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COMPUTER GRAPHIK

topics

Reports on Computer Graphics

Digital Interactive TV

EUROGRAPHICS 2002
Saarbrücken, Germany
September 2-6

Mixed Reality for Culture

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VICOMTech ISSUE

COMPUTER GRAPHIK 4/2002, Vol. 14

topics

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SEMINARE ZGDV Darmstadt

All business is local...based services?
WORKSHOP mit mehreren Referenten
20.09.2002
Chancen für Geo-Informationssysteme im breitbandigen Mobilfunk,LBS in der Unternehmens IT, adaptive GIS Dienste, Mobile Awareness, IntelliWhere´s LBS Framework, innovative mobile Dienste, Positionsbestimmung und Navigation, Sicherheit

Adobe Illustrator Einsteigerkurs
14.-16.10.2002
unterschiedlichste Zeichenwerkzeuge, Erstellen von Vektorgrafiken mit Linien und Kurven, Transformationen, Gruppieren von Objekten, Arbeiten mit Ebenen und Farben, Textfunktionen mit Pfadtext und Flächentext, Arbeiten mit Hilfslinien und dem magnetischen Raster, Festlegen von Standards im Startdokument, wichtige Voreinstellungen und Drucken

Visual Basic für Fortgeschrittene
16.-18.10.2002
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3D Studio VIZ Grundkurs
19.-20.10.2002
Überblick über 3D Studio VIZ, Verbindung von 3D Studio VIZ mit den CAD-Programmen, spezielle 3D Studio VIZ Werkzeuge: spezielle Modellierungstechniken, Rendering

Informationsvisualisierung
WORKSHOP mit mehreren Referenten
23.10.2002
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SEMINARE ZGDV Darmstadt

Corel Draw Aufbaukurs
30./31.10.2002
Hilfslinien, Lineale, Raster, Anordnen: CD-Label, Layout für eine Webseite, Textfunktion Mengentext: DinA4-Flyer mit importiertem Text/Grafik,Objektmanager (Layer): Anfahrtskizze Farbformate, Farbpalette anlegen, 3dimensionale Darstellung: Layout/-Präsentation Faltschachtel, Überblick, Effekte

Microsoft.NET Einführung
14./15.11.2002
Einführung in die .NET Plattform, C#, Visual Basic .NET und die CLR, ASP.NET Web Forms und Web Services, ADO.NET und XML, Mobile Anwendungen, Interoperabilität mit Win32 und COM

MS Project
21./22.11.2002
Begriffsbestimmungen, Projektorganisation, Projektplanung, Datenstrukturen, Benutzeroberfläche, Standardeinstellungen, Terminplanung: vorgangsorientiert, ressourcenorientiert, Optimieren von MS Project auf die Arbeitssituation Ansichten, Tabellen, Filter, Berichte usw., Projektverfolgung: Basisplan definieren, Ist-Daten einpflegen, Visualisierung und Analyse von Abweichungen

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JPEG Bilddatenkompression
07.10.2002
Einführung und Überblick über Standardtransformationen, Verstehen der konkreten JPEG zugrunde liegenden Transformation, Kompression und Datenverlust, stabiler Algorithmus

Eagle - CAD für Schaltplan- und Layout-Entwurf
07./08.10.2002
Aufbau und Konzept, Erstellung von Schaltplänen, Arbeiten mit der Bauelementebibliothek, Schaltungslayout, Erstellung von Fertigungsunterlagen

Novell ZENworks for Desktops
09./10.10.2002
ZENworks Features/Installation, Softwareverteilung, SnAppShot-Applikationen, Konfiguration der Applikationsobjekte, Workstation- und User-Management mit Policies, Workstation Imaging, Inventarisierung

XML Anwendungsentwicklung mit Java
10./11.10.2002
Auszeichnungssprachen, Sprachliche Konzepte und Einsatz von XML, Dokumenttypdefinitionen (DTD und XML-Schema), Datenkonvertierung und Selektion durch XML, Persistentes Halten von XML-Daten in Datenbanken, Parsen und Validieren von XML-Daten

CADOverlay 2000
Vektorisierung von Rasterdaten
21.-23.10.2002
Rasterbilder, Bildeigenschaften; Module von CADOverlay, Einfügen, Korrellieren und Speichern von Bildern, Bildverwaltung; Bilder bereinigen, bearbeiten, zuschneiden; REM-Regionen und deren Bearbeitung, Verbindungen von Bildern, Vektoren und Bildern; Vektorisierungsfunktionen

Multimedia Design Telekurs
14.-22.11.2002
Begriffe, Einsatzgebiete, Kriterien, Strukturmodell, Gestaltung von Text, Grafik, Bild, Animation, Screendesign, Navigationsdesign, Farbgestaltung, Hintergrund und Anwendungen

INI-GraphicsNet

Main Core Competencies
- Agent Technology
- Animation
- Augmented Reality
- Avatars
- Computer Supported Cooperative Work (CSCW)
- Computer Vision
- Data Exchange
- Graphical Information Systems (GIS)
- Graphical User Interface
- Human Computer Interaction (HCI)
- Imaging
- Image Processing
- Internet, Intranet
- I*net-based Learning and Training
- Mobile Computing
- Modeling
- Multi/Hyper Media
- Multimedia Data Bases
- Networking, Telecommunication
- Neuronal Nets and Evolutionary Algorithms
- OO-Framework and Compound Document Architecture
- Perceptual Computing
- Printing & Publishing
- Product Data Technology (PDT)
- Radiosity & Raytracing
- Secure Image Communication
- Security Technology
- Simulation
- Telework, Telecooperation, Telelearning
- Video Computing
- Visual Computing
- Virtual Reality
- Visualization

Main Application Domains
- Automotive industry
- Architecture, Interior decoration, design
- Bank and insurance business
- Biotechnology
- Air and space travel systems
- Chemical and pharmaceutical industry
- Cultural Heritage
- Education and training
- Entertainment
- Facility management
- Marketing and advertising
- Mechanical engineering
- Medicine and medical technologies
- Microelectronics
- Mobile information systems
- Online services and new media
- Pollution control
- Print machines
- Public administration
- Publishing trade
- Ship construction
- Social and public health, support of older and disabled persons
- Software industry
- Telecommunication, networking and service providers
- Telematics
- Telework Technologies
- T.V. Stations
- Tourism
- Transport and Traffic

Computer Graphics

Computer graphics is the **technology with which pictures, in the broadest sense of the word (synthetic graphics as well as grayscale and color images), are captured or generated, presented, manipulated, digitally processed in the appropriate form for the respective application and merged with other, nongraphical application data.** Computer graphics also includes the computer-supported integration and manipulation of these pictures with other kinds of data, such as audio, speech and video **(to create multimedia systems)** as well as corresponding advanced **dialogue and interactive technologies**. Concepts which characterize the important topics of computer graphics are, to name a few, visualizing information, visual data mining, visual computing, virtual reality (VR), augmented reality (AR), interactive Internet services and secure image transmission and communication.

Contents

EDITORIAL

Jorge Posada (VICOMTech),
Dr. Bernd Kehrer (ZGDV)

This TOPICS issue focuses mainly on actual research themes of VICOMTech, the INI-GraphicsNet member in San Sebastián, Spain. VICOMTech, after the start of activities early in 2001, is consolidating its position locally and internationally during its second year of operation, based on a broad range of national and European projects. As an important complement, this edition will have contributions from other members of the INI-GraphicsNet. Most of them introduce joint research projects with VICOMTech, which underline the remarkable evidence of the tight cooperation in the practice between INI-GraphicsNet members.

The direct relationship with a real media broadcasting group - EiTB, Basque TV & Radio-, the telecommunications partner of the INI-GraphicsNet Foundation in this joint-venture, has provided a rich and fruitful cooperation scenario and a key research line on Digital Interactive TV, where the synergies between the latest technologies of Computer Graphics and Broadcasting are fostered through applied research.

Another significant area of cooperation highlighted in the present edition is the use of Mixed Reality Technologies for Cultural Heritage dissemination. VICOMTech has the advantage of having direct influence in a region with much cultural diversity (for example, Basque, Spanish and French languages coexist), reflecting a truly European flavor where the multiculturalism and the variety of traditions and cultural expressions are part of everyday life. The possibilities of Mixed Reality technologies to disseminate this valuable cultural heritage are reflected in the related articles. The VICOMTech participation in the European Projects »art-E-Fact« and »artnouveau«, together with ZGDV and Fraunhofer IGD, is a clear hint of the importance of these activities.

The reader will find some articles related to Digital Interactive TV & Video services. One article describes the advanced Digital TV research laboratory of VICOMTech, which supports Computer Graphics applications and the MHP standard, and replicates the entire TV broadcasting cycle via terrestrial, cable or satellite signal. Another article is about an industrial research project from two Basque TV producers, interested in innovative Computer Graphics applications for sports broadcasting in Digital TV. A third article is about the advanced platform iTV from ZGDV for enhanced interaction with video contents via the Internet, which addresses the real possibilities of the Internet to enrich video transmission and interaction.

There are some interesting articles as well related to Mixed Reality for Cultural Heritage. In the EU funded Project art-E-Fact, a generic platform for the creation of interactive art experience will be developed using advanced technologies of Mixed Realities and Digital Storytelling. An EU Thematic Network for the transition to the digital era of arts and culture is the purpose of Artnoveau. The cooperation of VICOMTech with San Telmo Museum (San Sebastian´s main museum) and the Deusto University for dissemination of information about the old iron age culture in the Basque region is also a good example of research in this area. In the field of Knowledge Management, the EU-funded Project WIDE (where the INI-GraphicsNet is represented by Fraunhofer IGD, VICOMTech and CCG) aims to develop a semantic web-based information management and knowledge sharing system for product design and engineering. The EU project MUMMY, led by ZGDV, aims to enable mobile, personalized knowledge management based on the usage of rich multimedia to improve the efficiency of mobile business processes.

Last but not least, 3 additional projects are presented. In the Abateus project, VICOMTech in collaboration with ZGDV develops Basque conversational 3D avatars for TV and multimedia for an important 3D TV & Film producer. In cooperation with the Medical Applications Division of Fraunhofer IGD a joint project on the VITAL standard for vital signs is presented.

The interchange of Spanish and German researchers from VICOMTech and Fraunhofer IGD, funded by the Spanish Ministry of Science and the German service DAAD, enables a collaboration in the area of Large Model Visualization and is also described in this issue.

Finally, the newest member of the INI-GraphicsNet (GraphiTech) is also introduced in this issue. We wish our new Italian partners great success and give them a friendly welcome to the network. We believe, that Graphitech soon will become an important node of the INI-GraphicsNet.

VICOMTech: the joint-venture from INI-GraphicsNet and EiTB consolidates in San Sebastian

Dr. Julián Flórez, Jorge Posada (VICOMTech)

German Abstract

VICOMTech, das Zentrum für angewandte Wissenschaften, das gemeinsam von der INI-GraphicsNet Stiftung und der baskischen Broadcasting Group TV&Radio-EiTB in San Sebastian gegründet wurde, hat sich inzwischen sehr erfolgreich entwickelt. Es wurden sowohl lokale als auch internationale Projekte akquiriert und Beziehungen und Ressourcen für die zukünftige Entwicklung geschaffen. VICOMTech ist ansässig im Technologie-Park San Sebastian im Baskenland. Als multikulturelle und industrielle Region mit einer starken wirtschaftlichen Dynamik sind hier gute Bedingungen sowie Fördermöglichkeiten für die Forschung gegeben.
Mit aktuellen Projekten aus der Industrie, der baskischen und spanischen Verwaltung und der Europäischen Union bietet VICOMTech zum Nutzen der Gesellschaft als auch der Industrie qualitativ hochwertige Forschung im Bereich der grafischen Datenverarbeitung. Das Modell für angewandte Forschung von VICOMTech und dem INI-GraphicsNet schlägt eine »Technologiebrücke« zwischen Grundlagenforschung und Markt. Als Mitglied des baskischen Technologienetzwerks und mit Unterstützung der spanischen Regierung kann VICOMtech wichtige Beiträge für den F&E-Bedarf der Region und der lokalen Industrie liefern.

Almost twoyears after its creation, VICOMTech, the applied research center founded as a joint-venture in San Sebastian by the INI-GraphicsNet Foundation and the Basque Broadcasting Group -TV & Radio- EiTB, is going through a successful process of consolidation, acquiring local and international project, and establishing relationships and resources for its future development. VICOMTech is located in the Technology Park of San Sebastian, in the Basque Country, a multicultural and industrial region with high economic dynamism and strong support for research activities.

With current projects financed by industry, the Basque and Spanish governments, and the European Union, VICOMTech is offering industry and society high-quality applied research in Computer Graphics to improve their processes and services. The applied research model of VICOMTech and the INI-GraphicsNet helps build the technology bridge between basic research and the market. As a member of the Basque Technology Network, and with project support from the Spanish Government, VICOMtech is in a good position to help local industries in their R&D needs.

Member of INI-GraphicsNet

As a member of the INI-GraphicsNet, the international network of institutions for advanced education, training and R&D in Computer Graphics, VICOMTech has access to the knowledge and experience of leading institutions worldwide in applied research for Computer Graphics, such as the Fraunhofer Institute for Computer Graphics and ZGDV in Germany, Fraunhofer CRCG in the United States, Centro de Computacao Grafica in Portugal, CAMTech in Singapore, NEME-Tech in Korea and Graphitech in Italy.

VICOMTech (Visual Communication and Interaction Technologies Centre) is gradually building up a position of reference in the applied research scenario for interactive Computer Graphics, Virtual & Augmented Reality, and Digital Multimedia, both at the local (Basque Country / Spain) and international levels (Europe).

Core Research Competencies & Application Areas

The applied research activities in VICOMTech are divided into groups of core research competencies (horizontal technologies applicable in different fields) as well as into five application areas, where those core competencies can be used.

In the Figure 1 the main core competencies are shown:

- *Digital Interactive Broadcasting*, with all related communication technologies: compression and transmission formats, standards, streaming, interactive services, Internet & TV, etc.
- *Virtual / Augmented / Mixed Reality*: Virtual Environments,

Figure 1: VICOMTech premises in the Technology Park of San Sebastian

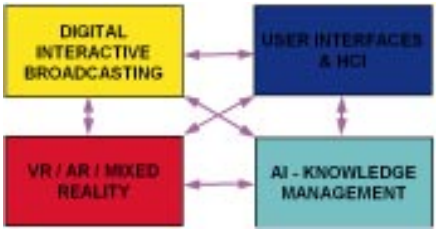

Figure 2: Group of core research competencies of VICOMTech

Virtual and Augmented Reality, 3D representation, tracking, pattern recognition, specialized API´s, simulation, etc.
- *User Interfaces & HCI*: avatars, multicultural environments, accesibility, adaptive user interfaces, speech analysis & synthesis, user assistance, intelligent user interfaces, etc.
- *AI & Knowledge Management*: behavior generation, intelligent characters, Semantic Web, AI for Design processes, agents, user profiling,etc.

The Figure 2 shows the five current application areas of these technologies:
- *Digital Interactive TV*: Hardware and software delivery platforms, associated standards, new services and interaction models, interface modes and designs, Internet connection, etc.
- *Medical Applications*: Telemedicine over the Internet and other area-wide network infrastructures, Augmented Reality for Medicine, multimodal simulations, etc.
- *Virtual Cultural Heritage & GIS*: Advanced interaction and navigation for virtual and mixed reality reconstructions, intuitive interaction and access interfaces to GIS information.
- *Edutainment and Tourism*: Multilingual interaction and interfaces, 3D Avatars and conversational interfaces, Internet and digital television-based distance learning delivery platforms.
- *Industrial Applications*: Interactive 3D visualization of product data, multimedia knowledge management, e-commerce, compression techniques for large CAD models, etc.

Research Personnel
VICOMTech has a multidisciplinary team of computer scientists and engineers in different fields, including Senior Ph.D. scientists, researchers with experience, junior researchers, and scholarship holders. Good relationships have been established with local universities so that students may do their final year project in VICOMTech; in addition, two researchers (Dr. Julian Florez and Dr. Tim Smithers) are lecturing in two universities regularly. Currently VICOMTech has a research staff of 17 persons and will have about 25-30 people in 2004.

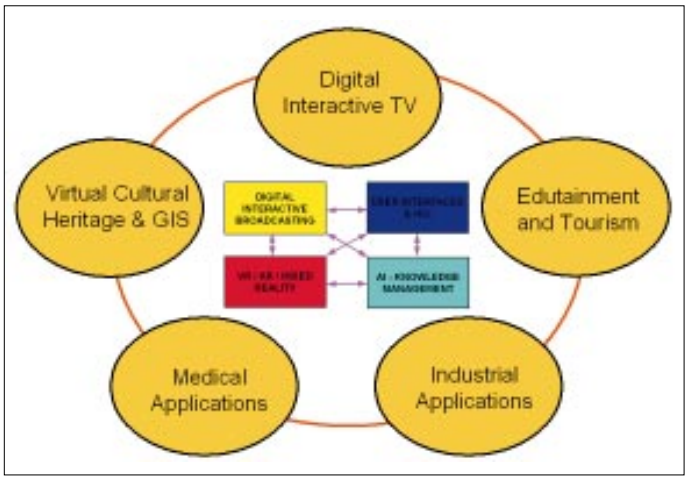

Figure 3: VICOMTech Application Areas, where the research competencies are applied

Current Projects
Currently VICOMTech has several ongoing projects. Two of the industrial projects are described in this edition, about basque Avatars and sport applications for digital television. Another 3 projects financed by the Basque and Spanish Administration are explained too, about telemedicine standards, Digital television lab and Mixed Reality for Culture. VICOMtech also participates in 3 EU Projects from the 5th Framework: Art-E-Fact, ArtNoveau and WIDE.

Collaboration in the INI-GraphicsNet
There has been a fruitful collaboration inside the INI-GraphicsNet in several activities of VICOMTech. In three EU projects, VICOMTech participates together with some institutes from the network (Fraunhofer IGD, ZGDV, CCG). Besides this, an internal cooperation with the Medical Applications division of Fraunhofer IGD on telemedicine standards and a German-Spanish interchange program with the Industrial Applications division of Fraunhofer IGD are ongoing.Cooperation on Conversational User Interfaces with ZGDV is taking place, andresearch visits with other divisions have also taken place. A successful VICOMTech workshop was organized in October 2001 in San Sebastian with the participation of several INI-GraphicsNet speakers.

