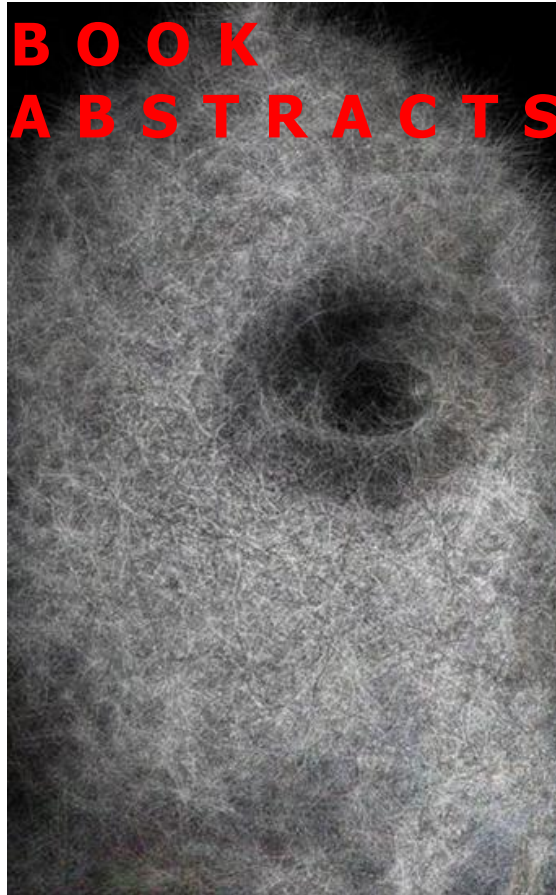


**IV10 - 14th International Conference
Information Visualisation**

26, 27 - 29 July 2010 • LSBU • London • UK •
<http://www.graphicslink.co.uk/IV10/>

**The
BOOK
ABSTRACTS**



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Design Department, University of Massachusetts Dartmouth,
USA



iV10

VIZ'10

**MEDI'10
VIS**

GMAI'10

BUILT VIZ'10



IV10 & cgiv2010 - DIGITAL ART GALLERY Online Exhibition
July 2010 - June 2011



VIRTUAL GALLERY VENUE
www.graphicslink.co.uk/DART.htm



Exhibiting Artists:

Akio Yamanaka // Japan

Corrinne Whitaker // member of
Contemporary Art in Los Angeles and the
Carmel Gallery Alliance, USA

Da Young Ju // Art College Hong-Ik
University, South Korea

Dena Elisabeth Eber // Bowling Green
State University, OH, USA

Gabrielle Peters // University of Applied
Sciences and Arts Computer Science,
Germany

Gloria DeFilipps Brush //Department
of Art & Design at the University of
Minnesota Duluth, USA

Hans Dehlinger // University of
Kassel, Germany

Harvey Goldman //University of
Massachusetts Dartmouth, USA

James Faure Walker //Kingston
University, UK

Jason Nelson //Griffith University
Australia

Jing Zhou //New Jersey, USA

Jonathan Craig Hounshell //East
Tennessee State University, USA

Joohyun Pyune // USA

Kathy Brew // independent videomaker,
USA

Roberto Guerra // Universidad Nacional
de Ingenieria, Lima Perú

Kellen Moss // 3D Animator

Leslie Nobler Farber //USA

Mary Visser //Southwestern University
USA

Monika Wulfers // USA

Martin John Callanan //UCL
Environment Institute, UK

Philip Sanders // New York University
USA

Sheila Pinkel // Pomona College, USA

Raymond St Arnaud // Canada

Victor Acevedo // USA

Victor Atman // USA

U_A_f2-3.3 // U_A_f3-1.2 // U_A_f3-2.4
© Hans Dehlinger, Professor Emeritus
University of Kassel, Germany

The subjects are line-oriented generative drawings, executed on a pen-plotter. The drawings make use of straight poly-lines only. By definition, such drawings are "sharp", because of the nature of the lines used. From photographic images "unsharp", (blurred, out of focus) images are well known. The ones we are interested in are the result of an intentional effort of the photographer. The question arises, can drawings be produced that appear to be unsharp despite being produced entirely of sharp lines. The drawings are experiments to generate such drawings. They are copped of three layers of the same drawing which are slightly scaled against each other. The point of origin of scaling is usually not in the center of the drawing.

**A Full-day Course:
Monday 26th July 2010, Time: 10:30 -17:00**

Art for Visualizers

Francis T. Marchese, Pace University, NY, NY 10038, USA
<http://csis.pace.edu/~marchese>

Abstract

Lectures, panels, and symposia that explore issues at the intersection of art and visualization have become a recurring theme at visualization conferences. Since 2003 the U.S. National Science Foundation and the journal *Science* have sponsored an International Science and Engineering Visualization Challenge in which many of the winning entries exhibit noteworthy aesthetic qualities that may be considered artistic in nature. And inspirations from artistic movements and practice have stimulated visualization research, particularly in the application of non-photorealistic or expressive rendering techniques to visualization problems.

The confluence of art and visualization has a long history. Indeed, the Paleolithic artists who painted on the cave walls of southwest France may have been the first visualizers. Or was it vice versa? Either way, throughout the intervening millennia visual artists have become proficient at transforming information into representations that are designed to communicate and provoke. The challenge facing a viewer of art is how to decipher an image's content and extract its meaning. This holds true for a viewer of visualizations as well.

Thus, the purpose of this tutorial is to introduce the fundamental skills for analyzing visual art that subsequently may be applied to scientific and information visualizations. It will offer an historical survey of the intersections of art and visualization with an emphasis on examples from contemporary artists, and provide an opportunity for participants to practice these skills within a gallery setting. To this end, the tutorial will be composed of two sessions. A morning session will focus on an historical survey, conceptual foundations, and skill acquisition. An afternoon session convening at The National Gallery of Art (Trafalgar Square), will allow

course participants to test their analysis skills on a selection of the gallery's paintings.

Organisation

Level of Tutorial: Introductory

Biography of the presenter:

Frank Marchese is Professor of Computer Science at Pace University where he teaches courses in computer graphics, visualization, human-computer interaction, and software engineering. His research interests span scientific and information visualization; novel user interfaces for visualization; distributed and collaborative visualization; integration of visualization into lifecycles for scientific research and software engineering; and the development of visualization systems at the intersection of art, science, and technology.

He is founder and Director of Pace's Center for Advanced Media (CAM) and the Pace Digital Gallery, the latter of which is collaboration between Pace University's Seidenberg School of Computing and Department of Fine Arts. He has published widely in science, technology, and art; is editor of the conference proceedings entitled *Understanding Images* published by Springer-Verlag, and is co-chair of Information Visualization 2010 (IV'10).

Dr. Marchese has a Ph.D. in quantum chemistry from the University of Cincinnati and was a National Institutes of Health Postdoctoral Research Fellow specializing in the statistical mechanics of liquids. He has been twice awarded Pace's School of Computing Excellence in Research Award, received the Kenan Award for Teaching Excellence, and been nominated for The Carnegie Foundation Teacher of the Year Award. In December 2008, he was awarded Pace University's Faculty Award for Distinguished Service. He is currently a visiting scholar at New York University's Institute of Fine Arts where he is studying museum curation, the relationship between text and image in medieval art, and the artistic origins of information visualization.

A Full-day Course:**Monday 26th July 2010, Time: 10:30 -16:00****Usability Evaluation and Information Visualisation**

Prof. Keith Andrews, Graz University of Technology, Austria
<http://www.iicm.edu/keith>

Abstract

The first part of this tutorial will look at usability evaluation in general. It will cover both usability inspection methods (such as heuristic evaluation, cognitive walkthrough, and action analysis) and usability testing methods (such as thinking aloud tests, formal experiments, and usage studies).

The second part of the tutorial will look specifically at the evaluation of information visualisations. We will step through the design, analysis, and reporting of two usability studies of infovis systems: a formative evaluation (thinking aloud test) and a comparative study (formal experiment).

Organisation**Level of Tutorial:** Introductory level**Biography of the presenter:**

Keith Andrews is a tenured associate professor at the Institute for Information Systems and Computer Media (IICM) at Graz University of Technology, in Austria. His research interests include information visualisation, human-computer interaction, and the internet. He has a B.Sc.(Hons) in Mathematics and Computer Science from the University of York, England, and an M.Sc. and Ph.D. in Technical Mathematics/Computer Science from Graz University of Technology.

Having lead the Harmony (Unix/X11 browser for Hyperwave) and VRwave (VRML browser) projects for several years, he is currently pursuing research in the field of information visualisation. Keith was program co-chair of the IEEE Symposium on Information Visualization in 2001 and 2002, and general chair in 2005.

Keith teaches undergraduate level courses on Internet and New Media, Human-Computer Interaction, and User Interface Design, and graduate level courses on Information Visualisation and Information Architecture and Web Usability, as well as various short courses and tutorials at conferences and for companies.

A Full-day Course:**Monday 26th July 2010, Time: 10:30 -17:00****Fundamentals of visual data mining, information retrieval, extraction, and analysis**

Haim Levkowitz, Associate Professor and Co-Director, Institute for Visualization and Perception Research, Department of Computer Science University of Massachusetts Lowell, USA
<http://www.cs.uml.edu/~haim/>

Abstract

Everyone knows how to "Google"; some people even know that Google is a "search engine"; but very few know that "search engines" are "information retrieval" engines. As the amount of information grows so rapidly, finding the right information, and analyzing it has become more and more challenging. Search technology has -- probably -- been the fastest- and steepest-growth segment, ever. And when you find information, that's just about the beginning of the next challenge: extracting meaning and knowledge out of it.

Today, most of your search queries are formulated by (usually very few) key words -- a very difficult way to express the semantic of your search needs. And the results appear as (very long) lists of text. To find what you've been looking for -- or to find out that it is not there - you need to scan through page after page after page of results, not a very efficient or effective process. Further, if you are trying to find non-textual information (images, sounds), you have very limited resources.

Can we do better than that? Yes. How? By replacing the sequential search through results' text with perceptually-stronger visual mechanisms, often referred to as visual text (or data) mining.

The goals of this course will be:

1. to explore the fundamentals of Information Retrieval and Mining;
2. to understand the basics of visual text and data mining;
3. to learn the most powerful information and knowledge extraction techniques;
4. to understand in what way non-text search and retrieval is different, and in what ways it is similar to text retrieval; and
5. to understand how the combination of these methods can make search much more powerful and effective.

Students will learn basic and advanced information retrieval techniques, visual text and data mining approaches, information and knowledge extraction methods, and their combined applications. In addition to text-based search, the course will examine retrieval of non-textual information (such as images, sounds, video, or any other non-text information) based on non-textual features, not just on text metadata.

The second part of the course will focus on mining and analysis, with a goal to extract meaning and knowledge out of the retrieved information.

Who should attend: researcher and practitioners in the fields of information retrieval and extraction, search, data mining, and visual analytics, as well as students aspiring to enter these fields.

Biography of the presenter:

Haim Levkowitz is an associate professor of computer science and co-director of the Institute for Visualization and Perception Research at the University of Massachusetts Lowell, in Lowell, MA, USA. He is a world-renowned authority on visualization, perception, color, and their application in data mining and information retrieval. He is the author of "Color Theory and Modeling for Computer Graphics, Visualization, and Multimedia Applications" (Springer 1997) and co-editor of "Perceptual Issues in Visualization" (Springer 1995), as well as many papers in these subjects. He has more than 35 years experience in teaching and lecturing, and has

taught many tutorials and short courses, in addition to regular academic courses.

3rd Doctoral Research Workshop Information Visualisation

Organised by
Information Visualisation Society

In cooperation with
**Visualisation & Graphics Research Unit, LSBU
The Visualization Lab, University of Plymouth**

The Information Visualisation Society (IVS) is an international organization that aims to provide a foundation for integrating the human-centred, technological and strategic aspects of information visualisation in order to promote international exchange, cooperation and development. Building upon the reported success of last year's workshop, IVS is pleased to announce the "**3rd Doctoral Research Workshop**" which will run as part of the 14th IEEE International Conference on Information Visualisation (IV10).

Doctoral Research workshop

This workshop focuses on the issues that doctoral students face during their studies and includes following interactive sessions:

- Introduction to "What is a PhD? " from panel members
- A short tutorial on one of the key aspects that PhD issues
- **Case studies** - Presentation of number of case studies from PhD students candidates to the workshop with aim that highlights the issues that facing in the course of their studies.
- **Expert panel feedback** - Each presentation is followed by discussion and suggestion not only from panem members but from fellow researchers.
- **Expert tips on individual PhD student presentation and research.**

Doctoral Research workshop - programme

Opening & Welcome from discussion Panel members:

Stuart, Dr. Liz, University of Plymouth, UK

Banissi, Prof. Ebad, London South Bank University, UK
Subject Liasing Committee chairs

Training session: “The PhD in Visualization Starter Kit”

Laramee, Robert S. Swansea University, UK

Writing a PhD in visualization is difficult. And those that are just starting out have not usually acquired all of the key skills necessary for completion since they are not normally taught as part of an undergraduate curriculum. For example, how does a researcher to navigate through the vast amounts of previously published literature related to their topic? Furthermore, for some, this may be their first time implementing a larger, long-term project. Developing a large software application requires more knowledge than implementing a small one. Given, a larger sized visualization application, how can bugs and problems be tracked down and eliminated? And what is a good starting point when it comes time to writing a research paper?

This tutorial presents some of the essential skills that a PhD candidate in Visualization acquires during their study including (1) reading and (2) writing research papers as well as (3) implementing and (4) debugging software.

We hope that the guidelines presented here will help jump-start the new researcher's journey towards a PhD in visualization.

The tutorial will be much more than merely a presentation of research papers in several ways:

- More Breadth: The tutorial will contain more background information and fundamentals than a typical research paper or presentation of research results.

- More Depth: Given the availability of more time, we will cover topics in more depth than normally given in a paper presentation.
- Supplementary Material: The course will feature supplementary material not normally available to audience members visiting a paper(s) presentation. This includes online high resolution images and animations, and supplementary literature.

Exploiting Domain Knowledge for Supervised Machine Learning Algorithms

Seifert, Christin Know-Center Graz, Austria

Classification and categorisation are common tasks in data mining and knowledge discovery. For the user only the classifiers final decisions are visible, the classifier itself remains a black box. Thus, the reasons for classifiers' decisions are not understandable to users and can not be influenced by the user. My work investigates visualisation and interaction methods to support both, understanding as well as adaption of classifiers. The envisioned visualisation methods focus on making complex, multidimensional classification decision easily perceivable for both, data mining experts as well as non-experts users. Interaction methods allow to integrate domain knowledge of users to increase classification performance. The visualisation system can then be used to compare, communicate and customise and enhance classifiers.

Information Visualization of multi-dimensional spike train datasets

Tucker, Roy C., The Visualization Lab, University of Plymouth, UK

Our research applies the techniques and principles of Information Visualization [1] to support the analysis of large datasets from many diverse scientific disciplines. At the Visualization Lab (www.plymouth.ac.uk/infovis), the core objective of our work is the development of highly flexible and intuitively interactive software to support the investigation of scientific datasets.

Built Information: Visual communication in digitally augmented public space

IV10_Doctoral Research Workshop

Birk, Klaus, University of the Arts London, Research Unit for Information Environments, London, UK

Evaluating Visualisations of Geographically Weighted Spatial Statistical Methods **Burke, Tommy** National Centre for Geocomputation, National University of Ireland Maynooth, Maynooth, Ireland

Geographically Weighted Spatial Statistical Methods are employed in a wide range of disciplines to analyse and interpret data where they are used to detect significant patterns or relationships. One of these methods, Geographically Weighted Regression (GWR), is used to examine processes that vary over space and time. There is little variation in the types of visualisations which are used to analyse the results of GWR. 2D Univariate maps, statistical summary tables and graphs of residual values are primarily used. Consequently, it is unclear whether other visualisation methods could be more effective for displaying the results. The research we are conducting focuses on evaluating different visualisation techniques for GWR. This will be achieved through user trials with different visualisation techniques to ascertain their effectiveness for a given set of tasks. The ultimate goal is to discover the most appropriate way to facilitate interpretation and analysis of Geographically Weighted Spatial Statistical results.

