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Reports on Computer Graphics

Advanced Interaction in Digital TV

Mobile Multimedia Solution for Outdoor Guided Visits

CCG, VICOMTech, GraphiTech ISSUE

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topics

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Technische Universität Darmstadt, Interactive Graphics Systems Group

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INI-GraphicsNet

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Computer Graphics is one of the key technologies of a modern information and knowledge society. The INI-GraphicsNet develops market-oriented, state of the art technology to foster and to support the innovation process of enterprises as well as the social development. Numerous businesses use our know-how to implement sustainable products and services. We achieve this with, for example:

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- Agent Technologies
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- Augmented Reality
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- Database Services
- Geometric Modeling / CAD-Model
- Graphical Information Systems (GIS), Facility Management
- GUI / Interaction Technology
- Image Analysis, Image Quality
- Imaging
- Internet- & Intranet-Solutions
- IT-based Learning and Training
- Medical Data / Image Processing
- Mobile Computing Technology
- Modeling and 3D-Reconstruction
- Multimedia and Hypermedia
- Multimedia User Interfaces
- Perceptual Computing
- Product Data Management
- Rendering
- Scientific Visualization
- Secure Image Communication
- Semantic Modeling
- System Integration
- Telecommunications
- Ubiquitous Computing
- Usability and Utility Engineering Technologies & Methods
- Virtual Prototyping
- Virtual Reality

Our expertise allows us to work on a multitude of industry-related topics which include, amongst others:

- eApplications
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- eBusiness
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- Visualization and Interaction in traffic technology and traffic telematics
- Ambient Intelligence
- Games and Edutainment
- Usability and Utility Engineering
- Software for the product and production development

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 **dialog 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, Raffaele de Amicis, Luís Almeida, Leonel Valbom

Dear Reader, we welcome you to this COMPUTER GRAPHIC topics issue. Co-edited by VicomTech, GraphiTech and Centro de Computação Gráfica (CCG), it aims at presenting some of the most recent R&TD projects under development at these three INI-GraphicsNet institutions. The work reported in this edition cover a broad range of application areas, all of them very actual and of special interest in terms of research field. CCG presents some of its ongoing strategic projects, namely the work developed for adaptation of Virtual Oceanarium environment for PC platform from original SGI platform; the work, and final results, achieved from the TORGA.NET project, developed in cooperation with University of Minho and some Spanish partners; the work developed for implementation of a solution for multimedia mobile tourist guides, to be used in large areas, like nature parks; the actual results of applications developed for Portuguese shoe industry in the context of FATEC project. The fifth contribution from CCG is the presentation of MeCMAP project, funded by the European Commission under the Leonardo da Vinci program, aiming at studying multicultural e-learning provision of reference material for SMEs and its free online publication through a set of five interactive databases.

VICOMTech includes in this issue five representative projects. The diversity of the projects presented shows clearly the potential of the technologies of the INI-GraphicsNet for real-world applications. KonekTV is a good example of how the newest technologies for Digital TV can be used for people with special needs such as the disabled and the elderly. TOPATU is an interesting project in which advanced user interfaces (conversational avatars) can be used in multiple contexts and platforms: Internet, mobile phones and television. The MIROVIEW project, developed in cooperation with companies of the civil engineering sector, shows an innovative way to improve the design process in steel detailing by exploiting the semantics of the process. In the AMICO project, new technologies are being developed for location based services in the Cultural Heritage area, especially suited for public exhibitions of cultural content. The resulting system is currently being used in the famous Kursaal Exhibition Centre in San Sebastian, for a special exhibition of the works of the architect Rafael Moneo.

Finally, the SIMUSOL project, developed in collaboration with expert companies and educational centres, works in an AR-based welding simulator for training purposes.

GraphiTech presents some of its current projects. As described in the first paper, GraphiTech's main interest in the project is focused on the development of advanced interaction techniques for VR, in order to improve usability during creation and modification of shapes.

The two following papers are driven by GraphiTech's interest towards representation and retrieval of semantic information from shapes. The former, whose work has been carried on as part of the EU Network of Excellence Aim@Shape, illustrates the use of Reeb Graphs to compare and retrieve 3D CAD models. The latter instead focuses on the retrieval of car blueprints through the analysis of geometrical, through sketches, and semantic information.

Further the last paper shows the results of another EU project called AMI-SME which focuses on the analysis of market information for SMEs. The paper presents the project's actual results and introduces the search engine specifically developed for the project.

Mobile Multimedia Solution for Outdoor Guided Visits

Luís Almeida, João Peixoto, António Freitas, Manuel Santos

Introduction

Visiting interesting cultural places, like ruins, museums, thematic parks, etc., tourists often express their disappointment about a lack of information or the impossibility to access it on site as a complement to the visit. Even more desirable is information presented in the context of the particular spots of the tour the visitor is following (Location-based Services) and according to his profile.

The usage of new and innovative technologies can be of fundamental importance to achieve such a goal, constituting also an additional motivation for visitors when choosing a place for a visit.

For such typically large areas, where visitors have to walk for kilometers in pre-defined tours, the traditional solution of groups being accompanied by a human guide can be very expensive and not affordable for the visitors. In this case, solutions including location-based services and mobile multimedia, able to permanently detect the visitor's position and present multimedia content in the context, represent the best option. Another important motivation for site curators and managers is the return of investment deriving from equipment rental fees.

Using existing know-how and having the chance to collaborate in the

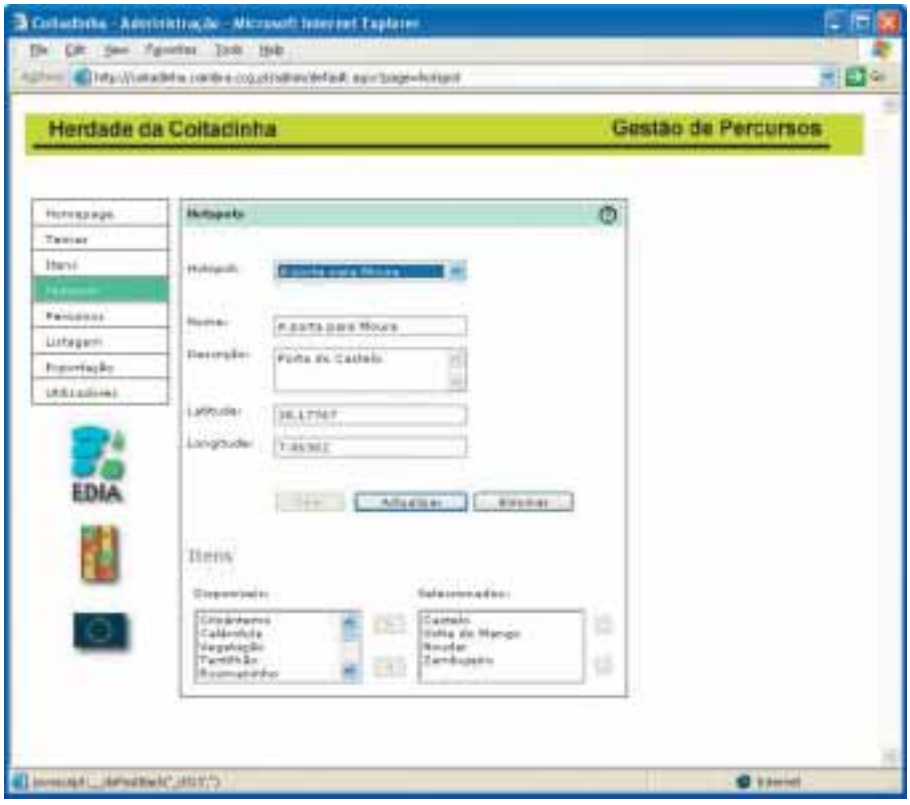

Figure 1: Example of HotSpot information management

German Abstract

Dieser Beitrag präsentiert ein mobiles Multimedia-System für Führungen im Freien. Es lässt sich an Orten wie archäologischen Ruinen, Naturparks oder ökologischen Museen u.v.a.m. anwenden; zur Zeit wird das System in einem Naturpark im Südosten von Portugal verwendet. Die Idee war eine Client-Server-Lösung zu konzipieren, wobei die Server-Komponente für die Abwicklung der Multimedia-Inhalte zuständig ist und die Client-Komponente, die aus einer PocketPC-basierten Lösung besteht, für die Darstellung der kontextabhängigen Darstellung des Multimedia-Inhalts während des Spaziergangs des Besuchers im Park.

Figure 2: One example of portable device configuration

establishment of an innovative nature park in the south of Portugal, which covers an area of 1,000 hectares in total, the Centro de Computação Gráfica (CCG), together with a Portuguese company with expertise about natural resources (ERENA, Lda), have developed an innovative solution for mobile guides for usage during the walks in the several thematic interpretation courses defined for the area. This park is conceived to be a place for nature interpretation and flora and fauna preservation in the sense of an »Ecological Museum«.

Synthetically, the idea is: the visitor walks the interpretation course holding the device that contains the multimedia information prepared by specialists. As is the case with any guided tour, the information required must be presented at the most important spots. The presentation must be performed »automatically«, preferably without the necessity for the user to ask for it. Therefore, the system must be able to detect when the visitor enters the focal positions and decide which sub-set of information is connected to each one.

Main Requirements and Challenges

Conceived as a wearable mobile solution, it has to be lightweight, easy to use, and an advantageous substitution for the traditional human guide. Therefore, the system must be able to support and present the different kinds of content, like photos, video, text, and audio files (narrator, animal vocalizations, etc), and the corresponding navigational functionalities. Furthermore, being a solution for usage in natural spaces to be preserved, the natural environment and landscape disturbance must be minimized as much as possible, i.e., installing equipment like communication antennas must be avoided.

Another important requirement is the possibility of having the information prepared for different user profiles, according, for instance, to the idiom, the level of expertise (students, biologists, ecologists, etc).

The courses on site can take hours and have total lengths of kilometers. Therefore, the mobile device autonomy, in terms of power supply, as well as the memory for multimedia content storage are priorities in terms of hardware specification. Another important aspect to have in mind is the natural landscape, where one can find areas of complete »open sky« alternating with areas with dense tree population. This can be a cause of instability, for instance, for position estimation by the Global Positioning System (GPS).

The Technical Solution

The platform functionalities must fulfill two main operations: creating the interpretation courses and corresponding association of multimedia content, and the contextual information presentation using the mobile device.

Based on these two main characteristics, we have conceived a client-server solution consisting of two different applications: a back-end web-based application, running in a server and accessible via web browser, providing all the necessary functionalities for the creation of thematic courses (figure 1) as well as for its export for mobile devices. A database stores all the course multimedia information available for use. The second application is installed on the PocketPC devices and is responsible for user position detection and calculation, as well as for the presentation of formatted interactive multimedia content.

Figure 3: Visitors using the solution on-site

Figure 4: Visitors using the solution on-site

The position calculation is performed by interpretation of GPS signal, using a receiver integrated into the PocketPC. We have tested two different approaches for GPS integration: one is communicating through wireless bluetooth which can be clipped on the visitor's belt and therefore does not imply direct contact with the PocketPC (figure 2). The other option is using a Compact Flash GPS receiver. In both cases the application installed on PocketPC receives the visitor's global position through the GPS receiver, deciding whether or not to present information and, if this is the case, what subset of information.

Depending on environmental and landscape conditions the GPS position can be hard to fix. If this is the case, the application detects and informs the user suggesting the operation in »manual mode«, which is a semi-automatic operation mode. Basically, the user has to know the identification for the spot he is entering, selecting the corresponding information from a menu.

For software development, the state of the art was adopted, namely the .NET® platform, using C# for the server development and VB for the client application.

Conclusions and Future Work

Different PocketPC hardware solutions were used for software testing. The tests proved the software robustness, provided the basic requirements in terms of operating system and available ports for GPS receiver integration and/or communication.

Field trials were carried out at Parque de Natureza de Noudar, in Alentejo, Portugal, by different users and different profiles. The feedback received confirms the added value gained by using these solutions for environmental interpretation. Furthermore, the information is prepared by specialists and presented »like it is«, therefore without errors or changes typically transmitted by human guides.

The solution implemented so far can be used for indoor visits, like for example in galleries and museums, as the software can be used independently of GPS position detection. Nevertheless, the user has to instruct the application about the information he wants to receive. Software improvements are under development for indoor automatic position estimation/detection, enabling the automatic presentation of information as the user walks through the rooms.

Consortium Partners and Acknowledgements

The work presented here was subcontracted by EDIA - Empresa de Desenvolvimento e Infraestruturas do Alqueva, SA, who trusted on CCG's expertise for this important contribution to the Nature Park of Noudar. This subcontract was signed under the INTERREG transnational funding program. Another special reference goes to ERENA, Lda (a Portuguese company expert on natural resources) for its contribution for multimedia content selection and preparation as well as for the system requirements and test. Special thanks to all persons from these two institutions who worked with CCG for the successful project development.

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Continuous Innovation for the Portuguese Footwear Industry

Sofia Gameiro, António Freitas, Rui Castro, Luís Almeida

German Abstract

Dieser Beitrag ist der zweite Teil eines Artikels, der in der CG TOPICS 4/2004 veröffentlicht wurde. Es sollen der aktuelle Status der CCG-Aktivitäten im FATEC-Projekt (Entwicklung innovativer Techniken für die portugiesische Schuhindustrie) und die jüngst erzielten Resultate dargestellt werden. Die Anwendungen sind inzwischen bei den Industriepartnern und dem portugiesischen technologischen Schuhzentrum in der Durchführungs- und Testphase. Einige der neuesten Entwicklungen und Ergebnisse dürften daher von Interesse sein und sollen hier vorgestellt werden.

Introduction

This article is presented as a sequence of a previous one presented in CG topics 4/2004, »Developing Applications for the Portuguese Footwear Industry«, aiming at the presentation of the most recent results from CCG's participation in the FATEC project consortium, namely for the development of the following applications:

- A modeling system for shoe heels and other shoe components - the ShoeHEEL 3D
- A system for virtual prototype analysis during the conception phase and designer studies, showing also the possibility of being used at exhibitions and fairs for the presentation of new models and seasonal collections - the ShoeCave
- An information management system for the support of prototyping and styling (of new shoe and new shoe components models) tasks and related information - the GestCAM

ShoeHEEL 3D

The ShoeHEEL 3D system developed by CCG is presently installed and under utilization at DCB - Componentes e Calçado, SA, a Portuguese company that produces footwear for the American trade company Aerosoles®.

In terms of new features and results, the system includes a special design module that introduces a set of tools for »imaginative« design of new heel models. This new module was created in order to suit the normal process of heel production, frequently based on paper sketches that are transformed to 3D digital models.

In this context, the user is allowed to sketch the heel lines in a 3D space or on three fixed different orthogonal planes (XoY, XoZ and YoZ). Using an available set of modeling tools and geometric operations, he can then manipulate the heel lines in order to define the shape/design, geometry and dimensions more accurately.

The heel creation is automatic, but subject to a previous geometry validation, in particular of the lines sketched by the user: the system, through an inclusion algorithm, progressively selects from the existing sketched curves those that match with the system's internal conceptual heel definition.

If this validation process fails, the system informs the user that the heel creation is not possible, asking for

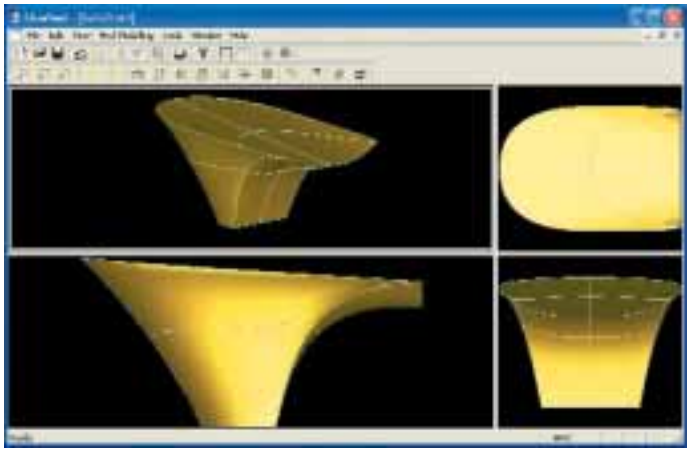

Figure 1: Aspect of the modeling process

Figure 2: A Physical prototype obtained from ShoeHeel 3D

additional manual modeling/design adjustments.

Production tests of physical models have already been implemented with excellent feedback from end-users: digital models of completely new heels were exported from ShoeHEEL, using standard industry file formats, and produced without errors using the prototyping equipment installed with the industrial partner, confirming the system's compatibility and integration (cf. figure 2).

The intensive testing and refinement of the system in industrial environment assures its utility and liability, complemented by the support of several filters for standard data formats for models import and export (IGES, STEP, STL, VRML).

ShoeCave

Major implementation efforts were applied for the ShoeCave system improvement, namely the application for the visualisation of models (both 3D virtual and digital images of physical models) and multimedia presentations for groups visiting booths during exhibitions and fairs.

A specific application has been developed for the preparation and control of the collection presentations (figure 3) and a special setup system has been conceived in order to better suit the exhibitions' and fairs' particular needs: it had to be light and easy to set up, offering an innovative and attractive image. Thus, a holographic screen was used for presentation projection (using a high-performance multimedia projector connected to the computer) in order to give the visitors the sensation of being looking onto a typical shop-window. This effect is reinforced by the possibility of visualisation in passive stereo mode. Interaction and inquire functionalities were also implemented in order to offer the visitors some degree of interaction and easy access to the information regarding the different collection models.

GestCAM

The GestCAM system is also presently installed and functioning at DCB - Componentes e Calçado, SA.

According to the feedback received from industry end-users, all functional requirements were met.

Conclusions and Future Work

All systems developed by CCG under the FATEC project exist now as functional prototypes and are presently installed and under utilization in industrial environment. Functional tests of the systems, in real-use conditions, were performed for functionality validation and improvement.

These systems aim at an higher level of information integration, by enabling the facility of information share, and by offering new interaction modalities for information manipulation, more intuitively and user-friendly, thus innovative when compared with those usually adopted and in use at the Portuguese footwear industry.

Therefore, these applications, together with others under development in the context of the FATEC project, constitute good examples of the national policy of investment on R&D, oriented to the development of innovative applications that correctly fit the footwear sector's specific needs.

Acknowledgements

For the development of all abovementioned systems, the collaboration of all consortium partners was of fundamental importance, namely CTC - Centro Tecnológico do Calçado, CEI - Companhia de Equipmentos Industriais and DCB - Componentes e Calçado, SA.

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Figure 3: Aspect of the user interface for presentation preparation and control

Porting the Virtual Oceanarium to GNU/Linux

Miguel Portela, Leonel Valbom

German Abstract

Das virtuelle Ozeanarium ist die virtuelle Darstellung des realen Ozeanariums in Lissabon, das im Rahmen der Weltausstellung EXPO'98 gebaut wurde.
Auf Grund der größeren Verarbeitungsleistung normaler of-the-self PCs braucht man für solche Simulationen jetzt keine Graphik-Großrechner mehr; sie können auch auf normaler Hardware durchgeführt werden.
Der GNU/Linux-Port ist eine preiswerte Version der Original-Anwendung. Er basiert sowohl auf Open-Source-Software als auch auf preiswerter Hardware.

Introduction
The Virtual Oceanarium is a virtual simulation of the »Oceanário de Lisboa«, including a representation of the entire EXPO'98 area and its interior, inclosing the central tank and the four existing habitats.

Increasing processing capacity of commodity computers makes it possible to run such a simulation on common hardware, instead of a graphics mainframe.

The goal of this project is to port the existing application to a low cost platform, making it therefore affordable for a whole new range of applications.

Original Implementation
The original Virtual Oceanarium runs on an Onyx2 Infinite Reality deskside computer with the IRIX Operating System.