Plans for the future
In the next two years, VICOMTech will finish the consolidation phase, reaching a more mature status in terms of projects, staff physical infrastructure and relationships with other institutions.

Points of contact

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Enhanced Interaction with iTV / Interactive Video

Matthias Finke, Dirk Balfanz

German Abstract

Heutige TV- und Video-Präsentationssysteme bieten Nutzern Interaktion hauptsächlich zur Bedienung des technischen Geräts oder des Mediums. Interaktives Video und auch Interaktives TV (iTV) auf Basis der Konvergenz zwischen Internet und Broadcast-Systemen, erlauben demgegenüber die Möglichkeit zur Interaktion mit Video-Inhalten und weiteren verbundenen Informationen. Gerade im Bereich des iTV muss hierbei auch eine Antwort gefunden werden, wie der Nutzer mit dem neuen Medium interagieren soll.
In diesem Artikel wird die Architektur eines interaktiven Video/TV-Systems beschrieben, das insbesondere den Handhabungsaspekt betont. Dabei wird die Technik des »off-screen hyperlinks« präsentiert, der einen vereinfachten Umgang mit der neuen Interaktivität ermöglicht.

Introduction
Today information retrieval via the Internet and interactive information in multimedia applications such asmultimedia encyclopedias are wellknown and widely used. But now, access through new modes gives users interactive information that is based on their own needs. In contrast, classic television has mainly developed by increasing the number of channels available. The interaction paradigm in television broadcasting has stayed the same. Many attempts to introduce Interactive TV have failed due to the fact that today's users are already accustomed to handling information in a more personalized and interactive way. Past approaches were chiefly limited to Video-on-Demand (VoD) functionality, Home Shopping applications or Electronic Program Guides (EPGs). This range of interactivity does not reach the level that other media already present. For future applications in the area of Interactive video / Interactive TV, it is crucial to provide interaction with the content and not only with the media itself. Possible areas of this interactive broadcast format could be business information, education, edutainment or sports.

System Architecture
The system presented in the following integrates set-top boxes, an Internet back channel and »off-screen« hyperlinking on PDAs used as an intelligent remote control. It enables the former television consumer to play an active part in the video presentation and to control presentation of additional information in order to become an information user - if he wants to. The video presentation consists of video content and additional information, dynamically assembled individually, according to every single client. Figure 1 gives a general overview of the system prototype.

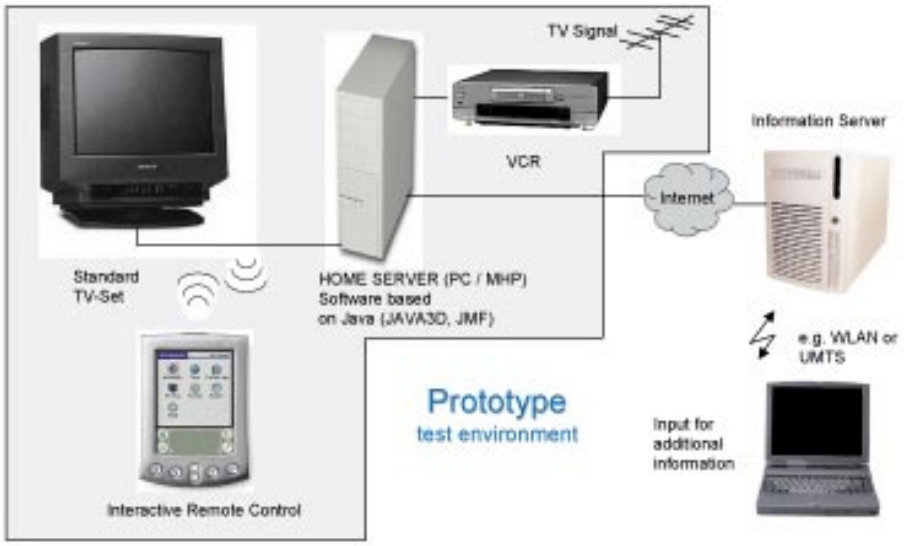

Figure 1: General System Overview

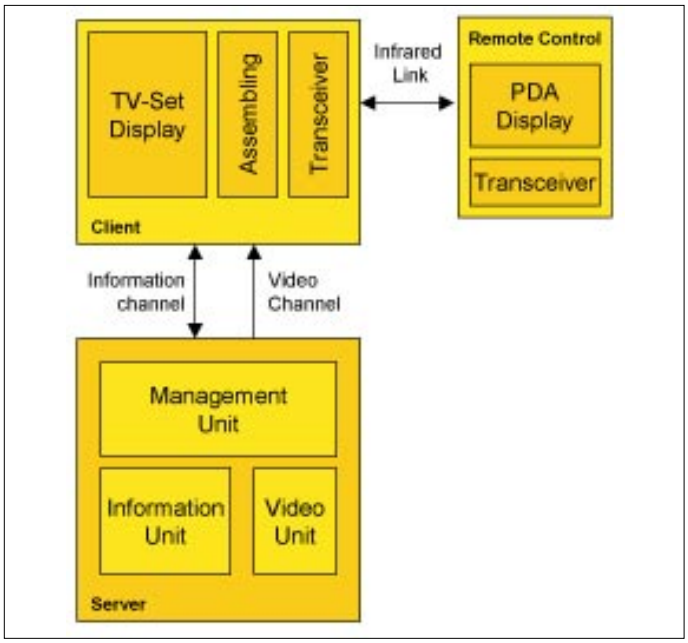

Figure 2: Architecture

Considering video presentation today, the video content can be separated from the information part that is given as an addition and which can be divided into two main groups:

- *Overall information*: This information type has a static character and will not change during the course of the presentation (e.g., abstracts of video content, names and roles of actors). It is usually generated before the presentation and may be provided via video text.
- *Time-dependent information*: This information type is of a highly dynamic character and is often directly related to the current video content. In live videos it is not predictable in any sense and is always time-dependent (e.g., names of persons visible on the screen, current standing in sport matches, stock exchange quotes, etc.). Today this information is often faded into the current video image, leaving no choice to the television user whether or not he wants to see it.

The system presented here provides the user with the option to determine how and when additional information is presented while watching video content.

The main components are the server unit, which may be connected to live sources and/or video-on-demand systems, an advanced television set capable of Internet access, and a bidirectional remote control including a dynamic animated screen. Figure 2 displays the underlying client - server architecture.

The server side is in charge of delivering the video content and the corresponding additional information. A primary task for the server is to handle the synchronization between these two information flows. The server architecture is designed as a distributed system, which means that the actual video server unit might be located at a different location from the information server. A video channel is established between the server side and all clients. This channel carries content, which is the same for all clients accessing it. So far, this channel is based on multicast streaming technologies using Internet connections. In the future, the video content could even be carried by broadcast systems via satellite.

A second channel defines the point-to-point connection between each client and the server. The channel realizes the data exchange underlying a point-to-point connection since it carries the information that is determined for a single client and not for a group. This point-to-point communication is based on Internet connections.

The client side is equipped with an advanced televisionset capable of accessing the Internet. Advanced TVsets from a large number of producers can already be found on the market. For the prototype solution of the system, an advanced Loewe televisionset was chosen, one that is not only equipped for Internet access but also capable of running Java Applets. In future these features will be covered by the standardized Multimedia Home Platform (MHP).

Information Access

The main challenge for the shown system was to find a solution that would provide the user with a simple and yet effective way to access the information resources upon his request. A PDA was chosen to substitute a normal remote control (RC) device for optimization of the information handling. Besides reproducing common RC functionality, the PDA displays within this application charts. A chart is a graphical surface containing icons and/or text elements. An icon or a text represents an »off-screen« hyperlink to additional information. This means with a click on these hyperlinks within the display area, a user requests additional information from the system, like a textual hyperlink within a web page. As a second option for selecting these hyperlinks, the PDA buttons below the display can be used as well. Usually the charts are divided into thematic subject groups providing a more structured overview about the possible information content accessible within the video presentation. Figure 3 shows a typical chart on a PDA device.

A PDA screen can also show the additional information itself. The intention here is to keep the main screen clean from small portions

of information that some users would like to see but not others.

With the PDA, a user requests not only additional information, but also defines his or her personal system preferences. Personal system preference capability is a great advantage for this application, since different users have different interests and background knowledge about the same subjects. When users retrieve identical information linked to the video content, it is always a compromise for the audience, not an ideal solution. Consequently, adapting additional information according to individual user needs results in more satisfaction.

The system preferences that can be set up by the user according to his needs can be divided into three logical main groups:

- *User preferences*: A user might change the language in which the information is displayed or choose certain topic categories of interest. The latter option would lead to adapted information content according to the personal interests of a user. Other options might include the display duration of the information content, etc.
- *Remote Control preferences*: These preferences define the remote control itself, for instance, color or gray scale displays, the display size or the assignment of the buttons which might be useful for left-handed users.
- *TV preferences*: The preferences of the television set can be compared with the ones of the remote control. Even here certain settings in the preference list allow the definition of the screen size and the TV aspect ratio, for instance.

Figure 3: Typical Chart

Figure 4: Interplay TV and Remote Control

Figure 4 shows the interplay of the remote control and the advanced television set. The displayed information is usually of a transparent type as can be seen within the figure.

Future work

Considering the convergence between the Internet and broadcast services, the presented system merges both network types in order to provide a video presentation combining video content with direct information retrieval upon user's request by implementing off-screen hyperlinks. In the future, the work will focus on the objects within the video scene. So far, additional information is linked to the video content but not linked to a video object in particular. Retrieving object information from video streams will be a challenging task.

From the hardware point of view, the Multimedia Home Platform (MHP) will be evaluated for the purpose of deploying the system.

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ABATEUS

Conversational 3D Avatar in Basque Language for Multimedia and TV Applications

Amalia Ortiz, Jorge Posada (VICOMTech)

German Abstract

Für die Entwicklung von Avataren, d.h. kleinen computergenerierten Figuren, die Aspekte menschlicher Konversation für die Interaktion mit dem Nutzer simulieren, ist es zweifellos von größter Bedeutung, welche Sprache sie sprechen werden. Es besteht immer die Gefahr, dass Minderheiten, die eine andere als die Landessprache sprechen, ohne ausreichende Sprachgenerierungs- und Sprachwiedererkennungssysteme die Avatare nicht nutzen können, weil die sprachlichen Botschaften nur in mehrheitlich gebrauchten Sprachen wie etwa Englisch oder Deutsch aufbereitet werden.

Introduction

The influence of computers has grown recently to the point where they have become essential tools for many people, not only in their jobs but also in their leisure time. The technology, however, is becoming more advanced and more difficult to understand for the average user. For that reason, an important change in the interaction between humans and computers is necessary.

Today the most common way of entering and displaying or printing data on the computer is based on the old WIMP paradigm (Windows, Icons, Menus and Pointers), which does not allow the user to interact naturally with the machine. The most natural way for humans to communicate is by speech. Innovative user interfaces are being developed with the ability to synthesize speech and recognize it also, with a representation of a 3-D synthetic character as a »partner« in the dialogue. These new interfaces are called Conversational User Interfaces, in which Avatars (for our purposes, 3-D speaking characters) play an important role.

Emotions and Minority Languages

An important advantage of having a conversational 3-D Avatar in a system is the facility that it gives the user in interacting with the system as if he would be communicating with a real person.

The synchronisation of speech and gestures and the simulation and generation of emotions are relevant research areas in this field.

Avatars are computer characters that can simulate aspects of human conversation, but they are currently subject to technological restrictions. Some of the characteristics that should be taken into account for their use on multimedia applications are: emotional capabilities, little polygonal weight, platform flexibility (PC's, PDA's, Digital TV, etc.) and real time response, since pre-recorded animations do not always serveif interactive communication is required.

Majority language users have the luxury of developed computer systems with voice recognition and synthesis capabilities. The risk exists that minority language users will be left without this cutting edge technology.

Figure: Conversational Interface.

The ABATEUS Project

The goal of ABATEUS is to have a platform for the development of Basque- speaking avatars, based on the characters of the televisionand film producers, Baleuko and Talape, and to explore their usesin innovative ways in the Internet, on CDs and Digital TV, as well as in the traditional television production environment. The project is based on the Avatar platform prototype, which already exists in VICOMTech for other languages.

Baleuko and Talape have much experience in 3-D animation. Baleuko produced one of the first 3-D movies in Europe among serveral others and produces about 8 minutes per week of BetiZu, a full 3-D cartoon series for the the EiTB-Basque TV channel, which is the most seen TV childre program.

Baleuko and Talape are interested in the area of computer graphics for television application, in particular, for the BetiZu character, a Basque-speaking space cow. The ABATEUS project will help in the automating of the production process and will allow the use of their »cartoon star« in other innovative, non-conventional areas. This technology can improve the current scenario of modelling and producing TV content and extend the company's (or companies') activities to other communication channels such as the Internet and multimedia CDs.

VICOMTech is responsible for the avatar platform as such, especially for 3-D graphics algorithms and the synchronization of modules. The group AhoLab from the University of the Basque Country is developing an emotional voice synthesizer for the Basque language to be integrated into ABATEUS. This activity is very important given the lack of commercial Basque synthesizers and the need for cartoon-like voices for BetiZu.

Currently the first prototype is fully functional and able to synthesize Basque texts with the BetiZu character. Work on emotional voice synthesis, representation quality and integration into other modules/platforms is ongoing. For this work, the companies subcontracting with VICOMTech have partial funding from the INTEK program from the Basque Government for 2 years from July 2001.

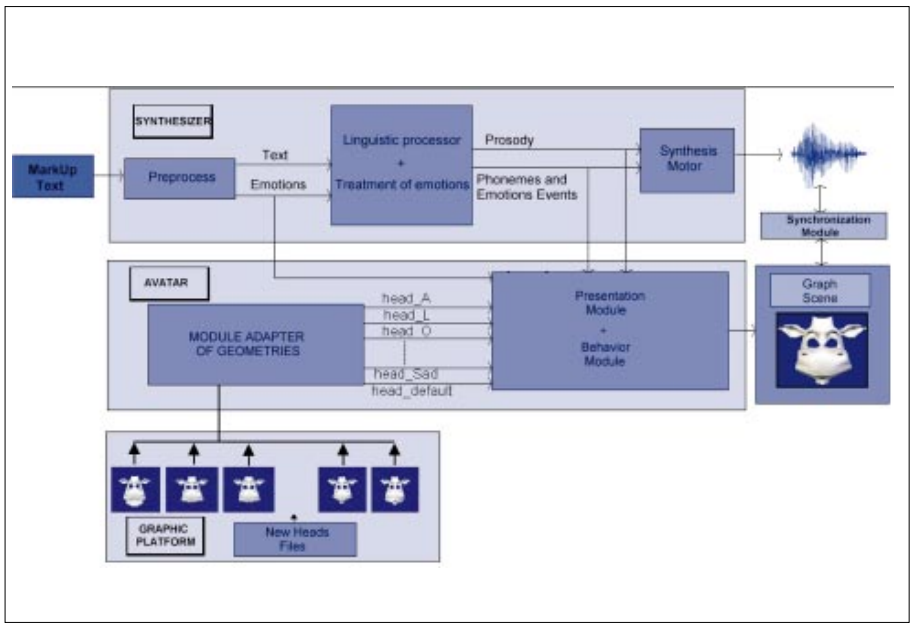

Figure: Architecture of the system.

Functionalities of ABATEUS

- MULTILINGUAL.
  The support of the Basque language, as opposed to majority languages such as English and Spanish, is a key result of the project. The University of the Basque Country (use correct name here and above) is developing an emotional voice synthesizer,where as VICOMTech integrates it into the avatar platform, including coordination with particular gestures appropriate to the Basque language.
- TRANSPARENCY AND USABILITY.
  In order to facilitate normal production for the companies, the usage of this system must be transparent. Integration with current character generation mechanisms is needed. A special module was developed with this purpose in Maya.
- FACIAL ANIMATION.
  Currently the facial parts that are animated, are the head, lips, eyes, pupils, eyebrows and eyelids. Other non-human characteristics, such as cow ears, are being implemented.
- FACIAL EMOTIONS.
  The emotions implemented in Avatar are a subgroup of the MPEG-4 emotions: happy, sad, upset or neutral, with parametric control of each emotion.
- HIGH RESOLUTION.
  The goal of the platform is to allow, as much as possible, high resolution models. Ideally the same resolution as that used in the 3-D animation processes by the companies would be reached, and it would be used transparently, utilizing an an ordinary PC with graphics card.
- SEVERAL CHARACTERS.
  The system is flexible; it contains a specific module which allows for changing from one character to another. Characters may look human or cartoon-like.
- TEXTURES AND MATERIALS.
  Textures and materials are supported by the system, including photographs of persons. With two or three photos it is possible to reproduce an Avatar with a real face, although this process currently requires manual intervention.

Figure: BetiZu integrated in a Web Page.

Figure: BetiZu as an assistant or digital story teller

– EVENTS.
  The system is capable of catching events from the user, such as »stop!«, »talk!«, and so forth. The research line is now directed to emotion events, such as laughter, shouts or surprise.

Lines of application
The prototype can be extended to the following scenarios, among others:
– *Internet*
  - As a companion for tales or games
  - As a reader for BetiZu news in the webpage of Baleuko
– *Digital TV*
  - As a guide to TV programming.
  - As a character to interact individually with a spectator
– *CDs*
  - As an interactive storyteller.
– *Normal television production environments*
  - As an automatic generator of gestures.

INI-Graphics Net Cooperation
VICOMTech collaborates in this project with GRIS and ZGDV (Department of Digital Storytelling), who give their advise in Avatar platform development, in which both groups have a great deal of experience, as well as with and a VICOMTech researcher who was trained in 2001 in ZGDV (Darmstadt, Germany) for three months. ZGDV, GRIS and VICOMTech are members of the INI-GraphicsNet.

Conclusions and Future Work
Avatars and Conversational User Interfaces open new possibilities for human-computer interaction, providing a much more natural user interface. Minority languages have been left behind in the commercial development of speech technology. Therefore, developing Avatars in those languages is important. Integration of Avatars into 3-D television and film production and related areas will provide added value because wellknown characters can be used in other contexts. Good initial results have been obtained so far; these need to be improved in the second phase of development Audio-visual technology will be enhanced for the Basque user by the development of Avatar technology.