3rd Information Visualisation SHOWCASE

Organised by
The Visualization Lab, University of Plymouth
Visualisation & Graphics Research Unit, LSBU

The SHOWCASE is a cooperative process for the presentation and discussion of your software, ideas and research.

The objective of the SHOWCASE is to provide delegates with the opportunity to present their work in a truly meaningful manner. This event provides presenters with the opportunity to proactively engage with a range of delegates from Academia and Industry in the broad field of Information Visualization.

Authors of posters, accepted for publication in the Book of Abstracts, will be offered a flexible format for display. Additionally, authors of full papers, accepted for publication in the IEEE published Conference Proceedings, may prefer to present their work during the SHOWCASE event, as opposed to the traditional oral presentation.

For example

- You may want to do a traditional poster display.
- You may want to give a demonstration of your software using a laptop.
- You can even bring your own equipment and do something entirely different.

Just let us know what you require and we will discuss these arrangements with you directly.

Showcase Interaction

During the SHOWCASE **interaction** will be **pro-actively supported**. During the session, presenters will be able to request one or more of the following interaction opportunities

1. **Usability study:** We can arrange for another IV10 delegate to visit you in order to participate in a usability evaluation

IV10_Show Case

2. **Peer-to-Peer feedback:** We can arrange for a relevant conference programme committee member or delegate to visit you and provide you with feedback
3. **Expert tips:** We can arrange for one of our Experts to visit you briefly during the SHOWCASE event

Additional Benefits

- Delegates who have the opportunity to present their work via the SHOWCASE event present their work to all IV10 delegates.
- The SHOWCASE is a **unique single track event** scheduled mid-way through the Conference, over a two-hour session.

Showcase Exhibitors:

OWL Ontology Visualization: Graphical Representations of Properties on the Instance Level

Kriglstein Simone

Mid-Season – Visualization of Actor-Networks with the case of a hotel archive

Kilchör Fabienne

Incremental Idea Generation System: Indigen

Chen Sheng-Han & **Chang Teng-Wen**

A framework to coordinate multiple data similarity maps

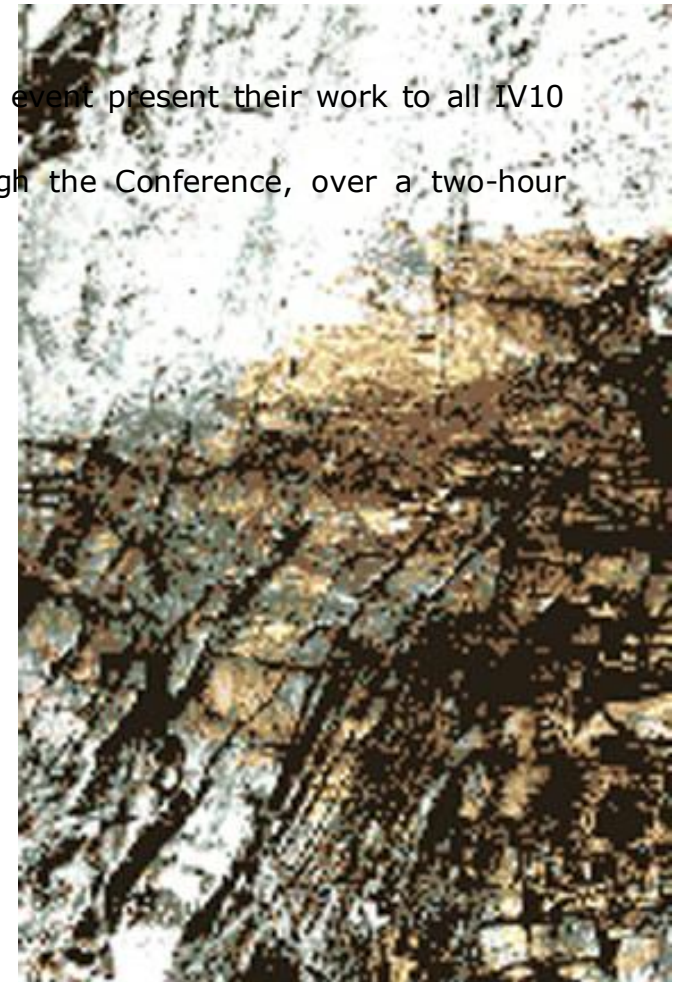
Eler Danilo Medeiros;
Paulovich Fernando Vieira;
Oliveira Maria Cristina
Ferreira & **Minghim** Rosane

Information Visualization of multi-dimensional spike train datasets

Stuart Liz & **Tucker** Roy C.

Wearing emotions: physical representation and visualization of human emotions using wearable technologies

Iaconesi Salvatore



Glen Memories
40 years of Wandering ~ Stepping Stones
Cynthia Beth Rubin

Monday 26 July 2010

10:00	< LONDON, LSBU: The Keyworth Centre – Mezzanine >	
	Registration	
10:30	< LONDON, LSBU: The Keyworth Centre – K605/6 >	
-	Information Visualisation	
13:00	Doctoral Research Workshop	
	Chairs: Stuart, Dr. Liz, University of Plymouth, UK Banissi, Prof. Ebad, London South Bank University, UK Subject Liasing Committee chairs	
	10.00 Registration	
	10.30 Opening & Welcome from discussion Panel members	
	10:45 "The PhD in Visualization Starter Kit" presented by Robert S. Laramee from Swansea University, UK	
10:30	< LONDON, LSBU: The Keyworth Centre – K305/6 >	< LONDON, LSBU: The Keyworth Centre - K613/14 >
-	Tutorial	Tutorial
13:00	Morning session	Morning session
	A Full-day Course: Monday 26th July 2010, Time: 10:30 -17:00	A Full-day Course: Monday 26th July 2010, Time: 10:30 -17:00
	Art for Visualizers Francis T. Marchese, Pace University, NY, NY 10038, USA http://csis.pace.edu/~marchese	Fundamentals of visual data mining, information retrieval, extraction, and analysis Haim Levkowitz, Associate Professor and Co-Director, Institute for Visualization and Perception Research And Graphics Research Laboratory Department of Computer Science University of Massachusetts Lowell, USA http://www.cs.uml.edu/~haim/

10:30	< LONDON, LSBU: The Keyworth Centre - K307/8 >
-	Tutorial
13:00	Morning session
	A Full-day Course:
	Monday 26th July 2010, Time: 10:30 -17:00
	Usability Evaluation and Information Visualisation
	Prof. Keith Andrews, Graz University of Technology, Austria
	http://www.iicm.edu/keith
13:00	< LONDON, LSBU: The Keyworth Centre - London Road Refactory >
	<i>Lunch Break</i>
14:00	< LONDON, LSBU: The Keyworth Centre - The Keyworth Centre - K605/6 >
-	Information Visualisation
17:00	Doctoral Research Workshop
	13.45 Introduction from Doctoral Research Workshop chair to the doctoral research presentation
	<ul style="list-style-type: none"> • Exploiting Domain Knowledge for Supervised Machine Learning Algorithms Seifert, Christin, Know-Center Graz, Austria • Information Visualization of multi-dimensional spike train datasets Tucker, Roy C., The Visualization Lab, University of Plymouth, UK • Built Information: Visual communication in digitally augmented public space Birk, Klaus, University of the Arts London, Research Unit for Information Environments, London, UK
15:30	Break
16:00	<ul style="list-style-type: none"> • Evaluating Visualisations of Geographically Weighted Spatial Statistical Methods Burke, Tommy, National Centre for Geocomputation, National University of Ireland Maynooth, Maynooth, Ireland
17.30	Close

<p>14:00 - 17:00</p>	<p>< LONDON, The National Gallery of Art (Trafalgar Square)> Tutorial: Morning session A Full-day Course: Monday 26th July 2010, Time: 10:30 -17:00</p> <p style="text-align: center;">Art for Visualizers</p> <p style="text-align: center;">Francis T. Marchese, Pace University, NY, NY 10038, USA http://csis.pace.edu/~marchese</p> <p>An afternoon session convening at The National Gallery of Art (Trafalgar Square), will allow course participants to test their analysis skills on a selection of the gallery's paintings</p>	<p>< LONDON, LSBU: The Keyworth Centre - K613/14> Tutorial: Afternoon session Fundamentals of visual data mining, information retrieval, extraction, and analysis Haim Levkowitz, Associate Professor and Co-Director, Institute for Visualization and Perception Research And Graphics Research Laboratory Department of Computer Science University of Massachusetts Lowell, USA http://www.cs.uml.edu/~haim/</p> <p>14:00 Early Afternoon session 15:30 Break 16:00 Late Afternoon session</p>
	<p style="text-align: center;">< LONDON, LSBU: The Keyworth Centre - K307/8 ></p> <p>Tutorial: Afternoon session</p> <p style="text-align: center;">Usability Evaluation and Information Visualisation Prof. Keith Andrews, Graz University of Technology, Austria http://www.iicm.edu/keith</p> <p>14:00 Early Afternoon session 15:30 Break 16:00 Late Afternoon session</p>	



Tuesday 27 July 2010

09:00	< LONDON, LSBU: The Keyworth Centre – Mezzanine > Registration
10:30	< LONDON, LSBU: The Keyworth Centre - Event Theatre > Opening & Welcome London SouthBank University (LSBU): Local Organising Chair: Prof Ebad Banissi – ISBU, UK Conference Chair: Prof. Francis T. Marchese – Pace University, USA Subject Liasing Committee chairs
10:50	< LONDON, LSBU: The Keyworth Centre - Event Theatre > Session IV10_1.1: Information Visualisation Chair: Marchese, Prof. Francis T., Pace University, USA <Keynote Lecture> Splashing around: some structural intuitions in art and science Professor Martin Kemp , Trinity College. Oxford University, UK
11:35	< LONDON, LSBU: The Keyworth Centre – Mezzanine > <i>Break</i>
12:00 - 13:00	< LONDON, LSBU: The Keyworth Centre - Event Theatre > Session IV10_1.2: Cultural Heritage Knowledge Visualisation - I Chair: Wyeld, Dr. Theodor G, Flinders University of South Australia, Australia 205 - "Conceptualisations of Self in Contemporary Interactive Artwork: A Case Study of Lynette Wallworth's Duality of Light", <u>Christine Nicholls</u> 104 - Immersive visualization architectures and situated embodiments of culture and heritage <u>Kenderdine, Sarah</u> 105 - Database Narratives: Conceptualising Digital Heritage Databases in Remote Aboriginal Communities <u>Cohen, Hart Kenneth; Dallow, Peter; Morley, Rachel; Kaufman, Lisa</u>

13:00	< LONDON, LSBU: The Keyworth Centre - London Road Refactory >	
	<i>Lunch Break</i>	
14:00	< LONDON, LSBU: The Keyworth Centre - K405/6 >	< LONDON, LSBU: The Keyworth Centre - K305/6 >
-	Session IV10_1.3: Information Visualisation - Theory & Techniques - I	Session IV10_1.4: KV_ Knowledge Visualization and Visual Thinking
15:20	Chair: Houtkamp, Dr. Joske, Utrecht University, The Netherlands	Chair: Bertschi, Stefan, loginb consulting, United Kingdom
	140 - Automatic Application of the Data-State Model in Data-Flow Contexts Cottam, Joseph A.; Lumsdaine, Andrew	153 - The use of visualization in the communication of business strategies: An experimental evaluation <u>Kernbach, Sebastian</u> ; Eppler, Martin
	113 - A Visualization Technique for Access Patterns and Link Structures of Web Sites Kawamoto, Makiko; Itoh, Takayuki	196 - Choosing Knowledge Visualizations to Augment Cognition: the Managers' View <u>Bresciani, Sabrina</u> ; Eppler, Martin
	190 - A 3D Visualization Technique for Large Scale Time-Varying Data Imoto, Maiko; Itoh, Takayuki	128 - How Users Perceive and Use Interactive Information Graphics: An Exploratory Study <u>Burmester, Michael</u> ; Mast, Marcus; Tille, Ralph; Weber, Wibke
	136 - Drawing Clustered Bipartite Graphs in Multi-Circular Style Ito, Takao; Misue, Kazuo; Tanaka, Jiro	

<p>14:00 - 15:20</p>	<p>< LONDON, LSBU: The Keyworth Centre - K307/8 > Session MediViz10_1.5: Information Visualization in Biomedical Informatics Opening and Welcome for IVBi Chair: Trutschl, Dr. Marjan, Louisiana State University Shreveport, USA</p> <p>189 - Real-Time Ray Tracing of Complex Molecular Scenes <u>Marsalek, Lukas</u>; Georgiev, Iliyan; Dehof, Anna Katharina; Lenhof, Hans-Peter; Slusallek, Philipp; Hildebrandt, Andreas</p> <p>169 - Identification, Tracking and Visualization of Platelets in Intravital Microscopy Doss, Joseph; Holloway, Randal; Slack, Jeremiah; Smith, Jennifer; Cvek, Urska; Stokes, Karen Y.; <u>Trutschl, Marjan</u></p> <p>161 - Interactive Patient Records <u>Müller, Heimo</u>; Sauer, Stefan; Kurt, Zatloukal; Thomas, Bauernhofer</p> <p>183 - Preparing, Exploring and Comparing Cancer Simulation Results Within a Large Parameter Space <u>Lunzer, Aran</u>; Belleman, Robert; Melis, Paul; Stamatakos, Georgios</p>	
<p>15:20</p>	<p>< LONDON, LSBU: The Keyworth Centre - The Keyworth Centre > <i>Break</i></p>	
<p>15:50 - 17:00</p>	<p>< LONDON, LSBU: The Keyworth Centre - K405/6 > Session IV10_1.6: Knowledge Visualization and Visual Thinking Chair: Bertschi, Stefan, loginb consulting, United Kingdom</p> <p>157 - Drawing Conclusions: Supporting Decision Making through Collaborative Graphic Annotations Eppler, Martin; <u>Pfister, Roland</u></p> <p>182 - An Application of Edge Bundling Techniques to the Visualization of Media Analysis Results Kienreich, Wolfgang; <u>Seifert, Christin</u></p> <p>101 - Visual Intention in Moving Image Editing and Eye-Tracking Methodology <u>Swenberg, Thorbjörn</u></p>	<p>< LONDON, LSBU: The Keyworth Centre - K305/6 > Session Viz10_1.7: Web Visualisation Chair: kresman, Prof. ray, Bowling Green State University, USA</p> <p>131 - Semi-Automatic generation of GUIs for RDF Browsing Pazienza, Maria Teresa; <u>Scarpato, Noemi</u>; Stellato, Armando</p> <p>126 - INSPIRE: A new Method of Mapping Information Spaces <u>Ruddle, Roy</u></p> <p>122 - Visualization of Web Page Content Using Semantic Technologies <u>Dali, Lorand</u>; Mladenić, Dunja</p> <p>191 - From data realism to dada aggregations: visualizations in digital art, humanities and popular culture Kera, Denisa</p>

15:50 - 17:00	<p>< London , LSBU: The Keyworth Centre – K307/8 ></p> <p>Session IV10_1.8: HCI - Interaction Design for Information Visualisations</p> <p>Chair: Groth, Dr. Dennis, Indiana University, USA</p> <p>165 - Hand motion recognition and visualisation for direct sign writing <u>Lu, Gan</u></p> <p>172 - Wiimote as an input device in Google Earth visualization and navigation: a user study comparing two alternatives <u>Sousa Santos, Beatriz; Dias, Paulo; Silva, Samuel; Ferreira, Carlos</u></p> <p>179 - EMG biofeedback based VR system for hand rotation and grasping rehabilitation <u>Ma, Sha; Varley, Martin Roy; Richards, Jim; Shark, Lik-Kwan</u></p>
17:45	<p>< LONDON, LSBU: The Keyworth Centre – K305/6 ></p> <p>Society of Information Visualisation – AGM (Annual General Meeting)</p>

19:00
–
21:30

Visualisation Social Networking Event

Evening Cruise on the Thames River

A view from the River Thames, a leisurely cruise capturing a panoramic view of the London skyline, a unique blend of modernity interwoven seamlessly into forms and shades of history and culture of one of the world grand capital cities, which cannot be missed.

An evening cruise on the river Thames has been organised for the conference delegates. Detail of this cruise is as follows:

Scheduled: Tuesday 27th July 2010

Time: 18:30 (sharp)

Location: [Embankment Pier](#)

Nearest Underground Stations: [Embankment](#)

Boat: Salient

Type of Function: Thames River Cruise with buffet

Duration: 18:30 - 22:30

COST: Registered Delegates at subsidised rate of: £20 per person

Guest at subsidised rate of: £30 per person

Please confirm your attendance for this social event by Monday 19th July 2010. Tickets and payment can be finalised at the conference registration desk.