Artificial characters, using artificial life techniques, simulate the natural behavior of the represented creatures, which were chosen by »Oceanário de Lisboa« biologists as being the most representative ones.

In addition to the user controlled mode, which allows for free navigation throughout the building, it is possible to observe automatically the behavior of some fishes, by following them throughout the tank.

Currently, the application is controlled by a 3D mouse and uses a projection table with active stereo as its display output.

The GNU/Linux Port
Due to its free nature, the GNU/Linux operating system was chosen for porting the Virtual Oceanarium to a PC platform.

Porting the Virtual Oceanarium to the GNU/Linux OS involved:
– The use of a different Scenegraph
– Development of a loader for the 3D Models
– The use of a layer for input and output handling

Since Open Source software was preferred, OpenSG was selected as the Scenegraph system for the project. As OpenSG does not support the Fraunhofer VR data-exchange format (FHS), it was necessary to write a specific loader for the 3D models.

The code went through a deep revision to replace all the geometry and mathematics, initially written for the »Y« Scenegraph, by their equivalents in OpenSG.

Except for the above mentioned changes, the simulation code was kept intact.

In order to interact with different VR input devices, VRJuggler was used with OpenSG. VRJuggler is a collection of tools which simplify the development of Virtual Reality applications. Besides handling input, it provides support for different types of output devices, namely 3D Stereo output and CAVE systems.

A joystick is used as user interface, allowing adequate control of the application with lower costs, when compared to the input gear commonly used in VR systems.

Ongoing and Future Work
At the moment, scenegraph-related modifications are almost concluded.

Some changes are being made to the way fish movements are computed.

In the original oceanarium, only bigger species had their body movements simulated. Fish corporal movements are now calculated by vertex shaders, being directly processed by the graphics hardware. This allowed to extend this feature to all the existing simulated species.

Different shaders are being created for species with distinct locomotion types, based on mathematical func-

tions that describe their movements.

The shaders can be seen in action in figure 2 where various mackerels »swim« with their characteristic carangiform locomotion type.

Future work includes enhancements to the sound implementation by introducing new features, such as new sounds with longer loops.

Water waves and caustics will be added later for a more realistic feeling of the oceanarium.

It will be possible to create courses to present the Virtual Oceanarium in an automated manner with predefined routes and duration.

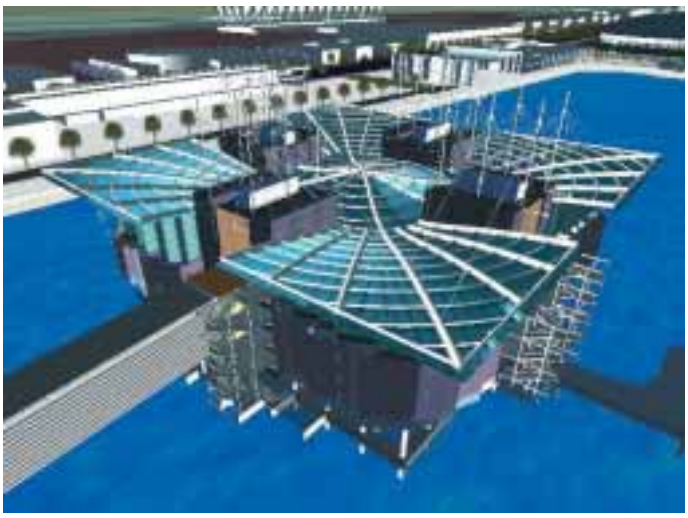

Figure 1: Exterior view

Conclusion

The port of the Virtual Oceanarium is based on open source, free software, and low cost hardware (PC platform). The use of OpenSG and VRJuggler allowed a seamless migration from the graphical server architecture to a desktop solution, while being able to maintain the existing simulation part of the application.

Some improvements were introduced by the use of hardware shaders, particularly in what concerned the fish corporal movements.

These are the first results of a series of studies on the Virtual Oceanarium implementation.

Further development will collect more species and tanks.

This application may be used not only for entertainment, but also for educational purposes.

Figure 2: Group of mackerels swimming. Their body movements are calculated by a vertex shader

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The MeCMAP – Multi-Cultural e-Learning Competencies Map

António Freitas, Manuel Santos, Luís Almeida

German Abstract

Dieser Beitrag stellt das MeCMAP-Projekt vor, welches von der Europäischen Kommission unter dem Leonardo-da-Vinci-Programm gefördert wird. Es zielt darauf hin Referenzmaterial für multikulturelles E-learning für kleine Unternehmen zu untersuchen und fünf Online-Datenbanken mit frei zugänglichen Informationen zur Verfügung zu stellen.

Motivation

With the integration of the European Union large companies as well as small firms operating in a knowledge based economy have to rely increasingly on the interrogation of non-domestic sources of information and knowledge bases, having to accommodate the particular cultural context of the region or country in order to gain or maintain a market advantage. Also, learning in the work place has increasingly to take into account the cultural diversity of its workforce, reflecting the multi-cultural social environments businesses are situated in. European social partners recognize that the lifelong development of competencies depends on a workforce with skills that include among others »at least a second language, computing skills, ability to communicate, including in a multi-cultural context, and the ability to learn how to learn«.

In a concomitant relationship the introduction of e-learning can act as a key driver in the business' adaptation to changing markets and the development of its workforce. Online learning developers and training designers will need to understand and address this multicultural context of their customers and clients in order to ensure a competitive advantage and reflect and accommodate an increasingly diverse market place and its workforce. The entire e-learning process, paying attention to culture is a key factor to success, it provides an intelligible interface that is user friendly and free of inappropriate stressors. Not only does it help us avoid offending or misleading diverse users, but it also helps organisations add value from the diversity that end users bring to it.

The Project

The MeCMAP project highlights the potential contribution of e-learning to vocational training within the EU. Beyond small businesses and their workforce, the project target audiences include e-learning and web developers, training providers and

Figure 1: Example of back office screen for information input/edition

Figure 2: Example of project query results

public administrators, as well as many other private sector organisations. The project is partly funded by the Leonardo program.

The project looks at multicultural e-learning provision for small businesses, supported by the establishment of five online databases:

- Collation and analysis of e-learning project results and initiatives that have addressed multicultural aspects, particularly in small businesses. This includes case studies to illustrate good practice
- European 'roadmap' of organisations to introduce and promote multilingual and multicultural e-learning competencies and standards, together with a description of current and relevant national or regional policies
- Common framework of reference for the competencies and qualifications of vocational teachers, trainers and technical specialist trainers working with small businesses in a multicultural context
- Resource pool of guides and reference material useful to trainers and developers working in multicultural e-learning environments
- Linguistic, social, technical, educational, economic, and geographical information. This will help visualize European multicultural e-learning contexts by utilizing a clickable map interface to link to the databases and highlights themes such as social exclusion and the digital divide in work based learning.

Of interest for academic audiences is the development of an analytical rationale including a range of definitions of multiculturalism to frame the various resources compiled in the MeCMAP databases.

We have now developed a draft version of the databases for pilot testing. By the end of the project the databases will be accessible from www.mecmap.org.

The Technical Solution

For the project development and implementation, tasks were assumed by the consortium partners, according to their profiles and competences. CCG has, among others, the responsibility for designing and building the overall database framework to organize, structure and make accessible resources and results across all databases above referred.

SQL server technology has been adopted for information management platform implementation and .NET for software development. All the reference material, collected, prepared, and revised by partners is classified and included into the databases. This operation can be performed remotely through the web-based backend application interfacing the databases. Such an application is restricted to authorized users, which are, for now, the project members. At a later stage a manager must be nominated for the job.

The geographical information database querying interface presents the particularity that the country (filtering information by country) the information refers to can be interactively selected in a clickable map.

Consortium Partners and Acknowledgements

The project is supported by the Leonardo da Vinci community action program on vocational training and jointly developed by a consortium of participants from five European countries:

- E-Novate Consultancy Ltd - a small e-learning consultancy, Margate, Kent, United Kingdom www.enovateknowledgespan.org
- Marchmont Observatory and partners under the School of Education and Lifelong Learning, University of Exeter, Exeter, United Kingdom www.marchmont.ac.uk
- AKOL (Trade Union of Adult Educators), Helsinki, Finland www.akol.fi
- WTA (Private Wirtschafts- und Technikakademie - training company), Rostock, Germany www.wta-rostock.de
- CCG (Centro de Computação Gráfica - software system developers), Coimbra, Portugal www.ccg.pt
- Metodiko - Pedagogicke Centrum - a national teacher in-service training agency, Banska Bystrica, Slovakia www.mpcbb.sk/index.html

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Grid Technology in TORGA.net Context

Rui Castro, Ana Lima, Adérito Marcos

German Abstract

Dieser Beitrag gibt einen allgemeinen Überblick über die Access-Grid-Technologie mit Hinweisen auf ihre technischen Aspekte und einer kurzen Beschreibung der Architektur eines Access Grid Node. Er stellt die Unterschiede zwischen der Access-Grid-Technologie und anderen herkömmlichen Technologien für Videokonferenzen dar und zeigt einige der Gründe auf, weshalb sich das TORGA.net-Konsortium für diese Technologie zur Durchführung von Videokonferenzen zwischen der Universität von Minho im Norden Portugals und der Universität von Vigo im spanischen Galizien entschieden hat.

Introduction

The TORGA.net - Trans Portugal Galicia Network - project is funded by Interreg III-A Community Initiative, Galicia North of Portugal Subprogramme involving the following partners: University of Vigo and Centro de Supercomputación de Galicia (CESGA) from Spain and University of Minho and Centro de Computação Gráfica (CCG) from Portugal. Its main objective is to build an efficient communication platform between the research and innovation communities of the South of Galicia and the North of Portugal, in order to encourage the collaboration between them and simplify the economic and social integration of this bordering zone. In practical terms, this project involves the installation of several Access Grid rooms. The Access Grid is an ensemble of resources including multimedia large-format displays, presentation and interactive environments, and interfaces to Grid middleware and visualization environments.

These resources are used to support group-to-group interactions across the Grid. For example, the Access Grid is used for large-scale distributed meetings, collaborative work sessions, seminars, lectures, tutorials, and training. Therefore, the Access Grid technology differs from desktop-to-desktop tools that focus on individual communication.

Access Grid technology

A Grid is a set of hardware and software resources distributed over the Internet that provide services accessible through a set of protocols and open interfaces (resource management, remote process management, communication libraries, security, monitoring support, etc) organized by well defined proceedings and good practices. The virtual organizations that interconnect through a Grid are responsible for their own security and resource management policies. This means that the technology used to build a Grid is complementary to other technologies enabling the use of distributed resources from the intranet of those organizations.

The need to use resources already available in the systems connected to the Internet and to simplify their usage created an opportunity for a new information technology known as Grid. The idea for this new tech-

Figure 1: Access Grid room in university of Minho (Braga)

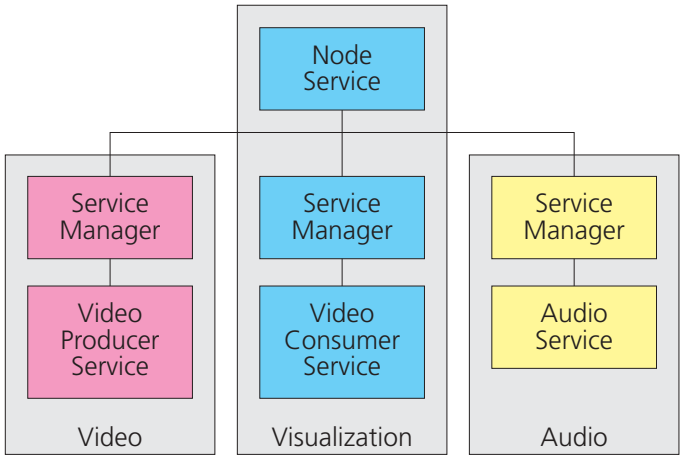

Figure 2: Structure of an Access Grid Node

nology is to offer access to various resources geographically dispersed, such as supercomputers, clusters, storage, information sources, tools, etc. Therefore, the distributed systems can be used as a single virtual system by various applications.

A Grid system is defined by the dependency in a centralized control, for being based on open standards and for providing quality of service. As such, the objective of the Grid technology is to bind resources of distinct administration domains, respecting the policies and internal management tools of those domains.

Access Grid is a framework of hardware and software resources over multicast networks with middleware interfaces, used to make human interaction and collaboration between local and remote spaces easier.

Each Access Grid Node connects to other nodes, creating a flexible Collaborative Virtual Environment that makes possible for multiple users located in different physical locations to communicate and collaborate as if they were working in the same room.

In an Access Grid Node, audio, video and data create environments that make other participant nodes feel like they were working in the same physical space.

In order to create this environment some aspects must be taken into account, like the room space, equipment layout and the construction and configuration of the Access Grid Node.

An Access Grid Node is composed of four components:

– Audio System,
– Video System,
– Visualization System, and
– Network

Access Grid vs. Conventional Videoconferences

What are the advantages of an Access Grid Videoconference System? What are the differences between Access Grid and conventional videoconferencing technology? Table 1 presents a comparison made between a videoconference taking place in an Access Grid Node versus a videoconference in a conventional room.

In a traditional videoconference session we have a peer-to-peer topology in which every peer establishes a connection with every other peer in the conference that usually resumes to one. This is mandatory with unicast networks, while in an Access Grid session, since it is based on a multicast network, one node (peer) broadcasts video, audio and data stream(s) only once and every other node (peer) receives that stream, repeated as many as it wants, only limited by its own bandwidth. This means that the Access Grid technology is scalable in terms of the number of participants in a particular session.

The possibility to share resources and applications is another important issue compared to other technologies. Some technologies allow at the most the sharing of a virtual board in which the participants can write and make simple drawings. However, with Access Grid, the participants can share applications like web browsers, slide show presentations, etc. More, the resources of each node can be shared and used by applications as a single virtual system.

Access Grid Node: Software Architecture

The Access Grid infrastructure has the following components (figure 3):

– *Venue Server*: is where virtual rooms are created, modified and removed using a tool called »venue management tool«.

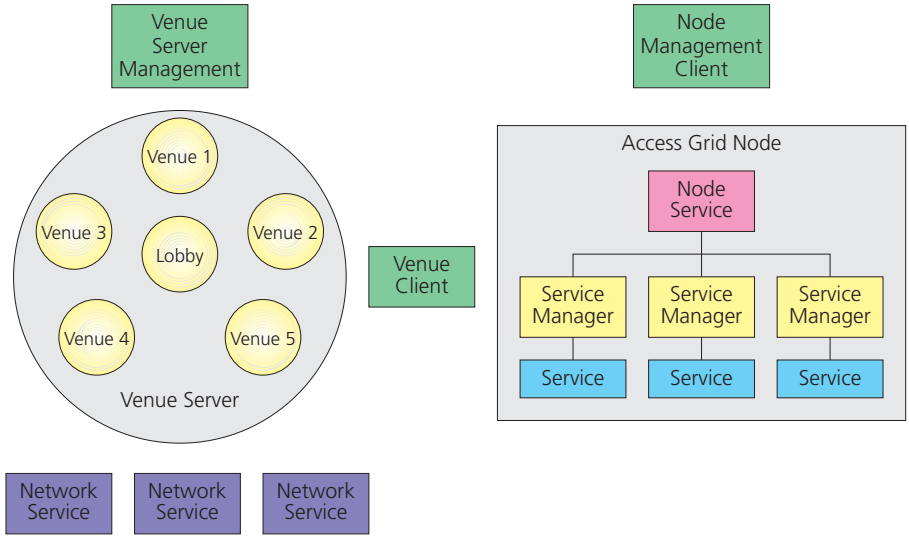

Figure 3: Client-server structure in virtual rooms

Videoconference Access Grid: Characteristics	Conventional Videoconference: Characteristics
Requires Broadband Networks (Internet2, GÉANT)	Require conventional networks: Internet, RDSI, ADSL
Multicast networks	Unicast networks
Multiple open source software resources	
Require multiple hardware resources	Require few hardware resources
Multiple audio/video streaming	
Projection of high quality image	Image of variable quality and small dimensions
Complex collaborative virtual spaces	Simple collaborative virtual spaces
Great interactivity	Poor interactivity

Table 1: Comparison between Access Grid and conventional videoconferences

Therefore, the Venue Server connects different Access Grid Nodes.

– *Venue Client*: software that serves as a connection between the node and the virtual class room (»virtual venue«)
  Allows:
  - To share data,
  - To share applications, such as Remote PowerPoint Presentation Tool, Whiteboard, GridFTP, distributed Web Browser, distributed Chat Room, shared Bookmarks, Voting Tool, Question & Answer Tool, etc.
– *Virtual Venue*: cooperative virtual space.
– *Node*: collection of hardware and software resources.

As seen in Figure 2, the Node Service connects to the Service Manager in each machine. The Node Service exposes to the outside the resources of each machine of the Node. Therefore, the components are:

– Node Service: central point of contact in a node.
– Service Manager: manager that controls the services in each machine. There is one for each PC to control the service execution.
– Service: include the hardware and software resources needed to provide a certain service (such as audio and video streaming).

The functionalities of each Node are determined by the services installed.

Conclusion

The experience provided by the Access Grid technology is very different from the traditional videoconferencing systems. In the domain of rich and interactive remote collaborations, Access Grid has an excellent performance when compared to other technologies.

Another feature that makes Access Grid stand up over other systems is its scalability; a session can be established between several nodes, each with the possibility to see the others; events with up to 100 participant nodes have already taken place using Access Grid technology. This is possible because Access Grid is based on multicast networks, meaning that one node has only one outgoing audio/video stream that flows over the multicast network to every other participant node.

Summarizing, the Access Grid technology offers the following capabilities:

– high-quality multichannel digital video and audio
– prototypic large-format display
– integrated presentation technologies (PowerPoint slides, mpeg movies, shared OpenGL windows)
– prototypic recording capabilities
– integration with Globus for basic services (directories, security, network resource management)
– macroscreen management
– integration of local desktops into the Grid
– multiple session capability

Points of Contact

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Interactive Mobile Assistants for Added-value Digital Contents

María Teresa Linaza, A. Susperregui, H. Escudero, D. Oyarzun, A. Ortiz

German Abstract

Dieser Artikel beschreibt die Konzeption und Implementierung eines Prototypen für den Gebrauch in Ausstellungsräumen, in welchen die Besucher mit tragbaren, WLAN-fähigen Geräten ausgestattet werden. Die Architekturmodelle in den Ausstellungen werden mit multimedialen Informationen erweitert. Sobald ein Benutzer in die Nähe eines Modells kommt, kann er auf jene Informationen zugreifen. Der Prototyp wird in einer Reihe von Architekturmodellen des berühmten spanischen Architekten Rafael Moneo während einer Ausstellung im September und Oktober 2005 im Kubo-Ausstellungszentrum der Kutxa Foundation in Donostia, San Sebastian getestet werden.

Introduction

During the last decades, a great number of projects related to the application of innovative technologies to Cultural Heritage have been implemented. Some European projects have assessed some of the most outstanding technologies: 3D digitalization and scanning techniques have been used for the reconstruction of historical objects (3D-MURALE), Virtual and Augmented Reality technologies allow new interaction ways for users and experts (ARCHEOGUIDE, RENAISSANCE, CHARISMATIC), mobile devices and multimodal interfaces provide intuitive and personalized access to scientific information from museums and archaeological sites.

Within these applications, multimedia guides must support important personalization of the content owned by cultural institutions in order to provide users with a visit in accordance with his/her background. At the same time, a guide for a museum or exhibition room should encourage learning and personal enrichment.

Therefore, information should be displayed taking into account the physical location of the visitor as well as the position of the artworks in their natural environment. The overall experience can be optimized by the connection between the information of the exhibition and the presentation to the visitor in a coherent way depending on the location.