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German-Spanish Collaboration on Virtual Reality Design Review of Large CAD Models

Alberto Larzabal, Jorge Posada (VICOMTech)

German Abstract

Im Rahmen der Kooperation mit dem Fraunhofer IGD im Bereich VR-Umgebungen für CAD-Design wird es mehrere Austauschbesuche von bis zu einem Monat zwischen dem Fraunhofer IGD (Abteilung Industrielle Anwendungen) und VICOMTech geben. Ziel ist es, gemeinsam an einem Projekt zur VR-Visualisierung für großformatige CAD-Modelle zu arbeiten. Dieser Austausch wird vom deutsch-spanischen Integrated Actions Program, sowie dem DAAD und dem spanischen Ministerium für Wissenschaft und Technologie finanziert. Die Kooperation ist für einen Zeitraum von 2 Jahren geplant.

Introduction

The increasing mobility of researchers all over the world allows not only for better personal and professional education but also for expansion of know-how. Strengthening relationships between research centres of different countries is crucial for improving the general situation of the scientific community. One of the aims of the INI-Graphics Net, an international network of institutions for education and training, is the transmission of information between centres from different countries.

Integrated Actions Program

The open borders policy among the countries belonging to the EC facilitates making connections between research centres from different European countries. The Integrated Actions Program, created and financed by the ministries of Foreign Affairs and Science and Technology aims for the exchange of knowledge in scientific environments in the EC. The governments subsidize short stays of researchers in foreign centers. The program also tries to establish a basis for long-term collaborations.

In this context, several research visits of one month or less will take place between Fraunhofer IGD (Department of Industrial Applications) and VICOMTech to work on a project about VR visualization for large CAD models. The German-Spanish Integrated Actions Program will finance the exchange, with the participation of the German Agency DAAD and the Spanish Ministry of Science and Technology. This cooperation will last 2 years.

Virtual Reality Viewers and traditional CAD systems

Why is the Virtual Reality (VR) viewer for Design Review for a large CAD models interesting? Although the whole model can supposedly be shown with the usual visualization tools of medium-level CAD systems, when the amount of information to be shown is increased above certain limits, these tools are just not powerful enough. Also, the functionality required is sometimes not available, since it goes

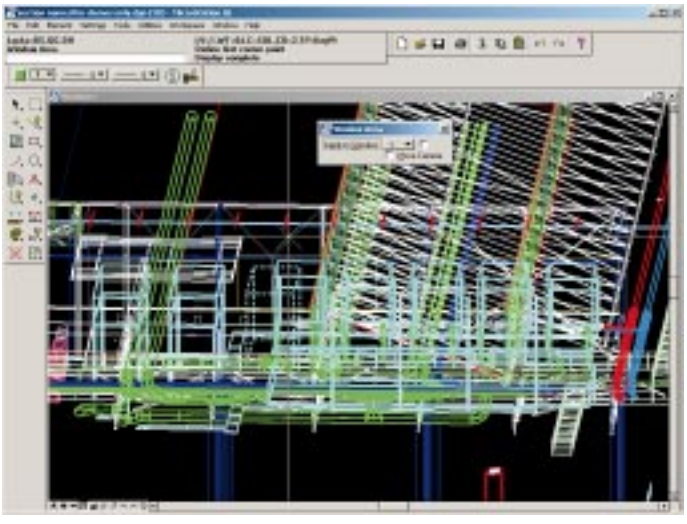

Figure1: CAD System with a large CADmodel of a Plant Design

beyond the mere display of geometric information (for example: PDM connections, cooperative work, etc.). On the other hand, the VR viewers allow immersed 3-D visualization, which is clearer, friendlier, more intuitive than many of the visualization tools offered by CAD systems, and can be customized to satisfy specific needs. Therefore, it is sometimes a good solution to »translate« large CAD models into VR systems that allow better understanding, inspection, and manipulation of the model. In this translation process it is important to maintain the information stored in the original model, this is, not only the visual appearance but construction, design and user-oriented information. A key factor here that is especially understimated is the semantics involved in the process.

Large Model Problem
Most CAD systems have some VR tools but usually they are quite simple and not very powerful:
- They can deal only with large and medium models
- They do not maintain the additional information associated with the CAD model.

To improve the translation and 3-D visualization capabilities implies working with the system resources as a limit. In this project, the user knowledge is considered a key factor for improving the performance with the same model and resources. The point is to try to use the semantics associated with the user knowledge and needs, as well as the model characteristics, with the goal of handling the model intelligently so that the VR model does not overload the computer resources. Thus, it is necessary to analyse the semantics of the information stored in the CAD model as well as require input from the final user regarding the semantics of the model.

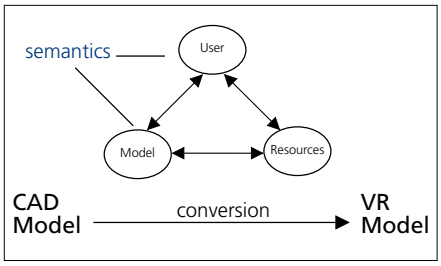

Figure 3: Semantics as a decisive factor in the conversion process CAD<->VR

Figure 3: Factors applied to large CAD models conversion - introduction of user and model semantics as a key factor in the conversion process

Semantics
Semantics is associated with user knowledge, not only in the design stage but in the conversion and visualization stages too. We call it »explicit semantics« when the knowledge can be extracted from related information placed by users -in a structured way- in the CAD system during the modelling stage (layer schema, names, version, well-structured groups...). On the other hand, we call it »implicit semantics« when a user is necessary to identify and fully reconstruct the knowledge stored in the model (catalog reconstruction, removal of aids for model construction, importance of a specific part...). An important fact related to implicit semantics is that the converted model is user customized.

With the intelligent use of the user and model semantics in the conversion process, we expect to improve considerably the performance of VR systems for inspection of large CAD models in a normal computer used in a designed workplace.

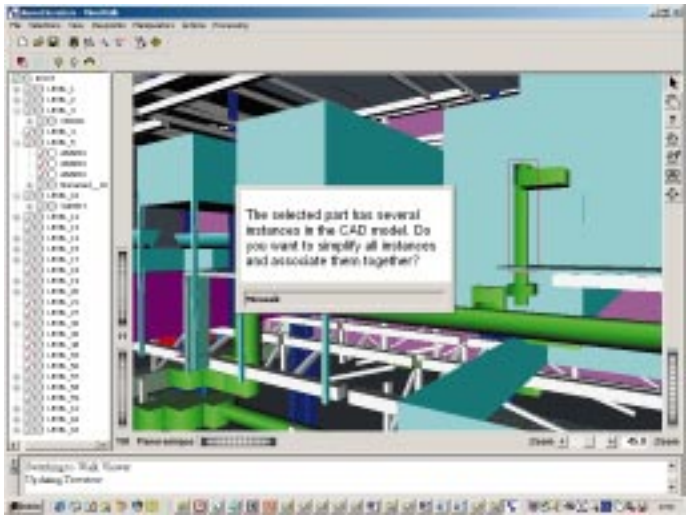

Figure 2: Semantic based VR System for Design Review of the Large CAD model

Application Areas
This approach can be applied to any scientific or technical area that uses large CAD models, such as:
- Industrial Plan Design
- Mechanical Parts
- Architecture

During the period of this collaboration, we will try to determine the importance of different factors for different large models and different user profiles and use those key factors to automate the conversion process for different user-resource profiles.

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Application of Mixed Reality Technologies in the Interpretation of Cultural Heritage

Dr. Maria Teresa Linaza, Dr. Tim Smithers (VICOMTech)

German Abstract

Ziel des hier vorgestellten Projekts ist die Entwicklung und Evaluierung neuer Konzepte für die Präsentation von kulturellem Erbe, wobei die Arbeit auf der Anwendung von modernster Mixed-Reality -Technologie beruht. Das Projekt versammelt Vertreter aller relevanten Forschungsbereiche, und die Ergebnisse werden für die zukünftige Erforschung und Entwicklung von neuen, innovativen Serviceleistungen und -Produkten im Bereich Cultural Heritage sowie deren Vermarktung richtungsweisend sein. Wir gehen bei unserer Arbeit grundsätzlich vom Besucher von Kulturstätten aus - Hauptziel ist es daher u.a. aufzuzeigen, wie Kunst und Kulturgüter ansprechend und bedienerfreundlich präsentiert bzw. erfahren werden können. Zugänglichkeit, Interaktion, individuelle Anpassung und Bildung sind darum die wichtigsten Aspekte der zu entwickelnden und zu überprüfenden Konzepte.
Da das Projekt interdisziplinär ausgerichtet ist, wurde eine Hauptarbeitsgruppe von Partnern aus den Bereichen Forschung, Industrie und kulturellem Erbe gebildet, um Fachwissen aus dem Bereich Mixed-Reality Technologie (VICOM-Tech), Vermittlung von geschichtlichen Aspekten des Kulturerbes (Universität Deusto) und Erfahrung bei der Präsentation von Kulturgütern und geschichtlichen Kunstgegenständen (San Telmo Museum) zu versammeln. Anlässlich der Hundertjahrfeier des San Telmo Museums wird ein neuer, innovativer Prototyp eines Mixed-Reality -basierten Cultural-Hertitage-Systems konzipiert und entwickelt werden. Ein zentrales Element dieser Ausstellung ist der virtuelle Schaukasten.

Introduction

Information and Communication Technologies (ICT) are some of the most important tools of this century. They impact the way people live, learn and work and the way institutions interact with society. During the last decade, new technologies have radically changed communications, business and cultural heritage. Cultural institutions should include innovative technologies in order to improve quality and cultural productivity.

The information society promotes improvements in the quality of life of all people. Intuitive access to information in daily environments is gaining great attention in the development of new technologies inside the information society. Mixed Reality technologies must play a decisive role here due to their contribution to the development of new user-friendly interfaces.

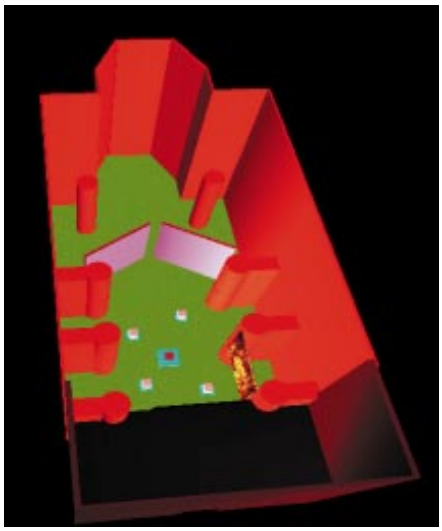

Figure 1: Aerial view of the exhibition

The final challenge of these emerging technologies is social acceptance. If hardware had a perfect intuitive interface, we would still need to define the way Mixed Reality technologies would be merged with daily activities.In other words, we still do not know whether Mixed Reality users would willingly wear helmets on their heads.

Objectives

The aim of the project reported here is to develop and test new concepts for the presentation of cultural heritage, based upon the application of advanced Mixed Reality technologies. It brings together representatives of all the major areas of expertise involved, and it will use the results to set out future directions for the research, development and marketing of new innovative cultural heritage services and products.

The approach adopted in the project is firmly based upon a human-centered view, and the main objectives of the project include the demonstration of new, exciting and user-friendly ways to present and experience art and cultural heritage. Accessibility, interaction, personalization, and education will thus be key aspects of the concepts to be developed and tested.

Current advances in display devices, multi-modal human-computer interaction, collaborative methods, and Mixed Reality techniques will be analyzed and evaluated with respect to their potential for cultural heritage interpretation.

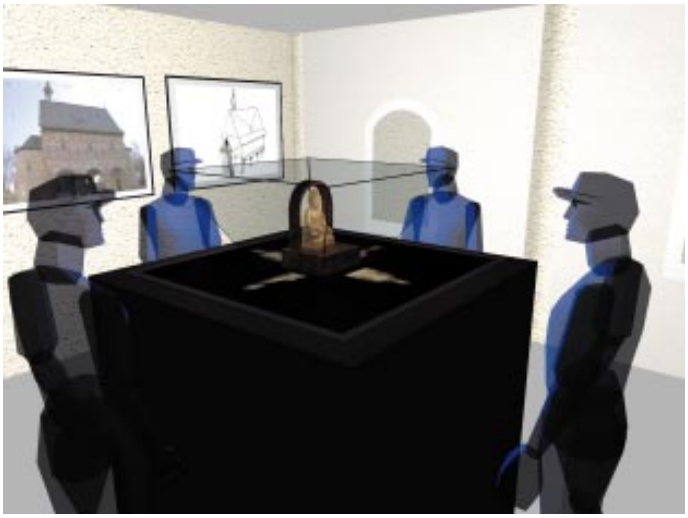

Figure 2: Virtual Showcase conceptual design.

Acknowledgement
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Exhibition set-up
A new innovative exhibition will be designed and constructed for the celebration of the centenary of the San Telmo Museum in San Sebastian (Figure 1). A central element of this exhibition will be an Augmented Reality set-up, probably based on the Virtual Showcase (Figure 2), showing objects from the old iron age in the Basque Country region. Conversations to cooperate with Fraunhofer CRCG (USA),founding member of the INI-GraphicsNet Foundation, for the use of the Virtual Showcase in the exhibition are ongoing. This would offer the possibility to mix real artifacts with high-resolution virtual 3-D images, thus enabling the visitor to see and interact with a mixed real and virtual combination.

The San Telmo Museum will be the venue for this exhibition, and it will be used to test and evaluate the effectiveness of the new interpretation and presentation concepts developed by the project. This will include both direct and indirect assessment of visitors' reactions and responses to the exhibition. In addition, it should help the content providers analyze new ways of teaching and learning using new technologies. Finally, this project will provide new practical knowledge (ideas, concepts and methods) for private and public agents involved in cultural heritage and local development.

Outcomes of the project
- A state-of-the-art review of current methods and technologies used, together with an evaluation of their effectiveness and acceptance in exhibitions, museums and at cultural heritage sites.
- A state-of-the-art review of the technologies available, their user-friendliness and acceptability.
- A review of pedagogical and educational aspects of cultural heritage presentations in order to establish what seems to be desirable in the future.
- An exploration of innovative services, applications, and products integrating Virtual and Augmented Reality technologies.
- An assessment of the visitor's behavior concerning the integration of ICTs in cultural heritage environments.

Consortium
Due to the interdisciplinary nature of the project, a core workgroup consisting of partners in research, industry, and cultural heritage has been established to combine knowledge of Mixed Reality technologies (VICOMTech), expertise in the communication of cultural heritage (University of Deusto) and knowledge and experience in the presentation of cultural heritage and historic art works (San Telmo Museum).

GraphiTech - A new member of the INI-GraphicsNet Foundation in Italy

Dr. Raffaele De Amicis

German Abstract

Die INI-GraphicsNet Stiftung, das Instituto Trentino di Cultura und die Universität Trento (Università degli Studi di Trento) haben sich am 2. Juli 2002 zum Joint-Venture GraphiTech zusammengeschlossen. Die Stiftung ist als Zentrum für moderne Technologien der grafischen Datenverarbeitung in Trento (Italien) ansässig: GraphiTech wird die Zusammenarbeit und Partnerschaft im Bereich Informationstechnologien zwischen der italienischen Region Trento und Deutschland vorantreiben und im Bereich F&E der Technologien und Serviceleistungen grafischer Datenverarbeitung Weltklasse-Leistungen erbringen. Es sind bereits enge Beziehungen zwischen den Einrichtungen geknüpft worden. Mitglieder des INI-GraphicsNet wie das Fraunhofer-Institut für Graphische Datenverarbeitung arbeiten bereits seit mehr als zehn Jahren in Forschungsprojekten mit der Universität Trento zusammen. Der Schwerpunkt der GraphiTech-Arbeit liegt im Bereich moderne grafische Informationsverarbeitung und visuelle Kommunikation, einschließlich VR-Technologie.

The INI-GraphicsNet Foundation, the Cultural Institute of Trento and the University of Trento incorporated the GraphiTech Center for Advanced Computer Graphics Technologies, a joint venture located in Trento, Italy, as a foundation.

Dr. Stefan Noll and Dr. Raffaele De Amicis, representing the INI-GraphicsNet Foundation, together with Massimo Egidi, rector of the University of Trento, and Diego Schelfi, vice president of the Cultural Institute of Trento, signed the research and co-operation agreement on July 2, 2002. Furthermore, Prof. Fausto Giunchiglia, vice rector of the University of Trento, has been nominated as president of the board of directors of GraphiTech, while Prof. Dr. José L. Encarnação, chairman of the board of directors of the INI-GraphicsNet Foundation, has been nominated as vice president.

The aim of the joint venture is to enhance the competitiveness of Trentino's industries through the development and application of advanced computer graphics. The focus will be on advanced graphic information processing and visual communication, including virtual reality. GraphiTech will stimulate information technology collaboration and friendship between the Trentino region, Italy and Germany and perform world-class research and development in advanced computer graphics technologies and services. The joint venture will benefit from the ideal combination of competencies and resources of the three partners, which complement one another, and will ensure an optimum of synergistic effects. The University of Trento is

Signing the agreement. From left to right: Stefan Noll and Raffaele De Amicis representatives of the of the INI-GraphicsNet Foundation, Massimo Egidi, rector of the University of Trento; Diego Schelfi, vice-president of the Cultural Institute of Trento

an internationally renowned research facility, the Istituto Trentino di Cultura is very successful in the area of technology transfer, and INI-GraphicsNet, with its globally acting research institutions, offers extensive expert knowledge. The joint venture will act as a 'technology broker' between Trento and the Italian economy, the University of Trento, the Centre for Scientific and Technological Research of the Cultural Institute of Trento and the INI-GraphicsNet, a major worldwide research alliance in the field of computer graphics.