Wednesday 28 July 2010

09:00	< LONDON, LSBU: The Keyworth Centre – Mezzanine >	
	<i>Registration</i>	
09:30 - 11:15	< LONDON, LSBU: The Keyworth Centre - Event Theatre > Session IV10_2.1: Information Visualisation – Applications - I Chair: Burmester, Prof. Michael, Stuttgart Media University Germany 146 - Associating Avatars with Musical Genres Holm, Jukka Antero; Siirtola, Harri; Laaksonen, Lauri 132 - Visualization of Multi-sensory Meeting Information to Support Awareness Heimonen, Tomi; Ovaska, Salla; Turunen, Markku; Hakulinen, Jaakko; Rajaniemi, Juha-Pekka; Rähkä, Kari-Jouko 147 - Wearing emotions: physical representation and visualization of human emotions using wearable technologies <u>Iaconesi, Salvatore</u> 118 - Dynamic Visualizations for Soccer Statistical Analysis Rusu, Adrian; Stoica, Doru; Burns, Edward; Hample, Benjamin; McGarry, Kevin; Russell, Robert 176 - Visualization of news access activity in the SAPO News website Raposo, Rui; Veloso, Ana; Correia, Pedro; Mealha, Óscar	< LONDON, LSBU: The Keyworth Centre - K207/8 > Session IV10_2.2: AGT - International Symposium on Applications of Graph Theory Chair: Maple, Prof. Carsten, University of Bedfordshire, UK 184 - Living flows: enhanced exploration of edge-bundled graphs based on GPU-intensive edge rendering <u>Antoine, Lambert</u> ; David, Auber; Guy, Melançon 164 - TRUST ENABLED SECURE MULTIPARTY COMPUTATION Dong, Renren; <u>kresman, ray</u> 185 - Bobox Model Visualization <u>Dokulil, Jiri</u> ; Katreniakova, Jana 221 - Challenges and Perspectives of Procedural Modelling and Effects <u>Yue, Yong</u> ; Fletcher, David 224 - A visualisation technique for the identification of security threats in networked systems <u>Viduto, Valentina</u> ; Maple, Carsten

<p>09:30 - 11:15</p>	<p>< LONDON, LSBU: The Keyworth Centre - K305/6 > Session IV10_2.3: Information Visualisation Chair: Müller, Dr. Heimo, Medical University Graz, Austria</p> <p>103 - Network Visualization of Human and Machine-based Educational Standard Assignment Reitsma, Rene F.; Diekema, Anne R.</p> <p>116 - The Network Lens: Interactive Exploration of Multivariate Networks Using Visual Filtering Jusufi, Ilir; Dingjie, Yang; Kerren, Andreas</p> <p>151 - Preserving coherent illumination in style transfer functions for volume rendering Herrera, Imanol; Buchart, Carlos; Borro, Diego</p> <p>170 - An Interactive Visualization Framework for Time-series of Web graphs in a 3D Environment ITOH, Masahiko; TOYODA, Masashi; KITSUREGAWA, Masaru</p> <p>218 - Combining Visual Analytics and Content Based Data Retrieval Technology for Efficient Data Analysis Rodrigues Jr., Jose Fernando; A. S. Romani, Luciana; Machado Traina, Agma Juci; Traina Jr., Caetano</p>	<p>< LONDON, LSBU: The Keyworth Centre - K405/6 > Session Viz10_2.4 :Visualisation Chair: Levkowitz, Prof. Haim, Institute for Visualization and Perception Research, University of Massachusetts Lowell, USA</p> <p>160 - Molecular Rendering with Medieval and Renaissance Color Theory Marchese, Francis T.; Marchese, Suzanne M.</p> <p>163 - A System for Real-Time Transcoding and Delivery of Video to Smartphones Marchese, Francis T.; Shefer, Lior D.</p> <p>162 - Real-Time Immersive Table Tennis Game for Two Players with Motion Tracking Li, Yingzhu; Shark, Lik-Kwan; Hobbs, Sarah Jane; Ingham, James</p> <p>123 - Visual Amortization Analysis of Recompile Strategies Zimmer, Stephan; Diehl, Stephan</p> <p>223 - Simulation and Visualisation for Electromagnetic Nondestructive Evaluation Simm, Anthony; Zainal Abidin, Ilham; Tian, Gui Yun; Woo, Wai Lok</p>
<p>11:00</p>	<p>< LONDON, LSBU: The Keyworth Centre - Mezzanine > <i>Break</i></p>	

11:30 - 13:00	<p>< LONDON, LSBU: The Keyworth Centre - Event Theatre > Session IV10_2.5: Information Visualisation ~ Application Chair: Eppler, Prof. Martin, University of St. Gallen, Switzerland</p> <p><Keynote Lecture> - Explore, Collaborate and Publish Large Spatio-Temporal Official Statistics Mikael Jern, Professor at University of Linköping and Director at National Center for Visual Analytics NCVA at Linköping University, Sweden</p> <p><Keynote Lecture> - How Can Analytical Imaging Contribute to Preservation of Cultural Heritages? Ari Ide-Ektestabi, http://www.kyotoheritage.jp, Kyoto University, Japan</p>
12:45 - 14:15	<p>< LONDON, LSBU: The Keyworth Centre - Lobby > Session IV10_2.6: POSTER – SHOW CASE Chair: Stuart, Dr. Liz, University of Plymouth, UK</p> <p>117 - OWL Ontology Visualization: Graphical Representations of Properties on the Instance Level Kriglstein, Simone</p> <p>120 - Mid-Season – Visualization of Actor-Networks with the case of a hotel archive* Kilchör, Fabienne</p> <p>217 - Incremental Idea Generation System: Indigen Chen, Sheng-Han; Chang, Teng-Wen</p> <p>226 - A framework to coordinate multiple data similarity maps Eler, Danilo Medeiros; Paulovich, Fernando Vieira; Oliveira, Maria Cristina Ferreira; Minghim, Rosane</p> <p>229 - Incremental Idea Generation System: Indigen Chen, Sheng-Han; Chang, Teng-Wen</p> <p>228 - Information Visualization of multi-dimensional spike train datasets Stuart, Liz; Tucker, Roy C.</p> <p>147 - Wearing emotions: physical representation and visualization of human emotions using wearable technologies Iaconesi, Salvatore</p>

13:00	< London , London SouthBank University (LSBU): London Road Refactory > <i>Lunch Break</i>	
14:15 - 15:15	< LONDON, LSBU: The Keyworth Centre - K207/8 > Session IV10_2.7: Information Visualisation – Theory & Techniques Chair: Forsell, Dr. Camilla, Linköping University, Sweden 174 - GVIS: an integrating infrastructure for adaptively mashing up user data from different sources Mazzola, Luca; <u>Mazza, Riccardo</u> 219 - Kinetic Inter-Acting: A System for Visual Analysis of Interaction Dynamics Deray, Kristine Ann; <u>Simoff, Simeon</u> 213 - Highlighting in Information Visualization: A survey <u>Liang, Jie</u> ; Huang, Maolin	< LONDON, LSBU: The Keyworth Centre - K305/6 > Session BuiltViz10_2.8: Built Environment Knowledge Visualisation Chair: Khosrowshahi, Prof. Farzad, Salford University, UK 220 - Models, mark-up, commentary and attention Counsell, John 206 - The Impact of Immersive Virtual Reality on Visualisation for a Design Review in Construction Bassanino, May Nahab; Wu, Kuo-Cheng; Yao, Jialiang; Khosrowshahi, Farzad; Fernando, Terrence; Skjærbæk, Jens 158 - Zero and Low Carbon Buildings: A Driver for Change in Working Practices and the Use of Computer Modelling and Visualization Hetherington, Robina; Laney, Robin; Peake, Stephen
14:15 - 15:15	< LONDON, LSBU: The Keyworth Centre - K405/6 > Session IV10_2.9: Visual Analytics Chair: Andrienko, Dr. Gennady - Fraunhofer Institute Intelligent Analysis- and Information Systems (FHG IAIS), Germany 107 - Event-based analysis of people's activities and behavior using Flickr and Panoramio geo-tagged photo collections Kisilevich, Slava; Krstajic, Milos; Keim, Daniel; Andrienko, Natalia; Andrienko, Gennady 199 - Visualise Web Usage Mining: Spanning Sequences' impact on Periodicity Discovery Alkilany, Ahmed Aburodes Assaid; Alkilany, Ahmed Aburodes Assaid 143 - Peek Brush: A High-Speed Lightweight Ad-Hoc Selection For Multiple Coordinated Views <u>Berger, Wolfgang</u> ; Piringer, Harald	
15:15	< LONDON, LSBU: The Keyworth Centre – Mezzanine > <i>Break</i>	

<p>15:45 - 17:00</p>	<p>< LONDON, LSBU: The Keyworth Centre - K207/8 > Session IV10_2.10: GeoAnalytics Chair: Jern, Prof. Mikael, Norrköping Visualization and Interaction Studio, Sweden</p> <p>154 - Swedish Road Weather Visualization <u>Lundblad, Patrik</u>; Thoursie, Jonas; Jern, Mikael</p> <p>159 - Taggram: Exploring Geo-Data on Maps through a Tag Cloud-based Visualization <u>Nguyen, Dinh-Quyen</u>; Schumann, Heidrun</p> <p>180 - 3D Edge Bundling for Geographical Data Visualization <u>Lambert, Antoine</u>; Bourqui, Romain; Auber, David</p> <p>108 - A 3D Visualization of Multiple Time Series on Maps Thakur, Sidharth; <u>Hanson, Andrew J.</u></p>	<p>< LONDON, LSBU: The Keyworth Centre - K305/6 > Session IV10_2.11: Information Visualisation - Theory & Techniques Chair: Andrews, Prof. Keith, Graz University of Technology, IICM, Austria</p> <p>141 - Polytree Numbering for Citation Networks Visualisation <u>Logvynovskiy, Alex</u>; Dastbaz, Mohammad</p> <p>137 - Double Tree: an advanced KWIC visualization for expert users <u>Culy, Chris</u>; Lyding, Verena</p> <p>156 - Visualisation of web based e-Learning activity Oliveira, Ana Patrícia; Mealha, Óscar; Santos, Carlos</p>
<p>15:45 - 17:00</p>	<p>< LONDON, LSBU: The Keyworth Centre - K405/6 > Session GMAI10_2.12: Imaging - I Chair: Yue, Prof. Yong, University of Bedfordshire, UK</p> <p>208 - A WAVELET INPAINTING BY A TIXOTROP MODEL <u>Nouri, Fatma Zohra</u>; MAOUNI, MESSAOUD</p> <p>212 - Visualization of Positive Data by Rational Cubic Spline Interpolant <u>Sarfraz, Muhammad</u>; Hussain, Malik Zawwar</p> <p>173 - YACBIR Yet Another Content Based Image Retrieval system <u>Ait-Aoudia, Samy</u>; Mahiou, Ramdane; Benzaid, Billel</p>	
<p>17:00</p>	<p>< LONDON, LSBU: The Keyworth Centre - Event Theatre > Session IV10_2.13: Animation, Special Effects and Multimedia Show Chair: Bannatyne, Prof. Mark, IUPUI, USA</p>	
	<p>< LONDON, LSBU: The Keyworth Centre K305/6 > European Visualisation Technology Link Meeting & Special Interest Group meetings</p>	

Thursday 29 July 2010

09:00	< LONDON, LSBU: The Keyworth Centre – Mezzanine >	
	<i>Registration</i>	
09:30 - 11:15	< LONDON, LSBU: The Keyworth Centre – K207/08 >	< LONDON, LSBU: The Keyworth Centre – K305/06 >
	Session IV10_3.1: Information Visualisation – Application - II	Session MediViz10_3.2: Biomedical Visualisation - Medical Imaging Techniques
	Chair: Hanson, Prof. Andrew J., Indiana University, USA	Chair: Lunzer, Dr. Aran, Hokkaido University, Meme Media Laboratory, Japan
	188 - Liquid Diagrams: Information Visualisation Gadgets <u>Andrews, Keith</u> ; Lessacher, Martin	155 - Using Web Services as Functional-Level Plug Ins for Interactive 3D Medical Visualisation Wang, Tao; <u>Zhao, Youbing</u> ; Liu, Enjie; Clapworthy, Gordon; Zhao, Xia; Wei, Hui; Dong, Feng
	138 - Information visualization in facility location and vehicle routing decisions <u>Lopes, Rui Borges</u> ; Santos, Beatriz Sousa; Dias, Paulo; Ferreira, Carlos	193 - Semi-supervised Tissue Segmentation of 3D Brain MR Images Zhang, Xiangrong; Dong, Feng; Clapworthy, Gordon; <u>Zhao, Youbing</u> ; Jiao, Licheng
	178 - Metric data analysis enhanced through temporal visualization <u>Bueno, Renato</u> ; Razente, Humberto L.; Kaster, Daniel S.; Barioni, Maria Camila N.; Traina, Agma J. M.; Traina, Caetano Jr.	166 - CardioAnalyser: A Software Tool for Segmentation and Analysis of the Left Ventricle\ from 4D MDCT Images of the Heart <u>Silva, Samuel</u> ; Madeira, Joaquim; Sousa Santos, Beatriz; Silva, Augusto
	130 - Interaction with computers using mobile devices <u>Sasakura, Mariko</u> ; Fujioka, Shinsuke; Yamasaki, Susumu	150 - Visualisation of Left Ventricular Dysfunction in the Virtual Pathological Heart <u>Lin, Xinyu</u> ; Mcfarlane, Nigel; Zhao, Youbing; Clapworthy, Gordon; Dong, Feng; Radaelli, Alberto
	181 - From Databases to Graph Visualization <u>Gilbert, Frédéric</u> ; Auber, David	187 - Investigating the Trend of Virtual Reality-based Stroke Rehabilitation Systems <u>Prashun, Prashant</u> ; Hadley, Glyn; Gatzidis, Christos; Swain, Ian
	115 - A Theme Landscape for Tagged Data <u>Münster, Evelyn</u>	

<p>09:30 - 11:15</p>	<p>< LONDON, LSBU: The Keyworth Centre – K407/08 > Session IV10_3.3: Design Visualisation Chair: Hetherington, Robina, Open University, United Kingdom</p> <p>197 - Use of Multiple Shape Attributes in Information Visualization: Guidance from Prior Art and Experiments Brath, Richard <presenter Brian Cort ></p> <p>186 - AmbientNEWS: Augmenting Information Discovery in Complex Settings Through Aesthetic Design Valkanova, Nina Vesselinova; Moghnieh, Ayman; Arroyo, Ernesto; Blat, Josep</p> <p>148 - From data to knowledge – Visualizations as trasformation processes within the DIK continuum Masud, Luca; Valsecchi, Fancesca; Ciuccarelli, Paolo; Ricci, Donato; Caviglia, Giorgio</p> <p>114 - The Classic Aesthetic and the Poietic Elements of Information Design Carlsson, Anna-Lena</p>	<p>< LONDON, LSBU: The Keyworth Centre – K405/06 > Session IV10_3.4: Information Visualisation Chair: Khosrowshahi, Prof. Farzad, Salford University, UK</p> <p>121 - Challenges of the Display Method: Time-based Digital Art in the Traditional Gallery Hounshell, Jonathan</p> <p>217 - Incremental Idea Generation System: Indigen Chen, Sheng-Han; Chang, Teng-Wen</p> <p>152 - Guidelines to Visualize Vessels in a Geographic Information System Rodighiero, Dario</p> <p>145 - A New Paradigm for Visualization and Generating Grid Geometry Art and Beyond Lin, Hsin Hsin</p>
<p>11:15</p>	<p>< LONDON, LSBU: The Keyworth Centre – Mezzanine > <i>Break</i></p>	