Description of the Project

The project analyzes the use of wireless technologies in the implementation of interactive mobile assistants based on Virtual Reality and storytelling technologies. The availability of portable devices with wireless capabilities has a great potential in different application domains. Using the wireless networks, mobile devices can detect the position of the visitor and stream additional content in real time.

The project relies on a high-bandwidth wireless infrastructure to download information about architectural scale models as visitors navigate through an exhibition. This enables to support them with interactive services and highly dynamic information. In addition, the same network infrastructure provides location information to the system.

The prototype will be tested on a set of exhibits of architectural scale models from the famous Spanish architect Rafael Moneo in the Kubo exhibition center of Kutxa Foundation in Donostia, San Sebastian during September and October 2005. As a visitor walks up to a particular exhibit, the prototype provides inter-

Figure 1: Schema of the proposed system

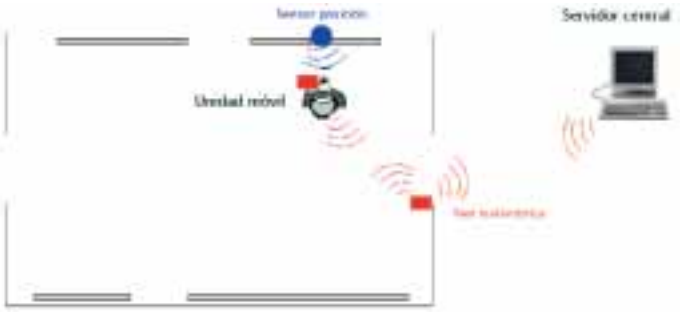

Figure 2: Wireless prototype.

action, information and ideas about the exhibit. In addition, visitors can learn more about architecture, and the history and evolution of the exhibit itself in a personalized way.

Technological Components

The prototype includes three main components: storage, management, and access to cultural multimedia content using relational databases, generation of content with an authoring tool and visualization of the multimedia content on the basis of wireless technologies.

Storage, management, and access to cultural multimedia content

The first step in the implementation of the overall prototype has been the definition of a database in the main server that stores the available multimedia contents. This database stores information about concepts that are related to the architectural scale models. Each piece of information includes different types of content: images, texts, spoken texts (in simple text format), videos, and audio files.

As content is personalized to the visitors, the same information is presented to different profiles of users. Therefore, a profile is attached to the content during the generation process. It must be mentioned that although each concept includes different pieces of information, each of these pieces is classified according to the user profile.

The output of the storage and management system has a web site format. The appearance of the output is based on some previously defined templates. These templates are created dynamically, allowing to change the distribution of the different types of content on the final web site for visualization. Content generators determine the final choice of the template and the content.

Tracking of the user

Location awareness is seen as a key issue within the project. The information about the position of the users is not interesting for them in most of the cases. But if a system is aware of the current location of the user, it can infer from the geographic position of the user what the most interesting contents are.

Within the project, we have selected a tracking system based on the location features of a wireless LAN. Due to the high-level features of the visualization device, which is sensible to the use of wireless connections, it also tracks the position of the user. The application allows to select the desired artefact from the database, its position in the room, and the area around the element where the user shall receive the information.

Once all these data have been inserted, the program automatically detects which information shall be provided to the visitor. The performance of the system is as follows. The tracking data is retrieved by the application which calculates if users are inside the areas where information shall be provided. If so, the identifier of the architectural scale model is sent to the application running on the hand-held device.

The Kubo exhibition center is composed of three exhibition rooms, with a total area of 739.6 m^2 distributed among three different exhibition rooms of 489, 146.6, and 104 m^2. In order to cover the mentioned area, five Access Points have been installed, three in the main room and one in each of the remaining rooms.

Visualization of the content

In order to implement a light, wireless, and compact prototype for the visualization of the content, the OQO handheld computer has been selected as the user interface. Due to its high performance, this device does not only allow the streaming of the personalized multimedia content to each visitor, but also tracks their position.

The OQO, a compact unit measuring 4.9'' x 3.4'' x 0.9'', is based on a 1GHz Transmeta Crusoe processor and weights approximately 400 g. We found the unit to have a battery life of nearly one hour and 45 minutes while requesting web information via wireless LAN, and to be relatively resistant to rough treatment.

As content is personalized, visitors must first enter some personal details, such as their interests and preferred language. Simple questionnaires are presented about these issues. As it was mentioned before, when the visitor gets close to a scale model, the visualization application receives the identification of the scale model in front of the visitor. Based on the profile of the visitor, the application makes a query to the server to decide which piece of information of the scale model is the most appropriate one for the visitor.

The server creates the web site and sends it to the hand-held device. One of the most innovative issues of the project is the inclusion of virtual characters who read the spoken text in real time. When the query is sent to the server, a servlet creates the audio and phoneme files, and stores them into the server. Then, the virtual character is inserted into the web page using an applet.

Acknowledgement

This paper is part of the work done within the project »AMICO-Asistentes móviles interactivos para la valorización de contenidos digitales«, financed by GAIA, Euskalcom and usyscom within the INTEK2004 program of the Department of Industry of the Basque Government.

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KonekTV, a new approach to iTV services

Igor G. Olaizola, Gorka Marcos Ortego

German Abstract

Europa steht an der Schwelle zum digitalen Fernsehen. Um die Kosten für den Massenmarkt zu begrenzen, sind die zur Zeit erhältlichen Set-Top-Boxen (STB) zumeist nur mit grundlegenden Dekodierungsfähigkeiten ausgestattet.
Das Projekt KonekTV wird dem Benutzer durch die Entwicklung einer PC-basierten STB mit neuer und besserer Funktionalität zusätzliche Möglichkeiten bieten. Zielgruppen sind hier insbesondere Senioren und Behinderte.
In diesem Zusammenhang und im Einklang mit dem Forschungsbereich Soziale Technologien bei VICOMTech liefert KonekTV benutzerfreundliche, intuitive und angepasste Schnittstellen, um spezielle Dienste wie Video-Konferenzen, e-Health, Internet usw. nutzen zu können. Dies stellt einen neuen Schritt im Prozess der e-Inclusion dar.

Introduction

Digital TV is coming as a new experience where the watcher leaves his/her passive attitude to become an active user who interacts with a new set of services. Although the digital technology offers a great deal of possibilities, this domain is influenced by the decoder manufacturers who are eager to keep the final cost of their products as low as possible in order to sell as much decoders as possible. This is the reason why the set-top boxes are not yet powerful enough to run most of the communication and entertainment services already available for current PCs.

This project aims at developing a hybrid decoder that combines the main features of a set-top box with the potentiality of the conventional personal computers (PCs), integrating the ease of use of a television set with the performance features of the PCs. This will allow the provision of advanced interactive services.

Although these services are basically addressed to every kind of user, this project focuses on the e-inclusion of those users who nowadays find various difficulties to access the digital content, services, etc. The project team considers the use of the television as a gateway to the Internet one of the best chances to promote and ensure the e-inclusion of elder people, people from rural areas, disabled people, etc.

Prototype

Accordingly, the prototype developed in KonekTV integrates the television with other kinds of services (e.g. video conference, video on demand, e-mail, conversational interfaces, and so on). One of the main ideas developed in this project is to group all multimedia services in just one device. Video on demand services, DVDs, DVB broadcast, recorded files, and video conference streams can be managed by the KonekTV device and displayed on the TV set in a very intuitive way.

The main features of the KonekTV device are:

- Standard components
  - i386 architecture
  - PCI slots
  - USB ports
- Connectivity
  - DVB-T card
  - IR receiver (for remote control)
  - Ethernet card

Figure 1: Screenshot of the system

Figure 2: Video conference

– Drives
  - DVD-RW
  - HDD
– I/O Interfaces
  - Remote control as input interface
  - TV screen as output interface

The software development has been implemented using standard C++ libraries on a Linux operating system, but due to the fact that the graphical layer has been programmed based on Qt libraries, most parts of the systems could be directly ported to another operating systems like Windows.

Services

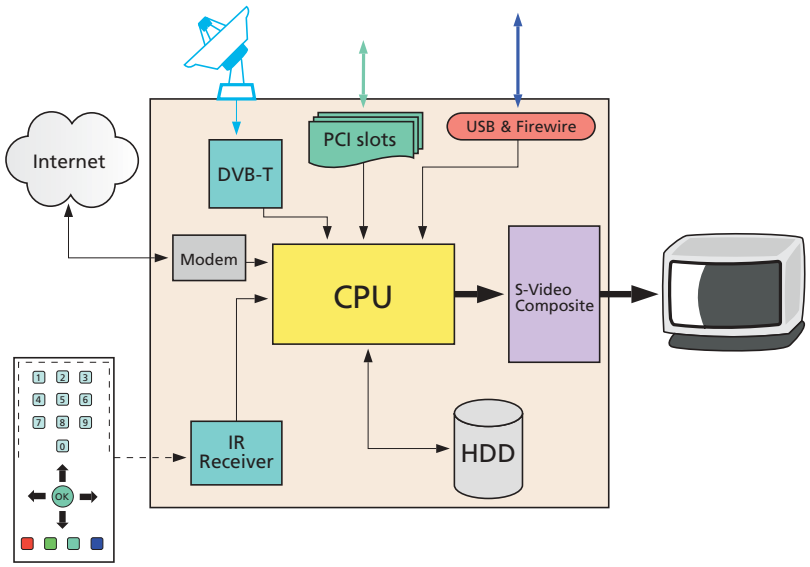
The KonekTV prototype is currently able to offer the following services:

– Digital TV (DVB-T) (live, recording, and playing)
– Video on demand
– DVD
– Music playing
– Video conferencing
– Internet browsing
– E-mail

System management guided by Avatars

The I/O interfaces introduce certain difficulties in some services. TV screens offer PAL features which are quite different from current PC screens. The lower resolution of PAL systems changes the features of web pages which are much more difficult to read and browse. Therefore, the goal of this project is not to offer Internet access through the television but to offer some services using the Internet framework.

The remote control is an easy and comfortable way for managing and browsing, but it is not a good device for typing. Although they can work like mobile phone keypads, it is not a comfortable way of writing. Thus, for example, the e-mail client sets more value on reading e-mails than on the writing process. This functionality can be very useful to send messages without any cost and in a transparent way.



Consortium

The consortium was constituted assuring its multidisciplinarity. It therefore consists of experts on digital television, engineering, accessibility, and digital service providers. ICAVI-BIKAIN is a company whose expertise is based on the consultancy in the field of assistive techniques for disabled people. DOMINION Ingeniería is an engineering company with a lot of expertise in the definition and development of technological projects in rural areas. During the last few years, DOMINION Ingeniería has brought the IST services to most of the remote rural areas in the Basque Country. Balada is a company providing their clients with the needed facilities for the access and hosting of IST services. Finally VICOMTech is member of the Ini-GraphicsNet with 5 years of experience in the development of innovative projects in the field of Digital and Interactive Television.

Points of Contact

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MiroView: Semantically Based Tools for Structural Steel Detailing Design

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Joaquín Oyarzun (LANIK), Juanjo Falcón (SOME)

German Abstract

»Structural Steel Detailing« ist eine von vielen Anwendungen der CAD-basierten Entwicklung. Die derzeit auf dem Markt erhältlichen Standardpakete sind jedoch nicht in der Lage, die nicht-geometrischen Daten eines Modells voll auszuschöpfen.
Aus traditioneller Sicht muss ein Benutzer sehr erfahren sein, um mit solchen Programmen die bestmöglichen Ergebnisse zu erzielen, und selbst dann ist es nicht ausgeschlossen, dass diesem Fehler unterlaufen. Probleme, die bei der Visualisierung, Dimensionierung, dem Vergleich von Anfangs- und Endphasen einer Entwicklung auftreten können, werden von der Industrie durchaus in Betracht gezogen, jedoch nur aus rein geometrischer Sicht behandelt.
In einem »Steel Detailing« Model ist eine Vielzahl an potentiell nützlichen Informationen enthalten; diese Informationen könnten auch in ihrem semantischen Zusammenhang betrachtet werden und so dem Entwickler eine Reihe weiterer Hilfsmittel liefern.
Die Hauptaufgabe in diesem Projekt ist es, eine Toolbox zu entwikkeln, welche auf den Grundlagen der Semantik Ingenieuren bei der Entwicklung von »Steel Detailing« Prozessen hilft. Diese Toolbox ist ein Plugin für eine gängige CAD-Software und enthält sämtliche Anwendungen, die ontologische Darstellungen der verschiedenen Prozesse, der Pläne des Benutzers sowie Elemente des Modells benutzen, um damit den Entwickler dabei zu unterstützen auch Faktoren auszunutzen, die im üblichen CAD-Ansatz nicht berücksichtigt werden.

Introduction

Nowadays, several CAD systems are available in the field of Structures Design (Technically known as Steel Detailing packages). However, such programs are often poor from the perspective of knowledge use, as the information embedded in the model is not fully exploited.

A common lack of information is due to the fact that non-geometric characteristics are usually not taken into account. Adjacent features or logical connections, like, for example, the fact that for every beam at least one joining element should exist, are the kind of information that is not offered as the CAD packages are solely focused on geometric entities such as lines, primitives, curves, etc.

Project Description

The main activity within this project is the development of a toolbox that uses semantics in order to aid engineers in the Steel Detailing process design. This toolbox is a plugin for a well-known commercial CAD software and it contains several applications that use ontology representations of the different processes, user intentions and elements in the model in order to assist the designer in exploiting factors that could be hidden in the traditional CAD approach.

Among the main objectives the following specifics can be mentioned:

- To develop an ontology-based description of the elements and operations involved in a steel detailing design
- To develop a semantic inference model that allows the Steel Detailing designer to execute modeling operations based on the above-mentioned ontology, using the specific parameters and design requisites mandatory in a 3D model interaction
- To extend at least one CAD system in its functionality, in order to obtain a 3D interactive navigation of a Steel Detailing model and the corresponding design review
- To accomplish the objectives, the latest advances in Computer Graphics and knowledge management will be applied. If possible, the CAD functions will be accessed via Meta APIs in order to have modularity and software independence.

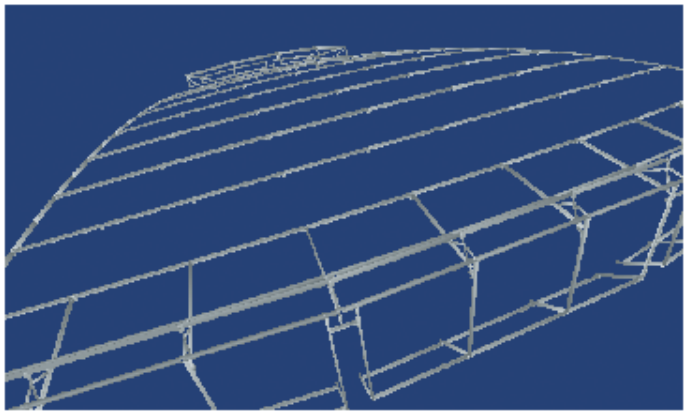

Figure 1: Steel Detailing Structure visualized using semantic criteria

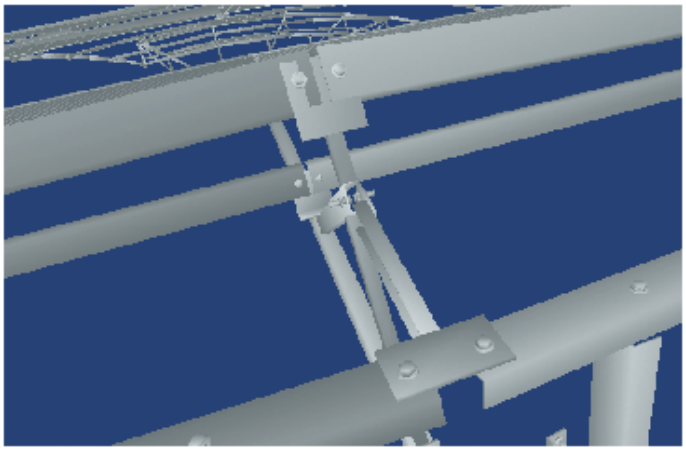

Figure 2: A close up showing some of the elements involved in the semantic process

Toolbox description

As pointed out before, the toolbox is composed of a set of semantically based add-ons among which the most important ones are:

A 3D interactive visualization tool: This is an application capable of basic interactions with the CAD program in order to have for instance a semantic 3D representation of the Steel Detailing structure, where for instance camera movements can be performed and then returned to the CAD model.

A customized dimensioning system: Today's CAD programs are able to dimension the entities for manufacturing purposes, the problem arises when some of the needed dimensions are not provided by the software, and hence the need of a special user knowledge and experience based dimensioning system is needed. This tool supports the dimensioning process by using the knowledge of the user to dimension the elements in a more suitable way intended for real manufacturing workshops.

A verification tool: From the starting point of the design process having just a wire-like structure and until the final design where a highly detailed structure is produced, some of the original elements can be dropped for several reasons, this tool compares both initial and final structures in order to point out the differences between them, giving the designer an extra aid by presenting them visually.

An automatic element placement tool: Some elements can be automatically placed when a Steel Detailing Structure is designed; this tool will provide the possibility to automatically add features based on the sub-structure of topical design stage, reducing design problems as some repetitive processes can be automatically produced.

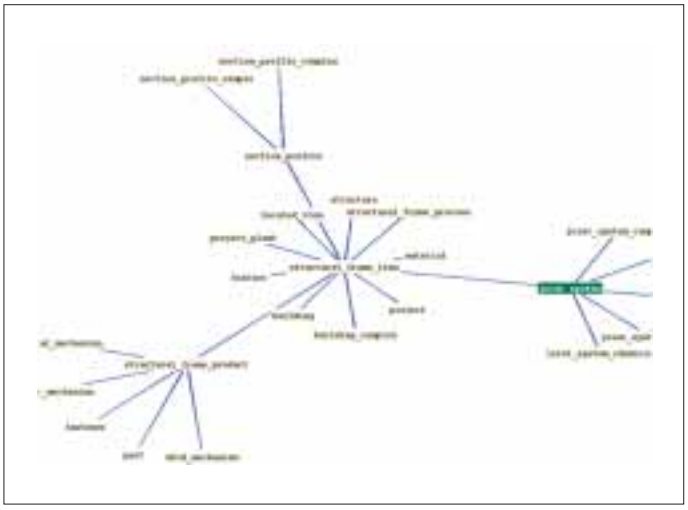

Figure 3: The supporting model ontology (excerpt)

Acknowledgments

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SIMUSOL – An Interactive Educational Welding Simulation System

Alvaro Segura

German Abstract

Schweißarbeiten sind ein Beispiel für einen industriellen Vorgang, der von qualifizierten Arbeitern ausgeführt werden muss. Die Ausbildung dieser Arbeiter erfolgt traditionell durch Übungen an echten Geräten, wodurch bestimmte Risiken und Kosten entstehen. Das Hauptziel des Projektes SIMUSOL ist die Entwicklung eines Systems für Schweißsimulationen, das zu Beginn der technischen Ausbildung zukünftiger Schweißer eingesetzt werden soll. Das System wird aktuelle Visualisierungs- und Interaktionstechnologien einsetzen und verschiedene Technologien wie Erweiterte und Virtuelle Realität auf ihre Eignung hin auswerten. Das Design wird von der ausgewählten Technologie abhängen und in jedem Fall verschiedene Schwierigkeiten beheben müssen.

Introduction

A number of activities in the industry imply certain risks, and thus require good previous training. In the first stages of training simulators can provide the trainee with valuable knowledge and practical skills in a safe environment. Welding is one of those activities presenting some risks and wasting costly materials and energy.

The goal of this ongoing project is to develop an interactive welding simulation system which can be used as a learning tool avoiding potential risks and especially reducing energy and material costs.