Points of contact

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art-E-fact: A Generic Platform for the Creation of Interactive Art Experience in Mixed Reality

Stefan Göbel, Dr. Tim Smithers, Michael Schnaider

German Abstract

Innerhalb des Projektes art-E-fact wird eine generische Plattform entwickelt, die Künstler, Autoren oder Mediendesigner dazu einlädt, aktuelle Technologien aus den Bereichen Digital Storytelling, Mixed Reality oder Multimodalitäten zu nutzen und interaktiv neue künstlerische Ausdrucksformen zu erkunden. Mögliche künstlerische Ausdrucksformen können neben klassischer Malerei oder Architektur beispielsweise moderne Foto-, Video- oder 3D-Modellierungstechniken in AR/VR-Welten enthalten.
art-E-fact wird als interdisziplinäres Forschungsprojekt des IST-Programms der EU durchgeführt und startet im Herbst 2002. Das Projektteam setzt sich u.a. aus Informatikern, Mediendesignern, Künstlern, Kunsthistorikern, Restauratoren und Marketingagenturen zusammen. Die Projektergebnisse werden in verschiedenen Workshops, Kursen und in Form einer Experimentierplattform fachspezifischen Anwendergruppen als auch auf Ausstellungen der Öffentlichkeit präsentiert.

With the *art-E-fact* project, an interdisciplinary team of computer scientists, media designers, artists, art historians, restorers and media publishers is striving for a new level of convergence between the arts and technology. The project will create a platform for developing and exploring new forms of creation, presentation and interaction with various kinds of artistic expression. Digital storytelling and mixed reality technologies will create new dimensions for artistic expression, thus building the foundation for new artistic applications.

In fact, digital storytelling in a mixed reality environment consisting of virtual autonomous characters, multimedia, physical props and devices, and multi-modal, human-oriented interactions has to be seen as both a new »medium« for the communication of informational content and a new form of art. However, there are still numerous obstacles facing artists and designers wishing to access the innovative tools for the creation of, or even experimentation with, mixed reality and digital storytelling. There is a considerable gap between the marketable creation technology that is used in art and design classes and state-of-the-art multi-modal interaction technology and autonomous animation. With its interdisciplinary team, *art-E-fact* is going to explore ways of building bridges to allow artists to more

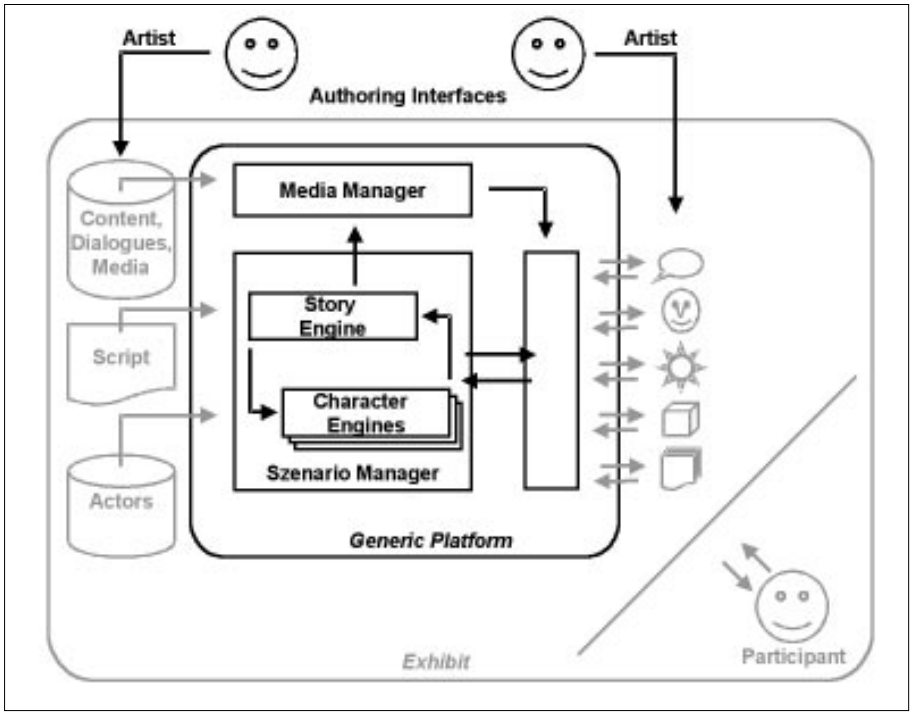

Figure 1: Generic platform (black, including authoring interfaces), to be used by artists who create an exhibit (grey), which is an interactive storytelling application in Mixed Reality

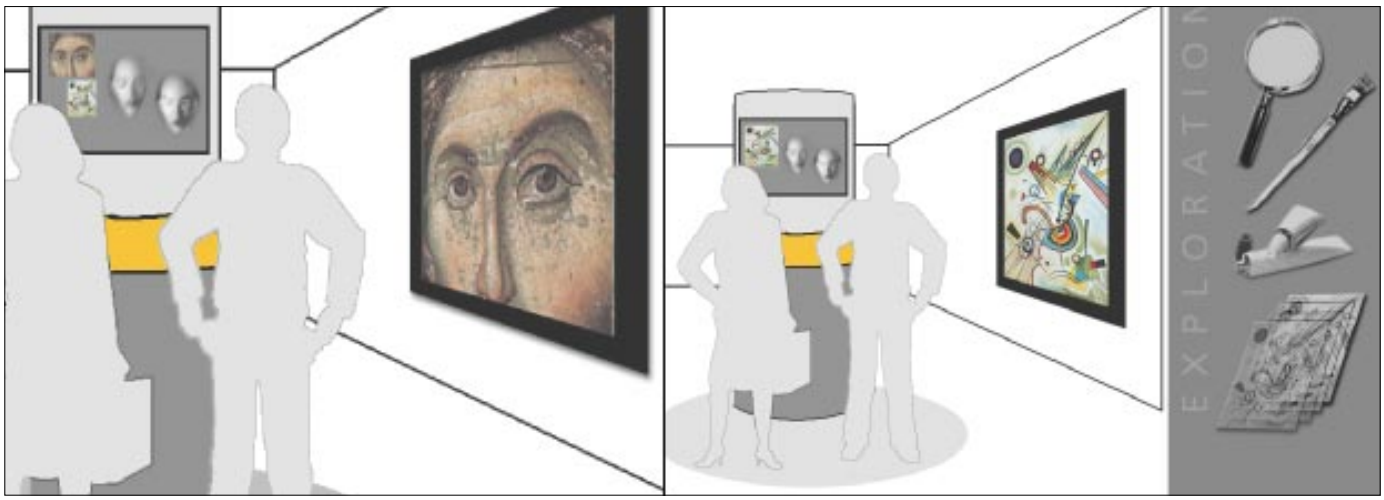

Figure 2: Sketched installation concept of visitors having conversations with virtual philosophers on the screen (left), with various options for physical props to interact (right).

easily access innovative technologies such as digital storytelling and mixed reality and make them applicable to their artistic discourses and expressions.

The main objective of the ***art-E-fact*** project, therefore, is to develop a generic platform for interactive storytelling in mixed reality that allows artists to create artistic expressions in an original way, within a cultural context between virtual (»new«) and physical (»traditional«) reality. The platform will be used as a foundation to actually build a compelling mixed reality installation that facilitates access to a knowledge base of inspirational art history material - reflecting the way humans have created art for at least the past 4000 years. Since the platform addresses artists in particular, it is essential to involve artists and the analysis of artistic methods right from the beginning of the project and through all project phases. As proof of the concept, a showcase will be created within an interdisciplinary team. This can be used for the evaluation of artistic methods, as well as for the diffusion and exploitation of the results, leading to more accessible tools for artistic expression in the future.

Generic platform for interactive storytelling in mixed reality

The generic platform for artistic creation in mixed reality is based on a kernel that combines a virtual reality system with a scenario manager for interactive conversations with partially autonomous virtual characters. Furthermore, components for media management and abstract device management enable flexibility and allow authors to design multimodal interactions on various abstraction levels.

Artists will create a mixed reality exhibit by using the generic system to shape a specific instance of expression. They will choose specific interaction devices and physical props to be used for anthropomorphic interactions, as well as corresponding interaction metaphors; they will define dialogues with a degree of autonomy and the behavior of virtual characters, and they will create multi-media elements to be accessed during runtime.

For production issues, the »artist« is considered to be an interdisciplinary team of writers, visual artists, hardware prop designers, programmers, etc. Artists and designers can access the system at different layers of influence detail. Those who have more advanced knowledge of procedural behavior descriptions and 3D animation can define rules and every detail of the result. Other authors can simply script dialogues on a higher level of abstraction.

In brief, the sketched generic system serves as an experimental platform allowing authors with artistic or humanistic backgrounds to make design decisions which go beyond state-of-the-art creation systems for digital media. Examples include:

- Providing interactive storytelling dialogue structures instead of »navigation« metaphors in hypertext structures.
- Enabling the design of holistic spectator experiences by integrating design issues concerning content, story, characters, their modalities and the hardware used instead of being constrained to mere screen design with a fixed interaction metaphor.

In summary, it is possible for artists to include anthropomorphic interactions such as speech, gestures, eye gaze and body poses into their mixed reality design and to direct lifelike avatars in order to act.

Exhibit as a case study

Within the project, an exhibit will be built that will serve as a case study and proof of concept to accompany the tool-building work through all phases of the creative production process. At the end of the project, the exhibit will be presented to the public. The exhibit should provoke intellectual discussions on the artistic process itself, focusing on mixing realities. Through the cooperation of renowned institutions from the fields of art history, art restoration, artistic creation and multimedia design and technology, a mixed reality art piece will be built that, in and of itself, »is« an interactive, contradictory discourse with different points of view about artistic creation. The basic scenario is briefly summarized in the following:

Spectators will be confronted with real historic paintings, such as Byzantine icons or western contemporary art, and will participate in a virtual discussion about them. A virtual character in the role of the analyst will present knowledge about its creation that is physically derived from the discussed real artifact through multilevel spectral imaging methods.

A different character takes the role of an art historian who builds the bridge from past expression techniques to modern techniques. Further virtual characters can be involved who take roles to either provoke reactions from visitors or ask questions in place of them. Spectators become participants as they interact with the characters and the paintings through anthropomorphic metaphors such as speech, gestures and physical props.

The virtual beings themselves, embedded in an electronic art piece, are in a recursive sense »artistic creations« and will be subject to careful design in the creation process. The resulting aesthetics, particularly in the context of the degree of confrontation involved, result from thoroughly elaborated details.

The joy of philosophical recursive reflections on art and art theory is a key motivation for the piece. The »artifact that discusses artifacts« bridges 4000 years of human art creation, motivation, materials and spectator interaction.

Finally, the resulting exhibit can also be seen as an example of educational software. It employs a method of presenting knowledge based on hermeneutics, making use of the Greek philosophers' dialogue, by distributing several interpretations across different characters.

The *art-E-fact* project is one of the selected proposals of the Cross Platform Action 15 of the IST program. It is supported by the European Union and will start in September 2002 with a Europe-wide consortium consisting of ZGDV e.V., Fraunhofer IGD, Sacred Convent of the Annunciation IMSP, Akademie der Bildenden Künste Vienna, VICOMTech, Centro Arteleku, Parque Tecnologico de San Sebastian and Giunti Multimedia SRL.

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artnouveau - *On the transition to the digital era of arts and culture*

Michael Schnaider (ZGDV), Dr. Maria Teresa Linaza (VICOMTech)

German Abstract

Das Projekt artnouveau zielt darauf ab, neue Ansätze und Visionen für die Präsentation von und für Kunst und Kultur herauszubilden. Als Thematisches Netzwerk geplant, ist es die Aufgabe des Projektes den Austausch von Informationen und Erfahrungen zwischen möglichst allen relevanten Gruppen aus Kunst, Kultur, Forschung und letztendlich Industrie zu fördern. Das angestrebte Ziel ist es, aus den Diskussionen und Erfahrungswerten sowie unterstützt von begleitenden Technologiedemonstratoren für Kunst und Kultur aus dem Umfeld Mixed Reality und Mensch-Maschine-Interaktion einen Vorschlagkatalog zu entwickeln, der für die weitere Entwicklung von Kunst und Kultur wesentliche Strömungen aufzeigt.
Gleichzeitig hat das Projekt die Aufgabe interessierte Partner aus unterschiedlichen Bereich für innovative Anwendungen in Kunst und Kultur zusammen zu führen.

Culture and arts are still dominated by traditional forms of presentation. While the digitization of cultural heritage and artistic artifacts is already an issue in the discussion and research of different involved parties, the process of creation or presentation of cultural and artistic exhibits using state-of-the-art technologies is often only a focus of small research groups and initiatives.

The *artnouveau* project is set up as a thematic network in the 8th Call of the Fifth Framework Program of the European Union in order to help, the cultural and arts community, and the community of technology suppliers to exchange their respective views on the application domain of cultural and artistic expression. This includes both the provision of access to cultural and artistic artifacts to the public as well as the process of artistic and cultural creation. Since the interface to create or access such artifacts is an important issue, the thematic network intends to focus on technologies related to Human Computer Interfaces, Mixed Reality and Computer Graphics. While establishing a network consisting of specialists in different related fields is in itself an important objective, the work to be performed inside the network should lead to hands-on recommendations for the utilization of technologies in culture and arts. Therefore, a consortium has been assembled which builds the initial backbone or core group of the network. Consisting of partners with individual strength in their related fields, the network aims at the provision of a generic framework and a set of directives and recommendations on how to successfully integrate new technologies into cultural and artistic environments and applications.

Because the network is going to take a user- and application-centered perspective, it fits perfectly into the landscape of existing research networks dedicated specifically to methodological advances in culture and arts, to the preservation and digitization of cultural and artistic content, as well as to standardization issues. It will adopt the role of an integrator and offers the potential to interrelate up to now unconnected endeavors.

The objectives of the network can be differentiated into at least two main areas, organizational objectives concerning the network itself and functional objectives concerning the action being undertaken within the network. The most important organizational objective will be the set up of a platform for exchange and discussion about issues related to technology utilization in the area of culture and the arts, bringing together all important players from cultural heritage information and arts and technology providers.

Figure 1: Interactive virtual exhibit.

Figure 2: Children in a virtual environment.

The process of discussion, exchange of knowledge and experience, as well as hands-on experience, will on the one hand foster technology awareness in the cultural heritage and arts community, and on the other hand help to foster understanding and awareness of the demands, conditions and requirements of the cultural and artistic application domain in the community of technology suppliers. Furthermore, the network should be extended toward a network of excellence in the field of technology-enhanced cultural and artistic applications which helps to establish links between the different existing networks and initiatives dedicated to culture and arts and between different IST projects in related fields.

As for the more functional objectives, the intended concrete results of the project will cover surveys on (1) the current situation of cultural and artistic creation and provisions for innovations and (2) experience at the European level concerning the implementation of IST technologies for exhibitions, cultural institutions and archaeological sites. Furthermore, a special focus will be given to possible new forms of interfaces between cultural and artistic exhibits and the end users. The interface for creators and producers of cultural and artistic exhibits will also be determined. This includes the identification of available new technologies in Europe for access by visual arts and cultural heritage specialists as well as already known technologies such as mixed reality, computer graphics, and human computer interfaces. A possible application of such technologies in a new domain demands an in-depth discussion between all involved parties to identify risks in the utilization of these technologies for cultural and arts applications. Gathering feedback on missing technologies or needed improvementsto meet the specific demands of the application domain is crucial.

Finally, *artnouveau* will developaproposal for future research directions in Computer Graphics, Human Computer Interface, and Mixed Reality and also a list of recommendations for the utilization of innovative technologies in the cultural and artistic domain. These recommendations will take into account various contributions from a wide range of parties dedicated to the subject of culture and the arts. The thematic network will be open to new members who want to participate in the discussion process and the evaluation of existing technologies.

A core group consisting of ZGDV, Fraunhofer IGD, VICOMTech, Universidade do Minho, Foundation of Hellenic World, Universidad de Deusto, Museo San Telmo, Centro de Computação Gráfica and the Museu Alberto Sampaio intends to start the *artnouveau* project, which will be supported by the European Commission in the Cross Action Program 15 in September, 2002. Relationships have been established to existing networks, important partners, and other projects in the domain of cultural and artistic expression, and these relationships will be extended during the project.

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WIDE - Semantic Web-based Information Management and Knowledge Sharing for Innovative Product Design and Engineering

Dr. André Stork, Dr. Tim Smithers, Brigitte Koch

German Abstract

WIDE ist ein von der EU im Rahmen des IST-Programms gefördertes Projekt (IST-2001-34417). Ziel des Projektes ist es, ein System zu entwickeln, das die Qualität und Effizienz von innovativem Produktdesign verbessert. Unter Anwendung von Technologien und Konzepten des »Semantischen Web«-einer Initiative des W3C, um das WWW intelligenter zu gestalten-wird ein Wissensmanagement-System entwickelt. Der Schlüssel zu innovativem Produktdesign liegt in einem verbesserten Informationsmanagement und Wissensaustausch zwischen den an dem Produktentwicklungsprozess beteiligten, interdisziplinär arbeitenden Gruppen, wie Designern und Ingenieuren.
Maschinenverstehbare semantische Informationen sowie die Anwendung von Ontologien und intelligenten Informationsfilter-Mechanismen bilden Schlüsselkomponenten bei der Entwicklung des WIDE-Systems.

The Project WIDE - Semantic Web-based Information Management and Knowledge Sharing for Innovative Product Design and Engineering - is funded by the European Commission (IST-2001-34417). WIDE aims at improving innovative product design by applying emerging Semantic Web (SW) techniques to develop and test an effective information management and knowledge sharing system for multi-disciplinary design teams. The WIDE system will support the effective and efficient inter-working of industrial designers and engineers by offering a natural and coherent environment for identifying information needs, finding and accessing different information sources, receiving and viewing information from the different sources and relating the results to the current state of the ongoing designing. In doing so, WIDE puts to a real test the emerging SW techniques and identifies where further work is needed to achieve the much greater levels of machine-aided decision support needed in today's fast moving, short time scale, innovative product design activities.

