 21 at the "Forum des Arts de l'Univers Scientifique et Technique (FAUST) in Toulouse and also at the European meeting on multi-media inter-activity and editing at the Palais de Tokyo in Paris from January 21 to 23.

Our goal here is to convince the public of the interest of revealing these difficult to access images, using a new electronic distribution medium. This multi-media, of particular interest to the teaching profession, will be transcribed on to a CD in format 4/3 and 16/9 and distributed for information.

Four CD photos were made in conjunction with the laboratories of Kodak-Pathé France in order to show the same laboratory documents as those included in the "SHOW ROM" but in higher definition with the possibility of moving through the image.

Editing

The indexing system determined as part of the NARCISSE project will be distributed in two forms: a hard copy and an electronic medium.

The CD-ROM Art et Sciences is an electronic, illustrated glossary with definitions in eight languages of the key-word forming the thesaurus. The iconographic index of 120 paintings was the choice to illustrate relevantly this terminology used in the first draft of an international standardisation in the field of art conservation.

A manual comes with the CD-ROM, comprising words of the glossary, also classified in the eight languages with equivalence tables for key-words dealing with topics such as "creation" "alteration" and "interventions". This glossary is used to harmonise the study and interpretation of scientific and technical "image" documents of the laboratories dealing with reduced size paintings and miniatures. It was printed in May 1993 by the Arquivos Naionais/Torre do Tombo of Lisbon.

An instruction guide, i.e. the description of the indexing system of the NARCISSE documentary base was produced in French. It is to be translated into five languages and will also be printed by the AN/TT of Lisbon.

CD-ROM, Art et Sciences

Scientific preparation

This electronic product is the result of eight months' work among international experts from the following institutes:

les Archives Nationales du Portugal, Lisbonne,

la Banque de Données des Biens Culturels Suisses, Berne,

le Rathgen ForschungsLaboratorium, Berlin,

le Laboratoire de Recherche des musées de France, Paris,

and:

le Collége de France, Paris,

le Département de Affaires Internationales, Ministre de la Culture, Paris,

l'Institut Suisse pour l'étude de l'art, Zurich,

l'Istituto Centrale per il Restauro, Roma,

l'Istituto di Fisica Politecnico, Milano,

la Generalitat de Catalunya-Servei de Restauracio de Bens Mobles, Barcelona,

le Museo del Prado, Madrid,

le Museu Nacional d'Art de Catalunya, Barcelona,

la Pinacoteca di Brera, Milano,

le Service de Restauration des musées de France, Versailles,

la Smithsonian Institution Conservation Analytical Laboratory, Washington,

le Statens Museum for Kunst, København.

These experts selected the most relevant examples from the photographic documents in their institutions, to illustrate the previously defined "key-words". They have taken great care to provide a representative range of culture both from a geographical and historical aspect. Consultation of these documents on an electronic screen requires high resolution, image digitisation.

The index cards of the works selected, comments on these works and quotes relating to the key-words or on these works are being prepared. It is planned to release this optical product at the end of August 1993.

Technical creation

The technical aspect was entrusted to EURITIS; Production of the CD-ROM **Art et Sciences** is mainly characterised by implementation of high definition images in colour and black and white. The images are stored in the JPEG standardised compression format. The latter is used to handle images up to a format of 2,000*3,000 pixels with 16 million colours. These images as classified and indexed by means of textual information, such as the description of the works and associated key-words.

The inquiry station runs a PC program with WINDOWS. The JPEG standard enables image handling according to different definitions, subject to the system and hardware resources provided by the station. The same image stored in a maximum definition can be displayed in 16 million, 32,000 or 256 colours. The definition varies from 2,000*3,000 for the highest to 500*750 for the screen image with the possibility of displaying small pictures and sections. These facilities enable users to work with simple or sophisticated hardware according to their budget. To summarise, the quality selected depends on the choice of the image-handling electronic card, screen type and printer. As for the image base, it remains unique and is compatible with different technical devices. An image defined with a number of dots greater than that on the screen can be seen in full definition by selecting details, irrespective of the screen format.

The AIRS database management system manages the dialogue with the user and undertakes searches for textual information. It sets up links with the image base. One image can be linked to several texts and one text can be linked at several images. The SCOPYR image management program in pyramid form, developed by AVELEM is a JPEG imager. It enables display of images in different formats, selects them, passes from one section to a smaller view then to the full definition image, lastly it accesses details and moves around in the picture.

These products are implemented by a unique user dialogue, adapted to the NARCISSE specifications. Some of its functions are to display separately text and image, undertake searches or tracking in the base on the description or screen image using requests.

Lastly the CD-ROM is protected by AIRS functionalities against attempts at unlawful operations, violating the operational rights which will be transferred to the different support users or owners. The same CD-ROM will be provided with possibilities of different authorisations according to the user type. Certain operations will be authorised or prohibited. In the same way, AIRS protects and manages the rights of the different holders of intellectual property rights on the works stored and can undertake accounting operations concerning the fees.

The originality of the NARCISSE CD-ROM, apart from its specific features resulting from the IMPACT project, lies in the implementation of software from the research projects ESPRIT, CITED, KWICK, TOOTSI, which are still unique in their applications, in this context of high definition image base management on a standard PC equipped with a CD-ROM player. These programs are definitive versions and already on the market.

Conclusion

The technological choices made within the scope of this European project have proved to be positive. Work accomplished over the last three years has today resulted in several products, created on an international level. The intellectual cooperation set up in the NARCISSE project should take the form of a permanent legal structure. A stable consortium will permit the continuation of work on scientific standardisation and will increase the number of partners, providing a source of new terminology and linguistic approaches, essential for progress in science. This idea was already expressed by Thomas Hobbes as early as the XVII century "In the Right Definition of Names lyes the first use of speech; which is the Acquisition of Science: And in wrong or no Definitions, lyes the first abuse"[1].

1 Thomas Hobbes - Leviathan (1651) quoted by Iain Hampsher-Monk, A History of Modern Political Thought, Oxford Blackwell, 1992, p. 18