The consortium is led by Redox Multimedia, a company specialized in multimedia and online e-learning courses for professionals, and includes VICOMTech as well as educational centers specialized in technical training with experience in welding courses.

System overview

The simulator is a virtual substitute of the real welding equipment, emulating parts such as the regulation panel and the welding hand tool. The system will provide its users with a set of practical exercises of increasing difficulty and will guide them while performing the virtual welds, storing statistics about their progress.

The system has a simplified physics simulation core, where the welding process is mathematically modeled, a visualization module and a physical setup including the tracked hand tool. The simulation algorithms are quite simple approximations, as more precise models are completely unusable in a real-time application.

Visualization module

During the project specification phase several designs for the visualization system have been considered. These include techniques such as augmented reality, virtual reality or

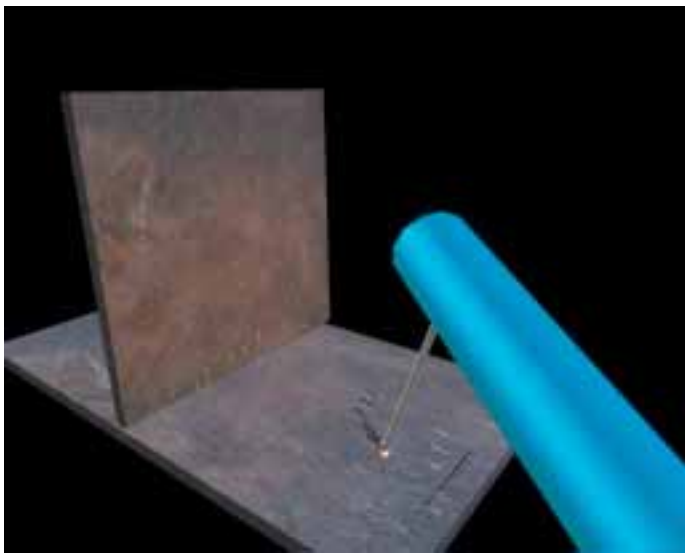

Figure 1: A work piece and the welding electrode in the simulator user's view

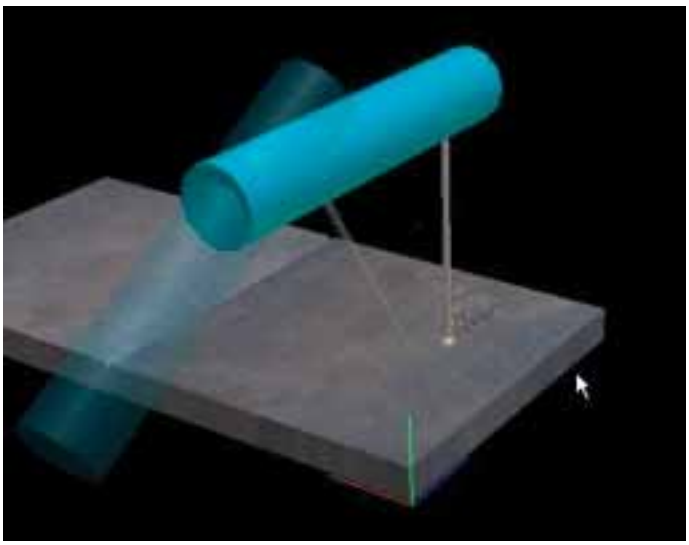

Figure 2: A transparent welding torch moving as a reference for a beginner user

3D graphics on an orientation-adjustable flat panel. In the case of an AR-based system, the user would use physical replicas of the hand tool and working pieces and the visualization subsystem would superimpose the evolution of the welded seam, sparks, and other information (guides and error indications) over his view.

A survey of the devices required for the different proposed designs was made in order to have a clear idea of their complexity, cost, and overall suitability for this project. For instance, a video-see-through AR supporting HMD with small cameras mounted has been identified, as well as several stereo VR HMDs and pose tracking devices.

Finally, an immersive Virtual Reality system using an HMD has been chosen as the best solution and is being implemented. The system integrates a cost effective head-mounted display based on recent OLED microdisplay advances. The simulator design in this case is quite similar to the augmented reality solution although everything, including the tool, electrode, and pieces to weld, would be computer-generated with real-time rendered 3D graphics.

Tracking module

The main input for an interactive virtual welding system is the motion of the welding torch (the evolution of its position and orientation). Although some limited testing can be performed using a conventional mouse a 6-DOF tracking device is needed. Initially as an inexpensive solution an optical tracking design was tried, based on markers attached to the tracked tool and a Webcam. However, it used too many computational resources and the values obtained had very low resolution and quite a lot of noise.

The current configuration uses an AC magnetic tracker from Polhemus. The resolution obtained (a fraction of a millimeter) is suitable for our application, while its static precision, which varies slightly with sorrounding magnetic fields and metallic objects, is not so important. The tracker includes two sensors, and our system uses the second one to track the user's head in order to display the correct view on the HMD.

A simpler, more affordable configuration is also available which uses a conventional monitor as visualization device, avoiding the need for a costly HMD and requiring only one tracking sensor. However this is not an optimal solution and is intended mainly for testing and some limited learning.

Educational content

Our virtual welding system is intended to be a learning tool. A set of exercises of different difficulty will be presented to its users. The system will include visual indications to guide beginners in the proper use of the hand tool. For example, as shown in figure 2, a transparent electrode holder will perform an exercise showing the correct orientation and movement speed and letting the user follow it with his interactive tool. More or less visual aids will be displayed depending on the skill level of the trainee. On the highest levels, the view will be darkened to match what real welders see through their protective visors.

Acknowledgement

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TOPATU: Virtual Character Multidevice for Contact Application

Amalia Ortiz, David Oyarzun, María del Puy Carretero

German Abstract

Das Projekt TOPATU wurde inspiriert durch die zunehmende Verbreitung des Internets, des Fernsehens und mobiler Geräte als Kommunikationsmedien, unter anderem zum Knüpfen neuer Bekanntschaften. Das Projektziel besteht in der Implementierung neuartiger Benutzerschnittstellen, so dass das Haupt-Interaktionselement mit dem Benutzer nicht mehr ein Text ist, sondern ein benutzerdefinierter und sprachbefähigter Avatar, also eine virtuelle Person, welche den Benutzer beim Kommunizieren mit anderen Benutzern, beispielsweise über Mobiltelefon, das Fernsehen oder einen mit dem Internet vernetzten PC repräsentiert.

Introduction

Project TOPATU is born to give answer to a series of tendencies that are observed in the present scene of the communications:

- The increment in the use of mobile devices
- The successful offers in the Internet services such as the Chat sites
- The necessity of interactive content to achieve a faithful TV viewer
- The importance in the personalization of the content
- The increment of the regional and local TV channels in the general context of the globalization

In this context the company Donewtech (DNT) has developed a mobile application, called M-Contact, which has a lot of functionalities for the communication between people such as diary, internal messenger, tools for defining the own profile, etc.

The expectation of this project is to implement a new user interface for M-Contact, so that the main interacting element with the user is not a text, but a speech-enabled avatar that the user has chosen in order to represent him or her when communicating with other users by mobile phone, TV or Internet connected PC.

Web scenario

One of the scenarios is based on the use of an Internet connected PC. The user must register on the Web by SMS. This is the payment method of the application, so that even if the user wanted to use only the web application, he or she would need a mobile phone to license.

Once the application has been paid for, the user can begin to define his or her profile using a graphical editor (figure 1) in order to configure his or her avatar integrated in the Web application. The profile will be saved to a database on the server, which he or she will be able to access from any of the applications (TV, PC, or mobile phone). As long as the database is not modified, the avatar will always have the appearance defined at the beginning. Another functionality of the Web application will be the possibility to create a private chat room with other users with similar affinities. In order to get this,

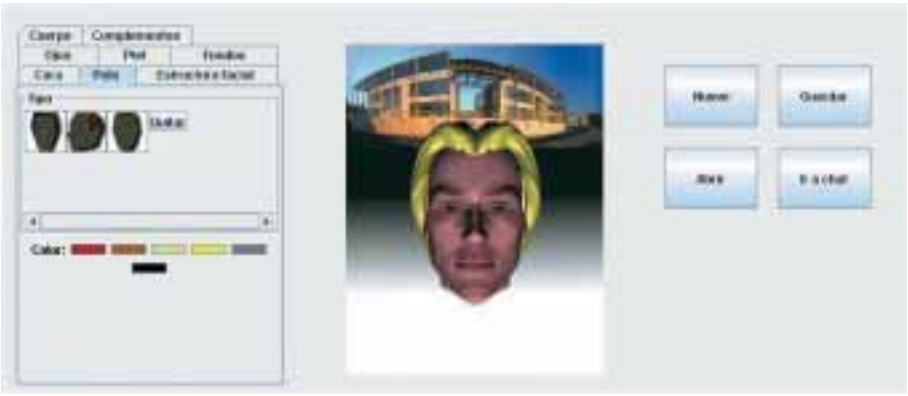

Figure 1: Authoring tool for defining the appearance of the avatar mobile phone scenario

Figure 2: An example of the first prototype

the user enters his or her profile search on the web page and requests compatible profiles to be sent to him or her. After having received the list with compatible profiles, the user will be able to choose his or her chat partner(s) via Web and to start a chat.

Mobile phone scenario

Once the user has licensed the application on the web page as explained above, he or she can download the application to his or her mobile phone as an easy-to-use MIDlet. The user might have already edited and stored the required user profile on the server with the graphical editor on the web page or he or she can do it now by filling a questionnaire. When the user has defined the avatar that should represent him or her, he or she can request compatible profiles of other users.

There are three ways to get these profiles of other users. The user requests the reception of other user's profiles from the server to his or her mobile phone, the user might see another interesting user profile on TV (see the third scenario below), or the user's mobile phone might have been in the range of Bluetooth so that another mobile phone with Bluetooth technology of a user with a compatible profile automatically sends a message to the user.

After having received a list of profiles, the user can send messages to others who receive the messages using http.

The integration of the 3D avatar in the MIDlet is one of the biggest technological challenges of the project, the reader can see a screenshot of the first prototype in the avatar Mobile phone scenario (cf. figure 2). It offers the possibility to receive »emotional« messages from a 3D avatar with a user-selected facial expression, while a user reads a message from another person.

TV scenario

The user has to send an SMS to a telephone number that is shown in a TV program so that his or her profile and message are published. Before doing this, he or she must have followed all the aforementioned licensing and profile definition steps. The TV program will not only show a text message but also play back an audio-visual message.

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Figure 3: Application scenarios

AMI-SME, a Solution for an Internationalization Process of Small and Medium-sized Enterprises

Eduard Barbu

German Abstract

Wachsender Wettbewerb und Globalisierungstrends fordern Firmen dazu heraus, die Zielmärkte für ihre Produkte und Dienste ins Ausland auszudehnen. Der Prozess der Internationalisierung macht viele Entscheidungen nötig. Hierzu werden entsprechende Informationen benötigt, die die Entscheidungsfindung unterstützen und die erfolgreiche Anwendung der Internationalisierungsstrategie garantieren. Zu den relevanten Faktoren zählen Marktpotenziale, konkurrierende Betriebe, die gesetzlichen Gegebenheiten, die Verkaufsorganisation und Marktereignisse.
AMI-SME hat die Strukturierung und Automatisierung der Ermittlung, Sammlung und Analyse von Marktinformationen zum Inhalt. Eine methodische Toolbox soll kleine und mittlere Unternehmen auf ihrem Weg zur Internationalisierung unterstützen, und ein umfassendes Werkzeug zur Informationsbeschaffung und -analyse wird über das Web zugänglich sein.

Introduction

Increasing competition and globalization trends are challenging companies to expand the target markets for their products and services into foreign countries. The process of internationalization necessitates many decisions. Adequate information about the target markets is required to support decision making and ensure the successful implementation of the internationalization strategy. Among the relevant factors are market potentials, competitors, the legal situation, the sales organization, and marketing events.

Started in November 2004 AMI-SME is a European project that aims at structuring and automating the identification, gathering, and analysis of market information. It is designed to support the internationalization process of small and medium-sized enterprises. 13 research and company partners from five European countries participate in the development of a methodological toolbox and an Internet search tool.

The expected results

The main outcome of the project will be a software package and an organizational concept:

- A methodical toolbox will guide SMEs (small and medium-sized enterprises) on their way to internationalization. It describes useful internationalization processes, pinpoints critical success factors, reveals information demands, and recommends information sources.
- A comprehensive information search and analysis tool will be accessible over the web. An information agent gathers information from within the company, from professional information providers and the Web, and presents the results according to the role of the searcher as well as the business process.

The technical solution

The technical solution will be based on knowledge management concepts, information retrieval (IR), natural language processing and data

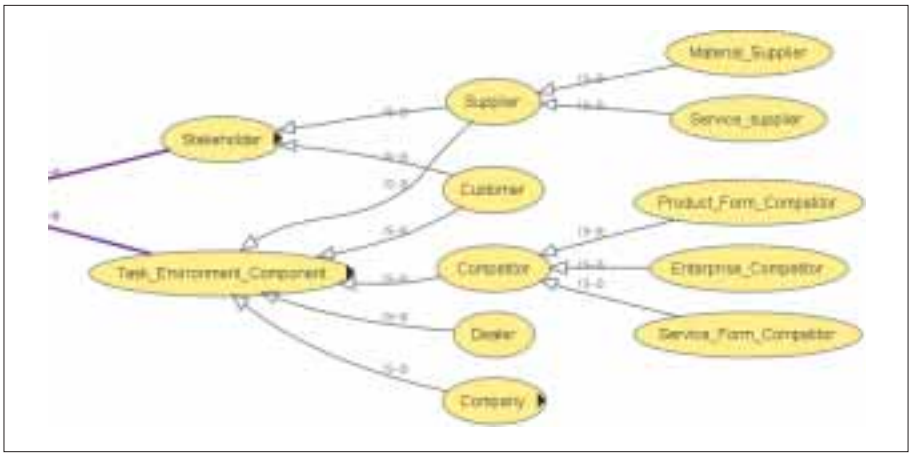

Figure 1: Snapshot of General Marketing Ontology

mining techniques. The searching process will rely on ontologies. In AMI-SME two kinds of ontologies are used:

- A higher level ontology named the general marketing ontology (which presently has around 250 concepts) intended to identify and formalize the most relevant concepts related to marketing and internalization processes
- Some lower level ontologies called the project ontologies. These ontologies are designed to cover a specific enterprise domain. They contain, for instance, exhaustive information about details concerning products, competitors, and other companies related to the enterprise.

Being coded in the Owl language the ontologies can be used on the future semantic web. In the AMI-SME project the ontologies will have two functions:

- To support the user in better specifying his information needs. When a user wants to query an IR system he or she has a vague idea of his/her information needs. Without a detailed knowledge of the subtleties of the retrieval environment and the characteristics of the document collection it is very difficult for the user to formulate a good question. It is obvious that the first attempt of formulating a question should be treated as unsatisfactory. Using the ontology the user can refine his query thus enhancing both the precision and the recall of the system.
- To categorize the searching results. In our case categorization is the task of assigning to the search results one or more categories from the general marketing ontology and the project ontologies. An automatic classification component can label the Search Result Document (SRD) with the concepts. Such a categorization can be manually changed by the user. The user can then select a category of interest to him and see all the related information in the search results. For example he can specify that he wants to see all the search results that were categorized under the competitor label.

In addition the AMI-SME system will support many other functions, the most important ones being:

- Starting a search periodically that is at a given time or event-based. This includes monitoring of specified sources on a regular basis as well as repeated queries.
- Supporting predefined strategies (guided search) to find information for satisfying a given information demand. Such a generic search strategy describes, among other things, questions and information sources. It is based on the consulting methods »competition forces« and »marketing mix«.
- The AMI-SME solution is based on English ontologies (the notation for the ontology concepts is English) during the project. It will be possible to manually translate the ontologies into other languages to support the information retrieval in other languages. In addition, a link to web services for semi-automatic translation might be provided, marking that this rough translation is less reliable.
- Clustering of search results, that is grouping the search results according to their similarity.
- Summarization of the search results, that is the presentation of the essential information of a document or of many documents.
- Categorization of search results, that is assigning one or more already known categories to the search results.
- Offering selectable functions for the analysis of the information in the results, such as visualization, statistical methods, expert qualification, etc.
- Allowing the relevant information source detection for a new country or a new industry according to a given generic description of information source categories.
- Information extraction from annotated internet information sources and from other information sources.
- Generation of interesting reports from the returned documents.
- Name Entity Recognition, that is identifying the name of organization, people, dates, etc in the retrieved documents.
- Presentation of the results in the original language and automatic translation of the abstract into English.
- Allowing the users to adjust their system according to personal preferences, country, industry, language, and project or product.

Conclusion

The AMI-SME solution is dedicated especially to SMEs that do not have the capacity to conduct detailed market analyses on their own. They will be provided with a general framework that assists them in their internationalization process.

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Using Topology Representation for Comparison and Retrieval of CAD Models

Olga Symonova, Giuliana Ucelli

German Abstract

Die Suche und der Abgleich von 3-D-Modellen ist für Leute, die kreative Design-Prozesse durchführen, eine zeitraubende Tätigkeit. Viele Versuche wurden schon unternommen ein einheitliches Erkennungswerkzeug für 3-D-Modelle zu erarbeiten, um eine Formabfrage effektiver zu machen. Die erweiterte topologische Struktur eines Reeb-Graphen erfasst typische Merkmale von CAD-Modellen, er ist kompakt und stabil gegenüber affinen Transformationen. Auf Grund dieser Eigenschaften sind Reeb-Graphen gut als Schlüssel bei der Recherche von 3-D-Modellen im Web und in Firmen-Datenbanken geeignet.

Introduction

Several years ago the process of designing a car took some years. The advent of CAD technologies has reduced this period by more then 50 percent. More and more technologies have appeared aiming at easing work and reducing intervention in the industrial process. But creative processes like conceptual styling do not follow predefined paths and no machine so far has succeeded in replacing human inventiveness.

One way to ease the work of designers is to support their creativity, optimizing the process of reuse of existing design solutions. In the creative process designers search for sources of inspiration gathering material of various types, e.g. newspapers, magazines, pictures, videos, and 3D models.

The bloom of the Internet and the increasing amount of information in it allows designers to find a ready model or its components rather than designing the model from scratch. They could also take inspiration from previous concepts and shapes stored in the companies' databases.

There are thousands of 3D models available on the Internet and in company databases, but still there exists a problem of performing their retrieval efficiently. Modern search engines perform retrieval of 3D objects based on their natural language description. Obviously such an approach does not give good results when dealing with non-text-based content. For 3D models natural language descriptions are usually derived from the name of the file or comments made by the author. Such annotations cannot provide enough information about the 3D object, or can be ambiguous and thus give poor retrieval results.