<p>11:45 - 13:00</p>	<p>< LONDON, LSBU: The Keyworth Centre – K207/08 > Session IV10_3.5: Information Visualization - Evaluation Chair: Bueno , Dr. Renato, Federal University of São Carlos, Brazil</p> <p>139 - Visualising Virtual Learning Environments: Case Studies of the Website Exploration Tool <u>Pascual-Cid, Víctor</u>; Vigentini, Lorenzo; Quixal, Martí</p> <p>215 - Evaluating Climate Visualization-An Information Visualization Approach <u>Johansson, Jimmy</u>; Neset, Tina; Linnér, Björn-Ola</p> <p>214 - A Guide to Scientific Evaluation in Information Visualization <u>Forsell, Camilla</u></p> <p>175 - Supporting the analytical reasoning process in maritime anomaly detection: evaluation and experimental design <u>Riveiro, Maria</u>; Falkman, Göran</p>	<p>< LONDON, LSBU: The Keyworth Centre – K305/06 > Session BuiltViz10_3.6: Sustainability in Built and Rural Environments (1) Chair: John Counsell, University of Wales Institute, Cardiff, UK</p> <p>177 - Affective qualities of an urban environment on a desktop computer Houtkamp, Joske; Junger, Mike</p> <p>200 - Human Perception, Virtual Reality and the Built Environment Johnson, Angie; Thompson, Emine Mine; Coventry, Kenny</p> <p>198 - The Management of Sharing, Integrating, Tracking, and Maintaining Data-sets, is a New and Rather Complex Task Harty, James; Laing, Richard</p>
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<p>11:45 - 13:00</p>	<p>< LONDON, LSBU: The Keyworth Centre – K407/08 > Session IV10_3.7: Cultural Heritage Knowledge Visualisation - II Chair: Kenderdine, Dr. Sarah, City University; Museum Victoria, Hong Kong S.A.R. - China</p> <p>201 - Ancestral Forces in Contemporary Indigenous Australian Women’s Art: 3 Case Studies of Multi-Dimensional Cultural Heritage Knowledge Visualization Marquis, Jenefer; <u>Wyeld, Theodor G</u></p> <p>202 - Re-Writing Recent History: developing a National reconciliation pedagogy using a video game for school age children. Wyeld, Theodor G</p> <p>211 – Embodying Affect: The Stolen Generation, The history Wars and Polesapart by Indigenous New Media Artist R E A Nicholls, Christine Judith</p>	<p>< LONDON, LSBU: The Keyworth Centre – K405/06 > Session IV10_3.8: GeoAnalytics Chair: Andrienko, Dr. Gennady - Fraunhofer Institute Intelligent Analysis- and Information Systems (FHG IAIS), Germany</p> <p>168 - GeoVisualisation of SAPO search activity Veloso, Ana Isabel; Raposo, Rui; Costa, João; Mealha, Óscar</p> <p>111 - Extracting Events from Spatial Time Series Andrienko, Gennady; Andrienko, Natalia; Mladenov, Martin; Mock, Michael; Poelitz, Christian</p> <p>134 - Exploring new ways of integration, visualization and interaction with Geotechnical and Geophysical Data Gonçalves, Vítor Manuel Andrade; Dias, Paulo; Almeida, Fernando; Santos, Beatriz Sousa</p>
<p>13:00</p>	<p style="text-align: center;"><LONDON, LSBU: London Road Building Refectory ></p> <p>Lunch Break</p>	

14:00	<LONDON, LSBU: The Keyworth Centre – Event Theatre >
-	SessionIV10_3.9: Information Visualisation
15:00	Chair: Wyeld, Dr. Theodor G, Flinders University of South Australia, Australia
	<Keynote Lecture>
	Oncology Lifeline – A Timeline Tool for the Interdisciplinary Management of Breast Cancer Patients in a Surgical Clinic Brian Drohan, Georges Grinstein, John Sharko, Chris Lawrence2, Kevin Hughes
	<Keynote Lecture> - Parallel Coordinates are better than they look! Alfred Inselberg, School of Mathematical Sciences, Tel Aviv University, Tel Aviv, Israel and Senior Fellow in Visualization, San Diego SuperComputing Center, San Diego, California, USA
	<Keynote Lecture> Information is Beautiful David McCandless, http://www.informationisbeautiful.net , London UK
15:30	<LONDON, LSBU: The Keyworth Centre – Mezzanine>
	<i>Break</i>
15:45	<LONDON, LSBU: The Keyworth Centre – K207/08>
	IV2011 - Committee Members Meeting
16:30	Close

Session IV10_1.1: Information Visualisation

Chair: Marchese, Prof. Francis T., Pace University, USA

<Keynote Lecture>

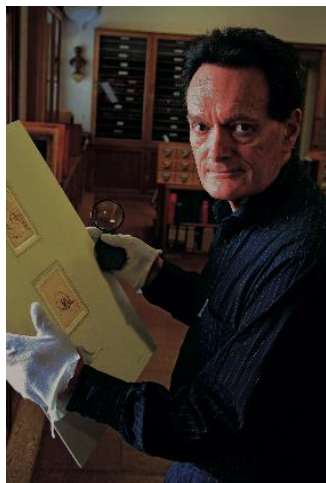
Splashing around: some structural intuitions in art and science

Professor Martin Kemp FBA is Emeritus Professor in the History of Art at Trinity College. Oxford University

Certain kinds of art and science originate in the intuiting of deep structures that lie behind appearance. Some of the structures are predominantly static, relying upon the fundamental forms of geometry; some are the result of process, like folding; others disclose the process itself, like splashing. These themes run across key aspects of visualization in art, architecture, design and various sciences from the Renaissance to the age of computers.

Biography of speaker: Martin Kemp

He was trained in Natural Sciences and Art History at Cambridge University and the Courtauld Institute, London. He was British Academy Wolfson Research Professor (1993-98). For more than 25 years he was based in Scotland (Universities of Glasgow and St. Andrews). He has held visiting posts in Princeton, New York, North Carolina, Los Angeles, Montreal and Harvard (I Tatti).



He has written, broadcast and curated exhibitions on imagery in art and science from the Renaissance to the present day. Books include, *The Science of Art. Optical Themes in Western Art from Brunelleschi to Seurat* (Yale University Press), and *The Human Animal in Western Art and Science* (Chicago 2007). He has published extensively on Leonardo da Vinci, including the prize-winning *Leonardo da Vinci. The*

marvellous works of nature and man (1989 and 2006). His book on the new Leonardo portrait is to be published in 2010.

He has curated and co-curated a series of exhibitions on Leonardo and other themes, including *Spectacular Bodies* at the Hayward Gallery in London and *Leonardo da Vinci. Experience, Experiment, Design* at the Victoria and Albert Museum in 2006 and *Seduced. Sex and Art from Antiquity to Now*, Barbican Art Gallery London, 2007. He was also guest curator for *Ca 1492* at the National Gallery in Washington in 1992.

Increasingly, he has focused on issues of visualization, modelling and representation. He writes a regular column *Nature* (published as *Visualisations*, OUP, 2000) and developed as *Seen and Unseen*, OUP 2006, in which his concept of “structural intuitions” is explored). He is currently writing a book on *Iconic Images from Christ to DNA*.

Session IV10_1.2: Cultural Heritage Knowledge Visualisation - I

Chair: Wyeld, Dr. Theodor G, Flinders University of South Australia Australia

Conceptualisations of Self in Contemporary Interactive Artwork: A Case Study of Lynette Wallworth's Duality of Light**Christine Judith Nicholls**

Flinders University Adelaide Australia, Australia

This paper, which is contextualised in terms of the broader history of the moving image, examines new media artist Lynette Wallworth's installation *Duality of Light* with respect to recent advances in neuroscientific research. These have led to greater understanding of how the brain processes visual imagery. Of greatest relevance to Wallworth's work is the discovery that the binding of the largely anatomically segregated attributes of colour, motion and faces occurs asynchronously and is subject to a temporal hierarchy. Moreover, such binding is post-conscious. Further to this, following Gansing (2003), while simultaneously factoring in these

recent neuroscientific advances, the idea of 'interactivity' is challenged. The inadequacy of 'interactive' as an undifferentiated descriptor, often uniformly applied to diverse new media works, is also highlighted. Works such as those created by Wallworth – whose work is informed intuitively by these recent neuroscientific findings – reveals, par excellence, the shortcomings of such homogenising terminology. Finally, this paper demonstrates the interwoven nature of the abovementioned subject matter and thematic concerns.

Immersive visualization architectures and situated embodiments of culture and heritage

Sarah Kenderdine

City University, Hong Kong; Museum Victoria, Australia

This paper describes a series of transdisciplinary research projects in five large-scale, interactive visualization architectures. These immersive architectures and their associated visual, sonic and algorithmic techniques offer compelling means for mapping and re-mediating the tangible, intangible and abstract aspects of culture and heritage landscapes. This paper brings these unique systems and the installations developed for them together for the first time. The task here is to highlight the strategies for embodied, kinaesthetic and multi-sensory and collaborative engagement as powerful ways to reformulate narrative made possible through these stereographic, panoramic, large-scale situated interaction.

Database Narratives: Conceptualising Digital Heritage Databases in Remote Aboriginal Communities

Hart Kenneth Cohen, Peter Dallow, Rachel Morley, Lisa Kaufman

University of Western Sydney, Australia

Interactive web-based resources are significant to the mediation of culture in that they act as an interface (Newton: 2003) between communities and information structures. The focus of this paper is on the use of digital media arts and user-centered technologies (Press & Cooper: 2003) to develop a digital heritage resource to revitalize a community's cultural capital. The paper addresses the creation and use of an interactive

database that forms the portal to a digital repository of archival media. The database supports and extends an Australian classic memoir, Journey to Horseshoe Bend by TGH Strehlow. Journey to Horseshoe Bend is a vivid ethno-historiographic account of the Aboriginal (Arrernte/Arrarnta), settler and Lutheran communities of Central Australia in the 1920's. The Journey to Horseshoe Bend database <<http://heuristscholar.org/cocoon/jhsb-test/item/69994/>> draws on a broad range of visual representations (including images, maps, concept diagrams, text and other media resources), and through hyperlinks connects these media to specific annotated points in an electronic version of the book. The paper focuses on the book's use as a digital heritage resource and explores the link between information architectures and knowledge practices, in particular contexts to address the following question: How can a digital heritage resource be conceived as a sustainable emerging "thing-in-the-making" to reflect community, cultural and knowledge interests?

Background resources: <http://heuristscholar.org/cocoon/jhsb-test/item/69994/> and project website: <http://www.commarts.uws.edu.au/jthb/>

Session IV10_1.3: Information Visualisation - Theory & Techniques - I

Chair: Houtkamp, Dr. Joske, Utrecht University, The Netherlands

Automatic Application of the Data-State Model in Data-Flow Contexts

Joseph A. Cottam, Andrew Lumsdaine

Indiana University, United States of America

The data-state and data-flow models of information visualization are known to be expressively equivalent. Each model is most effective for different combinations of analysis processes and data characteristics. Visualization frameworks tend to either (1) work within a single model or (2) permit either model in separate sub-frameworks. In either case, converting between the two models falls entirely to the programmer. The theoretical basis for automatic translation between the two models was

established by Chi. However, that process is insufficiently specified to be directly implemented. This paper characterizes the practical advantages of the data-state model. This is used to identify when such a transformation is beneficial. It then expands on Chi's theoretical framework to provide the tools for translating visualization program fragments from the data-flow to the data-state model. A partial implementation of the expanded theory is described for the Stencil visualization environment.

A Visualization Technique for Access Patterns and Link Structures of Web Sites

Makiko Kawamoto, Takayuki Itoh

Ochanomizu University, Japan

There have been two types of Web visualization techniques: visualization of Web sites themselves based on such as link structures or lexical contents, and visualization of browsers' behaviors. We think that integration of such two visualization techniques is very useful for Web site management, and therefore we are currently studying on visualization of access pattern and link structure on a single screen. This paper presents a Web visualization technique using our own multiple-category-embedded graph visualization technique. The presented technique constructs link structures using crawler software, and access patterns from access log files. It then integrates them and visualizes by our graph visualization technique. We expect that users can visually understand the relationship between access patterns and link structures, and utilize the knowledge for design and management of Web sites. This paper shows our case study and discusses typical access patterns we observed by the technique.

A 3D Visualization Technique for Large Scale Time-Varying Data

Maiko Imoto, Takayuki Itoh

Ochanomizu University, Japan

We represent time-varying data as polyline charts very often. At the same time, we often need to observe hundreds or even thousands of time-

varying values in one chart. However, it is often difficult to understand such large-scale time-varying if all the values are drawn in a single polyline chart. This paper presents a polyline-based 3D time-varying data visualization technique. The technique places a set of polylines in the 3D space, where the X-axis denotes time, the Y-axis denotes values, and the polylines are arranged along the Z-axis. It provides two views: the first viewpoint has a view direction along Y-axis, and the second viewpoint has a view direction along Z-axis. The technique displays the overview of the data from the first viewpoint, and the detail of the specific parts of the data from the second viewpoint. It also detects frequent or outlier patterns by applying SAX (Symbolic Aggregate approxImation), and displays them so that users can discover such characteristic patterns. This paper shows several interesting visualization examples to demonstrate the effectiveness of the presented technique.

Drawing Clustered Bipartite Graphs in Multi-Circular Style

Takao Ito, Kazuo Misue, Jiro Tanaka

University of Tsukuba, Japan

Bipartite graphs are often used to illustrate relationships between two sets of data, such as web pages and visitors. At the same time, information is often organized hierarchically, for example, web pages are divided into directories by their contents. The hierarchical structures are useful for analyzing information. Graphs with both a bipartite structure and a hierarchical structure are called "clustered bipartite graphs." A new clustered bipartite graphs visualization technique was developed for representing both bipartite and hierarchical structures simultaneously. In this technique, nodes in one set of the bipartite graph, which are leaves of a tree, are arranged in hierarchical multi-circular style. Then, nodes in the other set of the bipartite graph are arranged by the force-directed method. The technique enables step-by-step exploration for large-scale bipartite graphs.

Session IV10_ 1.4: KV_ Knowledge Visualization and Visual Thinking

Chair: Bertschi, Stefan, loginb consulting, United Kingdom

The use of visualization in the communication of business strategies: An experimental evaluation

Sebastian Kernbach, Martin Eppler

USI, Switzerland

An experiment was conducted to add empirical evidence whether the use of visualization is better than text in the communication of business strategies.

Seventy-four managers who took part in an Executive MBA program saw a presentation of the simplified strategy of BMW Financial Services. The visual support of the presentation was manipulated by the author and the according effects were measured. Three different types of visual support were chosen: text in the form of PowerPoint (1), visualization in the form of a visual metaphor (2,) and a roadmap (3). Each subject saw only one of the three types of visual support. The effects measured were attention, comprehension, agreement and retention. In addition the perception of the visual and the perception of the presenter were measured for each of the three conditions.

Subjects who were exposed to visualization in the form of visual metaphor and roadmap paid significantly more attention to the strategy, agreed more with the strategy and recalled the strategy better than did subjects who saw text in the form of PowerPoint. No significant superiority was found for visualization compared to text in understanding the strategy.

Subjects who were exposed to visualization in the form of visual metaphor and roadmap perceived the visual and the presenter significantly better than did those subjects who were exposed to text in the form of PowerPoint. In addition the perception of the visual accounted for 69% of the variation of the perception of the presenter.

Choosing Knowledge Visualizations to Augment Cognition: the Managers' View

Sabrina Bresciani¹, Martin Eppler²

¹University of Lugano (USI), Switzerland; ²University of St. Gallen (HSG), Switzerland

Growing evidence in the scientific literature and in organizations shows the positive impact of employing conceptual visual representation for individual reasoning, communicating and facilitating meetings in organizations. 116 managers responded a questionnaire on the usefulness of 12 common business visualizations for typical knowledge tasks in organizations. The resulting ranking provides an overview of the comparative suitability of visualizations for generating ideas, sharing knowledge, evaluating options and planning. The findings can be used by organizations for choosing visual templates as a support for specific knowledge tasks. Theoretical implications include the relationship between the structure level of knowledge visualization forms and convergent/divergent task type. Further implications for theory and practice are discussed.