The work of the WIDE project is based on the development of four important innovations:

– *Information management and knowledge sharing in multidisciplinary design teams*
Different people can use different technical languages, work together and share their knowledge without having to speak a common language. This means that a sufficient understanding of the other's terminology, without an ability to speak it, can form a sufficient basis for effective collaborative working and for sharing knowledge. The WIDE project takes this multi-language/cross-cultural idea as the basis for its model of support industrial designers and product engineers who work together and share knowledge

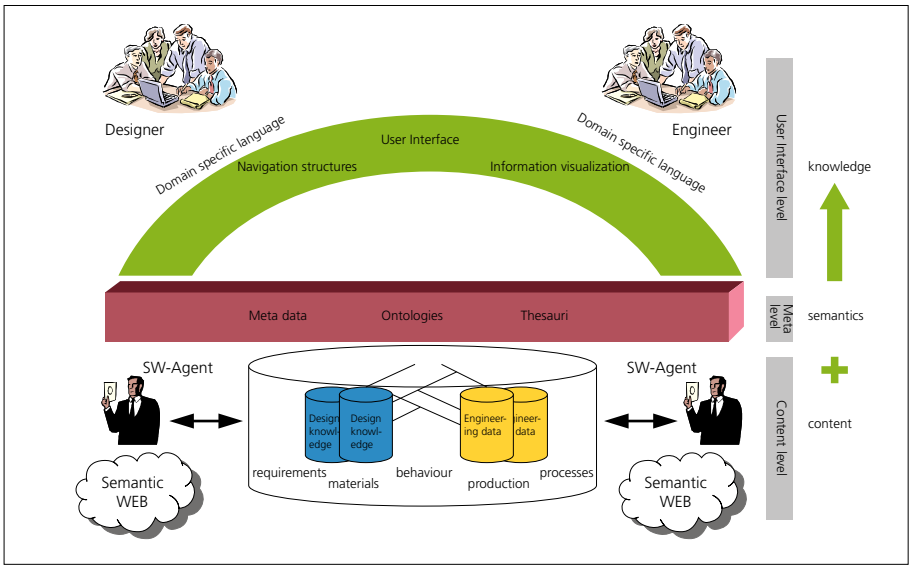

Figure 1: The system architecture of WIDE

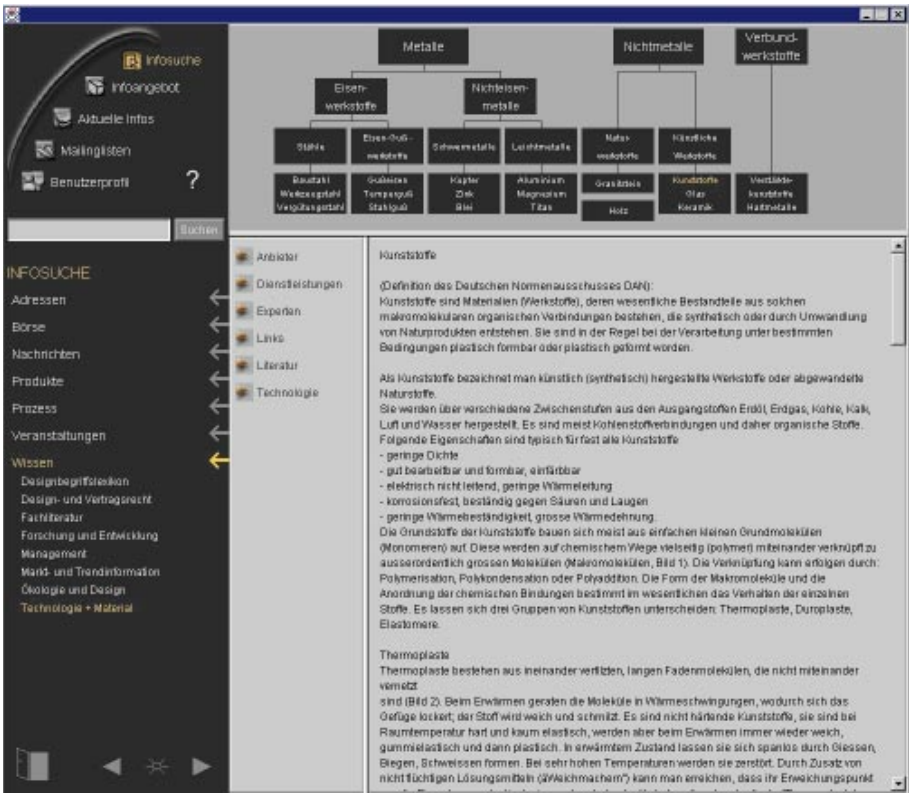

Figure 2 shows the DEPOT-demonstrator. This screenshot indicates a material tree with crossreferencing of materials and knowledge about features and processing techniques.

effectively and efficiently although they speak different technical languages and come from different professional cultures. This represents an innovative approach to effective knowledge sharing in product design, and is different from the more classical knowledge management approaches, which seek to have everybody involved speak the same language.

– *A process ontology supports the WIDE core system*
Ontologies define existing objects in a domain, their properties, and the relation between them. They are intended to support human interpretations of information about the domain covered by the ontology, and to support machine processing of the same information. The importance of ontologies as an essential component of Semantic Web technologies has led to a convergent work on ontology specification and web-based specification languages. The WIDE system will aim to use the emerging standards and tools in this area (e.g., XML and XMLS, RDF and RDFS, together with DAML+OIL). The WIDE project will be one of the first projects to develop and use a process ontology as a key element of its information management and knowledge sharing system for product design.

– *Use of an existing theory of the design process*
The design process ontology will define the different kinds of knowledge used and generated during designing, together with their roles and relations. This design process ontology will then be used by the system to identify what kinds of knowledge are being requested, used, added, or shared by users of the system, and to identify what other kinds of design knowledge could be relevant to the current design activity or activities. The WIDE design process ontology will be based upon an existing Knowledge Level theory of the design process which has been specifically developed to support the knowledge engineering of design support systems.

– *Application of emerging Semantic Web technologies*
Using Semantic Web technologies as the basis for a system to support information management and knowledge sharing in product design thus represents a challenging and serious test of the technologies involved. The WIDE system will thus pioneer the way towards the use of Semantic Web technologies in effective support of information management and knowledge sharing in design and in other business areas.

The system architecture is depicted in figure 1.
A demonstration model - the so-called DEPOT-system - that supports interdisciplinary knowledge transfer developed within the European ADAPT-initiative will serve as the basis for the WIDE system. WIDE extends and improves the DEPOT-demonstrator in various ways. Figure 2 shows a screenshot from the DEPOT-system.

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MUMMY: Mobile Knowledge Management

Dirk Balfanz, Dr. Jürgen Schirmer

The vision of the EU-funded project MUMMY is to enable mobile, personalised knowledge management based on the usage of rich multimedia to improve the efficiency of mobile business processes. MUMMY will provide (1) new multimedia and hypermedia technology for a seamless integration of pocket-sized computers into the knowledge management control loop, addressing the topics of knowledge acquisition, description, preservation, annotation, access and exchange; (2) substantiation of the expedience of the developed components through rudimentary portal establishment and trials in the application area of facility management and the construction industry. MUMMY will make use of new mobile connection possibilities, such as, »always on-line« and bandwidth, offered by wireless networks and bluetooth, as well as that of new Hardware possibilities offered by camera-equipped mobile phones or PDAs. We believe that the results from MUMMY will lead to time savings and cost reductions of about 5%, thereby improving overall quality of work performed.

Motivation

Mobility in our society is still increasing along with the growing market penetration of mobile phones and personal digital assistants. These pocket-sized computers serve as permanent companions, mainly in an off-line mode. In the future, circumvention of PC usage and *anywhere, anytime*, up-to-date and on-line knowledge access will have a great impact on our everyday life. In knowledge management systems, personal notes, project documents, and other knowledge objects within a knowledge base, are linked using hypermedia technology. Today, the efficient provision of rich multimedia and hypermedia, as well as on-line knowledge management facilities, for pocket-sized devices is not yet solved.

Mobile access to the »right« information by construction managers or facility managers is not yet available. Project managers in the construction domain are faced with an error-prone decision-making process, because of missing physical files and folders or unseen plan material. Ad hoc notes or images for business- rele-

German Abstract

Die Vision des EU-Projektes MUMMY ist es, durch personalisiertes, mobiles Wissensmanagement die Effizienz von mobilen Arbeitsabläufen zu erhöhen. MUMMY wird neue Multimedia und Hypermedia-Technologien zur nahtlosen Integration von »Westentaschencomputern« in dem Wissensmanagement-Regelkreis entwickeln und u.a. neue, mobile Kommunikationstechnologien und Endgeräte einsetzen. Die erarbeiteten Ansätze und Lösungen werden prototypisch in den Anwendungsfeldern Facility Management und im Baubereich ausgetestet.

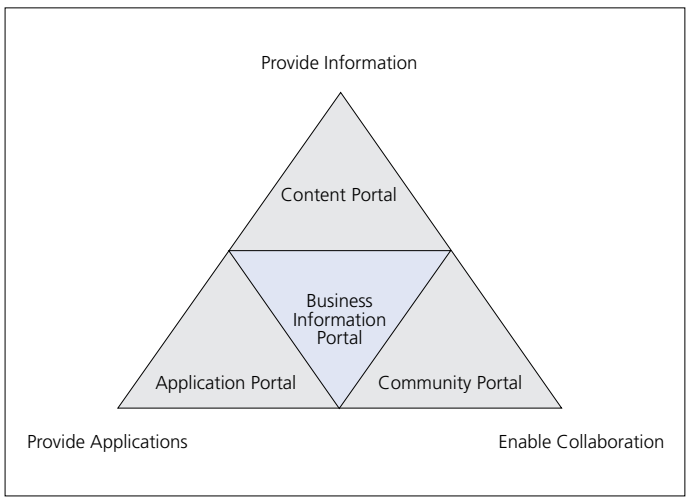

Figure 1: Components of knowledge portal

Figure 2: Image or video annotation of a construction site for use on pocket-sized computers

Figure 3: Site plan annotation and collaboration on mobile devices

vant decisions and planning and possibilities for context-sensitive retrieval are not given. For facility managers, on-line access to companies' databases and updating is not available, for example, when new installations are completed or maintenance work is done. Conventional workflow acquires the data onsite in a paper form; digital update is done afterwards in the office. Incorrect input is harder to recognise offsite, making it difficult to correct errors as needed and in a timely way.

Expected Results

Efficient communication of and collaboration with knowledge objects is a main objective of MUMMY. MUMMY will ascertain through research and trial how rich multimedia content and collaboration can be best applied within *mobile* knowledge portals (Figure 1), showing the potential business opportunities of mobile knowledge management.

In order to evaluate the developed technology, the MUMMY consortium will set up a portal prototype for the application scenarios of *facility management* and use on the *construction site*.

It will enable for instance, a construction or facility manager to have situation-aware mobile access to current project data, such as a construction plan, and will provide multimodal annotation and delivery of deficiency lists, as well as collaboration on acquired material and plans with remote experts. The problems to be addressed within the application scenarios will be identified through a strong user focus and the analysis of relevant business processes from the beginning of the project.

The scientific work will focus on the following subjects, primarily addressing the content and community portal:

- *Mobile annotation and collaboration* mechanisms
- *Video hyperlinks* on mobile devices
- *Metadata* based on RDF and/or MPEG-7
- *Personalisation* for access to situation-specific knowledge
- *Ontologies* for the annotation of knowledge objects

MUMMY's new mobile multimedia communication mechanisms will become important technology groundwork on which future efficient mobile knowledge portals for quite different application domains can be established.

Consortium

- Zentrum für Graphische Datenverarbeitung e.V., Germany
- INTRACOM SA, Greece
- University of Applied Sciences Wädenswil, Switzerland
- Czech Technical University, Czech Republic
- COSMOTE, Greece
- ELLINIKI TECHNODOMIKI A.E., Greece
- ARCADIS, Germany & The Netherlands

MUMMY is under signature and will be funded by the European Community: IST-2001-37365.
Start (expected):
September / October 2002
Duration: 36 months.

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Advanced Digital TV Lab in VICOMTech - Real Synergy between TV and Computer Graphics

Nuria Lopez, Julian Florez (VICOMTech)

German Abstract

Wegen der zunehmenden Nutzung von digitalen Technologien konnte die Forschung und Entwicklung im Bereich der grafischen Datenverarbeitung ihre Kompetenzen weit über typische Umgebungen (PCs, Großrechner, Laptops, etc.) hinaus ausdehnen. Es wird mittlerweile in/an einer Vielzahl von Bereichen und Geräten geforscht, wie etwa Handys, Spielkonsolen, PDAs usw. Solch ein neuer Bereich ist auch das digitale/interaktive Fernsehen. Die Möglichkeit, digitale Informationen zusammen mit dem traditionellen Sendesignal zu senden (und eventuell ein Antwortsignal zu empfangen) bietet der grafischen Datenverarbeitung ein neues Forschungs- und Anwendungsfeld. Das vielversprechende Potenzial, das sich aus dem digitalen Fernsehen ergibt, zieht weltweit die Neugier von Telekommunikations-Providern, Computerherstellern, Netzwerk-Providern, Konsumelektronikherstellern und Sendern auf sich. VICOMTech verfügt über ein voll ausgestattetes Digital-TV Labor, in dem die Möglichkeiten der grafischen Datenverarbeitung für das Digitalfernsehen erforscht werden.

Due to the increasing use and application of digital technologies, it is a fact that Computer Graphics R&D has extended its competencies far beyond the typical environments (PCs, mainframes, laptops, etc.) to a multitude of new devices and environments such as mobile phones, game consoles, PDAs, etc. One of the newest and most important areas in this transition is the digital/interactive television. The possibility of sending digital information such as applications, together with the traditionally broadcasted signal has opened a new field of research and application for CG. In Europe, the current situation is marked by the paradox of decided support from the EU and local governments and the technological uncertainties still remaining for the implementation of real applications. (The analog television will disappear in most countries in the European Union by 2010; several countries are initiating digital emissions this year or next.)

The tremendous potential of digital television is attracting interest from telecommunications providers, computer manufacturers, network providers, consumer electronic companies, and broadcasters around the world. Companies are realizing that convergence among personal computers, television sets, and the Internet has already begun and they are positioning themselves to maximize revenues from this new paradigm of interactive services.

Digital and Interactive TV computing paradigm

Digital television offers many exciting possibilities and opportunities: interactivity, data broadcasting, electronic commerce, better pictures, Internet services, improved audio quality and new applications that have not yet been dreamed about. There is a wave

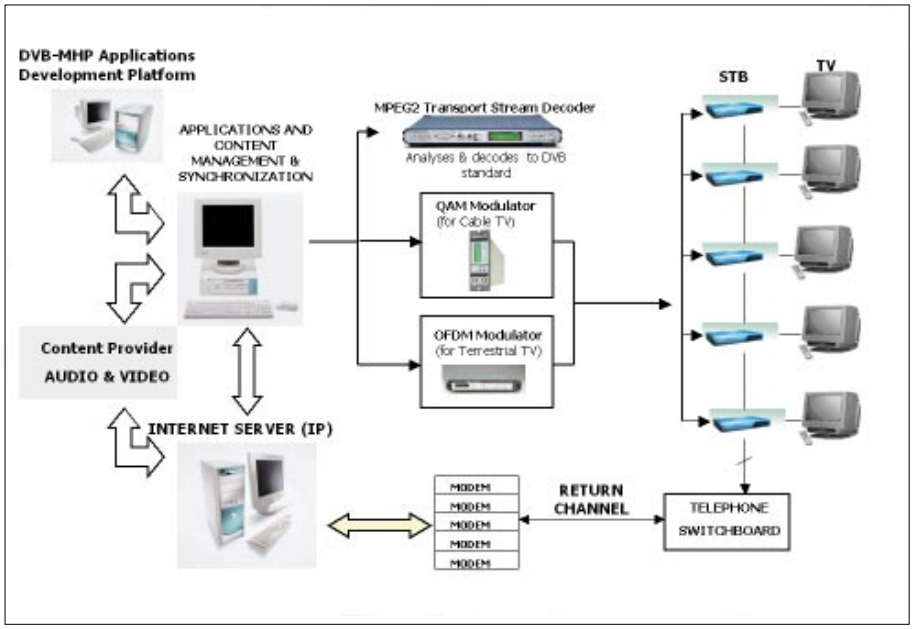

Figure 3: Interactive TV Main Components

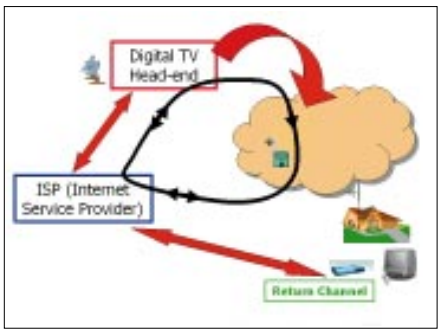

Figure 1: Interactive TV Computing Paradigm

of activity in the IT and broadcasting industry currently centered on providing millions of people with a suite of set-top applications that will firmly establish the next paradigm of interactive services through Digital TV. This new paradigm of developing interactive services for a set-top box-based architecture instead of a standard PC provides scientists and software developers with a wealth of new and exciting challenges and opportunities, Figure 1

As development of entertainment services for digital television markets gathers speed, software engineers and researchers are being challenged to develop a variety of Internet-TV-centric applications for the set-top box. Developing for a set-top environment is particularly challenging because they have (i) limited hardware resources, (ii) different distribution architecture and bandwidth for applications, and (iii) different interaction paradigms as when compared to a standard desktop PC.

Although some commercial, proprietary platforms for Digital TV already exist in the market, there is still a great need to fully exploit the real potential of this technology for interactive services. At this time, we are experiencing the first broadcasting of digital TV that follows the European standard DVB-MHP (Multimedia Home Platform). This new situation will help the development of new interactive services on a broad scale, based on open standards, that will benefit greatly from Computer Graphics expertise in other contexts. The fact is that there are still many matters to be resolved (lack of commercial set-top boxes for MHP terrestrial reception, for instance). Implementations of the standard are in most cases partial. Nevertheless prospects are very promising.

Content providers and users find themselves in a situation of double uncertainty: the purely technological questions, related to Digital TV definitive standards, and also the main difficulty, the need for new paradigms required todevelop new applications or adapt existing ones to the new environment.

Interactive TV Laboratory at VICOMTech

VICOMTech has designed and built an interactive TV Lab, containing the hardware and software for the main technological platforms involved in the deployment of Digital Interactive TV Applications and Services that support DVB-MHP standards, Figure 2.

The main purpose of this Lab is to experiment, to simulate and to contrast different interactive TV approaches in order to research the most relevant issues which have arisen when developing Digital TV applications and services for a set-top box environment.