Another solution can be the analysis of the geometry/morphology/topology of the model, which is independent of natural language-based annotations. 3D models are usually represented by polygonal meshes or clouds of points, or other formats that are easily convertible to mentioned representations. Of course direct comparison of hundreds of points will not give any result. Shape matching should be performed by using a description of the object which has lower dimension but at the same time captures its features. Moreover, models in a shape database or on the web are posed occasionally, have different scales, can have missing or overlapping parts. Thus a shape descriptor

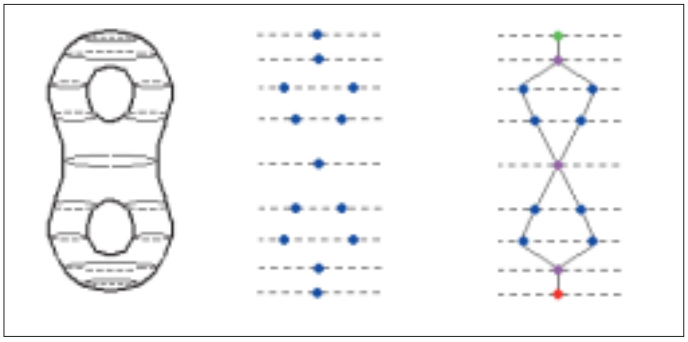

Figure 1: Constructing Reeb graph: extracting isocontours and determining critical nodes

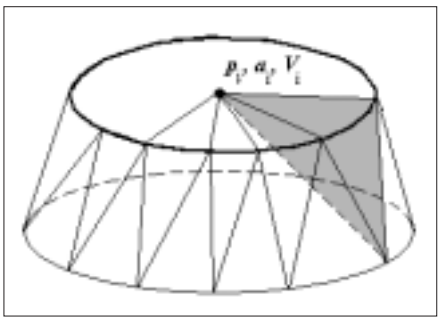

Figure 2: Augmenting nodes of the graph with geometrical information: perimeter of isocontour, area, and volume of the adjacent region

should be robust enough to overcome such transformations and defects.

Well-known examples of shape descriptors are shape distributions that allow to distinguish 3D models in broad shape categories (e.g. airplanes and chairs). Fourier transform and spherical harmonics with usually binary function defined on the voxel grid provide rotation-invariant shape descriptors. These shape descriptors do not perform shape retrieval equally on different types of models. Thus the shape distribution approach gives the best results of retrieval within categories of models with simple topology.

Graph structures are used in computer graphics to encode topological and geometrical information of a shape. Medial axes are widely used in image processing. The edges of the skeleton represent elongated areas of the image whereas the nodes encode regions where the elongated areas connect. Working with 3D models the computational cost of medial axes increases as the structure contains medial surfaces and not linear elements.

Reeb graph was introduced in the field of Computer Graphics in 1991 by Shinagawa et al. and turned to be a powerful structure for shape coding in different applications.

Topological structure of Reeb graph for CAD models

In the frame of Aim@Shape (http://www.aimatshape.net/) NoE European project together with the Institute of Applied Mathematics and Information Technology (CNR-IMATI) we propose to use the topological structure of the Reeb graph for model representation.

Reeb graph is defined on the real value function $f: M \rightarrow \mathrm{R}$ as an equivalence relation $(P, f(P)) \sim (Q, f(Q))$ where $f(P) = f(Q)$, and P and Q are in the same connected component of $f^{-1}(f(P))$. Therefore Reeb graph breaks into one element the points of the manifold M from the same connected component having the same value of the real mapping function f.

According to the mapping function defined on the shape, the Reeb graph can be invariant to affine transformations. The geodesic distance function and the distance from the barycentre allow to construct rotation and translation invariant Reeb graph, whereas the graph built using height function is not rotation invariant but corresponds to intuitive expectations of the skeletal structure of the model. Nodes of the Reeb graph represent critical regions of mapping function, and consequently topological changes of the shape. An edge connects two nodes in the graph if the corresponding regions are adjacent in the boundary representation of the model. Moreover Reeb graph gives an opportunity to reduce the representation of a model from 3D dimension to 1D graph structure. As a result, Reeb graph can be used as a descriptor of a shape, it is compact, captures the topology of a model, and it is invariant to affine transformations.

The construction of the Reeb graph starts from defining the mapping function and slicing the model into parts that correspond to the equal intervals of the mapping function. Each slice of the model is represented as a node in the Reeb graph. Adjacency of regions is represented by edges that connect corresponding nodes. Detection of critical nodes in the graph is performed through the evaluation of the value of the mapping function on the adjacent slices. Since the Morse theory states that there are no topological changes along the edges, topological changes correspond to the critical points of the mapping function and consequently to the critical nodes in the Reeb graph.

The efficiency of the Reeb graph has already been studied for free-form models, but its application for such models is limited because the graph is sensitive to the connectivity of the boundary representation, which is often violated.

In Computer Aided Design, models are usually created precisely, with particular attention to avoiding holes and overlaps in the boundary representation due to industrial and manufacture requirements. This gives the possibility to apply Reeb graphs as search keys for 3D CAD models in the retrieval process. Furthermore, models used in industrial processes are usually provided with defined orientation, which allows to construct Reeb graphs based on the height function in the defined direction.

The intent is to examine the effectiveness of different mapping functions for the construction of the Reeb graph and to explore the possibility of using Reeb graphs to capture characteristic features of CAD models like protrusions, inner cavities, and depressions, just to name a few. Augmenting nodes of a Reeb graph with geometric information on the corresponding shape will enrich the topological structure thus improving the accuracy of the results during the retrieval process.

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Sketch-based Intelligent Shape Modeling System for Conceptual Designing

Li Han, Giuseppe Conti

German Abstract

Im CAS/CAD-Bereich hat der wachsende Einsatz von Schnittstellen zum Freihand-Zeichnen bei der Modellgenerierung einen höheren Grad an Freiheit in den Entwurfsprozess gebracht. Die vorgeschlagenen Interaktionsmethoden sind jedoch noch weit entfernt vom typischen Prozess der Verfeinerung, der normalerweise von grob nach fein und schrittweise durchgeführt wird. Weiterhin kann ein solches System nicht verwendet werden, wenn Informationen auf einer höheren, semantischen Ebene entschlüsselt und gehandhabt werden müssen. Wir präsentieren eine ansprechende Interaktionstechnik, die den schrittweisen Verfeinerungsprozess, der typisch für konzeptionelles Entwerfen ist, unterstützt. Weiterhin werden adaptive Benutzer-Modellierungstechniken verwendet, mit einer innovativen Entscheidungsbaumstruktur für den verfeinerten Entwurf.

Introduction

The capability to design innovative products is a key factor to foster the competitiveness of industrial products. In particular, the conceptual design phase plays a strategic role since the creativity and synthesis, which characterize it, are of great importance for the design of an industrial product. Therefore, it appears clear that, in order to boost efficiency and enhance creativity, innovative and adequate tools have to be developed.

Recent years' experience suggests that a great improvement to the design of such tools can be introduced by improving their level of »intelligence«, i.e. the capability to discern commands expressed by the user. This new tendency will yield a new generation of systems capable to dynamically adapt to designer needs, in opposition to current systems that require designers to adjust to the technology adopted. The new generation of design systems in fact should be able to understand the designer's behavior. That is, they should be able to comprehend the users' actions, the way they identify a shape or they interact with the drawing tools during the design process. Finally such a system should present the information provided to the user in a flexible, efficient, and supportive manner.

The aforementioned requirements have fuelled recent years' research on sketch-based modeling systems. These allow the user to quickly create 3D models through simple freehand strokes rather than by typing in parameters. However, the majority of these systems propose interaction metaphors which are far from the designer's traditional approach, typically featuring a top-down and stepwise refinement process. Furthermore, they cannot be used when information at a higher, semantic level is to be decoded and manipulated.

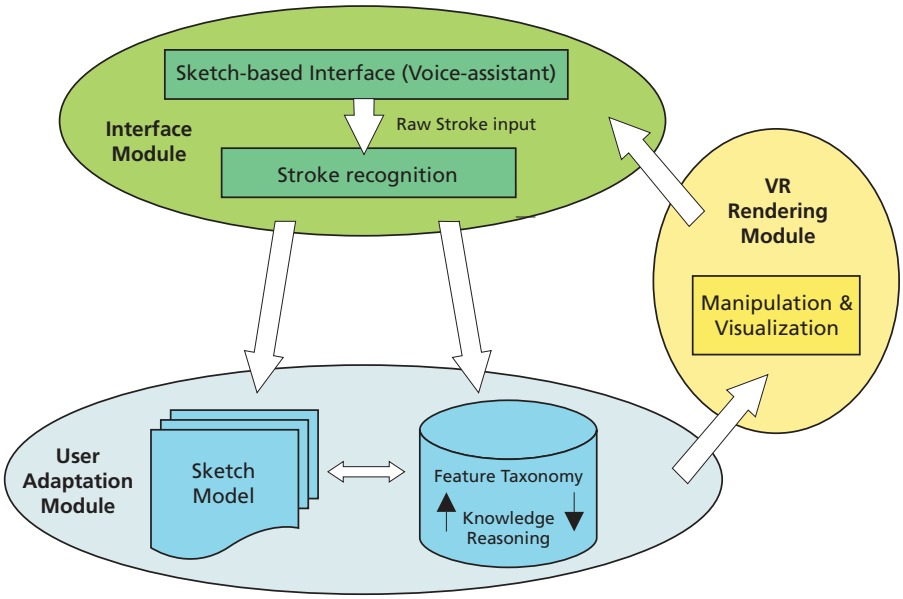

Figure 1: The proposed architecture for sketch-based modeling system

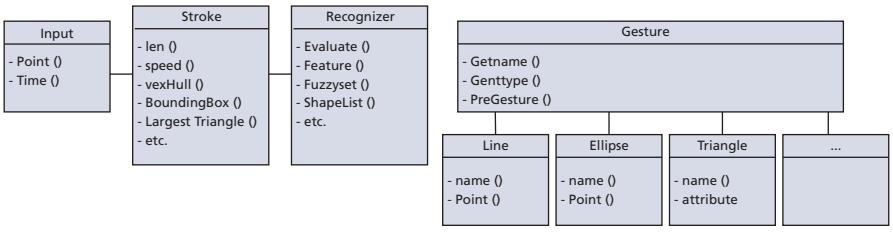

Figure 2: Class diagram for the stroke recognition

Here we are trying to improve the intelligence of interaction techniques of sketch-based interfaces; we have proposed an adaptive user modeling technique by introducing an innovative decision-tree structure for top-down designing. Our final 3D models can be described by roles, properties or constraints, which can be reused in other applications, for instance 3D models Retrieval and Shape analysis and so on.

Architecture for Sketch-Based Modeling Systems (SBMS)

We have considered the process of sketching as the information flow from/to the designer's brain. For this reason the sketch-based system developed had to be able to show the evolution of the corresponding designing behavior by providing intelligent reasoning of the user's input. As illustrated in Figure 1, the proposed architecture for such a sketch-based modeling system consists of an interface module, a user adaptation module and a rendering module.

The interface module provides the interactive behavior and it supports stroke recognition. Since usually the raw stroke input information is unclear, the module plays a key role for the effective extraction of geometric features and constraints. At this stage we analyze the input and we obtain the speed, length, vertex sets, other object attributes and so on. Then, based on the evaluation of these features and corresponding fuzzy sets, we assess the shape and save it within a shape list, as illustrated in the class diagram of figure 2.

The user adaptation module accepts such basic information (e.g. geometric and topological constraints, basic geometric entities, and time sequences) and it processes them through a stepwise refinement process. To do so the module constantly extracts attributes from the latest sketches arriving from the interface module through a series of real-time operations. This data is then transformed according to the constraint solving model adopted. Eventually the final models will be saved in a model database where the description of the relevant attributes of each model is kept.

Finally, the rendering model performs the post-processing and visualization process allowing the use of tailored representation such as non-photorealistic rendering or alike.

Responsive Interaction Based on Sketching

In order to be able to retain the differences between users' drawing styles and to enable the user to generate graphic objects of higher complexity, we have introduced a »responsive« interaction mechanism which can dynamically adapt to the constraints defined by the user's input (see Figure 3). Its implementation is based on a decision-tree structure in the user adaptation module (cf. figure 4).

During the process of recognition, each stroke will automatically activate the user adaptation module which performs the constraint reasoning and the matching process according to the extracted properties. Here we introduce an adaptive decision-tree to manage the reasoning process based on parameters and constraints ranging from low level to highly semantic level. The higher-level semantic models can be described by a series of composite constraints and basic objects (see Figure 5), so that they can be reused in other applications. In general the approach proposed is truly incremental since each stroke links to the information about the previous one and it depends on the constraints defined up to that point. Furthermore the featured database

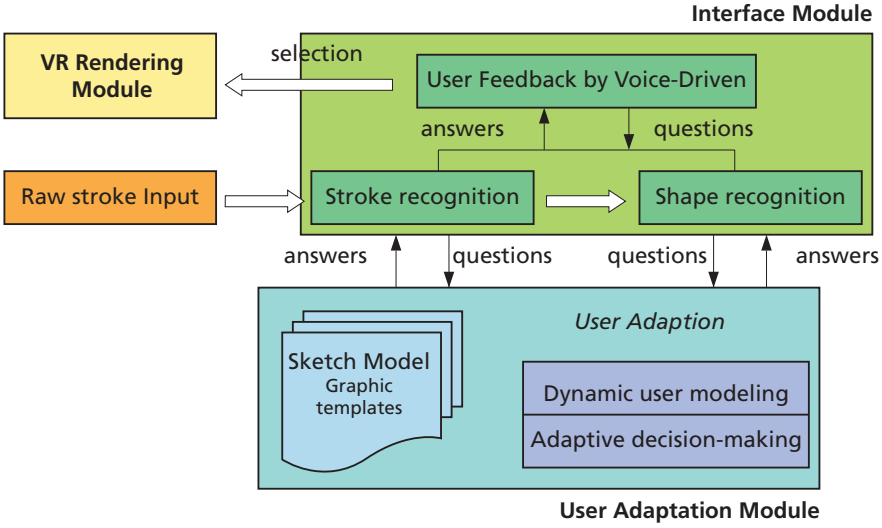

Figure 3: The framework for the responsive interaction mechanism

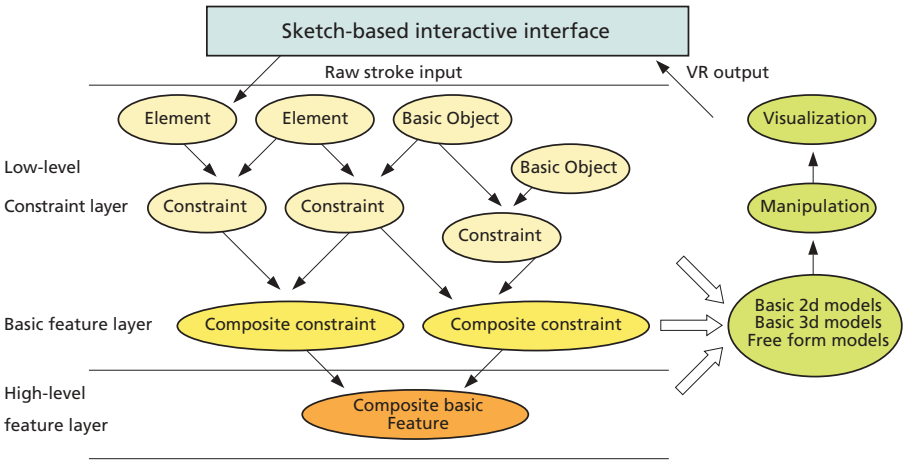

Figure 4: The reasoning tree structure in the user adaptation module

can be extended through the insertion of new constraints and new nodes.

Conclusion and Future Developments

In this paper, we introduce a sketch-based conceptual design system, which aims at achieving the stepwise refinement process that is typical of the early stages of the design process. The system presented, features an adaptive decision-making mechanism which is capable of understanding complex objects thanks to an efficient reasoning method. This approach naturally fits into the normal workflow since it seamlessly integrates into the natural process of sketching. The user in fact is not asked to interact with menus or buttons. Instead the method, based on the analysis of partial structure similarity, is at the same time efficient and user-friendly since it provides the designer with a series of possible alternatives to choose from while he/she is sketching. Moreover by improving the representation of the graphical object and the logic behind the reasoning technique, the method presented can easily adapt to the designers' graphical styles making it very robust and reliable to use.

Future developments will try to further improve the constraint reasoning technique. In particular we will look for a better representation of high-level features through semantic description.

Points of Contact

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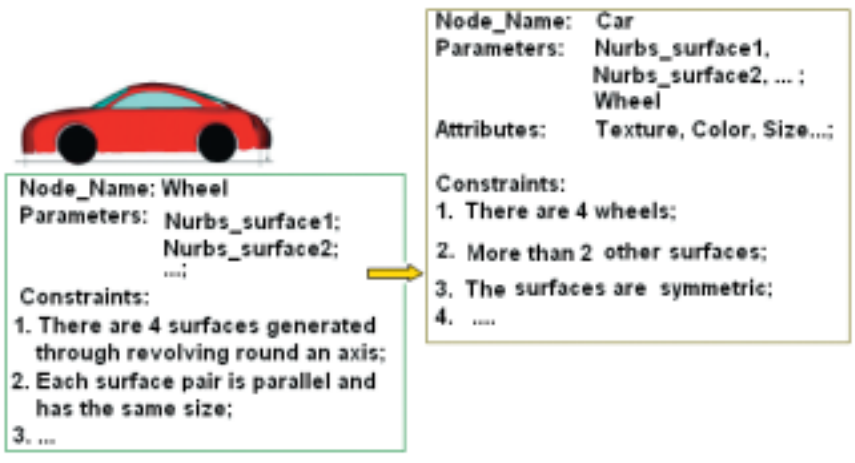


Figure 5: Semantic description of 3D models

CSSIR – Car Blueprint Image Retrieval Using Sketch and Spatial Information

Minh-Son Dao, Raffaele de Amicis

German Abstract

CSSIR ist eine Anwendung, die die Suche nach Blueprint-Bildern unterstützt. Diese Anwendung hilft dem Benutzer aus einer Blueprint-Datenbank ein gewünschtes Auto herauszufiltern, und das nicht nur mit Hilfe von Textinformationen (z.B. technischen Parametern) sondern auch geometrischen Informationen (wie Skizzen, Perspektiven) und räumlichen Zusammenhängen (beispielsweise semantischen Inhalten). Während die meisten Anwendungen zur Abfrage von Bildern, insbesondere Auto-Blueprints, nur Text- oder geometrische Informationen bzw. beides, verwenden, wurde CSSIR als kompaktes Werkzeug gestaltet, welches dem Benutzer eine flexible Methode anbietet, ihre Anfragen der menschlichen Perspektive anzugleichen.

Introduction

The car industry itself offers a lot of interesting things which are related to engineering, artistic, economical, and personal fields. Although each field has its own different aspects to consider, there is one common requirement - searching, comparing, and classifying cars.

Given a desired car, there is a huge number of methods for users to describe how such a car looks like in their perspective. The desired car could be described by text - its technological parameters such as perimeter of wheels, distance from top of roof line to base line, etc., or by freehand sketch - some major drafting sketches such as wheels, volume, waist line, and accent line, etc. Then, the users try to find in their car database those cars matching most of the features »looking like« the features they described.