How Users Perceive and Use Interactive Information Graphics: An Exploratory Study

Michael Burmester, Marcus Mast, Ralph Tille, Wibke Weber

Stuttgart Media University (HdM), Germany

This paper presents an exploratory empirical study about users' reception and usage behavior with interactive information graphics. We assume users to act interest-driven. Therefore no explicit tasks were assigned to participants. In order not to distract the user, retrospective thinking aloud was employed. Results show that (1) usage durations were heterogeneous between users and between different types of interactive information graphics; (2) users tended to watch introductory animations; (3) initial orientation without interaction on the first content screen (after intro) was rather long with 23 seconds on average; (4) story-based approaches seem to motivate users but might lead to less intensive reception of information; (5) several reception and usage problems have

been identified regarding information presentation and interaction. Interactive information graphics tend to overwhelm users with too much information and disregard well-known principles and rules of the old media

Session MediViz10_1.5: Information Visualization in Biomedical Informatics

Opening and Welcome for IVBi

Chair: Trutschl, Dr. Marjan, Louisiana State University
Shreveport, USA

Real-Time Ray Tracing of Complex Molecular Scenes

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¹Saarland University, Germany; ²DFKI Saarbruecken; ³Center for Bioinformatics, Saarbruecken

Molecular visualization is one of the cornerstones of structural bioinformatics and related fields. Today, rasterization is typically used for the interactive display of molecular scenes, while ray tracing for generating high-quality images, taking typically minutes to hours to generate and requiring the usage of an external off-line program.

Recently, real-time ray tracing that can combine the interactivity of rasterization-based approaches with the superb image quality of ray tracing has appeared. We demonstrate how real-time ray tracing, when integrated with a molecular modelling tool, allows for better understanding of the structural arrangement of biomolecules and natural creation of publication-quality images in real-time. However, unlike most approaches, our technique seamlessly integrates with a full-featured molecular modelling tool BALLView, allowing to perform all the standard day-to-day tasks directly and interactively with the superb visual quality.

Identification, Tracking and Visualization of Platelets in Intravital Microscopy

Joseph Doss¹, Randal Holloway¹, Jeremiah Slack¹, Jennifer Smith¹, Urska Cvek^{1,3}, Karen Y. Stokes^{2,3}, Marjan Trutschl^{1,3}

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Intravital microscopy permits observation of live events in intact tissues to study a variety of issues, including quantifying cell-vessel wall interactions. The analysis of the parameters is labor-intensive, subjective and limited to broad categories of blood cell-vessel wall interactions. We are developing an algorithmic approach that aids in analysis, automatically and objectively detects and tracks platelets, and expands information derived from such videos. We integrate computer vision and break the identification, tracking, and visualization into steps. We enable simple and computationally efficient means of eliminating movement within a video based on positional shifting of an identified feature and visualize platelet paths.

Interactive Patient Records

Heimo Müller, Stefan Sauer, Zatloukal Kurt, Bauernhofer Thomas

Medical University Graz, Austria

Researches in humanities and social sciences indicate that people using more visual information would be more creative and benefit on a larger scale from the power of the human mind. Therefore information should be recorded not only by static text, but rather it is conceivable to construct new visual languages that are not based on letters, but on icons. We developed a set of medical symbols, which can be used in visual representations of medical records and to build complex medical statements. Each of the basic symbols is available in 4 abstraction levels, which can be combined in a 'visual sentence'. Complex visual representations are recognized more easily than simplified versions, and on the other hand the simple version can be perceived and memorized in

a faster way, than complex signs. To prove this hypothesis and to evaluate the perception of the symbols in a medical context we created a web-based evaluation tool covering two perception tests. With the help of the symbol library we developed a visual language for patient records and an interactive browser

Preparing, Exploring and Comparing Cancer Simulation Results Within a Large Parameter Space

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¹Hokkaido University, Japan; ²University of Amsterdam, The Netherlands;

³National Technical University of Athens, Greece

The ACGT Oncosimulator is an integrated Grid-based system, under development within a 25-partner EU project, for patient-specific simulation of the response of a tumour and surrounding tissue to various forms of therapy. The validation of the simulation code is an activity requiring extensive human-driven visual investigation of the influence of each of the dozens of parameters to the code, and comparison of the simulation results against the known outcomes of past patient treatments. This activity therefore calls for a visualisation environment that supports users in navigating through an extremely large result space, and in making comparisons among sets of results extracted from that space. We describe the innovative features of the OncoRecipeSheet, an environment designed to meet these requirements.

Session IV10_1.6: Knowledge Visualization and Visual Thinking

Chair: Bertschi, Stefan, loginb consulting, United Kingdom

Drawing Conclusions: Supporting Decision Making through Collaborative Graphic Annotations

Martin Eppler, Roland Pfister

University of St. Gallen, Switzerland

Although the application of sketch-based chart annotation is not pervasive in management, the use of sketchmarks can provide numerous benefits to managerial discussions. The collaborative use of chart annotations can support management teams in their decision making based on quantitative charts by visually eliciting and capturing interpretation processes, clarifying basic assumptions, stimulating different perspectives, and extrapolating trends into the future. Sketch-based annotations combine the simplicity and immediacy of drawing with the clarity and richness of charting. In this paper, we provide the rationale for this under-researched visual management and communication practice, illustrate it through examples, and – as our main contribution – provide a first overview classification of the different sketchmarks that management groups can use in their discussion of quantitative charts (for such contexts as strategy or project reviews). In the end of the paper we briefly describe our future research in this area and highlight implications for management. We provide basic sketchmark forms and guidelines for managers and facilitators in the appendix.

An Application of Edge Bundling Techniques to the Visualization of Media Analysis Results

Wolfgang Kienreich, Christin Seifert

Know-Center Graz, Austria

The advent of consumer-generated and social media has led to a continuous expansion and diversification of the media landscape. Media consumers frequently find themselves assuming the role of media analysts in order to satisfy personal information needs. We propose to employ Knowledge Visualization methods to assist consumers in complex media analysis tasks. In this paper, we describe an approach which enables the interactive visual analysis of knowledge extracted from news media content. We have applied a force-directed edge bundling algorithm to node-link diagrams which depict semantic relationships between key political actors. The resulting visualization fosters the identification of high-level edge patterns which indicate strong semantic relationships. We report on design, implementation and evaluation of this

application, which has been published by the Austrian Press Agency APA in 2009.

Visual Intention in Moving Image Editing and Eye-Tracking Methodology

Thorbjörn Swenberg

Dalarna University / Mälardalen University, Sweden

Moving images production teams' skills in directing the visual perception of viewers have been confirmed lately through eye-tracking methodology. One interest lies in explaining the use of different techniques by the production team for its realization of visual intentions.

This paper undertakes the development of a method for grasping the film or video editors' intentions underlying the editing of moving images, and has been carried out in a pilot-study. The method suggested considers conventions of the trade, ethnographic study of the editing of specific edits, as well as testing of sequences of moving images where the intention with each edit is known. This test is conducted on viewers, with the use of eye-tracking techniques in a laboratory setting.

The findings are that this method should be useful in distinguishing between when the editors' grip on the audience is firm, and when it is rather vague. But the paper also suggests new concepts for understanding the viewers' gazes when watching moving images

Session Viz10_1.7: Web Visualisation

Chair: kresman, Prof. ray, Bowling Green State University, USA

Semi-Automatic generation of GUIs for RDF Browsing

Maria Teresa Paziienza, Noemi Scarpato, Armando Stellato

University of Rome "Tor Vergata", Italy

In this paper we present an approach to automatic generation of GUI for browsing of RDF data based on observation of existing forms and their

adaptation to available RDF graphs. The objective of such an approach is the rapid prototyping of forms and their associated queries by exploiting the vast amount examples that is already available from the Web, and trying to automate those steps requiring human intervention (form template extraction, query specification) for customizing found examples to developer's specific needs.

INSPIRE: A new Method of Mapping Information Spaces

Roy Ruddle

University of Leeds, United Kingdom

Information spaces such the WWW are the most challenging type of space that many people navigate during everyday life. Unlike the real world, there are no effective maps of information spaces, so people are forced to rely on search engines which are only suited to some types of retrieval task. This paper describes a new method for creating maps of information spaces, called INSPIRE. The INSPIRE engine is a tree drawing algorithm that uses a city metaphor, comprised of streets and buildings, and generates maps entirely automatically from webcrawl data. A technical evaluation was carried out using data from 112 universities, which had up to 485,775 pages on their websites. Although they take longer to compute than radial layouts (e.g., the Bubble Tree), INSPIRE maps are much more compact. INSPIRE maps also have desirable aesthetic properties of being orthogonal, preserving symmetry between identical subtrees and being planar.

Visualization of Web Page Content Using Semantic Technologies

Lorand Dali, Dunja Mladenić

Jožef Stefan Institute, Slovenia

This paper presents a system for visualizing the information contained in the text of a web page. The goal of the visualization is to help the users better and faster understand the text on a web page and/or find related content on the internet. These visualizations are possible due to the use of text mining, natural language processing and semantic web technologies.

Our system tries to make these technologies instantly accessible to a wide variety of users reading a wide variety of web pages. This high coverage of both users and content can be achieved because the system is implemented as an extension to Firefox, one of the most popular browsers, and because the visualizations are computed on the fly for any page the user happens to be reading at a given moment.

From data realism to dada aggregations: visualizations in digital art, humanities and popular culture

Denisa Kera

National University of Singapore, Singapore

Whether in art, humanities or on the open APIs (Application programming interfaces) and mashups we see the same impulse oriented towards data as means of a critical distance to the visual and media saturation of our world. These emerging critical and visual practices define what we will call the new realism of data, a data oriented realism that does not simply represent reality per se but performs the process of its construction and representation with an almost iconoclastic fervor. It offers distance from the power and seduction of the online image by allowing us to experience the construction and visualization of various data and by experimenting with the creative interpretations of these data in the form of user generated mashups and digital art visualizations that sometimes share the aesthetic strategies of the early dada collages.

Art visualizations but also user created and recycled mashups are means not only of modern day politics but also ontology and tools of a new metaphysics. They revive an interest in reality hidden in data that is indifferent to human needs, intentions and politics and which often expresses an autonomy of different systems on humans. They bring the surrender of any teleology or even conspiracy theory by presenting the complexity and emergence present behind data. They define an attempt for new realism based on these hybrid, complex and process based ontology of flows rather than ontology of lasting, stable and well arranged structures and patterns.

Session IV10_1.8: HCI - Interaction Design for Information Visualisations

Chair: Groth, Dr. Dennis, Indiana University, USA

Hand motion recognition and visualisation for direct sign writing

Gan Lu

University of Central Lancashire, United Kingdom

Although SignWriting provides an intuitive notation system based on pictorial symbols to enable any sign based language in the world to be transcribed into a written form, it is a time consuming process for keyboard based input. To address the challenge of direct sign writing, the paper presents a human-computer-interaction system developed for recognition and visualisation of hand movements. The system is shown to be able to display the corresponding SignWriting symbols for various hand movements performed by two hands based on motion characteristics such as movement planes, movement directions, straight/curve movement paths, clockwise/anti-clockwise movements, and single/repeated movements.

Wiimote as an input device in Google Earth visualization and navigation: a user study comparing two alternatives

Beatriz Sousa Santos¹, Paulo Dias¹, Samuel Silva¹, Carlos Ferreira^{1,2}

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This paper presents a user study performed to compare the usability of the Wiimote as an input device to visualize information and navigate in Google Earth using two different configurations. This study had the collaboration of 15 participants which performed a set of tasks using the Wiimote as an input device while the image was projected on a common projection screen, as well as a mouse on a desktop. Results show that most users clearly preferred one of the Wiimote configurations over the

other, and over the mouse; moreover, they had better performances using the preferred configuration, and found it easier to use.

EMG biofeedback based VR system for hand rotation and grasping rehabilitation

Sha Ma, Martin Roy Varley, Jim Richards, Lik-Kwan Shark

University of Central Lancashire, United Kingdom

Individuals who have upper limb movement problems include people with cerebral palsy (CP) and stroke victims. Both these conditions lead to difficulties in daily activities such as reaching, grasping etc. Virtual reality (VR), which could provide a repetitive multimodal task-oriented rehabilitation environment for patients to undertake self-training in safety, is considered to be a suitable tool for medical health rehabilitation. Using electromyography (EMG) biofeedback in rehabilitation could provide patients with opportunities to improve the ability by assessing their muscle activity response and learning self-control of movement during specific training tasks. This paper presents a study on developing EMG as an important interactive tool in a VR based system for hand rotation and grasping motion rehabilitation. The input interface includes an EMG system and a real-time magnetic motion tracking system, and the output interface is a PC monitor. The developed EMG biofeedback based VR system enables the user to interact with virtual objects in real-time with multiform feedback. Ten healthy subjects participated in the preliminary task evaluation test, and the results suggest that the specified skills have improved during training. The beneficial effects of the developed system indicate the potential values for further clinical application.

Session IV10_2.1: Information Visualisation – Applications- I

Chair: Burmester, Prof. Michael, Stuttgart Media University
Germany

Associating Avatars with Musical Genres

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Accessing personal and online music libraries with thousands of songs has become an everyday activity. Instead of textual lists, the libraries can also be accessed using graphical visualizations such as adaptive avatars. To develop the idea further, we designed 17 stereotypical avatars representing different musical genres. To study how well the avatars were recognized, an online questionnaire with 71 participants was arranged. This paper discusses the design of avatars in more detail, explains which musical genres were selected for the study and why, and presents the results of the questionnaire.

Visualization of Multi-sensory Meeting Information to Support Awareness

Tomi Heimonen, Saila Ovaska, Markku Turunen, Jaakko Hakulinen, Juha-Pekka Rajaniemi, Kari-Jouko Rähkä

Tampere Unit for Computer-Human Interaction (TAUCHI), Department of Computer Sciences University of Tampere, Finland

Awareness of shared work activities is important for fostering professional relationships. This paper introduces visualization techniques for a meeting support system based on automatic speech recognition and multi-sensory meeting information capture, including voice levels and participant comments. The system has been deployed in live meetings over the past 5 months and we report meeting participants' expectations and findings from the field study. Initial findings suggest that the proposed approach can facilitate awareness without the need for detailed meeting

transcriptions and associated audio recordings, however quality of the speech recognition results and the effectiveness of how they are visualized remain critical factors for increased adoption.

Wearing emotions: physical representation and visualization of human emotions using wearable technologies

Salvatore Iaconesi

University of Rome "La Sapienza", Italy

An interesting loop can be created by representing and visualizing human emotions using wearable technologies. Emotions visualized using electronic devices that are worn on the body can create an enhanced skin that can be used to activate cognitive processes that are relevant to social communication, knowledge dissemination, education and, extending horizons, to the interaction with architectures, spaces, people, objects and the general environment.

Here we investigate on the possibility to use emotion classification and representation methodologies to create designs and to enact dynamics that are significant from cognitive, ethnographic and psychologic perspectives.

Several methodologies have been created over time to identify human emotions, acting on linguistic, biometric and interactive levels. Each methodology serves different purposes and achieves different goals. As an example, Plutchik's classification refers to a psychoevolutionary approach, allowing us a structural analysis. Or Paul Ekman's method, allowing us to approach cross-cultural contexts analyzing face expressions. Or Oatley and Johnson-Laird, who started semantic analyses of emotion, opening up paths for them to be represented using neural networks and computer systems. Or Aaron Sloman's version, tententially disconnecting from psychology and starting to focus on emergent dynamics. Or, more recently, Dacher Keltner's social and ethnographic centered approach, allowing us to investigate on social interactions, cultural backgrounds and, again, on emergent dynamics.

These and more approaches have been experimented theorizing, designing, prototyping and testing (measuring, evaluating, iterating) several setups in which the classic model for interaction design (sensor-comparator-actuator) has been applied to the creation of wearable electronic devices that allow individuals to wear a realtime visualization of their (or other people's) emotions, as related to times, places, social interactions, impersonation, re-enactment.

The documented experimentation produced results describing the uses and effects of these forms of technological emotional skin.

Dynamic Visualizations for Soccer Statistical Analysis

Adrian Rusu¹, Doru Stoica², Edward Burns¹, Benjamin Hample¹, Kevin McGarry¹, Robert Russell¹

¹Rowan University, United States of America; ²University of Craiova, Romania

The analysis of large sums of soccer statistics can be extremely difficult if the data is not presented graphically. As a result, we developed an application, titled Soccer Scoop, which provides two separate visualizations that can aid a soccer team manager. With this application, a team manager can compare two players on different teams, analyze a particular player before signing them to a contract, measure the performance of a particular player at different positions, generate practice exercises, and determine if a particular player plays better on the road or at home. The visualizations used in this application apply information visualization techniques, such as glyphs, modified star plots, details on demand, color, and gestalt principles.