A very important issue to be explored is the way the existing expertise and accumulated knowledge in CG can be exploited and reused to adapt (or augment) existing applications for Digital TV, as well as the establishment of a framework for developing applications in this new computing paradigm. The full exploitation of the possibilities offered by the return channel and the Internet access is another key issue to be considered. Usability, integration, interactivity, adaptive user interfaces, etc., are some of the aspects that need to be addressed from a general framework, before specific contents and applications are implemented. Special features (advantages and restrictions) of the new digital TV architecture must be taken into account, as well as new application possibilities opened by the combination and synchronization with the broadcast signal, which need to be investigated.

The overall TV Lab structure considers its different functional parts: applications development, integration of applications and A/V content, broadcasting unit, set-top boxes for reception, return channel and its management, Figure 3. Some of the technological objectives pursued are:

- Evaluation of tools and programming environments available for design and development of interactive services.
- Study of interactive services implantation methodology, as well as their development cost evaluation.
- Evaluation of Digital Head End functional requirements.
- With regard to the Internet access, reserching of technological needs to be met both at the Head End and at the users' Set-top box.
- Evaluation of user response to TV interactive services.

The new Interactive TV Lab of VICOMTech will contribute to supporting, promoting and assisting content providers and users in using interactive technologies as a tool for the improvement of their efficiency and competitiveness. It will also consolidate VICOMTech as a reference technological centre for the multimedia sector.

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Interactive Services for Sports in Digital TV Based on DVB-MHP Standards

Igor Leanizbarrutia Zugasti

The continuous transformation of analog systems into digital systemshas marked the technological evolution during the last decade in the broadcast sector. It has allowed the introduction of new and different types of services as well as an increase in the quality of the services delivered. The possibility of sending digital information (data + applications) together with the traditionally broadcasted signal (audio and video), sometimes combined with a return signal via Internet, has opened a new field of research and application for Computer Graphics.

Most of the new delivered services are linked to the biggest satellite and cable digital TV platforms. Services like Electronic Program Guide (EPG), interactive news services, interactive sports applications, telebanking, teleshopping, etc. highlight some of the possibilities that the new technology offers. Most of these services have been developed under proprietary platforms and can be considered preliminary attempts to exploit the huge commercial potential that is involved. However, there exists still a great need to fully exploit the real potential of this technology for interactive services.

Right now, we are experiencing the first broadcasting of digital TV that follows the European standard DVB-MHP (Multimedia Home Platform). It is hoped that this new situation will help the development of new interactive

German Abstract

Zur Zeit erleben wir die ersten Ausstrahlungen von digitalem TV gemäß der europäischen DVB-MHP (Multimedia Home Platform) Standards. Es bleibt zu hoffen, dass diese Entwicklung vielfältige, neue interaktive Möglichkeiten, basierend auf systemfreien Standards, auf den Weg bringt. Bis dahin müssen allerdings noch einige Probleme aus dem Weg geräumt werden, wie etwa die auf dem Markt fehlenden Set-Top-Boxen für den MHP-Empfang. Die Implementierung der Standards erfolgt in den meisten Fällen nicht vollständig. Trotzdem scheint die Entwicklung vielversprechend. Im Folgenden wird ein interaktiver Sportservice vorgestellt, der von VICOMTech entwickelt wurde. Diese Anwendung wurde von den Sportsendung-Produzenten STT und G93 gefördert und vom EiTB (dem baskischen Fernsehsender) unterstützt. Sie wurde gemäß der DVB-MHP Standards entwickelt.

Figure 1: Individual information for each user

Figure 2: Real-time information of the match.

services on a broad scale, based on open standards. Many matters remain to be solved: lack of commercial set top boxes for MHP terrestrial reception, for instance or the fact that implementations of the standard are in most cases partial. Nevertheless, prospects are very promising.

For example, an interactive sport service (interactive pelota) that was developed at VICOMTech has been presented. This application has been promoted by the sports content producers STT and G93 and supported by EiTB (the Basque TV Channel) and has been developed under the DVB-MHP standard.

The Interactive Service

Interactive pelota represents a good example of interactive sport service for digital television. This application offers the user all the information already broadcast together with the sport event but with important differences. In the current emission the user has to wait for the information to be sent, which is shown periodically, without the choice of selecting information. Our application allows the user to apply for specific information at any time.

The application introduces two important differences: first, it offers the user more information, but in an à la carte way, so he does not receive extraneous information as happens currently. Second, and more important, it allows interactivity, offering the user the choice of changing the emission content at will.

Choosing only wanted information is not really »interactive« because all the information is being sent without listening to the user. Everybody gets the same information as a whole, but it is the user who makes his selection at home.

The interactivity is possible thanks to the return channel, which gives the user the choice of acting as a transmitter of information, in addition to its function as receiver. This capability offers the user many possibilities, which range from applying for exclusive services to interacting with other connected users.

Without question this capability introduces a dramatic change both in the way television is understood and in the concept of spectator. It becomes the main character of the stream of information because its decisions alter the content.

Interactivity not only means that users can send their requests to the source of the broadcast. In fact, the return channel also becomes a connection to the Internet through which users can send and get data to and from everywhere. This connection becomes the definitive link between television and Internet. Users will have available all of the services the Internet offers, which till now have been exclusive of the PC environment at the same time as they enjoy television enhanced with new interactive services.

Interactive Pelota

All we have previously described about interactive services and the Internet is in practice limited by existing technical restrictionsboth in the equipment needed and in the infrastructures used for development. Considering these actual

Figure 3: Motion tracking information in real time

limitations, VICOMTech is developing an interactive application for the pelota matches in television.

This application is fully compliant with the MHP standard, because it is developed with both its limitations and advantages. It provides the usualanalogical emission, such as score, number of fouls, etc. The user can consult this information at any time displayed on the screen when he wishes.

In addition, the application provides exclusive services related to interactivity. Some kinds of information about the match might only be of interest to some users at a specific time. This might not be interesting to everyone. It is at this point that interactivity arises: for example, a specific user wishes to knowabout one player´s performance in previous championships. When selecting this information, the user asks the broadcaster for information that is emitted just for himself.

The set-top box of the user, through its return channel, sends the user's request to the broadcaster, who inserts the requested information into the data carousel with a specific user identifier. This guarantees that the one who requested the information is the only one who gets it. This way, users are not overwhelmed by information of no interest to them.

Using this system, the application allows the user to interact with services such as requesting information about players, their sport careers, triumphs and defeats, predictions about their futures, information about the state of the championship this year and in previous years, etc. (Figure 1). Although this information is not qualitatively different from what has been received, it is a novelty that it is requested by a specific user and sent only to him.

The application also allows the user to participate in a survey, giving his opinion on who is going to win (interactivity), and following the state of the survey in real time.

Nevertheless, the most novel characteristic of the application is the information in real time that is obtained about a match in progress. (Figure 2)

VICOMTech is also investigating adding the capacity to make motion capture, track players, and show the data in real time to the application. (Figure 3)

Once again, the bandwidth and set-top-box processing capacity limitations restrict advances in the applications.

It is important to mention the inherent difficulty in interactive applications development for television: the synchronization and speed of the emission. While watching television, nobody wantsto wait 10 seconds to see what he wants on the screen. By contrast on theInternet, there is a certain tolerance towards connection delays. The information arrangement sent by the carousel must be maximizedbecause there are approximately 500 Kb/s where all the information for everybody must fit. This is the challenge of developing interactive content for television.
Because it is a very demanding and technologically limited environment, serious problems, which are only the first obstacles to be overcome, have already arisen.

Partners
STT
G93
EITB
Asociacion VICOMTech

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VITELE: Telemedicine communication platform for vital signs transmission based on the VITAL standard

Igor Garcia (VICOMTech), Ilias Sachpazidis (Fraunhofer IGD), Jorge Posada

German Abstract

Telemedizin-Plattformen sind ideal für die Arbeit in schwer zugänglichen Gebieten bzw. in Gebieten mit einer schwachen Infrastruktur. Außerdem bieten sie großartige Möglichkeiten der unauffälligen Kontrolle von Patienten in ihrem Alltag. In den letzten Jahren beschäftigten sich einige internationale Forschungsprojekte mit den Möglichkeiten der Telemedizin in verschiedensten Anwendungsgebieten. Bis heute jedoch ist die Nutzung der Telemedizin noch sehr beschränkt und die technischen Vorraussetzungen stehen nur selten zur Verfügung. Ein Grund hierfür liegt in fehlenden Standards zur Darstellung und Übertragung von Live-Abbildungen der Körperorgane. Daher hat das CEN, das europäische Normungs-Komittee (European Committee of Normalization) einen Standard namens VITAL definiert (Vital Signs Information and Representation). Dieser regelt die Möglichkeiten der Präsentation, Speicherung und Übertragung von Organabbildungen. VICOMTech und das Fraunhofer IGD arbeiten gemeinsam an einer Kommunikationsplattform für Telemedizin auf der Basis der VITAL Richtlinien.

Introduction

Telemedicine platforms offer a good solution in areas of difficult geographical access or with lack of proper infrastructure, as well as in the unobtrusive monitoring of patients during their normal, everyday life. In the last years, a number of international research projects have focused in exploring the telemedicine possibilities in various contexts. To mention 2 examples, TeleInViVo EU-Project (winner of the 2001 IST Prize) provided a telemedicine platform for 3D Ultrasound inspection of patients in remote areas or emergency situations, and the ongoing EU-Project @HOME aims to develop a platform for remote home monitoring of patients (in both projects Fraunhofer IGD has participated). In the same way, other from medical & pharmaceutical companies and research institutions worldwide are developing promising prototypes for the telemedicine products and services of the future. Furthermore, mobile & home-care is identified by the Commission as the future third pile of medical industry (next to pharmacy and medical imaging).

However, in the real world the uses of telemedicine are still restricted and not available in a widespread and accepted fashion. One of the reasons for this is the lack of standards for the representation and transmission of vital signs. Therefore, the isolated efforts of the research community have serious difficulties of integration, and commercial products based on proprietary representa-

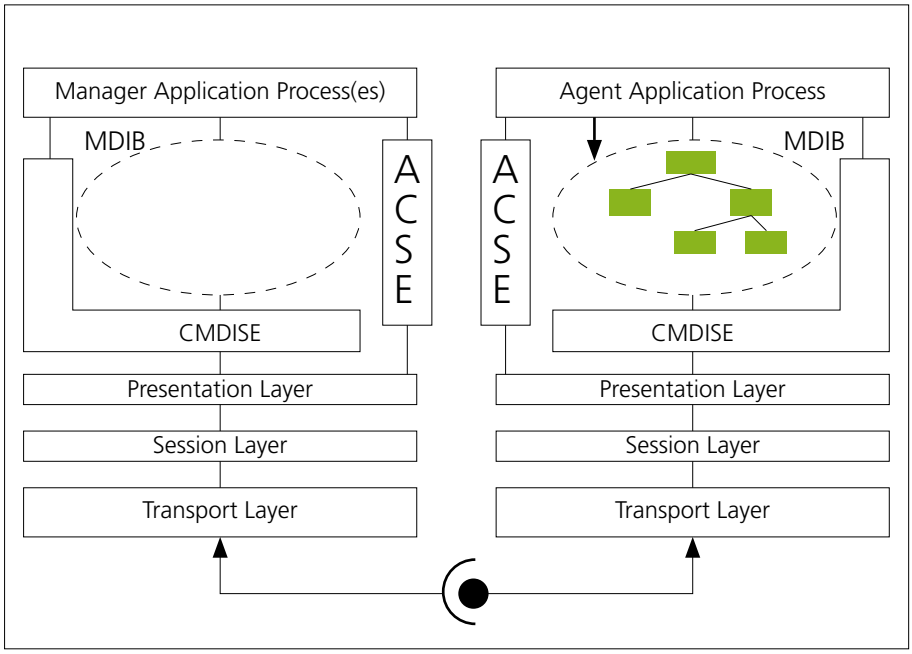

Figure 1: Manager - Agent structure of the VITAL Standard

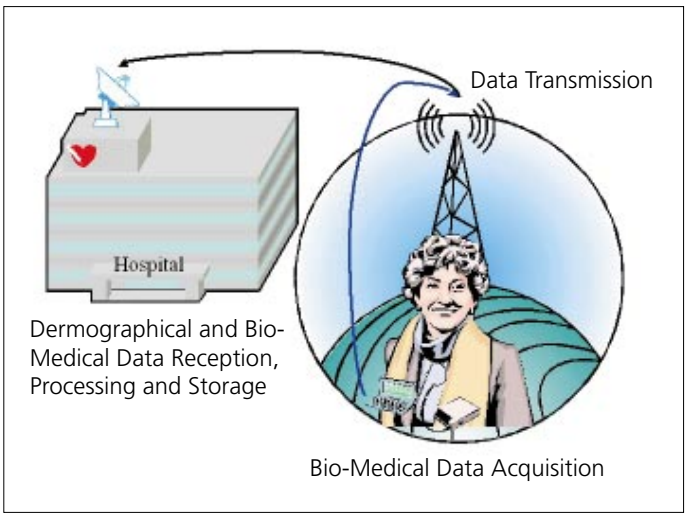

Figure 2

tion formats are not compatible with each other, impairing the fast development of telemedicine solutions.

The VITAL standard

For these reasons the European Committee of Normalization – CEN has defined a standard called VITAL (Vital Signs Information and Representation), which defines the way in which human vital signs can be represented, stored and communicated. It has been only recently approved, and is still ongoing several adaptations and changes. A challenging research issue is to integrate this new standard in existing and new telemedicine platforms to verify, extend and improve it.

The standard defines a Manager-Agent structure able to communicate vital signs as it is shown in the Figure 1. MDIB stands for »Medical Data Information Base«, the object oriented database storing vital signs information, and it is the central part of the standard. It is composed of several objects (Virtual Medical Devices, Channels, Measurements, etc.) that together describe the vital signs. ACSE means »Association Control Service Element«, and is the method used to establish logical connections between medical device systems. CMDISE is the »Common Medical Device Information Service Element«, it provides services allowing access to the object instances in the MDIB together with the associated protocol.

VITELE Project

Following the research line of other initiatives at European and international level, VICOMtech and Fraunhofer IGD are working together in the development of a VITAL compliant platform for representation, storage and communication of vital signs. The platform will be flexible enough to be used in multiple platforms (PDA, PC, etc.), following the manager-agent architecture of the standard, with an open representation schema and extension possibilities. As a proof of the validity of the platform, it will be tested and integrated in several ongoing projects of the division Medical Applications of Fraunhofer IGD, such as the @HOME - Remote home monitoring of patients.

Current Results and Future Work

An initial successful prototype has been tested in July during a stay of 2 weeks of a VICOMTech researcher in Fraunhofer IGD, for representing and transmitting data from an ECG connected to a pocket computer, to a central server. Improvements and extensions include total automation of signal acquisition and transmission, as well as testing in other existing telemedicine platforms.

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EIVICOT - Cost Effective Integration of Production Partners with Video-Conferencing Tools, A Case Study in Brazil

Luiz M. A. Santos, Gino Brunetti

German Abstract

Eine effektive Kommunikation zwischen verteilt arbeitenden Spezialisten und Technikern in der produzierenden Industrie wird zunehmend wichtig zur schnellen Problemlösung und Entscheidungsfindung. Hierzu erarbeitete das vorgestellte Projekt eine Lösung für einen brasilianischen Schuhfabrikanten, dessen Produktionsstätten bis zu 5000 km voneinander entfernt liegen. Das Resultat beinhaltet die Konzeption eines konvergierten Firmennetzes zur Integration von Daten, Sprache, und Video sowie die Weiterentwicklung einer mobilen, multimedialen Konferenzeinheit zum Einsatz vor Ort in den Produktionsstätten. Das Projekt wurde in Kooperation zwischen dem Centro de Excelência em Tecnologias Avançadas (CETA-RS), Brasilien, dem Fraunhofer IGD und der Universität UFRGS realisiert. CETA-RS ist eine gemeinsame Initiative des brasilianischen Bundeslandes Rio Grande do Sul und der Fraunhofer-Gesellschaft zur Etablierung angewandter industrienaher Forschung in Brasilien.

Introduction and Motivation

In accordance with trends in geographic distribution of product development processes, a shoe industry in Brazil has presented a representative project case. In this industry, the product development, prototyping, and production planning are steps that take place in the mother plant. Afterwards, the manufacturing tasks are distributed and realized in different factory plants, which are located up to 5,000 km away.

Communication and integration between engineers and technicians are key factors to achieve an effective process and increase productivity. For example,sample shoes have to be analised and commented within short time frames; similarly, production problems have to be reported and clarified straight away (Figure 1). These factors are common in every industrial environment, but especially for the shoe industry, they are crucial.

Partners Integration for Mobile Activities

In the given case study the production lines are located in large buildings. There, in addition to the manufacturing workforce, there are technicians responsible for maintaining the machinery, and others, for checking the product quality in the various stages of the process. These technicians are well trained to solve any possible problem. However, sometimes there are complex and unpredictable situations, for which the technician needs to ask for assistance from an expert at the engineering office. Currently, these critical problems are clarified via mobile phone, and digital pictures are sent by e-mail from the technician's office. In the worst case, a professional expert has to travel to the respective factory plant. All these affect substantially operational costs.

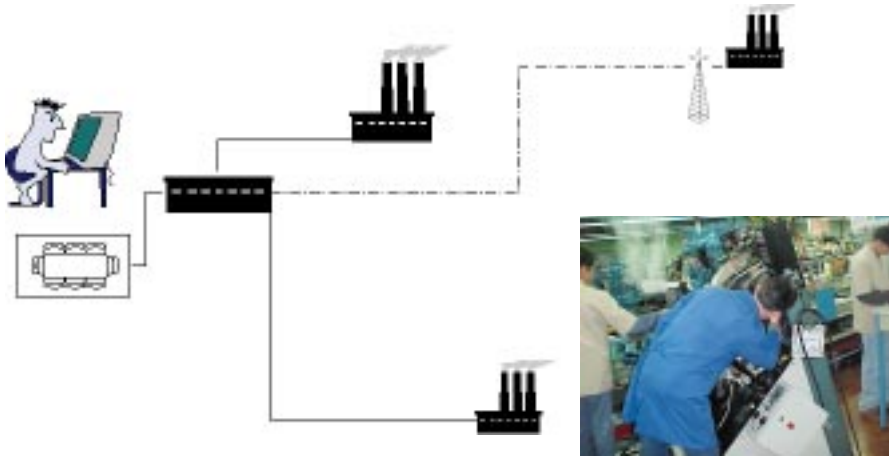

Figure 1: Remote but integrated production partners.