This process can be considered as content-based retrieval, especially image retrieval where the query is explained rather by freehand sketches than text. Content-based retrieval has already been paid attention to by researchers for decades. There are quite a few applications and algorithms which have been proposed for content-based retrieval, ranging from

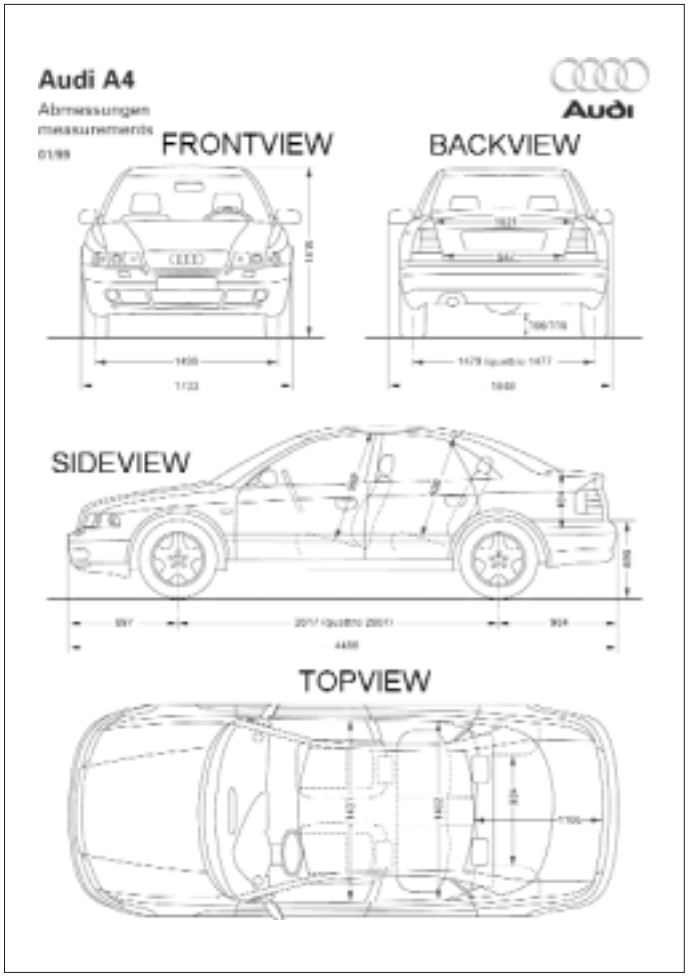
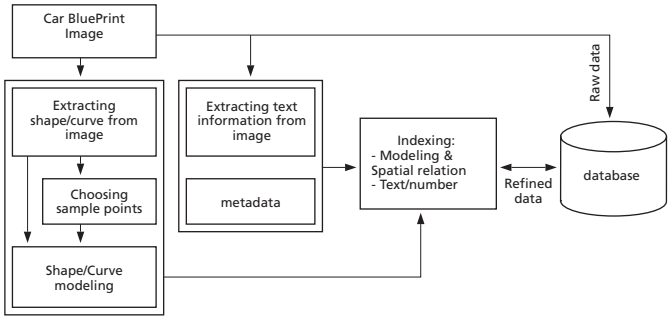


Figure 1: Example of car blueprint image

Figure 2: From drawn raw data to normalized data



military, civil, to personal areas. These show that it is possible and worth while applying content-based retrieval and computer graphics techniques, to build a system which can serve the demand of searching, comparing and classifying cars.

CSSIR has been designed as an application to retrieve a car from car blueprint image databases. The major characteristic of CSSIR is to offer the users a flexible way to make their queries according to the human perspective.

Overview of CSSIR

CSSIR is constructed with three layers, (1) a user layer where users are offered interface tools to order their queries, (2) a query layer where the core of our system is located, (3) a database layer where the raw database and the normalized database are stored and indexed.

– *User layer*
The major role of this layer is to offer a visual interactive interface by which users can describe their queries. Beside a tool of freehand drawing, a set of fundamental geometric elements is carefully designed such as line, poly-line, chord, etc. in order to make the users feel free to drawing their queries. Another mission of this layer is to browse the results after doing the query. This layer enables the user to scroll ranking results and choose the best results under the user's point of view.

– *Query layer*
This layer undertakes a searching process. It ranks and returns ranking results to the user layer. Moreover, its responsibility is to analyze a query sample which is converted from the user query into features and to start the searching engine.

– *Database layer*
This layer manages all type of data involving raw data - car blueprint images, normalized data - feature data by which indexing and querying schemes are constructed, and metadata - all technical information of cars such as the distance between two wheels, etc.

Conclusions

Up to now, CSSIR has proved that integrating text information, geometric information, and the spatial information flexibly meets the query requirements of users from a human perspective, especially in the car technology area.

In future, the automatic number recognition scheme will be studied and integrated to the pre-processing stage in order to update the technological parameters of cars (e.g. distance between two wheels, distance from rear to back wheels) to metadata in order to decrease the burden of effort and time when constructing a database.

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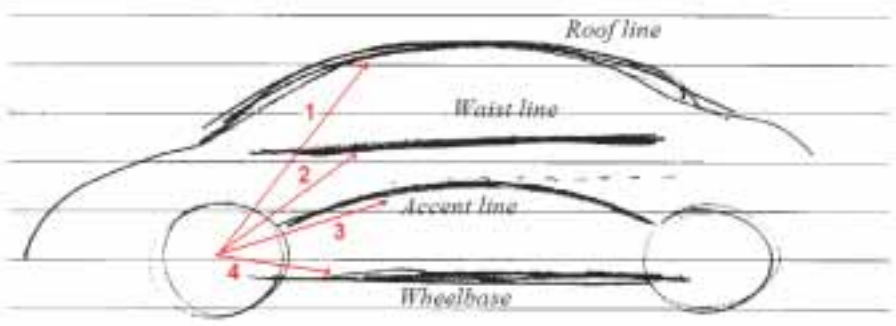

Figure 3: Spatial relationships

Climbing the Ladder with New Media – and Staying There

Wrene Robyn

Advancement, promotion, recognition - who of us does not dream of getting ahead? To be able to keep up with the job market and to stand out from the mass of job applicants it is important to further qualify. Advanced training will add to your chances to make a great leap forward. And if you want to work with an international enterprise it is often indispensable to have international experience.

Seven years ago, the founders of The IMEDIA Academy, located in Providence, Rhode Island, USA realized the importance of advanced training combined with international experience in the multimedia domain. Since 1998 they have been offering the interdisciplinary supplementary/postgraduate International Certificate Program for New Media (ICPNM). This program is supported by the INI-GraphicsNet Foundation and the Technical University of Darmstadt and realized in close cooperation with the Rhode Island School of Design. In April of 2005, following a stringent review of its curriculum and educational practices, The IMEDIA Academy was granted U.S. national accreditation by the Accrediting Council for Continuing Education and Training.

ICPNM combines multimedia technology with design, media management, and marketing and so closes the gap between four essential vocational fields of today. In the courses, seminars, workshops, and discussion rounds of ICPNM the participants learn to handle existing and emerging new media technologies and applications with the guidance of internationally experienced lecturers. »We address key aspects like 3D Modelling, Multimedia Design, Information Visualization, and Creative Marketing. ICPNM does, however, not only impart facts but sets the same value on the so-called soft skills. This is why teamwork, product presentation, and project management are an inherent part of the course scheme,« Dr. Jörn Kohlhammer, department head at Fraunhofer IGD and ICPNM lecturer, explains.

The IMEDIA Academy offers the program twice a year in Rhode Island. There, participants from all over the world get the skills necessary to forge ahead in their careers. 22 weeks of full-time training in Providence followed by an intensive four-month internship in an international enterprise (plus orientation and travel weeks) optimally prepare the participants for

Figure 1: In small groups it is easier to learn (Photo by Josh Baker)

German Abstract

Um heute auf dem Arbeitsmarkt mithalten und seine Karrierechancen verbessern zu können, sind Zusatzqualifikationen und Auslandserfahrung von großer Bedeutung. Seit 1998 bietet die IMEDIA Academy in Providence, Rhode Island, USA, das interdisziplinäre Ergänzungsstudium International Certificate Program for New Media an, das Multimediatechnologie mit Design, Media Management und Marketing verbindet. Das Programm, das aus 22 Wochen Vollzeit-Unterricht und einem viermonatigen Praktikum besteht, wird zweimal jährlich durchgeführt. Zu den Stärken des ICPNM-Studiums gehört aber nicht nur der Erwerb der fachlichen Qualifikation, sondern auch die Vermittlung der so genannten Soft Skills und die multikulturelle Zusammenarbeit der Teilnehmer. Absolventen aus aller Welt berichten von guten Erfolgen und besetzen Positionen in fast allen Bereichen der Neuen Medien. Die Anmeldefrist für das nächste Programm, das vom 9. Januar bis Anfang Dezember 2006 läuft, endet am 9. Dezember 2005.

their later tasks. »The content of the program opened new doors for me,« the former ICPNM participant João Perreira from Portugal explained. And, indeed, graduates of the International Certificate Program for New Media have occupied positions in nearly all domains of the new media industry, including information technology, game design, and online banking.

»I don't know any study course in Germany imparting the knowledge necessary for multimedia projects in such a compact and practice-oriented manner,« Mark Bernhardt, who has successfully completed the program, tells us. Greg Nunamaker, participant from the USA, adds: »The technical courses were taught with graphic design and interaction in mind instead of just straight math and analytical theories.«

Among the participants you find graduates of the branches of computer science, electrical engineering, arts, and design, but also professionally experienced people and career changers. The participants not only appreciate the expertise they gain by participating in ICPNM, they are also impressed by the multicultural collaboration. Within the IMEDIA Academy Europeans are sitting next to Asians, Americans to Africans, and every single one of them contributes to the vitality of the program. This is a strong point of the ICPNM studies, according to João Perreira: »I loved the multicultural aspect. It was great making friends from other cultures.« Lecturer Natalia Onufrieva too is enthused: »It is a unique group of students, all coming from different backgrounds, but very dedicated, very creative, and making great accomplishments.«

Figure 2: The ICPNM study courses reside in an ample building in the heart of Providence

David Bellino, an ICPNM graduate, proves how successful the training with the IMEDIA Academy can be. During his ICPNM internship in 2004 he supported the U.S. Navy in developing unmanned undersea vehicles. Due to this collaboration the U.S. Congress allocated a joint project to an association of companies, universities, and state institutions, managed, among others, by The IMEDIA Academy. Today, one year later, David Bellino is product area manager with the U.S. Navy responsible for the development of such unmanned undersea vehicles.

Kelly Driscoll, director of Digication, an internship sponsor, says: »I have had great experiences working with the IMEDIA students and graduates and hope to continue such relationships in the future.« Matthew Mellone, senior designer with toy producer Hasbro, a business also sponsoring internships, sees the ICPNM graduates as top candidates for vacancies in the design area.

Preconditions for participation in ICPNM are good English language skills (TOEFL test), two years of successful studies or equivalent professional experience in the fields of computer science, engineering science, architecture, arts, design, education, humanities, or digital media (or related areas), as well as basic knowledge of EDP and mathematics.

The next program will start on 9th January 2006 and will finish early in December 2006. The term of application ends on 9th December 2005. Per semester the International Certificate Program for New Media offers a limited number of places. The order of allocation follows the receipt of application. International participants needing a visa are especially recommended to register early. Those applying before 15th October 2005 will get a tuition discount of 1,000 US dollars.

Further information and application documents are available in the Internet under: http://www.icpnm.org/

Figure 3: Interactive Virtual Aquarium: Project work of an ICPNM participant in the field of 3D Modeling, Animation, and Human-Computer Interaction

Point of Contact

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Certify your future – the New

A tailor-made qualification program is a decisive factor for corporate success in the long term. Qualified employees fully utilize creative processes, enabling their employers to reach leading positions in the market.

The IMEDIA Academy in Providence, Rhode Island, USA therefore offers a qualification and continuing education program for New Media that is designed to meet the specific demands of enterprise. imedia's close cooperation with industry and economy reflects the increasing importance of New Media:
A company that trains its employees today, will have the competitive advantage tomorrow.

THE imedia ACADEMY

Experts of international repute present state-of-the-art curriculum combined with the latest research outcomes from the field of information and communication technologies. These are, amongst others:

- 3D 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 the Windows and Macintosh platforms

In addition, the participants learn to broaden their horizons e.g. by:

- Design As Process: Problem Identifying/ Solution Seeking
- Communications: Processes and Products
- Technology Evaluation and Integration
- Media Management

You will find further information on the internationally recognized certificate, application deadlines, procedures, and tuition fees online at www.imedia.edu, or you can contact us directly:

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» *I have specialized in 3D animation, visualization and web design, and I have been working for exhibition planners, urban planning architects, artists, computer scientists and architects.* «

Klaus Lehnhard, Germany, owner of a company

» *I've been able to use the design skills I learned in IMEDIA to further develop the corporate image of the company.* «

Catherine Mireille Ferrari, Philippines, Corporate Communication in Thailand

» *Now I'm involved in projects related to human interaction in Virtual and Augmented Reality environments. I use multimedia software that was introduced to me in IMEDIA classes.* «

Pedro Branco, Portugal, Ph.D. student of human computer interaction

Media Program IMEDIA

Scholarship for International Certificate Program for New Media

The INI-GraphicsNet Foundation in Darmstadt, Germany, offers promising candidates scholarships esp. partial scholarships. Interested candidates should submit their applications as soon as possible. Candidates who submit applications prior to first round application deadlines have the best chance of success, as later applications can only be considered if funds remain available.

Point of contact for scholarships

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www.inigraphicsnet-stiftung.de

The Academy

In 1998, the IMEDIA Program was founded as a joint venture by the Rhode Island School of Design (RISD) in Providence, the INI-GraphicsNet Foundation in Darmstadt, and the Technische Universität Darmstadt (TUD). The aim was to create an internationally recognized and unique qualification program for interactive digital media. The Academy, established in 2002, works closely with universities, research institutions and affiliated companies in Europe, Asia and the USA, uniting academic research with the principle of life-long learning and entrepreneurial innovation.

Partnerships with various companies show the increasing industrial significance of New Media. Through its Industry Forum, imedia collaborates with Bertelsmann Media-Academy, Burda Medien, Daimler Chrysler, SAP, Siemens, as well as with Siemens Business Services and Telekom Business Academy. Two subsequent program levels for New Media are currently under development. With its educational offerings, particularly the International Certificate Program for New Media, The IMEDIA Academy uniquely complements the qualification branch of the INI-GraphicsNet.

Managing Member Institutions

INI-GraphicsNet Foundation Darmstadt; Germany

Technische Universität Darmstadt; Germany

Further Members of the ICPNM University Consortium

Ewha Womans University, Korea

Nanyang Technological University; Singapore

Universidad del País Vasco Euskal Herriko Unibertsitatea The University of the Basque Country; San Sebastian; Spain

Università Degli Studi Di Trento, Trento; Italy

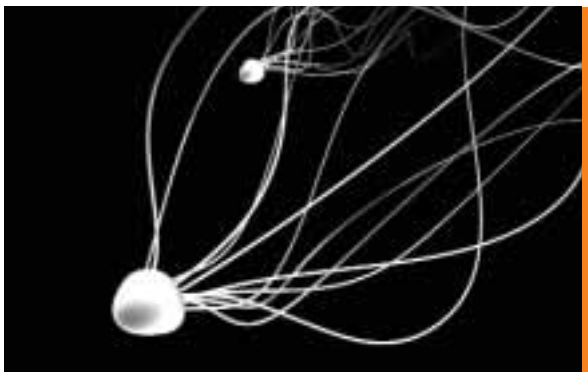
Universidade do Minho, Braga, Guimarães; Portugal

Rhode Island School of Design Providence, Rhode Island; USA

The Peter Kiewit Institute, University of Nebraska, Omaha; USA

University Rostock, Rostock; Germany

University of St. Gallen, Switzerland



CONFUO©O – Secure and Legal P2P Filesharing

Peter Ebinger, Martin Schmucker

German Abstract

Der Schutz geistigen Eigentums (engl.: »intellectual property rights«, IPR) ist ein wichtiges Anliegen jedes Rechteinhabers. Ungenügender IPR-Schutz hat zur Folge, dass Rechteinhaber ihre Inhalte nicht zur Verfügung stellen, solange nicht ein Minimum an Sicherheit gewährleistet ist. Insofern hat der Mangel an IPR-Schutz auch für den Verbraucher spürbare Folgen.

Technologieentwickler haben versucht, die Interessen der Rechteinhaber zu untersuchen und identifizierte Anforderungen zu erfüllen. Diese Bestrebungen führten schließlich zur Entwicklung von Digital Rights Management (DRM) Systemen.

Leider werden die bisher verfügbaren DRM-Systeme nur zu einem geringen Teil den Anforderungen gerecht. Insbesondere werden die Rechte der Verbraucher nur ungenügend berücksichtigt.

Die Verbraucher sind daran interessiert, dass Inhalte verwendet werden können. Folglich vermindert eine Technologie, die die Verwendung des Inhalts einschränkt, den Wert des Inhaltes. Dies trifft auf aktuelle DRM-Systeme zu: Sie schrecken den Verbraucher ab. Die »Abschreckung« potenzieller Käufer kann offensichtlich nicht im Interesse der Rechteinhaber sein.

CONFUO©O berücksichtigt die Anforderungen der Verbraucher an Nutzbarkeit und das Interesse an IPR-Schutz der Rechteinhaber. Es handelt sich um ein legales P2P-Vertriebssystem.

The protection of intellectual property rights (IPR) is a significant issue for content and rights owners. Due to insufficient IPR protection, they tend to distribute their content reluctantly. Technology developers have tried to address the needs of content and rights owners. These endeavours resulted in the development of digital rights management (DRM) systems. Unfortunately, existing DRM systems so far only meet a very small range of requirements. Especially, consumer requirements are not considered sufficiently.

From a consumer's point of view, content usage is important. As a direct consequence, technology that restricts content usage limits the value of the content: existing DRM solutions do in fact reject consumers.

In contrast to this, CONFUO©O considers the consumers' demands on usability and the content creators' and owners' quest for IPR protection. It is a P2P distribution framework where the content exchange is in accordance with IPR. Thus, users can be sure that they act within the legal limits.

Characteristics

CONFUO©O initially was developed to support new or niche artists. The major design requirement was that content exchange in CONFUO©O has to be in accordance to IPR. Furthermore, traditional content usage should not be impeded.

But the main assumption for CONFUO©O is that consumers are not bad: They prefer legal solutions to illegal exchange. As a consequence, CONFUO©O's aim is not to protect individual content by locking it in a secure container. Instead CONFUO©O is a P2P-based distribution platform for the secure and legal distribution of unencrypted content. Its main characteristics are:

– *Cost transfer to the participating peers*: CONFUO©O is based on P2P. Each peer contributes to the network with storage and

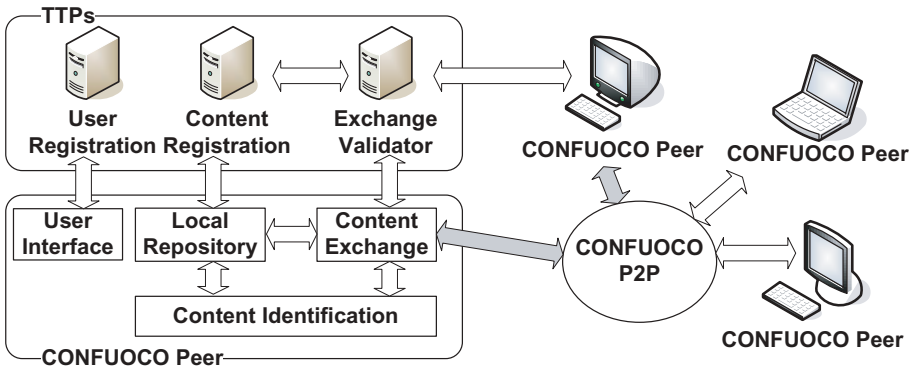


Figure 1: In the CONFUO©O system, trusted third parties (TTPs) are responsible for content registration and user registration and authentication. Each content has to be registered to a user before it can be distributed within CONFUO©O. The peers mutually observe each other and report foul peers. Foul peers are reported to the exchange validation TTP in a provable way.