Visualization of news access activity in the SAPO News website

Rui Raposo, Ana Veloso, Pedro Correia, Óscar Mealha

Universidade de Aveiro, Portugal

This paper holds as its core objective the report of the research developed towards the conceptualisation and prototyping of an Information Visualisation system capable of providing a quick and accurate view of the

set of data collected by the SAPO Broker web service regarding access activity in the SAPO news website. SAPO Broker, a real-time monitoring application that collects data generated by every type of activity within the SAPO Web Portal. The research presented and its results undertook two major challenges:

- i) design a visual metaphor capable of integrating news related collected data for a specific target audience, technology setup and context of use;
- ii) design user friendly and context valid interaction tools able to assist data analysis and help improve news editorial related tasks.

Throughout this paper the need for transdisciplinary teamwork and diverse scientific knowledge correlation is reinforced, as we believe it should be when the core issue is Information Visualisation.

Session IV10_2.2: AGT - International Symposium on Applications of Graph Theory

Chair: Maple, Prof. Carsten, University of Bedfordshire, UK

Living flows: enhanced exploration of edge-bundled graphs based on GPU-intensive edge rendering

Lambert Antoine, Auber David, Melançon Guy

LaBRI, France

This paper describes an approach exploiting the full capabilities of GPU's to enhance the usability of edge bundling in real applications. Edge bundling, as well as other edge clustering approaches relying on the use of high quality edge rerouting. Typical approach for drawing edge-bundled graph is to render edges as curves. But curves generation can have a relatively high computational costs and do not easily comply with real-time interaction. Furthermore, while edge bundling provides a much better overall readability of a graph, the bundles make it more difficult to recover local information. Our goal was thus to provide fluid interaction allowing the recovery of local information through specific interaction techniques. The system we built offers folklore or classical interaction such as zoom &

pan, fish-eye and magnifying lens. We also implemented the Bring & Go technique by Tominski et al. [19]. We proposed an approach exploiting the full computing power of GPU's when rendering graph edges as parametric splines. The gain in efficiency when running all curves computations on the GPU turns bundling techniques into techniques that can be embedded in interactive systems concerned with graphs of several thousands of nodes and edges.

Trust Enabled Secure Multiparty computation

Renren Dong¹, [ray kresman](#)²

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Hamiltonian cycles (HC) play an important role in graph theory and data mining applications. Two Hamiltonian cycles that don't have an edge in common are known as edge-disjoint Hamiltonian cycles (EDHC). EDHC is useful in computer networks. They have found applications in improving network capacity, fault-tolerance and to make data mining algorithms more collusion resistant.

This paper extends previous work on collusion resistance capability of data mining algorithms. We first propose a new trust model for network computers. We then use this model as a basis to improve the collusion resistance capability of data mining algorithms. We use a performance metric to quantify the improvement.

Bobox Model Visualization

[Jiri Dokulil](#)¹, [Jana Katreniakova](#)²

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The Bobox project is a parallelization framework based on the idea of putting together a number of simple components to create a data processing, non-linear pipeline. The structure (the model) of the pipeline a directed graph, but with several specific properties. In order to display the pipeline in a debugger application that is a part of the framework, we have

adapted some of the graph drawing algorithms to leverage the specific properties and challenges found in Bobox model visualization.

Challenges and Perspectives of Procedural Modelling and Effects

Yong Yue, [David Fletcher](#)

University of Bedfordshire, United Kingdom

The use of procedural modelling has risen dramatically over the last decade. This has been partly due to the increase in computing power, affording developers the opportunity to use methods that were previously infeasible. A further reason for this growth is due to the improvement of the representation of human knowledge. The development of procedural modeling has, thus far, been somewhat disjointed and ad hoc as different areas of graphics, gaming and modelling have been utilizing the technique with little reference outside of their own specialisation. This paper provides an overview of procedural modelling covering key techniques and applications and then suggests a framework for the development of a procedural modelling system that can form areas of land of both populated areas and bodies of water.

A visualisation technique for the identification of security threats in networked systems

Valentina Viduto, [Carsten Maple](#)

University of Bedfordshire

Today's IT infrastructures, systems and applications are more complex than ever. Increased complexity of networked systems has led to poorer prediction of threats and management of business requirements. Objective decision making requires identifying, measuring and evaluating all enterprise events, either positive or negative (risks) and keeping them in perspective with business objectives, in terms of interdependency and materiality.

One solution for better identification and evaluation of security threats is by the use of visualisation techniques. This paper focuses on hierarchical

technique, which combines attack scenario and layered security model. The model tells the state of a play and can assist in decision making process.

Session IV10_2.3: Information Visualisation

Chair: Müller, Dr. Heimo, Medical University Graz, Austria

Network Visualization of Human and Machine-based Educational Standard Assignment

Rene F. Reitsma¹, Anne R. Diekema²

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Rapid growth in the availability of digital libraries of K-12 curriculum, coupled with an increased emphasis on standard-based teaching has led to the development of automated standard assignment tools. To assess the performance of one of those tools and to gain insight into the differences between how human catalogers and automated tools conduct these standard assignments, we explore the use of network modeling and visualization techniques for comparing and contrasting the two. The results show significant differences between the human-based and machine-based network maps. Unlike the machine-based maps, the human-based assignment maps elegantly reflect the rationales and principles of the assignments; i.e., clusters of standards separate along lines of content and pedagogical principles. In addition, humans seem significantly more apt at assigning so-called 'methodological' standards.

The Network Lens: Interactive Exploration of Multivariate Networks Using Visual Filtering

Ilir Jusufi, Yang Dingjie, Andreas Kerren

Linnaeus University, Sweden

Networks are widely used in modeling relational data often comprised of thousands of nodes and edges. This kind of data alone implies a challenge for its visualization as it is hard to avoid clutter of network elements if using traditional node-link diagrams. Moreover, real life network data sets usually represent objects with a large number of additional attributes that need to be visualized, such as in software engineering, social network analysis, or biochemistry. In this paper, we present a novel approach, called Network Lens, to visualize such attributes in context of the underlying network. Our implementation of the Network Lens is an interactive tool that extends the idea of so-called magic lenses in such a way that users can interactively build and combine various lenses by specifying different attributes and selecting suitable visual representations.

Preserving coherent illumination in style transfer functions for volume rendering

Imanol Herrera, Carlos Buchart, Diego Borro

CEIT and Tecnun (University of Navarra)

Volume rendering has been widely used in different fields where several rendering algorithms have been developed, such as shear-warp, ray casting or splatting. But independently of the rendering method, transfer functions are usually used for mapping values and other properties of the volume into colors. As an improvement of transfer functions, style transfer functions are being used, where sphere maps extracted from artwork are used instead of plain colors. In this paper we propose an interactive designer that would allow the user to create styles in a easy way, and shade them with just a color or a texture. In addition, it guarantees a coherent illumination, making it possible to easily use style transfer functions to achieve realistic rendering.

An Interactive Visualization Framework for Time-series of Web graphs in a 3D Environment

Masahiko ITOH, Masashi TOYODA, Masaru KITSUREGAWA

The University of Tokyo, Japan

This paper proposes an interactive 3D visualization framework for time-series of web graphs. The purpose of our framework is to enable users to examine the evolution of the web graphs by comparing multiple graphs in different timings and topics. We provide multiple views for visualizing web graphs that represent web graphs of particular timings in a 3D environment. Visualized web graphs are snapshots of different timings or are created from different keywords. We visualize them in 2D planes in the 3D environment. Each 2D plane is placed along a timeline that is one axis in the 3D environment. We call such web graphs TimeSlices. Users can add new TimeSlices along the time line, and can manipulate them to animate web graphs. Moreover, we provide overlay views and parallel views in the 3D environment to compare web graphs. Users can seamlessly change such viewing modes. Our system also can visualize two web graphs created from different key words to show evolutionary correlation between them. This system enables us to observe structural and temporal changes of multiple web graphs such as shift of influential blogs or power shift of diffusion of blogs among topics.

Combining Visual Analytics and Content Based Data Retrieval Technology for Efficient Data Analysis

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One of the most useful techniques to help visual data analysis systems is interactive filtering (brushing). However, visualization techniques often suffer from overlap of graphical items and multiple attributes complexity, making visual selection inefficient. In these situations, the benefits of data visualization are not fully observable because the graphical items do not pop up as comprehensive patterns. In this work we propose the use of

content-based data retrieval technology combined with visual analytics. The idea is to use the similarity query functionalities provided by metric space systems in order to select regions of the data domain according to user-guidance and interests. After that, the data found in such regions feed multiple visualization workspaces so that the user can inspect the correspondent data sets. Our experiments showed that the methodology can break the visual analysis process into smaller problems (views) and that the views hold the expectations of the analyst according to his/her similarity query selection, improving data perception and analytical possibilities. Our contribution introduces a principle that can be used in all sorts of visualization techniques and systems, this principle can be extended with different kinds of integration visualization-metric-space, and with different metrics, expanding the possibilities of visual data analysis in aspects such as semantics and scalability.

Session Viz10_2.4 :Visualisation

Chair: Levkowitz, Prof. Haim, Institute for Visualization and Perception Research, University of Massachusetts Lowell, USA

Molecular Rendering with Medieval and Renaissance Color Theory

Francis T. Marchese, Suzanne M. Marchese

Pace University, United States of America

This paper reports the application of Medieval and Renaissance color theory to the computer graphic rendering of molecular models. In particular, Alberti's and Cennini's color theories were employed to render shaded geometric primitives such as cylinders and spheres that are the components of traditional ball-and-stick and space filling molecular models. These results were compared with standard rendering based

on the OpenGL API or through ray tracing. It is found that by implementing Alberti's and Cennini's color theories as color maps within a simple chemical illustration program it is possible to create molecular imagery comparable to contemporary computer graphics schemes.

A System for Real-Time Transcoding and Delivery of Video to Smartphones

Francis T. Marchese, Lior D. Shefer

Pace University, United States of America

This paper presents a report of a system that delivers customized video content to mobile devices. Constructed from open source components, it can stream transcoded video to mobile devices in real-time. In addition, it allows publishers to add content into their video streams on-the-fly. As a demonstration of this system's capabilities, an application was designed to deliver transcoded Adobe Flash content to Apple iPhones in real-time with the insertion of randomly selected commercial content.

Real-Time Immersive Table Tennis Game for Two Players with Motion Tracking

Yingzhu Li, Lik-Kwan Shark, Sarah Jane Hobbs, James Ingham

University of Central Lancashire, United Kingdom

Presented in this paper is a novel real-time virtual reality game developed to enable two participants to play table tennis immersively with each other's avatar in a shared virtual environment. It uses a wireless hybrid inertial and ultrasonic tracking system to provide the positions and orientations of both the head (view point) and hand (racket) of each player, as well as two large rear-projection stereoscopic screens to provide a view-dependent 3D display of the game environment. Additionally, a physics-based ball animation model is designed for the game, which includes fast detection of the ball colliding with table, net and quick moving rackets. The system is shown to offer some unique features and form a good platform for development of other immersive games for multiple players.

Amortization Analysis of Recompile Strategies

Stephan Zimmer, Stephan Diehl

University of Trier, Germany

Dynamic recompilation tries to produce more efficient code by exploiting runtime information. Virtual machines like the Jikes RVM use recompilation heuristics to decide how to recompile the program, i.e. what parts are recompiled at what level of optimization. In this paper we present our post-mortem amortization analysis based on improved call stack sampling.

Our tool presents the results of the analysis as an interactive visualizations to help both virtual machine implementors improve their recompilation strategies, as well as programmers assess whether these recompilation strategies pay off not only for their application as a whole, but also for individual methods.

Simulation and Visualisation for Electromagnetic Nondestructive Evaluation

Anthony Simm, Ilham Zainal Abidin, Gui Yun Tian, Wai Lok Woo

Newcastle University, United Kingdom

This paper reviews the state-of-the art of modelling, simulation and visualisation and reviews the recent development of modelling, simulation and visualisation software for Nondestructive Evaluation (NDE). Simulation and visualisation can assist design and development of electromagnetic sensing and imaging techniques and systems for non-destructive testing; feature extraction and inverse problems for quantitative non-destructive evaluation. After reviewing the state-of-the art of electromagnetic modelling and simulation, case studies of R&D of electromagnetic NDE for eddy current distribution and thermography are discussed.

Session IV10_2.5: Information Visualisation ~ Application

Chair: Eppler, Prof. Martin, University of St. Gallen, Switzerland

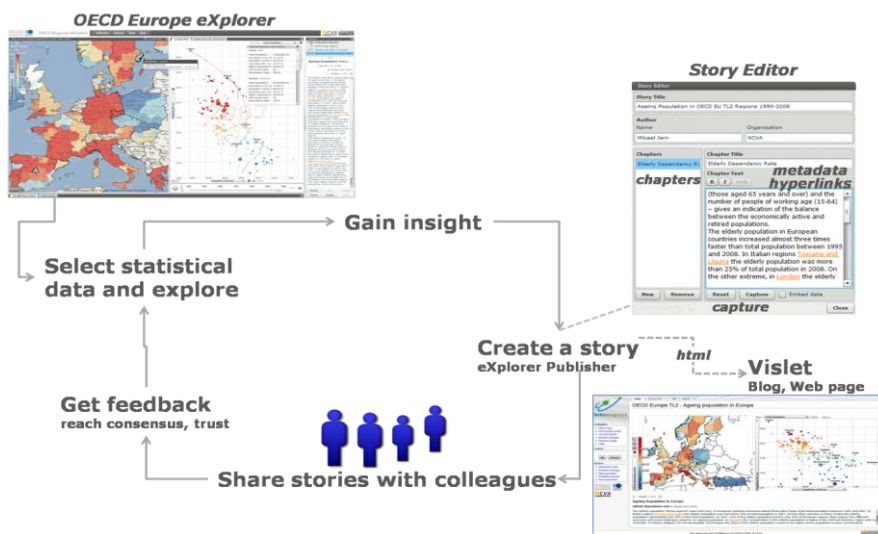
<Keynote Lecture>

Explore, Collaborate and Publish Large Spatio-Temporal Official Statistics

Jern, Prof. Mikael

National Centre for Visual Analytics, ITN, Linköping University, Sweden

Official statistics such as demographics, environment, health, social-economy and education from national and sub-national sources are a rich and important source of information for many important aspects of life and should be considered to be more used and acknowledged in education. Educators and their students would be able to get informed and at the same time participate in increasing the knowledge on how life is lived and can be improved. Public statistics databases, e.g. EuroStat, OECD, Worldbank, WHO and numerous national statistics bureaus etc. can be reached on the Internet. This is producing what is often called information



overload and causing people to be increasingly faced with the problems of filtering and interpreting enormous quantities of information. We know that official statistics are used as a more or less important background for decisions especially in government administration and policy making. However, in education, official statistics are much less recognized and used than they ought to be and among the informed public they are even less used.

The Internet provides a communication infrastructure which offers the opportunity to also participate in the production of content. A better understanding of how educators and their students can elicit better user understanding and participation by exploiting dynamic web-enabled geovisual analytics and its associated science of perception in learning is the focus of this presentation in relation to the use of multidimensional spatio-temporal statistical data. Public available Web tools ([Open eXplorer](#)) are explained that help and engage educators to communicate progress initiatives measuring economic, social, educational, health and environmental developments to students and citizens. NCVA has since 2008 in close research collaboration with [OECD](#) developed and evaluated geovisual analytics tools for exploring and communicating statistical information. Storytelling and publishing statistics news in blogs or digital newspapers are examples of our latest research direction. Means are explained how the author (educator) 1) select spatio-temporal and multidimensional national or sub-national statistical data, 2) explore and discern trends and patterns, 3) then orchestrate and describe metadata, 4) collaborate with colleagues to confirm and 5) finally publish essential gained insight and knowledge embedded as dynamic visualization “[Vislet](#)” in blogs or web pages with associate metadata. The author can guide the reader in the directions of both context and discovery while at the same time follow the analyst’s way of logical reasoning. We are moving away from a clear distinction between authors and readers affecting the process through which knowledge is created and the traditional models which support editorial work. Value no longer relies solely on the content but also on the ability to access this information. Audiences are increasingly gathered around Web enabled technologies and this distribution channel is, more than ever, in control of the information value chain.