Figure 2: Installation for maintaing connectivity on the factory floor.

Figure 3: Co-operative problem solving.

It would be more productive if the technician could remain »in front of the problem,« and discuss the problem with the expert with pictures or video, taken according to the expert's instructions and have the trial monitored by the expert as well. The same apparatus could also support remotely assisted training.

Re-structuring the Corporate Network

The proposed videoconferencing service requires a robust communication network providing sufficient bandwidth. Therefore, the study proposed a new structure for the corporate network such that the additional traffic of multimedia data, resulting from the proposed systems, would not constrain or interfere with the traditional engineering and business data. The proposed solution has been a converged network integrating the corporate traffic of data, voice, and video between the different sites of the company. To achieve that, the resulting network topology had to deal with the heterogeneous network infrastructure in terms of bandwidths, supported protocols, and providers currently available in Brazil.

Systems for Co-operative Mobile Activities

The proposed technology for supporting the mobile activities was a portable computer with additional input/output devices; here, conditions of use in factory building (e.g., noise environment), user abilities, and task procedures were important selection criteria. To allow the technician to move around the production line while maintaining access to the corporate network, the proposed and tested link was a Wireless LAN with access-point devices installed in optimal spots of the factory building (Figure 2).

Based on assessed requirements, a prototype software realization for supporting the technical discussions, a conference system has been further developed. This is able to distribute and share graphical images, real-time video and audio, plus annotations and pointing mechanisms even over constrained resources such as the wireless link. It incorporates innovative features, which allow the system to run seamlessly over the heterogeneous platforms serving the office user (expert) and the mobile user (technician). At the user level, the set of features can be characterized as user-centered; this means that the interaction mechanisms and media mode are responsive to the supported working task, operation condition, and users' abilities (Figure 3).

This case study has been performed on request ofCalçados Reifer Ltda, within an international cooperation among the Centre of Excellence in Advanced Technologies of the State of Rio Grande do Sul (CETA-RS) and the Federal University of Rio Grande do Sul (UFRGS), both in Brazil, and the Fraunhofer IGD.

CETA-RS is a joint activity between the Fraunhofer Society and the State of Rio Grande do Sul and its industry, to establish an applied research infrastructure in Brazil.

Points of contact

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Celebration of the 10th Anniversary of the Fraunhofer IGD Rostock
On June 14, 2002, the Fraunhofer Institute for Computer Graphics (IGD) Rostock celebrated its 10th anniversary.

200 guests from politics, industry and research took part in the celebration.

Welcoming speeches from the areas of business, science and politics acknowledged the 10 years of successful development of the Fraunhofer IGD Rostock. Speakers were:

- Dr. Ebnet, Minister for Economic Affairs in Mecklenburg-Vorpommern
- Prof. Encarnação, Chairman of the Fraunhofer Group for Information and Communication Technology
- Prof. Hantzschmann, Speaker for the Computer Science Department of the University of Rostock
- Dr. Seidel, Manager of the Rostock Business Association
- Dr. Kehrer, Managing Director of the Computer Graphics Center (ZGDV)

Prof. Urban, the associate director of the IGD Rostock, gave a short presentation reflecting on the development of the Fraunhofer IGD Rostock since its foundation in January 1992.

At that time, the Fraunhofer IGD Rostock had 7 staff members from the institutes of the former Academy of the GDR and from departments of the University of Rostock. The first research topics were the visualization of marine environmental data, telecommunications and imaging. Today, the Fraunhofer IGD Rostock has 35 employees, around 45 students working part-time and four departments which determine the research topics:

- Multimedia Communication
- Visualization and Interaction Techniques
- Mobile Multimedia Technologies
- Entertainment Technologies

As is traditional in the INI-GraphicsNet, Prof. Encarnação and Prof. Urban honored long-time employees for their ten years of service to the INI-GraphicsNet at this celebration.

In the afternoon, a scientific program with three invitational talks took place, followed by a demo tour presenting actual research solutions from the Fraunhofer IGD Rostock and ZGDV. The invited speakers for the scientific program were:

- Prof. Markus Gross from the Institute of Scientific Computing of ETH Zurich, with a talk about »The Blue-C - Designing the Future of Collaborative Virtual Reality«
- Prof. James J. Thomas from Battelle Pacific Northwest Laboratory, with a talk about »What is Your Relationship with Your Information Space«
- Dr. David Zeltzer from the Fraunhofer Center for Research in Computer Graphics, with a talk about »Decision-Centered Visualization: Time-Critical Situation Awareness and Decision Making«

The scientific program was part of the 9th international workshop on »Design, Specification, and Verification of Interactive Systems - DSVIS2002«. This workshop took place from June 12-14 and was organized jointly by the Fraunhofer IGD Rostock and the Computer Science Department of the University of Rostock.

A demo tour through the labs of the Fraunhofer IGD Rostock offered all guests the opportunity to see actual research results and to talk with the scientists.

The presentation of 22 actual R&D projects from the Fraunhofer IGD Rostock, but also from other institutions in the INI-GraphicsNet,

Prof. Encarnação and Dr. Ebnet thank Prof. Wildenhain (from left to right) for his support of IGD Rostock by giving him a present

Prof. Encarnação and Dr. Ebnet thank Prof. Maeß, the former Rector of the University of Rostock for his support of IGD Rostock by giving him a present

Prof. Encarnação and Dr. Ebnet congratulate Prof. Urban on ten years of successful development of IGD Rostock

Dr. Kehrer, Managing Director of the ZGDV, during his address

Prof. Groß during his scientific talk

Prof. Thomas during his scientific talk

Evening Event at Lokschuppen

demonstrated innovative solutions and new trends in IT.

A gala party at night completed the celebration of the 10th anniversary. The evening event took place at »Lokschuppen« in the town harbor of Rostock. Prof. Bertram Herzog gave a dinner speech reflecting on his impressions of Rostock from 1992 until today. He accompanied the development of the Fraunhofer IGD Rostock and stayed at the institute several times for two to three month periods.
During the evening event, treats for the eye and ear were presented by the employees of the IGD Rostock. All guests enjoyed the 'Scheherazade's Daughters' belly dance group led by staff member Claudia Herzig and the 'Burning Bullfrogs' blues band of staff member Kay-Uwe Graw.

We thank all research partners and customers for their congratulatory words and look forward to ongoing cooperation.

Annual Conference of the European Association for Computer Graphics
Eurographics 2002
September 2-6, Saarbrücken, Germany
Max-Planck-Institut für Informatik and Universität des Saarlandes

This year's Eurographics conference will be held in Saarbrücken on September 2-6. Its theme, ''Bridges between real and virtual worlds'', aims to reflect the rapidly growing capabilities of computer graphics to assist nearly all areas of business and life.

In the first two days there will be a broad range of Tutorials, which will address special aspects of computer graphics and its applications: 3D Data Acquisition, Facial Modeling and Animation, Cloth Animation and Rendering, Programmable Graphics Hardware for Interactive Visualization, Inhabited Virtual Heritage, Point Based Computer Graphics, Spectral Trends in Color Reproduction, Modeling and Rendering of Synthetic Plants, View-Dependent Rendering for Polygonal Datasets and Geometric Data Structures for Computer Graphics.

There are three invited talks on »Artificial Animals and Humans: From Physics to Intelligence« (D. Terzopoulos, New York), »Interactive Visualization with Programmable Graphics Hardware« (T. Ertl, Stuttgart) and »3D Scanning Technology: Capabilities and Issues« (R. Scopigno, Pisa). More than 50 papers will be presented in 13 sessions. This year the focus of these presentations is on Rendering and Illumination techniques and, of course, special aspects of Virtual and Augmented Reality, such as virtual humans.

Additionally there will be state of the art reports on »Global Illumination for Interactive Applications and High Quality Animations«, »Interactive High-Quality Volume Rendering with Flexible Consumer Graphics Hardware«, »Visual Data Mining«, »Feature Extraction and Visualisation of Flow Fields« and »Tone Reproduction and Physically Based Spectral Rendering«. Industrial seminars in the areas »Games and Entertainment Applications«, »Chemistry and Life Sciences« and »Virtual and Augmented Reality in the Automotive Industry«, an industrial panel in the OpenSG context as well as posters, and lab presentations of about 50 European computer graphics research labs will complete the program of the conference.

Please see
http://www.eg.org/eg2002
for more information or contact:
EG02 Conference Secretariat
phone:+49.681.9325.440
email: eg2002-info@eg.org

Workshop BIOSIG 2002
The city administration accepts digitally-signed tax returns which citizens have sent in via the Internet; businesses sign contracts electronically at their home offices; and doctors exchange patient information over the Web. This is what the much awaited new information and communication society could look like. Many government institutes and businesses however are afraid of exchanging confidential information over an electronic network. They are doubtful whether security, data protection, and legal obligations can be guaranteed. Electronic signatures and biometric systems are considered by experts to be key technologies. They will provide technical and legal security and thereby make a great variety of services in e-government more attractive as well as tap e-business market potential. The German parliament has already placed the electronic signature on a par with the handwritten signature. But the greatest breakthrough for the digital alternative has not yet occurred, even if public administration, for example in Bremen, is willing to take on a leadership role in that regard.

The controversial biometrics debate in the public and in the media, as well as the doubt about the security of cryptographic methods for electronic signatures, show that explanations of the possibilities and limits of the system are urgently needed. The BIOSIG Workshop 2002, Biometrics and Electronic Signatures on July 19, 2002, in the Fraunhofer Institute for Computer Graphics (IGD), Darmstadt, was dedicated to this task.

Attendees of the workshop could choose between two presentation tracks after introductory speeches in the morning. They learned about the technical foundations and success criteria of biometrical systems and the electronic signature. In the afternoon, the presenters concentrated on describing system interfaces and different uses for the systems. The event was sponsored by the Competence Center for Applied Security Technology (CAST), the Computer Graphics Center (ZGDV), and the BIOSIG group of the Society for Informatics (GI).

For the presentations and the final podium discussion, the event sponsors invited specialists from research, government institutes, and business. These specialists reported on their practical experiences with electronic signatures and biometrical systems,whether in single applications such as bank signature cards or in larger projects like the introduction of multifunctional identification cards for the U.S. Department of Defense. The presenters demonstrated the legal aspects of the security system and explained the current condition of work on the evaluation and certification of the system.

In the final podium discussion, experts discussed whether e-government will aid a breakthrough in biometrics and electronic systems and bring market success. You can find current information at the following URL: *http://www.cast-forum.de/events/2002/biometrie*

SEMINARS
ZGDV

All business is local... based services ?
Opportunities for Geo Information Systems in broadband mobile networks
September 20, 2002

Today, Geoinformation systems (GIS) play an increasingly important role in analyzing and representing location based phenomena and events. It can be assumed that around 80% of today´s data volumes are georeferenced. Correspondingly, the geodata market has become a billion dollar business which will create a greater market share upon its completion through the use of mobile components. The advantage of GIS should not be overlooked: geoinformation systems can integrate all data ranging from regional planning procedures to analysis of customer relations and customer flow and the associated traffic problems as well as make available data to various analysis tools through suitable interfaces. In this way, spatial phenomena can be explained, various scenarios simulated and strategies planned.

With a mobile component, geoinformation systems can also be used on-site as an aid to decision making. For example, America´s farmers can drastically reduce the amount of fertilizer and pesticides they put on their crops with the help of a satellite supported navigation system and corresponding computer supported on-site evaluations. Not only would this reduce their costs, but it would also spare environmental resources. The fact that better information leads to better decisions especially applies to mobile geoinformation systems. If one believes the analysts, then mobile network businesses will achieve 35% of their revenues from

mobile Internet services and messaging services by 2005. With GPRS and UMTS dawns a new era: GIS data from various providers can easily be made mobile through increased capacity in data transmissions.

Location Based Services (LBS) makes possible the specific provision of information about the surroundings or position of a mobile person - anywhere, anytime, or on any device, mobile or stationary. The limitations no longer lie in the hardware but rather in the missing standards and interfaces in data storage and communication among various data formats. The workshop in this sense gives an overview of the possibilities of mobile GIS applications and Location Based Services and presents future perspectives. Experts in the area will report on the state of the technology, give examples and reveal its integration into business IT.

The workshop will be held in german language.

Program

8:30
Reception • Coffee• Handout Workshop Documents

9:15
Greeting

9:30 - 10:15
Location Based Services in Business IT
Dr. P. Ladstätter, SICAD Geomatics

10:15 - 11:00
Adaptive GIS services for mobile city and tourist information systems
Dr. A. Zipf, European Media Laboratory EML

11:00
Break

11:15 - 12:00
Mobile Awareness and GIS
D. Balfanz, ZGDV e.V.

12:00 - 12:45
map2carry - never lost in space, location based services and solutions
H. Grünfeld, traffic information and management GmbH

13:00
Lunchbreak

14:00 - 14:45
IntelliWhere´s LBS Framework for mobile solutions
H. Spörl, INTERGRAPH (Germany) GmbH/IntelliWhere

14:45 - 15:30
Innovative mobile Services for the Rhine Main Region
Dr. U. Jasnoch, GIStec GmbH/ InGeoForum

15:30
Break

15:45 - 16:30
Project TelNav - Positioning and Navigation on the basis of an area-wide digital aerial view map of Germany
B. Langen, ExperTeam AG

16:30 - 17:15
Multilateral security for mobile services - another topic for specialists only?
M. Hoffmann, Fraunhofer SIT

Information Visualization Status, Critique and Perspectives
October 23, 2002

What at the beginning of the 1990´s was reserved for only a small group of computer specialists using expensive super computers greets us today at every computer work place: graphic interfaces as a de facto standard for human-computer communication. While most people today have a very clear idea about what is meant by scientific visualization (for example, graphical representation of statistical data or computer animation of processes in the real world), nevertheless information visualization is still a relatively young research area.

The exponential growth of internet use for private and commercial purposes has, on the other hand, to an extent hardly known, brought together »surplus and shortage in a way that is difficult to separate,« as Prof. Knorz has stated. Because of this, the research field of data analysis plays a special role today.

All concepts, methods and tools can be classified under »Information Visualization« which represents visually the information from data banks, digital libraries or other large document collections. Through computer supported processing and visual representation of abstract information, information visualization aims to simplify cognitive access to electronically stored data.

The continually growing amount of information as well as shared information resources in global networks requires new methods of accessing and processing information.

Prof. Dr. Altendorfer illustrated chances and potentials of the media sector in his guest lecture

Multimedia Competence Center Opened in Rostock

The Multimedia Competence Center in Mecklenburg-Vorpommern will offer its latest technology for businesses and institutes.

The opening of the innovative technology center was celebrated on June 14 2002 in Rostock. The state of Mecklenburg-Vorpommern and the city of Rostock contributed more than 500,000 Euros in sponsorship funds to the project.

The Competence Center´s offerings are directed at all businesses that want to benefit from the newest multimedia technologies. Small and middle-sized businesses can also use the latest technological facilities of the new service center in order to realize their projects quickly and economically. Various possibilities are available to the user, for example for video production and processing, 3D modelling or DVD production, all on more than 200 square meters. Furthermore, two multimedia computer laboratories offer interested businesses the possibility to professionally present their products or systems to customers or to conduct employee training.

The Competence Center for multimedia technology in Mecklenburg-Vorpommern brings together two strong partners: the Multimedia Technology Center at the Rostock Innovation and Business Development Center and the Forum for Multimedia Technology KOMM-MV. As a Center for Graphical Dataprocessing forum, KOMM-MV, a forum of Computer Graphics Center, will take over responsibility for the contents and technical advice of the multimedia center with the goal of establishing new digital media services in business. Even career training. will be carried out starting in October this year. Forum members which range from multimedia firms to research institutes will be able to organize intensive experience exchanges with regional businesses. They will also support the technology transfer between research and business. This will accelerate regional business development. The Minister for Economic Affairs in Mecklenburg Vorpommern, Dr. Otto Ebnet, as well as the Mayor of Rostock, Arno Pöker, among others, attended the celebratory opening.

Point of contact

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Researchers and Students at INI-GraphicsNet

Due to its international nature, the INI-GraphicsNet has a long tradition of exchanging researchers and students. Visitors in research and academia from all over the world have been hosted in INI-GraphicsNet institutes, which are adjoined to local universities and participate in university research, teaching and life. The Portuguese Centro de Computação Gráfica (CCG) has a relationship with the University of Minho, CAMTech in Singapore with the Nanyang Technological University (NTU), and CRCG in the US to RISD and Brown University. The German institutes are adjoined to the University of Rostock, the Darmstadt University of Technology and the Johann Wolfgang Goethe-University in Frankfurt (Main).

Student exchange programs between IGD and CRCG in Providence or CAMTech in Singapore directly support the exchange of students between these institutes. But of course there are other possibilities to obtain funding for exchanges when none of these internal exchange programs apply. Marie Curie Fellowships, for example, provide European placements for pre- and post-doctoral researchers, usually up to the age of 35, and for experienced researchers. Currently, applications under the 5th framework are no longer accepted, and the 6th framework will be launched in November, 2002.That of course will depend on the progress of the political debate and decision-making processes. Yet it seems very promising for international research networks like INI-GraphicsNet, since the fellowships won't be limited to exchanges between European countries anymore. The first proposals may be submitted by the end of the year if everything works as planned.

Additionally, there are some programs in the EU which may be helpful to set up new international connections.

The Asia-Link Program is a new initiative by the European Commission to promote regional and multilateral networking between higher education institutions in EU Member States and South Asia, South-East Asia and China. The program aims to promote the creation of new partnerships and new sustainable links between European and Asian higher education institutions, and to reinforce existing partnerships. Eligible countries are the 15 Member States of the European Union:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom and the following 17 Asian countries/territories: Bangladesh, Bhutan, Brunei, Cambodia, China, East Timor, India, Indonesia, Laos, Malaysia, Maldives, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam (cooperation with Afghanistan is currently »suspended«). The Asia-Link Program has published a first Call for Proposals with two deadlines: May 24, 2002 and October 24, 2002.
For further information, have a look at
http://europa.eu.int/comm/europeaid/projects/asialink/index_en.htm

Similar programs already exist for setting up connections with other countries, suchas the USA, Canada, Japan or Latin America (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela).
For more information on these EU programs and projects, have a look at
http://www.europa.eu.int/comm/europeaid/projects/index_en.htm.