Figure 2: This figure shows the system's feedback if the user wants to distribute content that is not registered: Content that is unknown to the CONFUO©O system has to be registered prior to its distribution by a user who is responsible for the distribution of this content. Unregistered content is not distributed within the CONFUO©O system.

bandwidth. The distribution costs are totally transferred to the participating peers.
- *Secure and legal exchange*: Content cannot be distributed unless it is registered to the user who first enters it in the network. CONFUO©O identifies the content distributed within. Thus, new content can be identified easily. And it can be filtered and registered before entering CONFUO©O.
- *Support of a wide range of business models*: The content owners can choose their favourite business model for each piece of content. CONFUO©O supports the distribution of free content as well as the distribution of content that has to be paid. In addition to these traditional models, CONFUO©O supports rights collecting societies and cultural »flat rates« as the distribution of content can be monitored without violating the privacy of its users.
- *Access to content*: In CONFUO©O content can be distributed without additional security mechanisms, e.g. encryption. This has advantages for users as they can enjoy content on their favourite device without facing the obstacles of current DRM incompatibilities.
- *User privacy*: Current DRM systems control content usage. Thus each access to content is monitored and sensitive user information (e.g. in the license) is exchanged with each access. As CONFUO©O only restricts content distribution this access-based information is obsolete.
- *Identification of cheating peers*: The implemented protocol ensures mutual observations of the peers: P2P networks are designed for data exchange. In CONFUO©O data exchange with one unmanipulated peer is sufficient to identify a cheating peer. Thus, the risk for a potential misuser of being identified is very high and fraud players will use alternative technology for the illegal exchange of content.
- *User awareness*: Users are always informed about critical actions. They cannot distribute copyright-protected content unintentionally. CONFUO©O prevents them from illegal actions. Thus, a user can always be sure that her/his actions are legal.

Advantages

This design of a secure distribution platform based on P2P has several advantages including the following:

- CONFUO©O is a P2P-based distribution platform that provides a reasonable level of security. Customers are not deterred by technical obstacles that prevent the full enjoyment of content.
- Content owners can block or withdraw the distribution of their content within CONFUO©O.
- CONFUO©O allows the selling of content. The corresponding business model is separated from the distribution framework and can be chosen by the content owner individually.
- Users do not have to be afraid of downloading content illegally. Their actions within CONFUO©O do not violate IPR.

Summary

CONFUO©O provides a new solution for the secure and legal distribution of content. Users can be sure that they act within the legal framework. Nevertheless, the content creators or owners do not lose content control. They are always able to withdraw content published within CONFUO©O.

Due to its design, CONFUO©O also allows the distribution of DRM-protected content. Thus CONFUO©O supports a wide range of business models including flat rate and even rights collecting societies.

Point of Contact

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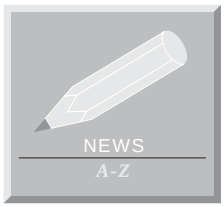

Eurographics - 25th anniversary

The Eurographics Association is the leading professional Computer Graphics Association in Europe. The first conference called Eurographics already took place in Bologna in 1979. The Eurographics Association itself was incorporated in Switzerland in 1980.

The international organization is devoted to the needs of professionals in computer graphics and all related visual disciplines. The Eurographics Association has very successfully promoted the field of computer graphics by encouraging scientific careers and by supporting the development of science and technology in this field. During the last 25 years, a number of research areas within graphics have evolved into distinctive fields, including multimedia, visualization, interactive systems, virtual reality, and computer animation. The Association provides a home for these communities through working groups and their workshops and through inclusion of these concerns within the annual conference.

The 25th Eurographics conference in Grenoble, France, in 2004 triggered a year-long celebration to mark the association's 25th anniversary. The celebrations ended with Eurographics 2005, that took place from August 29th to September 2nd in Dublin. The theme for the conference 2005 held on the campus of Trinity College Dublin in Ireland, was »The Evolution of Graphics: Where to next?«. With talk subjects like »Realistic or Abstract Imagery«, »Movie Making at Pixar« or »Evolution of Autonomy in Game Animation« the speakers presented new technologies, innovative techniques, research directions and challenges for the computer graphics sector.

Act Global – also necessary for small enterprises

New cooperation between INI-GraphicsNet Foundation and Irish Private Equity Investor helps young enterprises grow at an international level

On 11th Juli, 2005 the Darmstadt INI-GraphicsNet Foundation and the Irish Private Equity Investor ENTRE Ireland Ltd. signed a cooperation agreement.

The Eurographics chairpersons since its foundation (from left to right): Prof. Dr. Hans-Peter Seidel, Prof. Pere Brunet, Carlo Enrico Vandoni, Prof. Roger Hubbold, Prof. Dr. Josè L. Encarnação, Prof. David Arnold, Dr. Paul ten Hagen, Prof. Phil Willis, William Terence Hewitt, Dr. Jürgen Schönhut, Prof. Dr. Dieter W. Fellner

This new cooperation aims at supporting small and newly started businesses on their way to the international market. For this purpose the INI-GraphicsNet Foundation and ENTRE Ireland Ltd. will, among other things, carry out joint projects in the field of technology transfer, innovation, and start-ups, exchange know-how and expertise from their core areas as well as collaborate in the staff training. »From the cooperation, quite a number of synergy effects will develop, such as finding financial resources, granting expert advice for start-ups, or in public relations. This enables us to offer a very comprehensive support for a promising access to new markets,« Wolfgang Kniejski, executive manager of INI-GraphicsNet Foundation, is convinced.

Since 1999, INI-GraphicsNet Foundation have promoted the creation of spin-offs from research institutions and provided advice for scientists from INI-GraphicsNet ready to start a spin-off business. Here too, the global competition is of increasing importance. So even small and new businesses have to make foreign investments and enter new markets to be able to work successfully. This poses many challenges especially for young businesses, as they must adapt to new legal, political, social, and economic conditions.

The new cooperation between INI-GraphicsNet Foundation and the ENTRE Ireland Ltd. now affords an optimal support to the founders. »The long experience of the Foundation in supporting new high-technology companies together with the experience ENTRE Ireland Ltd. has in managing international companies, assure an optimal consulting and an excellent service to our customers. In addition they benefit from a unique network facilitating their access onto the international market,« explained Prof. Encarnação, founder and chairman of the INI-GraphicsNet Foundation, the benefits of the cooperation.

Lord J.E. Perth, chairman of ENTRE Ireland Ltd., also highly appreciates the cooperation and enjoys the lively discussions about »how we shall jointly address future challenges. I very much look forward to unifying their and our ideas and, by doing this, creating something new.«

Jubilee of ZGDV Rostock: 15 Years of Advanced Training for the Professional Career

For 15 years now the Computer Graphics Research Center Rostock (ZGDV) has offered training seminars and workshops for executives, professionals, job beginners, and students / Current seminar program with new course offers available

Key aspects of the seminar topics offered by ZGDV are IT themes in the domains web design, Java, image processing and design, supplemented by management and office communication courses. »The demand for advanced training has considerably increased in the course of time while the financial means of the interested clientele are more restricted. The time factor, too, plays an important role - companies are no longer able or willing to do without their staff in the daily business more than absolutely necessary,« so Eva-Maria Mahnke of the training department of ZGDV. »By offering specialized and compact courses we try to meet these requirements, for more and more people realize that advanced training is a chance to enhance their skills and position in the job market.«

Recently, many of the one- to two-day courses of ZGDV are held in the evening or weekend, so that very busy people, too, will have the opportunity to upgrade their skills.

The recently available seminar program meanwhile covers more than 150 course themes which are oriented towards the actual job market trend and so tailored to the needs of the particular occupational groups. »In addition, as a modern research institute we have the latest technologies and recent know-how so that we can grant a high quality of the seminars to our participants,« Mahnke continues.

The topics of the new seminar program are manifold: The offers range from professional design of your personal web presence, to success-oriented approaches for product development or digital photography and image processing, to enable interested persons to be fit for their professional career. Beside a sound knowledge the participants can also practice key qualifications, so-called soft skills. Social competences like team orientation and communication skills are more than ever valued with German enterprises: In today's job offers these skills are required as an absolute must. In small groups knowledge and skills of the learners are intensively developed and practiced in particular applications. After the successful participation of a seminar the participant gets a certificate.

The complete seminar program and the registration form is available on the Internet under www.zgdv.de. Further information can also be requested per e-mail to awf@rostock.zgdv.de

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Feldafinger Kreis - Trends in the Network

Six leading representatives each from industry and science constituting the Feldafinger Kreis are investigating the trends in the network to stimulate the Internet research in Germany. Among the members is also Prof. Dr. José L. Encarnação, director of the Fraunhofer IGD. The Feldafinger Kreis, by giving recommendations about how to proceed, helps intensify the dialogue between industry and science and gives assistance to quickly and efficiently turn research results into innovative products, services, and methods. The results of Feldafinger Kreis suggest the research work necessary in the future so that industry and science will follow the proper trends. At a symposium, the members presented an analysis of the competitive position of Germany in the research on »Self-managed Systems«, »Intelligent Software Agents«, »Web Services«, »Networked Smart Labels«, »Grid Computing«, and »Peer-to-Peer« and derived recommendations about how to proceed politically. The 12 experts presented the developed trends and the recommendations derived therefrom, a work involving about 100 German researchers, at the Symposium of the BDI at Haus der Deutschen Wirtschaft in Berlin on the 22th August 2005.

From left to right: Claus Weyrich, Anton-Hendrik Schaaf, Carsten Rolle, Hartmut Raffler, Hans-Albert Aukes, Günter Müller, Wolf-Dieter Lukas, August-Wilhelm Scheer, Jörg Eberspacher, José L. Encarnação, Gerhard Barth, Wolfgang Merker, Manfred Broy, Friedmann Mattern, Wolfgang Wahlster, Diemar Theis

Color. Abstraction and Perception
Within the exhibition series house-art Fraunhofer IGD presents the color-intensive pictures of Harald Wilke
From 16th September to 12th October Fraunhofer IGD is presenting the works of the art therapist Harald Wilke in the exhibition »Color Spaces«.

The pictures of the North Hessian artist are featuring spontaneity, since they are not pre-planned but are developing in the process of painting. In large format on canvas, wood, or cardboard the artist lends expression to his pictures by a strong, merging coloring.

»After a phase of expression I find something essential in the picture, which I further elaborate, then, sometimes re-abandon. In this way something realistic or abstract is developing or color spaces are emerging,« the artist explains his modus operandi. Particularly his abstract pictures invite the beholder to experience familiar as well as new impressions in a seamless process of perception. Harald Wilke wants to allow the beholder of his works to resonate in the experience of the colors and to sense subtle the emotions of the soul.

The artistic background of Wilke has always involved a social commitment. The apprenticeship as an artist glazier was followed by a baccalaureat diploma at the secondary school for design in Münster in 1985. Then he worked as a social assistant in Ahaus and as a carer for the elderly in Hamm (all Westphalia). In 1990 he started to study art therapy with a final degree in 1994, thus realizing his concern to combine art and working with needy people. Then Wilke was engaged in several institutions in art therapeutic work, with cancer patients performing painting therapies for mentally needy people as well as workshops of aerated concrete or clay sculpturing before starting to work freelance as an artist and art educator in December 2004.

So far his pictures were shown in the following exhibitions:
- Rehacentrum Urbachtal, Neukirchen, Germany (1998-2001)
- Erlenhof, Neukirchen, Germany (1999)
- Karvina, Czechia (2000)
- Zwalm, Belgium (2001)
- Schloss Bergheim, Edertal, Germany (2003)

The art opening took place in presence of the artist on Friday, 16th September.

Artech 2005: in the frontiers of the imaginary
Artech 2005 was the second realization of a workshop concerned with disseminating information about Digital Arts in their multi-faceted artistic and technical forms. At the same time it aims at promoting contacts between the main Iberian contributors concerned with the conception, production, and dissemination of Digital Arts.

Artech 2005 workshop is a way to disseminate innovative experiences at the level of research, conception, application and education in digital arts. The central theme is technology, as a tool in the service of artistic vision and creativity, or as driving force for the creation of Digital Art that can be defined as art using digital technology as its product, process, and/or subject.

Furthermore, Artech 2005 aims at bringing together the scientific, technological, and artistic community with members of the general public, interested in art, in order to establish a space for reflection, exchange of experiences, and help for artists in the creation, understanding, and appreciation of Digital Art. It has in mind also the establishment and strengthening of a cross-frontier network for Portugal and Galicia that will be a network of excellence involving reciprocity and collaboration in respect of projects and joint initiatives in this area.

In this event the topics were related to Sound and Music, Static and Moving Images, Interactive Multimedia, Virtual and Augmented Reality, New Experiences, including questions of Space, Hardware, Software, Support Networks, as well as the Design and Production of Art in its many forms, formats, and expressions.

Artech 2005 was hosted on the 27th of August this year, at the auditorium of the Museum in Vila Nova de Cerveira, during the XIII International Biennial of Art, an exhibition that takes place in Cerveira every two years, lasting about one month. This year, the XIII Biennial showed 139 artworks from 96 artists from 17 countries.

The workshop became a meeting point for researchers, experts, teachers, artists, and casual spectators, who were visiting the XIII Biennial exhibition.

In the invited session, Prof. Christa Sommerer from the Department of Interface Culture of the University of Art and Design, Linz, Austria, pre-

sented the paper »Designing Emotional, Metaphoric, Natural and Intuitive Interfaces for Interactive Art, Edutainment and Mobile Communications«.

In the following sessions ten papers and five short papers were presented on themes such as: Real-Time Electronic Music, Computer-Assisted Musical Composition, Audio-visual and Multimedia Creation, Net Art and Digital Culture, 3D Design and Animation, Technology in Art Education, New Experiences, and applications. Details of the program can be found on http://artech2005.ccg.pt.

Artech 2005 was organized by Computer Graphics Center, Guimarães, Portugal, and was partially funded by the Foundation for Science and Technology of the Portuguese Ministry of Science and Technology (Fundação para a Ciência e Tecnologia) and Algoritmi Center from the University of Minho, Braga-Guimarães.

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Verifying Sponsoring Successes: Automatically and Objectively

DIRECT INFO enables an automatic success control of sports sponsering / Workshop shows project results and latest trends of media technology

The media and entertainment industry is advancing. According to a study of the auditing company PriceWaterhouseCoopers their turnovers will increase annually by an average of 4.7 per cent until 2008, which is far more than the national economy in Germany. Not only has advertising in the Internet considerably gained importance - the growing digitalization of the contents holds a great potential too. This involves the need for developing new methods and technologies for processing as well as analyzing and providing digital multimedia material. This is why the Cognitive Computing and Medical Imaging department of Fraunhofer Institute for Computer Graphics deals with this topic in different projects. In the DIRECT INFO project funded by the EU the scientists are developing a system for an automatic success control of sponsoring activities based on the analysis of TV broadcasts.

Nearly two million Euro per year are spent by German enterprises to benefit from the positive image of well-known teams or particular athletes. These immense amounts prove that an effective success control has become necessary. But the technologies available today fall short of this task. In general, the media agencies still need an extensive staff searching the different programs for sponsor mentions. »Using DIRECT INFO the control and analysis of multimedia content shall be considerably facilitated,« explains Volker Hahn, coordinator of the project at Fraunhofer IGD. DIRECT INFO does not only measure number and time of the sponsor mentions but also includes additional information in the context of the mention. So the sponsoring company does not only learn when and how often they are mentioned in connection with the sponsored persons but also of the context their names were mentioned in and whether the presentation was positive, negative or neutral. Manual intervention shall be reduced to the control of the results yielded by the system. This will considerably reduce the expenditure of labor and cost for an effective control of sponsoring successes.

The system will be of interest to different target groups. On the one hand, it enables media and PR agencies to provide their customers with an objective evidence of success of their activities. On the other hand, athletes and sports clubs can use the results to acquire new sponsors. Finally the system can also be of use for smaller companies interested in sponsoring. A first prototype of DIRECT INFO was completed this September.

The results of this project will be presented within the workshop »Future Challenges for Media Management & Monitoring« at Fraunhofer IGD in Darmstadt on 17th and 18th October 2005. Furthermore, during these two days numerous experts from science and practice will deliver insight into latest trends and technologic developments in the media domain. What will future commercials look like? Which are the technologies multimedia data can be analyzed and effectively managed with? Which is the use the end user gains from the new technologies?

These and many other questions will be answered in the workshop. An exhibition gives the opportunity to get information about new technologies. Objective of the workshop is to bring together researchers, users, and producers and, in this way, offer a platform for the exchange of ideas.

Workshop »Future Challenges for Media Management & Monitoring«
Date: 17th / 18th October 2005
Location: Fraunhofer IGD, Fraunhoferstraße 5, 64283 Darmstadt, Germany

Further information about the workshop as well as the detailed program and a registration form are available in the Internet under:
http://www.igd.fraunhofer.de/igd-a7/mir2005

The registration fee amounts to 250 Euro. Further information about the DIRECT INFO system is available in the Internet under: www.direct-info.net

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ZGDV active at »hessen-IT around the clock«

ZGDV showed exhibits at the 24-hour Hessian IT Congress 2005 in Frankfurt / Lecture in the night program about »State of the art in Computer Graphics and Games«

»hessen-IT around the clock« was the motto of the first Hessian 24-hour IT congress. From 7th to 8th September themes like IT security, e-learning, or the mobile office were in the focus at the Campus Westend in Frankfurt. In a 24-hour non-stop program numerous workshops, demonstrations, and

an exhibition presented to the visitors the latest trends and innovations of the information and communication technology. The event, organized by the Ministry of Economics, Traffic, and State Development of the State of Hesse addressed the whole IT sector: producers, users, public administration, service providers, students, and scientists of all age groups had the opportunity to get in touch with each other. Open during the whole time, the exhibition invited to learn about and to test the latest technologies.

Among these were also some developments of Computer Graphics Research Center ZGDV. »The enormous success of the GameDays proved the great interest in our work. This is why we were happy to comply with the request of the government of the State of Hesse to show some of our exhibits at the congress,« Dr. Stefan Göbel, head of the Digital Storytelling department of ZGDV, explains his motivation for supporting the IT congress.

»With our exhibits the visitors can not only see high-quality examples from the research landscape of Hesse but also experience that technology can really be fun.«

The art-E-fact exhibit of ZGDV Darmstadt, e.g., showed how modern technologies can revive old paintings. A virtual expert explains how Francesco Guardi created his »View of Venice«. The visitor can hold a virtual X-ray equipment to the painting revealing what lies covert under the painting's surface.

You feel like playing water-polo, but don't want to get wet? In the interactive AR water-polo game the digital and the real world interact. Being the goalkeeper of the water-polo game developed by ZGDV Rostock, you have to catch the balls in time to defend the goal.

Fraunhofer Institute for Computer Graphics too was represented by an exhibit. The StepMan developed by the researchers of Fraunhofer IGD in Rostock makes sure that joggers don't come out of step, for the StepMan automatically adjusts the beat to the speed of the jogger. The visitors of the hessen-IT congress could see for themselves that this does not derogate the quality of sound.

All interested persons are awake in the dark

Another highlight were the many night events. From 10 p.m. to 9 a.m. the visitors could take part in more lectures and demonstrations, marvel at performances of action artists, experience an impressing image quality in the digital cinema, or relax in the game lounge. ZGDV had an active part in these sessions. In his talk »State of the Art in Computer Graphics and Games« Axel Feix, researcher of the Digital Storytelling department of ZGDV, spoke about the latest trends and the state of the art in computer graphics and computer games.

Interactive, Three-dimensional, Mobile - Geodata in a New Dimension

Fraunhofer IGD at INTERGEO 2005 / CityServer3D allows interactive, three-dimensional, and mobile visualization of geodata

Everyone who has worked with an atlas knows how difficult it is to get an spatial understanding of two-dimensional maps, plans, or drawings. Three-dimensional models, however, procure an impressive idea and are better comprehensible by the user. This is why 3D models are increasingly used in different areas, from tourism and city planning to traffic and knowledge transfer.

The Graphic Information Systems department of Fraunhofer Institute for Computer Graphics deals with the processing of spatial 3D data by means of geo information systems in various projects. Using their own developments the researchers analyze and visualize big city and landscape models to develop mobile three-dimensional applications and realistic reconstructions able to run in the Internet and make them available to the users. Some of these developments were introduced at the worldwide largest fair for Geodesy, Geoinformation, and Land Management, INTERGEO 2005, in Düsseldorf.