Biography of speaker: Mikael Jern

1970-1976, Prof Jern worked with Professor Hertz at University of Lund. Together they invented the Colour Graphics System based on the first ink jet plotter for raster based visualisation software in the world. 1980, he founded UNIRAS addressing industry with a more general-purpose raster graphics approach. UNIRAS became a world leading supplier of Visual Data Analysis. Jern coordinated several EC projects in the domain of knowledge-based information visualization and also consulted with the EC Commission as a technical expert. He has published more than 200 technical papers and books in visual computing and visualization application areas. SIGGRAPH 1993, he was elected "pioneer of computer graphics" based on his breaking new ground research together with Hertz in raster graphics. 1999, he was appointed professor in information visualization at Linköping University. In 2008, he founded NCVA (Swedish National Center for Visual Analytics) with support from the Swedish Knowledge Foundation to focus research on web-enabled geovisual analytics concepts. In close collaboration with OECD, he has created awareness and interest for dynamic information visualization to explore and communicate large spatio-temporal and multivariate regional statistical data. He is now a frequent speaker at international statistical conferences

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<Keynote Lecture>

How Can Analytical Imaging Contribute to Preservation of Cultural Heritages?

Professor Ari Ide-Ektessabi,

<http://www.kyotoheritage.jp>, Kyoto University, Japan

We present our recent research results on developing an integrated system for digitizing, analyses, and displaying of cultural heritage assets. The three basic components of this system are non-contact digitizers, software for analysis of pigments, and a zooming viewer for displaying the large files.

Grabbing images: The scanners produce high resolution, good color quality digital images of large artworks. Eleven of such systems have already been designed and manufactured which are used on site for various projects for digitizing Japanese and Koreans important cultural heritage, by museums and temples. Three color (RGB) digitization, eight color (multi-band) digitization, infrared (IR) imaging are possible with minimum damage from light sources to the artwork. In addition, polarized light imaging can also be employed, allowing golden and shiny metallic surfaces to be accurately scanned.

Analyzing images: Using simulation software on the digital image files, colorimetric curves and spectral data with micrometer special resolution can be obtained. The colorimetric and spectral information will provide museums and researchers with rich and crucial information on historical degradation of colors, and deep understanding for conservation and restoration of art objects. For example in cases of pigments used in ancient Japanese artworks, for example, a database with more than 1000 hues was developed as a model to be used containing colorimetric information, allowing researchers to estimate the materials used in such paintings. By continuously adding new data, the system can be expanded and developed into an international database for the analysis of ancient art, covering Egyptian, Roman, Greek, Persian, Indian, Chinese and other world heritage assets.

Displaying images: The digital image files produced by the high-resolution scanners have sizes between 20GB and 200 GB, depending on image parameters. These immense files can be displayed using a specially designed viewer software, allowing detailed viewing in very high-resolution, on computers and workstations.

Biography of speaker: Ari Ide-Ektessabi

Ari Ide-Ektessabi was born in 1952. He was a student in Faculty of Electronics Engineering, Kyoto University, Japan during 1973-1983, and obtained his PhD in electronics engineering. His field of research was designing systems of charged particle beams for fabrication and analysis of surfaces and materials. He joined Kyoto University as an associate professor in 1991 and as a

professor in 2001. He was the leader of four major projects related to developing advanced technologies (hardware and software) in art and cultural heritage as follows:

- Development of High-resolution Large Flatbed Scanner for Digitizing Large Artworks and Non-Destructive Pigment Estimation - Japan Science and Technology Agency, Comprehensive Support Program for Creation of Regional Innovation: Key Seed Projects for Regional R&D, FY 2004-2007
- An Integrated System for Secure and Dynamic Display of Cultural Heritage - Japan Science and Technology Agency, Comprehensive Support Program for Creation of Regional Innovation: Regional R&D Resources Utilization, FY 2006-2008
- Developing the Technical Foundation for International Digital Museum - The Feasibility Study Program 2009, Ministry of Education, Culture, Sports, Science and Technology (MEXT), Realization of the System and Basic Technical Elements of Digital Museum
- International Joint Research on High Resolution Digitization of Asian World Heritage - Japan Special Coordination Funds for Promotion of Science and Technology, Asia-Africa Science and Technology Strategic Cooperation Promotion Program, FY 2009-2011

He published more than 200 papers in material processing, analytical techniques using accelerators, charged particle beams and synchrotron radiation.

His book on application of synchrotron radiation (Springer, Heidelberg 2007) gives a detailed account of application of high energy x-rays to high resolution imaging at single cell level.

His current interest is focused on "Science and Technology for Art" the topic of 10 symposia that he organized during the last 5 years.

Session IV10_2.6: POSTER – SHOW CASE

Chair: Stuart, Dr. Liz, University of Plymouth, UK

OWL Ontology Visualization: Graphical Representations of Properties on the Instance Level
Simone Kriglstein

University of Vienna, Faculty of Computer Science

For several ontology applications, a combination of classes with their instances, their properties on the class level and on the instance level are from interest. However, the focus of most visualization approaches is on the hierarchical and non-hierarchical relationships on the class level. This paper presents an approach to visualize datatype properties and object properties on the instance level. For this purpose, three different layouts were developed for the ontology visualization tool Knoocks. Furthermore, the paper discusses results of an evaluation that was motivated to identify which one of these layout versions was preferred by the users. The evaluation should also reveal if the concept of the representation of the properties was understandable for them.

Mid-Season – Visualization of Actor-Networks with the case of a hotel archive

Fabienne Kilchör

Bern University of the Arts, Switzerland

Complex operations, operating working-process as well as **disparate collections** can be explained with the **Actor-Network Theory** (ANT). This theory, which originated in the field of science studies, is a distinctive approach in social theory and research. It can be described as a material-semiotic method. This post-structural theory maps relations which are both material (between things) and semiotic (between concepts). **People, ideas, objects and technologies form a single network**. The ANT may look at explicit strategies for linking different elements together in a network so that they form an apparently coherent whole. The ANT offers the alternative of visualizing variable approaches of Knowledge Visualization of qualitative information. The heterogeneous material, its content and utility often are not visible until they exist in parallel and operate in an interconnected fashion.

The research project explores how **complex and multilayered networks** and information beams, of a very heterogeneous character, can be brought together, visualized and communicated with the methods of Knowledge Visualization.

Knowledge Visualization as a sub-discipline of Visual Communication generates visual representations of quantitative and qualitative data. The field aims to clearly represent complex data – often with an advantage over forms of linguistic or standardized visual representations.

Up till now, archives are generally two-dimensional and text-based. In collaboration with our project partner “Hotelarchive Switzerland”, we are examining what is useful in new kinds of Visualization Forms.

The objective is to connect very diverse information beams around a hotel archive – such as photos, postcards, furniture, guest-books, administrative papers – which are all witness to the daily life and spirit of their times and thus convey more than just “objective” information. The solution will be a documentation consisting of innovative visual arrangements, transformed

to generically recommendations and guidelines for the Knowledge Visualization of Actor-Networks.

This visualization-tool provides an **overview** of a complete hotel inventory, with a **simplified access** to the history of business and life of hotels in Switzerland – in parallel to the traditional archive, constituted by “Hotelarchiv Switzerland”. The project offers the opportunity for researchers in fields like architecture, tourism and history **to find new information, while revealing unanticipated connections and correlations**.

The visualization of Actor-Networks is a central issue in the planning and application of extensive social and economic processes. One of the benefits of unconventional visualization forms is to provide alternative solutions to connect and gain access to data which is complex in its management, a process which in turn generates new knowledge. Generally, these **visualization tools** are used for Knowledge Management and for new Visual Methods in the handling of multilayer structures, which require regular up-dating.

Project development: Fabienne Kilchör, fabienne.kilchoer@hkb.bfh.ch

Cooperation: Hotelarchive Switzerland, www.hotelarchiv.ch

Contact: www.hkb.bfh.ch/zwischenaison.html

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Incremental Idea Generation System: Indigen

Sheng-Han Chen, Teng-Wen Chang

National Yunlin University of Science and Technology, Taiwan

Cultural Heritage is quickly disappearing when time goes by. Cultural Heritage is a valuable knowledge of the mankind. Further, narratives of cultural heritage can help us to appreciate its culture and knowledge, and through visualization be able to deepen our understanding of knowledge. Visualizing the filtered knowledge: narratives, people not only receive or thinking, but also through convergence to gain further reflection of heritage. This paper will develop a narrative visualization system (called Indigen) that will apply the storytelling techniques for narrative visualization purpose. The information of Traditional Chinese garden will be used as the knowledge to test Indigen.

A framework to coordinate multiple data similarity maps

Danilo Medeiros Eler, Fernando Vieira Paulovich, Maria Cristina Ferreira Oliveira, Rosane Minghim

University of Sao Paulo, Brazil

Similarity maps comprise a class of visualization techniques that provide a graphical metaphor of the similarity relationships amongst data instances.

Such representations are important because many data analysis tasks require a good understanding of such relationships. In this paper, we handle similarity maps constructed using multidimensional visualization techniques, which work by projecting high-dimensional data into a lower dimensional visual space, whilst seeking to preserve the relevant data relationships defined in the original data space.

One way to minimize the effects of the inevitable information loss incurred by projection processes is to provide multiple views - e.g., different maps from the same data set obtained with different parameters or projection techniques, or yet maps derived from different representations of the data, such as image and text collections relative to the same underlying phenomenon. In this case, users should be able to rely on appropriate coordination strategies capable of helping them to extract the most from the different data views and expose relevant data relationships.

We argue that a rich set of coordinations may be defined for similarity maps. We propose a coordination framework to define such coordinations and illustrate how this framework enables merging the outputs of multiple coordination actions. We illustrate how this joining of coordinations provides a useful resource for users to handle similarity maps obtained from different data types.

Information Visualization of multi-dimensional spike train datasets

Liz Stuart, Roy C. Tucker

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Our research applies the techniques and principles of Information Visualization [1] to support the analysis of large datasets from many diverse scientific disciplines. At the Visualization Lab (www.plymouth.ac.uk/infovis), the core objective of our work is the development of highly flexible and intuitively interactive software to support the investigation of scientific datasets.

Wearing emotions: physical representation and visualization of human emotions using wearable technologies

Salvatore Iaconesi

University of Rome "La Sapienza", Italy

An interesting loop can be created by representing and visualizing human emotions using wearable technologies. Emotions visualized using electronic devices that are worn on the body can create an enhanced skin that can be used to activate cognitive processes that are relevant to social communication, knowledge dissemination, education and, extending horizons, to the interaction with architectures, spaces, people, objects and the general environment.

Here we investigate on the possibility to use emotion classification and representation methodologies to create designs and to enact dynamics that are significant from cognitive, ethnographic and psychologic perspectives.

Several methodologies have been created over time to identify human emotions, acting on linguistic, biometric and interactive levels. Each methodology serves different purposes and achieves different goals. As an example, Plutchik's classification refers to a psychoevolutionary approach, allowing us a structural analysis. Or Paul Ekman's method, allowing us to approach cross-cultural contexts analyzing face expressions. Or Oatley and Johnson-Laird, who started semantic analyses of emotion, opening up paths for them to be represented using neural networks and computer systems. Or Aaron Sloman's version, tendentially disconnecting from psychology and starting to focus on emergent dynamics. Or, more recently, Dacher Keltner's social and ethnographic centered approach, allowing us to investigate on social interactions, cultural backgrounds and, again, on emergent dynamics.

These and more approaches have been experimented theorizing, designing, prototyping and testing (measuring, evaluating, iterating) several setups in which the classic model for interaction design (sensor-comparator-actuator) has been applied to the creation of wearable electronic devices that allow individuals to wear a realtime visualization of

their (or other people's) emotions, as related to times, places, social interactions, impersonation, re-enactment. The documented experimentation produced results describing the uses and effects of these forms of technological emotional skin.

Session IV10_2.7: Information Visualisation – Theory & Techniques

Chair: Forsell, Dr. Camilla, Linköping University, Sweden

GVIS: an integrating infrastructure for adaptively mashing up user data from different sources

Luca Mazzola, Riccardo Mazza

USI - University of Lugano, Switzerland

In this article we present an infrastructure for creating mash up visual representations of the user profile that combines data from different sources. We explored this approach in the context of Life Long Learning, where different platforms or services are often used to support the learning process. The system is highly configurable and adaptive: data sources, data aggregations, and visualizations can be configured on the fly by the administrative user without changing any part of the software, and have an adaptive behavior based on linear combination of conditions about user or system characteristics.

The visual profiles produced can assume different graphical formats and can be bound to different data, automatically adapting to personal preferences, knowledge, and contexts. We applied our infrastructure to a set of federated Learning Management Systems, retrieving information from different sources and creating some indicators of the learning activity. The software we developed provide learners with adaptive indicators of the learning state, and allows instructor to monitor the progress of their learners.

Kinetic Inter-Acting: A System for Visual Analysis of Interaction Dynamics

Kristine Ann Deray¹, Simeon Simoff²

¹University of Technology Sydney, Australia; ²University of Western Sydney

Interactions are central to our endeavours. Whether in a face-to-face session with a doctor or via one of Web 2.0 applications, the way interactions unfold has an impact on the final outcome of the session. This paper addresses the problem of the development of a visual language and analysis system, enabling visual reasoning about the quality of interactions. The paper presents a system of encoding the way interactions unfold. It presents the foundations of KIA (Kinetic Inter-Acting) visual language and the visual analysis system with this language. The language is then evaluated through comparison with expert judgments when applied to cases in health care. KIA (the language and the analysis system) enables both humans and machines to utilise information about how interactions unfold in order to improve interactions and the processes that depend on them.

Highlighting in Information Visualization: A survey

Jie Liang, Maolin Huang

The University of Technology, Sydney, Australia

Highlighting was the basic viewing control mechanism in computer graphics and visualization to guide users' attention in reading diagrams, images, graphs and digital texts. As the rapid growth of theory and practice in information visualization, highlighting has extended its role that acts as not only a *viewing control*, but also an *interaction control* and a *graphic recommendation mechanism* in knowledge visualization and visual analytics. In this work, we attempt to give a formal summarization and classification of the existing and potential highlighting methods and techniques that are and are able to be applied in Information Visualization, Visual Analytics and Knowledge Visualization. We propose a new three-layer model of highlighting. We discuss the responsibilities of each layer in the different stage of the visual information processing.

Session BuiltViz10_2.8: Built Environment Knowledge Visualisation

Chair: Khosrowshahi, Prof. Farzad, Salford University, UK

Models, mark-up, commentary and attention

John Counsell

University of Wales Institute, Cardiff, United Kingdom

This paper explores an evolutionary approach towards post creation markup and commentary attachments to 3D Virtual Reality models of Built Heritage from 1995 to date. A particular focus of the several projects described over this period was to enable and support web-based collaborative modelling of the built and natural environment, covering facsimiles of its current form, various interpretations of historic settings, and interpretations of the future in the form of versions of planning proposals.

Throughout these projects a need was defined for non-proprietary and software-independent forms of 'mark-up' for: commenting on the evolving state of and versions of modelling; linking to many different media, documentary sources and base data that served to evidence these interpretations; and for achieving consensus in opposing or supporting planned proposals. It is suggested that the necessary 3D capable GIS that support a 'Google Docs' approach to web based 3D modelling collaboration and commentary are only now beginning to emerge.

The Impact of Immersive Virtual Reality on Visualisation for a Design Review in Construction

May Nahab Bassanino, Kuo-Cheng Wu, Jialiang Yao, Farzad Khosrowshahi, Terrence Fernando, Jens Skjærbaek

The University of Salford, United Kingdom

Communication during the design process has a substantial role because; it exchanges messages and conveys ideas to people with different skills

and interests. Also, the development of high quality 3D modelling, photo rendering and VR software has shifted the way we communicate architecture, from a conventional one to a digital format and so, provided us with another way for the communication of information, the visualisation of processes and the creative expression of ideas.

This paper investigates the impact that Immersive Virtual Reality technology can have on visualisation of a design review scenario in construction, which was developed during the course of the European CoSpaces project and the potential of such technologies to alter the way enterprises work.

Zero and Low Carbon Buildings: A Driver for Change in Working Practices and the Use of Computer Modelling and Visualization

Robina Hetherington, Robin Laney, Stephen Peake

Open University, United Kingdom

Buildings account for significant carbon dioxide emissions, both in construction and operation. Governments around the world are setting targets and legislating to reduce the carbon emissions related to the built environment. Challenges presented by increasingly rigorous standards for construction projects will mean a paradigm shift in how new buildings are designed and managed. This will lead to the need for computational modelling and visualization of buildings and their energy performance throughout the life-cycle of the building.