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ALUMNI

Addressing former staff members of INI-GraphicsNet:

The INI-Graphics-Alumni Forum

is a meeting-place and pool for former staff members of the INI-GraphicsNet. If you wish to become a fellow member please contact:

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Dr. Dirk Reiners
OpenSG: A Scene Graph System for Flexible and Efficient Realtime Rendering for Virtual and Augmented Reality Applications
June 21, 2002
Advisors: Prof. Dr. J. L. Encarnação, Prof. Dr. Stefan Müller

This work covers the problems of scene graph systems. Currently used systems like Open Inventor or OpenGL Performer cover current and coming developments only partially. The work is concerned with three main parts: Extensibility, Parallelisation and Graphics Hardware Abstraction.

Extensibility is a central problem given the quickly changing requirements posed by new applications. To support it new mechanisms are developed that allow dynamically extending the system. This concerns object creation as well as manipulation of objects, which is done via a reflectivity concept. The active components of the system, the traversals, have also been embedded into a new, extensible concept.

Parallel processing is gaining importance due to the latest developments in processor and system architectures. In a VR application there are a number of independent tasks which can be executed in parallel and which access and anipulate the scene graph's data. To protect these from each other each task needs a private copy of the data. Using an appropriate synchronisation of accesses this division could be achieved using minimal memory overhead while allowing fast access and easy distribution of data between threads.

Graphics hardware abstraction is forced by the growing diversification in the graphics board market. At the same time algorithms to create real time displays are moving further and further away from the classic, simple approaches and switch to using multiple stages and/or passes to create the final image. To give an application a usable access to these features without burdening it with too many details an extensible method to encapsulate the OpenGL state has mbeen developed, which together with a new structure called DrawTree is used optimize and abstract the display tasks.

The central algorithms and methods developed in this work have been implemented in the free OpenSG system (www.opensg.org). It is used and enhanced by a number of universities and research institutes.

Dr. Dirk Reiners celebrates his graduation

STUDY & DIPLOMA THESES

XML Topic Maps for the Management and Retrieval of Domain-specific Competencies in a Research Institute
Diploma thesis by: Christine Haller
Supervisors: Erik Meißner (ZGDV)

The objective of this work was the investigation of topic maps as described in ISO/IEC 13250 for supporting the administration, organization and search for domain-specific competencies of members within the INI-GraphicsNet.

Starting from the review process practiced in the INI-GraphicsNet, information structures were analyzed by gathering the available terms and their meaning as regards a search in the context of the review process. From this data, a formal model was defined. Subsequently, all determined topics and associations were transferred into the formal notation of a topic map (XTM 1.0). The classification of domains then formed the basis for the modeling of the structure of the domains, which is important for a semantics-based navigation and search. Furthermore, the organizational structure of the INI-GraphicsNet and context-sensitive cross-references were formally conceptualized.

All formal models were specified as valid topic map documents consisting of three abstraction levels:
level M0: abstract level (XTM elements)
level M1: conceptual model of the competence and organizational structure
level M2: exemplary input of data.
For presentation purposes in the intranet, XSLT scripts were developed which transform the competence topic map into HTML. Another diploma thesis (Alexander Diegelmann: Visualization of Topic Maps Using Scalable Vector Graphics) defined alternative XSLT scripts for transferring the developed topic map into SVG for graphical access.

The design and definition of the competence topic map showed that topic maps possess the potential to improve the review process. An optimization of the review process was achieved by improved and faster access to competence specifications, particularly through linking information resources and topics among themselves.

Intelligent Behavior Control and World Modeling for Virtual Humans in Virtual Environments
Diploma thesis by: Daniel Kullmann, Supervisors: David Zeltzer, (CRCG CBV) ; Torsten Fröhlich, (IGD A4)

Autonomous virtual humans must be able to solve problems in their virtual environment. Starting from an animation system that was developed in two other diploma theses, a system for autonomous virtual humans was developed. The basis of the system is a framework for the behavior control of the virtual human. It consists of three parts: a perception module that provides information about the virtual environment and user commands to the virtual human, a planning system for the creation of plans, and an action manager that is responsible for the execution of the plans. The planner is a simple, rule-based (reactive) planning system that can be extended with specialized planning algorithms. These planning algorithms solve complex problems that are too hard for the reactive planner. Two complex problems that were dealt with are path-finding and the grasping of objects. For path-finding, one needs a proper representation of the virtual environment which is then used to search for a path. The A* algorithm was used for the actual search in that representation; it was extended to take the height, width, step height and step length of the virtual human into account. Additionally, a connection had to be made between the path-finding module, the animation module and the arbitrary scene. This enables the virtual human to follow a found path. The architecture of the system integrates the perception system, the planning system with specialized planning algorithms, and the action manager with the visualization of the scene.

Automatic Recognition of Artificial Text in Video Streams
Diploma thesis by: Stefan Maier Supervisor: Dipl.-Ing. Stephan Volmer, M.Sc.

The efficient organization of video data within a database calls for information on the content of the video streams. Unlike stored documents, abstract binary video data do not provide information explicitly.

Therefore, additional content information, called annotations, is manually supplied at storage time and can be used to organize the video database. Because of the high costs and the great amount of time needed for manual content indexing, it is hardly possible to index the growing number of digital videos. Therefore, this mass of digitally stored video data required an automatic system able to create the annotations needed.

This diploma thesis describes a process for extracting information from video streams automatically. What is extracted is artificial text which was added in the post-production phase of the video and which generally represents a basic information source regarding the semantics and the content of a video stream. Therefore, this artificial text is very well-suited to the automatic annotation of the video content.

The text recognition system that was developed consists of an analysis part in which the displayed artificial text is localized by a segmentation step and a frequency analysis of the video frames, and a processing part in which the text areas that have been located are converted by OCR software into alphanumeric characters. These extracted characters finally can be added to the video streams as annotations.

Development of Security Protocols and New Approaches to Application Service Providing for Mobile Devices
Diploma thesis by: Stefan Schwalm Supervisors: Jalali-Sohi Mehrdad

In Application Service Providing (ASP), framework security is one of the most important issues. Current approaches for implementing such frameworks take advantage of elaborate protection mechanisms such as signatures, public and private key encryption and smart cards.

Because these technologies are demanding in terms of processing power, many of them are not, or are only partly, applicable to mobile clients and their limited capacities. This means that new methods must be found for guaranteeing an acceptable degree of security if such devices are to be used within ASP frameworks.
In the approach suggested in this report, a secret DES key shared between the client and the server is hidden inside the Java classes to be executed on the mobile client. Using this key, the client and server can establish a secure communication channel without the need for utilizing expensive protocols like SSL. The protocol used is HTTP; security is guaranteed by signing and encrypting the transferred data with the shared secret key. Obfuscation is applied to obscure the application logic of the client code, thus making it tamper-resistant and protecting the hidden secret key.

By these means, two leasing models for an application or service are implemented, one based on access frequency and one based on the period of time an application can be used. Depending on the leasing model, either the number of valid accesses or the expiration date is checked by a short HTTP request to the server every time the application is invoked. Only applications with a valid license are allowed to be executed. In addition to this, in the period-of-time model, the expiration date is continuously checked against the system clock at runtime.

The methods introduced seem particularly suited to small applications aimed at mobile phones, such as games, or location-based services which have a limited lifetime and are not expensive or valuable enough to put much effort into reverse engineering.

In order to proof the proposed concept, a prototypical implementation based on Java was developed.

Visualization of the Development of the Sahara Through a Virtual Reality Exhibit for a Public Exhibition.
Diploma thesis by: Thomas Guthier Supervisors: Torsten Fröhlich, Ulrich Joger, Frank Klees

The landscape of the present-day area of the Sahara has substantially changed in the last 20,000 years. Areas which today are empty of human habitation were earlier populated. This work occupies itself with the representation of a three-dimensional model of the Sahara over the course of this time. The different conditions of the area (free water, flora and fauna) are animated in real time. The user has the ability to move continuously through both landscape and time and to explore the respective realities. The »public exhibition« application area necessitates that the scientific content is arranged in a generally comprehensible form. The simple ease of use and robustness of

the system were therefore important. Essentially, the work covers three main points:

1.Terrain rendering

An interactive representation of the landscape at maximum resolution is not possible due to the number of polygons necessary (over 8 million). The level of detail was therefore rendered using the »ROAMing« algorithm. In order to avoid artifacts being lost in the representation of the ground structure, the procedure was enhanced with so-called »Color-ROAMing«.

2.Object simulation

Plants existed only at certain times and in certain places. Still, the various types follow a life-cycle characteristic. A procedure was developed to determine the existence of objects and to simulate their development. It is therefore possible for the observer to explore both the landscape at any point in time, as well as any continuous changes over time.

3.Representation of complex scenarios

In order to represent complex scenarios, such as passing animal herds, a possibility was found to integrate high-quality existing video material into the scene. The resulting material is scaled and is represented using virtual binoculars.

Rights Clearinghouse for Selling Software

Diploma thesis by: Thorsten Pohl
Supervisors: Mehrdad Jalali-Sohi

The goal of this diploma thesis was the development of a rights clearinghouse for the FILIGRANE system. FILIGRANÉ (FlexIbLe IPR for Software AGent ReliANcE) is a framework which realizes a Web architecture and protocols for the secure exchange of the mobile code on the Internet. The FILIGRANE rights clearinghouse acts as a central authority that controls the licensing of a software manufacturer to a provider, and the further licensing of the software to another provider or to end users, so that no illegal license agreements are made. Furthermore, the FILIGRANE rights clearinghouse realizes a monitoring Web interface for sales based on the concluded contracts. Software manufacturers and providers can use the rights clearinghouse to access their content and structurally prepared information on the contracts and sales.

Development of Automated Movement Control for a Geographically Distributed Audio-visual Telepresence System

Diploma thesis by: Groß, Jochen
Supervisors: Krafzig, Urs (IGD A9)

A telepresence system called BiBiH 1 has been developed at the »Fraunhofer Institut für graphische Datenverarbeitung« in Darmstadt. This system includes a dummy head; software applications to grab, send and display audio and video-data; and hardware to visualize the data.

In this diploma thesis, a concept for the intelligent electromechanical control of a dummy head was developed. The user gets the opportunity to control the remote telepresence system with a head-tracker over the network. The line of vision of the dummy head is set mechanically by servomotors. A change in the line of vision has a direct effect on the grabbed video and audio data.

The software parts needed for the control of the servomotors were programmed and implemented in C++. The servo's moves are mostly equivalent to the user's moves, because only the latest tracking data is used and the data that has not yet been processed is rejected. In this way, nearly smooth movement of the dummy head can be assured.

Moreover, the construction of a new dummy head began in this work. Cameras have already been put into a new head. Also, a link for the necessary DOFs (degrees of freedom) has been designed and constructed.

International Certificate Program for New Media

Introduction

The International Certficiate Program for New Media is offered by Fraunhofer CRCG in collaboration with the Rhode Island School of Design/Continuing Education and the Technische Universität Darmstadt, Germany for international, early to mid-career professionals in government, industry, business or education.

- Participants benefit from a rigorous and comprehensive six-month course of study in the technological, visual arts, and business aspects of new media with an additional three-month period of exclusive involvement in ongoing projects.
- Accompanied by Web-based course material for distance course preparation and review, the program offers a sequence of learning experiences that encompasses a specific body of knowledge and theory regarding the design, use, and applications of new media.
- Program participants are integrated into ongoing research and design activities and are assigned sub-tasks based on their interests and the needs of the project.

Program Outcomes

Core competencies, which are expected to emerge from this program, include both content and process outcomes.

Content competencies include:

- 3-D Modeling
- Animation
- Multimedia Design and Production
- User Interface Design and Development
- Web Page Design: Tools and Techniques
- Electronic Commerce
- Fundamentals of Interactivity
- Fundamentals of Video for Multimedia Production
- Introduction to Audio for Multimedia and the Web
- Cross-Media Publishing
- Creative Marketing

…on Windows XP platforms.

Process competencies include:

- Team Learning and Learning On A Team
- Design As Process; Problem Finding/Solution Seeking
- Communications; Processes and Products
- Technology Evaluation and Integration
- Management of the Media and Communication Industry

Program Details and Cost

- The program runs annually from beginning of October to end of June.

Registrations are accepted as early as April of the corresponding year. Experience in the use of computer-based application systems as well as a working knowledge of the English language will be assumed. Further prerequisites include an understanding of the principles of data structures and programming, basic knowledge of math and specifically linear algebra, and basic HTML skills.

Taking into consideration the different working backgrounds and constraints of participants, the certificate program has several options:

- The certificate can be achieved by full, six-month involvement or by choosing a specialized package.
- The required, subsequent three-month practicum can be completed at Fraunhofer CRCG, through internship with local Providence industry, or at the home institution or company.
- The tuition for full registration amounts to approximately U.S. $20,000, covering the whole nine-month program. For detailed and up-to-date information please refer to URL http://www.icpnm.org
- Participants are responsible for covering all tuition and miscellaneous costs in full. However, Fraunhofer CRCG will provide any documentation necessary to support the participants' search for external funding.

For more information and to request registration forms, please refer to URL http://www.icpnm.org

or contact:

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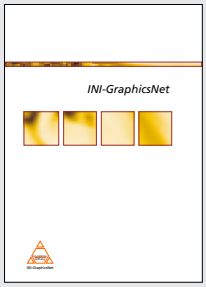

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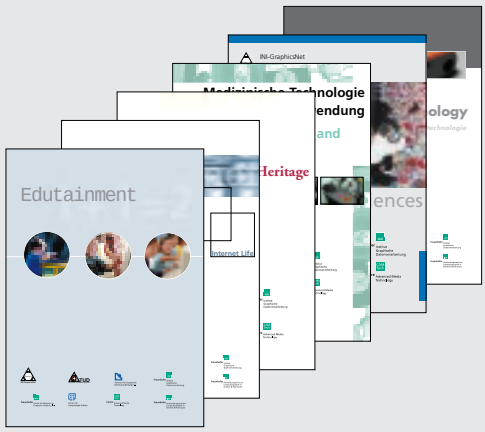

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- ❒ Annual Report of the Technische Universität Darmstadt TUD, Interactive Graphics Systems Group, TUD-GRIS (annually in German)
- ❒ Annual Report of the Computer Graphics Center, ZGDV (annually in German)
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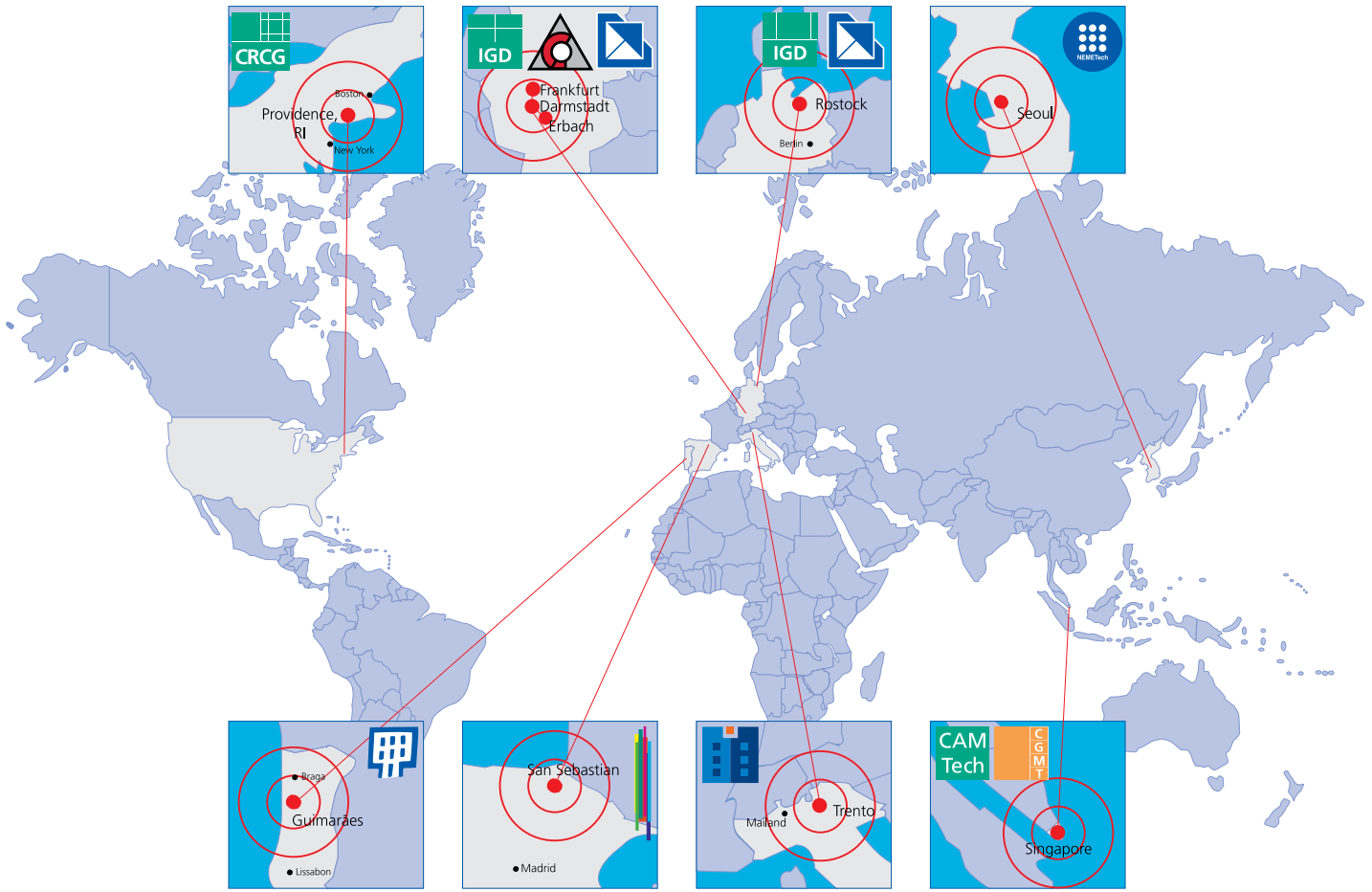

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