One of the technologies presented is the CityServer3D. This is a 3D geodata server, able to access different database systems and formats and thus allows an efficient management and storage of the data. Geometries as well as their topologies, materials, facts, and meta information like level of detail or addresses can be stored in it. The system also supports textures and hierarchical structures so that the user can manage even complex architecture models him/herself. In addition, the integration of a temporary component allows the storing of buildings of different periods.

Due to this detailed and structured information it is possible to perform specific queries with thematic and time conditions, to filter single elements, or extract complete landscape models.

On the basis of the CityServer3D technology it is, e.g., possible to realize three-dimensional city maps on the mobile phone. These city maps do not only facilitate the orientation of tourists, they also give additional information on hotels, sights, or events. And how did this city look like a century ago? This too can be answered by the CityServer3D technology. It enables a virtual trip through different epochs so that the tourist can not only navigate through the present streets and sights but also experience how the city has changed in the course of time. He can also navigate through three-dimensional architectural models, look at details, and in this way explore the building virtually.

The core of the CityServer3D is the server component. It enables the access to the data stored in the database via different interfaces. Furthermore, it is structured in a way that further data sources can additionally be accessed in form of external databases or files. For this purpose the server possesses a meta model in his kernel which processes the transferred data and transfers them in 2D or 3D format to the clients or other servers via different interfaces.

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Researchers and Students at INI-GraphicsNet

Due to its international nature, the INI-GraphicsNet is obliged to 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) is related to the University of Minho, CAMTech in Singapore to the Nanyang Technological University (NTU) and imedia, The ICPNM Academy in the US to RISD, the Rhode Island School of Design. The German institutes are adjoined to the Universität Rostock and the Technische Universität Darmstadt. Recently several new institutes joined the INI-GraphicsNet. VICOMTech in San Sebastian/Spain, IGI in Seoul/Korea and GraphiTech in Trento/Italy. And of course not to forget the new partnerships with the affiliated universities. These are the Universidad del País Vasco Euskal Herriko Unibertsitatea (University of the Basque Country), the Ewha Womans University in Korea and Università degli Studi di Trento in Italy. Student exchange programs between IGD and imedia in Providence or CAMTech in Singapore directly support the exchange of students between these institutes. This way it's very easy and much less bureaucratic for students to get financial support. But of course there are other possibilities to get funding for exchanges where non of these internal exchange programs apply. Several hints on how to find these scholarships can be found on the studINI Web Site *http://www.inigraphics.net/students/studini/index.html.*

Of course the student exchange appointee will assist you too, if you have further questions. Another good starting point for a search for scholarships is *http://www.daad.de/.*

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. Last December the first calls for proposals under the 6th framework have been published. Individuals may have a look at *http://europa.eu.int/comm/research/fp6/mariecurie-actions/action/fellow_en.html* to find the actual proposals and the deadlines for applications. A good place to start searching for Marie Curie Actions is the new website *http://mc-opportunities.cordis.lu*.

While Marie Curie Fellowships are targeting experienced researchers, there are other funding opportunities for internships. The Leonardo da Vinci program for example supports exchanges for internships within Europe. Due to the increased number of INI-GraphicsNet institutions within the European community, this program seams to be very promising (see also *http://europa.eu.int/comm/education/programmes/leonardo/new/leonardo2_en.html).*

Do not hesitate to contact studini@igd.fraunhofer.de for information and for assistance with the application.

Additionally there are some new calls for application for PPP projects, programs for the exchange of persons in predefined projects. These programs are offered by the DAAD and are available for a special exchange country and typically a German project partner. More information on that subject you can find at *http://www-zv.upb.de/~eb/neu%20eu%20web/ppp.htm* (in German).

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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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GRADUATIONS

Dr.-Ing. Eric Blechschmitt
July 18, 2005
»Adaptive Human-Computer Interaction For Mobile Agents«
Supervisors:
Prof. Dr. José Luis Encarnação
Prof. Dr. Thomas Kirste

Mobile communication technologies and mobile computing devices have evolved into a common part of our everyday life. Advances in the production of electronic components enable the manufacturing of smaller and increasingly more powerful devices. The additional option to access the Internet wirelessly has added significance to mobile computing devices. Internet services are no longer confined to the use of desktop PCs but more and more by means of a broad spectrum of mobile devices such as Personal Data Assistants or mobile telephones.

By integrating multiple devices in a network a potential computing platform arises which enables mobile and distributed application programs. Mobile agent platforms meet particular requirements of mobile application programs and can be used as a runtime environment. This work examines the impact of this development on network-based agent applications and focuses on the dynamic adaptation of user interfaces to mobile and stationary devices.

The dissertation presents a model for the development of mobile agent applications which integrate various mobile and stationary devices. The model defines the architecture of an agent-based mobile User Interface Management System consisting of a dialog component, an adaptation component, and multiple synchronized presentation components. The synchronization is performed on the presentation layer and also on the dialog layer. The dialog component uses an interaction object model,

Dr. Eric Blechschmitt celebrating his graduation

where the elements synchronize each other. The object model is generated from an abstract dialog language.

On the basis of the concepts of this work a concrete implementation has been realized to verify the advantages of the approach in comparison with the state of the art. The system enables to encode user interfaces in an abstract manner, to adapt the encoded user interfaces to various devices, and allows a continuous execution of dialogs among different devices.

The work closes with an evaluation and comparison of different existing user interface transcoding systems with respect to software engineering concerns.

STUDY & DIPLOMA THESES

Automatic Search of Brand Piracy in the Internet - Semantic Analysis and Evaluation
Diploma thesis by: Simon Buß
Supervisors: Dipl.-Inform. Peter Ebinger, Dipl.-Ing. (FH) Ulrich Pinsdorf

Year by year companies suffer losses of billions of Euros by brand and product piracy. The internet is playing a more and more important role in this respect. To protect brands and products from abuse, significant effort is required, because currently the discovery of violations against the rights of intellectual property owners can only be managed by involving a lot of human resources.

Within the scope of this thesis a flexible system was developed to monitor internet contents and detect suspicious websites. For this aim, the contents (text, images) of websites are analyzed and evaluated in multiple steps. The system is able to adopt to multiple scenarios by changing its configuration.

Learning in Artificial Spaces: Specification and Implementation of a distributed 3D Learning Environment
Diploma thesis by: Tamara Michel
Supervisor: Nadeem Bhatti

»Learning by doing« is in most professions a saying which always fits. The project »Virtual Car Dealer« (VAH) approaches the field of computer-based learning environments with a 3D learning environment patterned on real car dealer's facilities. The vocational training in Germany foresees visiting lectures as well as attaining practical work experience in companies. The separation of theory and practical experiences causes a gap transferring acquired knowledge from the school into real processes of daily business. The »Virtual Car Dealer« complements the German vocational training system by offering an assisting virtual learning environment, where the learners will be capable understanding complex business processes and workspace specific knowledge. The focus of this thesis is to compare different works in the field of learning worlds in order to propose one best fitting solution for »Virtual Car Dealer«. Additionally an exemplary implementation of the proposed solution is realized.

Use of the Trifocal Tensor for a Real-time Markerless Camera Tracking
Diploma thesis by: Thomas Spall
Supervisor: Dr.-Ing. Didier Stricker

This diploma thesis was carried out at the Fraunhofer Institute for Computer Graphics in Darmstadt from December 2004 to May 2005. During the work it was elaborated whether it is possible to use the so-called trifocal tensor, an object well-known from general Three-View-Geometry, to achieve an online estimation of camera pose without using artificial markers.

For this purpose the already existing software library VisionLib was augmented by a diverse set of new modules for tensor computation and analysis. Furthermore a reference implementation showing the successful use of trifocal tensor for live-tracking of the camera movement was created.

Transaction Security for the Migration of Mobile Agents
Diploma thesis by: Pham Thi, Thu Trang
Supervisor: Dipl.-Inform. Jan Peters

At Fraunhofer IGD, the project SeMoA (Secure Mobile Agents) covers research in security-centered middleware platforms and mobile agents. Thereby, the most important property of mobile agents is their mobility, i.e. the ability of migrating program code, data, and current state from one host system to another. The corresponding research community discusses basic problems of agent migration, its optimization, and security issues. SeMoA already implements the majority of depicted (security) requirements for agent migration. Nevertheless, a recent simulation study which has been carried out in cooperation with a department of the University of Kassel discovered that the technical implementation of agent migration lacks of non-repudation of agent delivery. In turn, the certification of agent delivery as part of the agent migration process is necessary to enable a legally binding of mobile agents. Therefore, a protocol has been developed and implemented as part of this thesis to realize agent migration as transactional process, subsequently extending the existing migration concept. Requirement was the ability of migration roll-back in case of failures or active attacks. Since the receiver of an agent can interrupt the communication at any time, or refuse to send the acknowledgment for the completion of agent migration, the developed protocol contains corresponding error handling. The extended migration protocol has been implemented in Java and integrated into the agent system SeMoA. Besides inquiry of state of the art in the areas of agent migration and legally binding of mobile agents and discussion of security properties of related migration protocols, this thesis contains a protocol evaluation with respect of performance and robustness.

Ontology-based Extraction of Metadata from Patent Documents
Diploma thesis by: Silke Jäger
Supervisor: Neyir Sevilmis

The project WIDE tries to save the knowledge of a company in a way that offers the information to all users at any time, without any problems searching it. Within the project the search for the documents is carried out on the so-called Metadata Level. The metadata is described by RDF documents.

The scope of this diploma thesis is to build a software component, which extracts relevant metadata from a document and writes it to an RDF file in order to automate the process of creating the RDF specification. The software component fetches the metadata from an ontology which is designed during this diploma thesis too.

The documents are given in the Microsoft Word format. The extraction of metadata has to be carried out for two given document types. These document types and their metadata are described in an ontology, which was designed using the ontology editor Protégé.

The software component contains two algorithms. One is used to locate the metadata within the documents, which is to be written in an RDF file. It considers the different layout of the metadata within the documents. The second algorithm is used if a table is found. It extracts metadata which is to be sent by e-mail to a user group.

Conceptualization and Realization of a Framework for Model-Based, Automatic User Interface Generation
Diploma thesis by: Santiago Tainta Ausejo
Supervisor: Ali A. Nazari Shirehjini

The Personal Environment Controller (PECo) is a digital assistant system that provides the user with a unified facility for organizing as well as accessing the different media repositories at his disposal and direct manipulation of the physical environment (projectors, TV sets, hi-fi systems, lights, shutters, etc.). To interact with the environment, PECo´s user interface is based on the 3D visualization of the room, allowing the user the intuitive selection of a device, basing his selection on the device position and orientation within the 3D model of the room. The main purpose of this thesis is the development and implementation of a system that can dynamically update this user interface, providing PECo with a model that describes the environment. It will be based on the UPnP architecture and the Ubisense system. UPnP allows us to perform the discovery and control of the available devices. Ubisense is a commercial indoor location system. They will inform us of the changes in the environment through some events that our system will receive and process to automatically generate the 3D user interface model.

The main application area for PECo are AmI meeting rooms. Unfortunately, UPnP is oriented to the house automation. Consequently, a generic UPnP Presentation Architecture for AmI meeting rooms has been developed. This architecture introduces besides standard lighting devices also a UPnP design for complex projection settings, analog audio-video devices, shutter blinds and media repositories. Using this architecture, AmI developers benefit from UPnP device discovery as well as standardized access to devices and media repositories.

Simulation of the dynamic Behavior of Cables for Construction Simulation in VR
Diploma thesis by: Wolfgang Schotte
Supervisor: Dipl.-Math. Alexander Rettig

Today's construction and visualization systems are increasingly making use of virtual reality. To allow the simulation of all materials and components of interest as well as of all single production steps in virtual reality, methods are necessary, which can both be integrated into existing interactive simulation environments and correctly emulate the physical characteristics of the real components regarding collision and motion. The method presented in this diploma thesis allows for the dynamic simulation of the behavior of cables in virtual reality. By means of impulse-based simulation of rigid bodies a method has been developed, which fulfills the specific requirements of a cable simulation to be usable interactively. Besides the actual cable dynamics the simulation integrates self-collision and collision of the cable model with a given volume as well as sliding and static friction. Furthermore manipulators and clips are integrated by which the user can interact with the cable model.

Except for the self-collision detection method, the simulation method shows

linear runtime behavior related to the number of modelled sections of a cable segmentation. On a computer with one Athlon 64 3200+ processor it is possible to compute a cable model consisting of up to 150 segments with a time increment of 0.01 s in real time. In the interactive simulation the cable model demonstrates a good approximation of the physically correct behavior regarding collision and motion.

The presented method for cable simulation can also be used to simulate other objects of constant length, such as flexible hoses and pipes in technical applications or e.g. arteries in medical ones. The simulation method itself is not limited to a uniform type of segments. Implemented appropriately different types of bodies can be merged into the simulation model. The method itself can be advantageously integrated into other simulation environments as well.

Development of a system for the platform-independent specification and presentation of user interfaces.
Master thesis by: Timo Kopp
Supervisor: Dipl.-Psych. Kai Richter

With the increasing availability of information technology in our every-day lives, also the diversity of devices we are confronted with, is increasing. Apart from the classical desktop PC, today a great number of mobile device classes have appeared, which will become more and more attractive and powerful in near future. Also in the public space information technology such as terminal systems, information systems but also lifts and other technical installations are becoming a common phenomenon.

The diversity of different devices with similar applications but differences in power, context of use, display and input devices urges application manufacturers to develop and maintain similar applications for different platforms in parallel. Take for example a standard desktop PC and a mobile device, one with a high-resolution display of more than 1024 by 768 pixels interacted with by mouse and keyboard provides totally different preconditions than a 320 by 320 pixels display of a palm-sized computer interacted with a pen. Nevertheless for both devices adapted versions of the Microsoft Office suite are available.

One of the major problem of such multi-device applications is the fact that a user has to be able to recognize commonalties between the same application on different devices in order to re-use his knowledge about the application on one device. This transfer of knowledge between devices depends on the similarity of an application on both devices.

This diploma thesis contributes to the development of a framework for the presentation and development of platform-independent user interfaces. This framework allows device specific user interfaces to be generated from one abstract representation (in W3C XForms). Application developers can create the user interface once and deploy the application to different platforms while adaptation is realized by the framework. In this work the core functionality, handling and setup of a XForms model and user interfaces have been developed.

Automated Discovery of Brand Piracy on the Internet - Information Retrieval and Syntactic Analysis

Diploma thesis by: Jens Vogel
Supervisors: Ulrich Pinsdorf, Peter Ebinger

Year by year companies suffer losses of billions of Euros by brand and product piracy. The Internet is playing a more and more important role in this respect. To protect brands and products from abuse, significant effort is required, because currently the discovery of violations against the rights of intellectual property owners can only be managed by involving a lot of human resources.

Within the scope of this thesis a flexible system was developed to monitor Internet contents and detect suspicious websites. Therefore, the contents (text, images) of websites are analyzed and evaluated in multiple steps. The system is able to adopt to multiple scenarios by changing its configuration.

The first part of the development deals with web crawling, the syntactic analysis and the storage of web pages in a database. The second part is the semantic analysis and evaluation of the retrieved web content based on specific inquiries. The goal of this thesis is the design and implementation of the first part.

Real-time Rendering of Volumetric Tomography Data for the Integration into a Surgical Simulator
Diploma thesis by: Jessica Friberg
Supervisors: Johannes Behr, Dr. Ulrich Bockholt

Over the last fifteen years volume rendering has become an important part of examining, exploring, and evaluating volume data. Huge medical datasets generated by Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) can be explored in 3D using volume rendering. Even interaction with the data is possible today and it has been shown that this is of great value when diagnosing, practicing, and/or learning. In order to make interactive volume rendering possible a range of sophisticated methods have been developed. Often high-end graphic hardware is applied when developing applications for 3D volume rendering. This is an obstacle when it comes to integrating the techniques into the normal hospital environment. It would be preferable, if the applications were general enough to run on standard computers.

In this thesis a volume renderer for standard computers with a good visual result and a relatively high update rate, sufficient for interaction, has been developed. The last years tremendous developments of graphic hardware have enabled to write programs, so called shaders, directly communicating with the graphic pipeline. The developed renderer employs such shaders because of its superiority in speed to normal software rendering. One purpose for the renderer is that it will be used for exploring medical data as a part of a project between Fraunhofer Institute and the Hospital of Mainz.

Examination and Development of Accurate Auto Calibration Procedures for Offline Video Augmented Reality
Master thesis by: Siben Wang
Supervisor: Dr.-Ing. Didier Stricker

Two images of a single scene are related by the epipolar geometry, which can be described by a fundamental matrix if the internal parameters of the images are unknown. It captures all geometric information contained in two images. Its determination is very important in many applications such as scene modeling, vehicle navigation, and object reconstruction, which are widely used in Augmented Reality (AR) to enhance and augment the user's view with additional information, generated from a computer model.

In this work, an introduction to the epipolar geometry is given, and a review of the current techniques for estimating the fundamental matrix and its optimization are provided. This report also discusses the implementation particularities and it presents the results obtained by comparative tests with the application that I developed.

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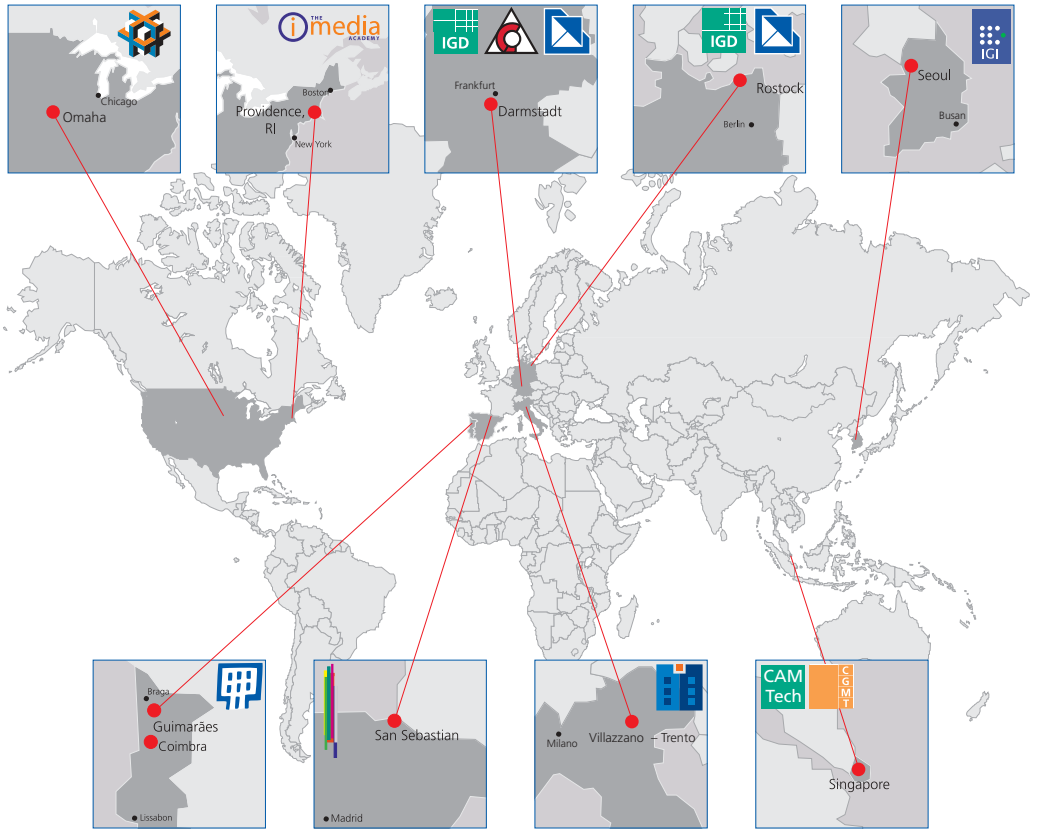

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