This paper briefly outline how the UK government is planning to reduce carbon emissions for new buildings. It discusses the challenges faced by the architectural, construction and building management professions in adjusting to the proposed requirements for low or zero carbon buildings. It then outlines how software tools, including the use of visualization tools, could develop to support the designer, contractor and user.

Session IV10_2.9: Visual Analytics

Chair: Andrienko, Dr. Gennady - Fraunhofer Institute Intelligent Analysis- and Information Systems (FHG IAIS), Germany

Event-based analysis of people's activities and behavior using Flickr and Panoramio geo-tagged photo collections

Slava Kisilevich¹, Milos Krstajic², Daniel Keim³, Natalia Andrienko⁴, Gennady Andrienko⁵

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Photo-sharing websites such as Flickr and Panoramio contain millions of geo-tagged images contributed by people from all over the world. Characteristics of these data pose new challenges in the domain of spatiotemporal analysis. In this paper, we define several different tasks related to analysis of attractive places, points of interest and comparison of behavioral patterns of different user communities on geo-tagged photo data. We perform analysis and comparison of temporal events, rankings of sightseeing places in a city, and study mobility of people using geo-tagged photos. We take a systematic approach to accomplish these tasks by applying scalable computational techniques, using statistical and data mining algorithms, combined with interactive geo-visualization. We provide exploratory visual analysis environment, which allows the analyst to detect spatial and temporal patterns and extract additional knowledge from large geo-tagged photo collections. We demonstrate our approach by applying the methods to several regions in the world

Visualise Web Usage Mining: Spanning Sequences' impact on Periodicity Discovery

Ahmed Aburodes Assaid Alkilany, Ahmed Aburodes Assaid Alkilany

Sebha University, Libyan Arab Jamahiriya, Libya

In this paper we present a more effective method to discover the periodicity in web log sequence data which handle missing sequences which may occur during the aggregation process, such as sequences that swing between two periods. On other hands, a sequence may start near

the end time of a period where the rest of those sequences appear in next period however, these kinds of issues certainly it will leave its effect of periodicity discovery. Moreover, we incorporated OLAP data cube techniques in the aggregation process in order to handle large generated sequences and visualised the discovered periodic patterns, in order to study its impact on periodicity discovery.

Peek Brush: A High-Speed Lightweight Ad-Hoc Selection For Multiple Coordinated Views

Wolfgang Berger, Harald Piringer

VRVis Research Center, Austria

Linking+Brushing is a proven concept to reveal relationships across multiple views. Defining complex selections, however, may involve a significant interaction overhead. This paper proposes Peek Brush, a point-brush that is designed to temporarily select and highlight items hovered by the user's mouse cursor. This enables quickly skimming through the data to identify relationships between different data projections within seconds. The Peek Brush serves the purpose of defining a starting point to a more focused inspection using brushes with higher complexity. In order to achieve rapid visual updates, we discuss acceleration techniques like preprocessing, threading, and layering. As a result, the Peek Brush is able to scale to datasets with millions of entries. A case study demonstrates how the Peek Brush minimizes the interaction effort required from the user. It delivers a quick overview and reduces the time needed for the initial visual analysis step from minutes to seconds.

Session IV10_2.10: GeoAnalytics

Chair: Jern, Prof. Mikael, Norrköping Visualization and Interaction Studio, Sweden

Swedish Road Weather Visualization

Patrik Lundblad¹, Jonas Thoursie², Mikael Jern¹

¹NCVA/ITN LiU; ²SMHI, Sweden

The large and ever-increasing amounts of time-varying and geospatial digital weather information related to emergency scenarios that must be accessible to the public represent a major research challenge. A need to analyze and make decisions, often in time-critical situations, demand interactive web-enabled visualization tools that can aid the user to explore, communicate and publish visually large geo-information spaces. Geovisual analytics is an emerging research task facilitating dynamic time-linked visual representations that enable the users to simultaneously analyse relations among several different attributes with the aim to augment an analyst and decision-maker capabilities to assimilate complex situations and reach important knowledge. In this context, we introduce a web-enabled application for road weather visualization, a tool for analyzing and communicating information about road weather conditions particularly during the Swedish winter months. RoadVis is customized in close collaboration with domain experts from Swedish Meteorological and Hydrological Institute (SMHI) and the Swedish road administration facilitating a collection of dynamic map, weather and information visualization methods integrated with the Adobe© Flash© and Flex© development platform.

Taggram: Exploring Geo-Data on Maps through a Tag Cloud-based Visualization

Dinh-Quyen Nguyen, Heidrun Schumann

University of Rostock, Germany

Searching and exploring on digital maps are normally performed through simple text boxes and zooming and panning interfaces. In this paper,

however, we present a novel technique, namely Taggram, which combines texts onto maps to support geo-tagged data exploration. It is designed to show geo-tagged data in form of sizeable and colorized tags, benefiting by the concepts of Tag Clouds, and to support exploring those data interactively through a fisheye menu adaptation. The technique was demonstrated for geo-tagged data exploration; however, as other thematic geo-data can be partially represented in abstract form of texts, Taggram can be a method for the presentation and exploration of such geo-data in other application scenarios.

3D Edge Bundling for Geographical Data Visualization

Antoine Lambert, Romain Bourqui, David Auber

LaBRI, UMR CNRS 5800, University Bordeaux 1 & INRIA Bordeaux Sud Ouest, France

Visualizing graphs containing many nodes and edges efficiently is quite challenging since representations generally suffer from visual clutter induced by the large amount of edges and their crossings. That problem becomes even more important when nodes positions are fixed, such as in geography where nodes positions are set according to geographical coordinates. Edge bundling techniques can help to solve this issue by visually merging edges along common routes but it can also help to uncover high-level edge patterns in the network and therefore to understand its overall organization. In this paper, we present a generalization of Lambert et al. [Lambert10] to reduce the clutter in a 3D representation by routing edges into bundles as well as a GPU-based rendering method to emphasize bundles densities while preserving edge color. To visualize geographical networks in the context of the globe, we also provide a new technique allowing to bundle edges around and not across it.

A 3D Visualization of Multiple Time Series on Maps

Sidharth Thakur¹, Andrew J. Hanson²

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In the analysis of many spatially-referenced time-dependent data, gaining an understanding of the spatio-temporal distributions and relationships among the attributes in the data can be quite challenging. We present a visualization technique that addresses some of the challenges involved in visually exploring and analyzing the distributions of geo-spatial time-varying data. We have developed a pictorial representation that is based on the standard space-time cube metaphor and provides in a single display the overview and details of a large number of time-varying quantities. Our approach involves three-dimensional graphical widgets that intuitively represent profiles of the time-varying quantities and can be plotted on a geographic map to expose interesting spatio-temporal distributions of the data. We show how combining our visualization technique with standard data exploration features can assist in the exploration of salient patterns in a data set. The visualization approach described here supports expeditious exploration of multiple data sets; this in turn assists the process of building initial hypotheses about the attributes in a data set and enhances the user's ability to pose and explore interesting questions about the data.

Session IV10_2.11: Information Visualisation – Theory & Techniques

Chair: Andrews, Prof. Keith, Graz University of Technology, IICM, Austria

Polytree Numbering for Citation Networks Visualisation

Alex Logvynovskiy, Mohammad Dastbaz

University of East London, United Kingdom

Citation networks form directed acyclic graphs. Visualisation of the reference relationship within the network requires fast determination of

ancestor-descendant relationships among the nodes within the digraph. Polytrees (singly connected digraphs) constitute an important class of acyclic digraphs and can be viewed as generalised directed trees where multiple parent nodes are permitted. In this paper, we propose a new ancestral numbering scheme for polytrees that allows fast determination of ancestor-descendant relationships among the nodes without traversal. The scheme is used to index and visualise reference relationships within citation networks

Double Tree: an advanced KWIC visualization for expert users

Chris Culy, Verena Lyding

Accademia Europea Bolzano-Bozen, Italy

In this paper we present Double Tree, a new visualization of Key Word In Context (KWIC) displays targeted to support linguistic analysis. Inspired by Wattenberg's and Viégas' [1] Word Tree visualization, Double Tree extends the idea of representing KWIC results as trees. We address several issues with Word Trees with respect to the specific demands of linguists and discuss the design decisions and implementation details that we chose for Double Tree. In particular we present our approach for displaying a two-sided tree. We describe details of the layout, including how frequency and linguistic information is incorporated, and what user interaction is supported. We conclude with some consideration on possible next steps for Double Tree.

Visualisation of web based e-Learning activity

Ana Patrícia Oliveira, Óscar Mealha, Carlos Santos

University of Aveiro, Portugal

The aim of the current paper is to report on the conceptualisation of visual methods and techniques that were adapted for the monitoring of community participation on Thinkster e-learning platform. This platform supported the research activities of Masters students in Multimedia Communication program at University of Aveiro (2008/2009 academic year). In this context, a Web based functional prototype was developed in order to allow teachers and system administrators the visualisation and

analysis of the users' interactions on Thinkster's communication and information system. The prototype was evaluated with an analytical methodology that revealed some of the target users' expectations and their satisfaction level.

Session GMAI10_2.12: Imaging - I

Chair: Yue, Prof. Yong, University of Bedfordshire, UK

A WAVELET INPAINTING BY A TIXOTROP MODEL

Fatma Zohra Nouri, MESSAOUD MAOUNI

Université Badji Mokhtar, Algeria

Image inpainting is a fundamental problem in image processing and has many applications [1] and [2], motivated by the recent tight frame based method on image restoration in either the image or the do-main transformation. In this work, we present an inpainting model based on tixotrop non-Newtonian fluids [3] for damaged wavelet coefficients. The advantage of this model is to make a benefit from the smoothing model and correct the lying out of the contours by putting them more clearly. Experiment results using our model show that better inpainting quality can be achieved with much less computing time.

Key-Words: Inpaining, wavelet diffusion, Tixotrop models.

Visualization of Positive Data by Rational Cubic Spline Interpolant

Muhammad Sarfraz, Malik Zawwar Hussain

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This paper discusses the problem of constructing positive cubic spline interpolation. To obtain smooth curve for positive data, piecewise rational cubic function has been used. In the description of rational interpolant, two families of parameters have been constrained to preserve positive shape of the data, the rational spline scheme has a unique representation. In addition, to preserve the shape of positive data sets, the degree of smoothness attained is C2.

YACBIR Yet Another Content Based Image Retrieval system**Samy Ait-Aoudia, Ramdane Mahiou, Billel Benzaid**

ESI Ecole nationale Supérieure en Informatique, Algeria

Vision is central in human perception. Images are everywhere. Real life applications produce and use huge amounts of different types images. Retrieving an image having some characteristics in a big database is a crucial task. We need then mechanisms for indexing and retrieving images. CBIR (Content Based Image Retrieval) systems perform these tasks by indexing images using the physical characteristics automatically extracted and searching by an image query. We will present a CBIR system named YACBIR (Yet Another CBIR) that combines several properties (color, texture and points of interest) extracted automatically to index and retrieve images.

Session IV10_3.1: Information Visualisation – Application - II

Chair: Hanson, Prof. Andrew J., Indiana University, USA

Liquid Diagrams: Information Visualisation Gadgets

Keith Andrews, Martin Lessacher

Graz University of Technology, Austria

Information visualisation techniques have sometimes been slow to diffuse into more widespread public use. Recent advances in cloud computing have opened up opportunities to bring information visualisation to the masses in ways previously not possible.

Liquid diagrams are a suite of information visualisation gadgets written in Flex, which visualise live data contained in Google Docs spreadsheets through the Google Visualization API. Users can interactively configure the visualisation and any changes in the online spreadsheet data are reflected immediately in the display. In contrast to other solutions, liquid diagrams gadgets specifically support the printing and export of both vector (SVG) and raster (PNG) graphics versions of the visualisations, allowing users to construct and export high-quality diagrams for inclusion into other works.

The suite of visualisation gadgets currently available includes: area charts, bar charts, heat maps (choropleths), line charts, pie charts, treemaps, and parallel coordinates plots. Star plots and voronoi treemaps are coming soon.

Information visualization in facility location and vehicle routing decisions

Rui Borges Lopes^{1,2}, Beatriz Sousa Santos³, Paulo Dias³, Carlos Ferreira^{1,2}

¹DEGEI, University of Aveiro, Portugal; ²CIO, University of Lisbon, Portugal; ³IEETA/DETI, University of Aveiro, Portugal

Facility location and vehicle routing are amongst the most important logistic decisions in today's organizations. These aspects are intertwined and, in some cases, should be addressed in an integrated way (giving rise to the location-routing approach). A decision support tool that can make easier the visualization (and editing) of information regarding these problems is becoming increasingly important as: it enables to further understand the problem at hand; and, at the same time, it fosters better communication of the decisions in a way easier to understand by the general public. This paper presents some concepts for information visualization on the problems arisen by the aforementioned decisions, which have been incorporated in a decision support tool and tested using usability evaluation methods.

Metric data analysis enhanced through temporal visualization

Renato Bueno¹, Humberto L. Razente², Daniel S. Kaster^{3,4}, Maria Camila N. Barioni², Agma J. M. Traina⁴, Caetano Jr. Traina⁴

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Human vision can naturally interpret data in spaces up to 3 dimensions. When data is embedded in higher dimensional spaces, in most cases the visualization is not intuitive. Regarding metric domains such task is even harder, since they even have spatial representation. Moreover, it is pretty common to analyze how data evolve over time to understand phenomena and assist decision tasks.

This paper presents three interactive and intuitive techniques to visualize metric data which varies over time. Each technique focus on a different way of interpreting temporal information and they were implemented in the FastMapDB tool.

The first one shows data in a timeline over an axis containing the temporal information. The second technique uses the temporal data to show the variation in the space that elements suffer over time through an overlapped view of snapshots. The last one allows analyzing complex

data whose temporal information must be considered in the similarity between elements, employing the new concept of metric-temporal spaces. We also show experiments in order to demonstrate the usefulness of the techniques.

Interaction with computers using mobile devices

Mariko Sasakura, Shinsuke Fujioka, Susumu Yamasaki

Okayama University, Japan

We propose a new interaction way that uses mobile devices to input and output devices of computers. The idea is simple but powerful. We use a mobile device which people carry with at all time, as an input-output device of computers. In this paper, we show an example application which uses the interaction we propose and discuss its possibility.

From Databases to Graph Visualization

Frédéric Gilbert^{1,2}, David Auber^{1,2}

¹LaBRI, Université de Bordeaux, France; ²Gravité, INRIA Bordeaux Sud-Ouest

The first step of any information visualization system is to enable end user to import their data set into the system. However, non expert user are faced to the difficult task of choosing how their data should/could be transform to be used in these Infovis systems. In that paper we address the case where end users want to use dataset in tabular format. We propose a novel method for automatic graph generation from these dataset. That method consists in first building taxonomy of dimensions. Then, that taxonomy is used to provide to user a system that enables to interactively navigate into the set of possible data transformation.

A Theme Landscape for Tagged Data

Evelyn Münster

Ludwig Boltzmann Institute Media.Art.Research, Austria

The wide variety of visualization methods for numerical values have, up until now, outweighed the relatively modest selection available for nominal

dimensions. **Theme Landscape** is a visualization method designed for tagged data that typically contains a large number of nominal dimensions. It provides an overview of large data volumes, doing so by positioning objects in a landscape according to how similar their tags are. **HexBoard** technology has been used for dimension reduction. A further distinctive feature of Theme Landscape concerns the icons. The tags that belong to an object can be identified according to the shape of its icon. Each keyword is assigned to its own unique glyph and these glyphs form, in any combination, a hexagonal icon. For the prototype a data archive of interactive media artworks has been used, which had been tagged using a taxonomy.

Session MediViz10_3.2: Biomedical Visualisation - Medical Imaging Techniques

Chair: Lunzer, Dr. Aran, Hokkaido University, Meme Media Laboratory, Japan

Using Web Services as Functional-Level Plug Ins for Interactive 3D Medical Visualisation

Tao Wang, Youbing Zhao, Enjie Liu, Gordon Clapworthy, Xia Zhao, Hui Wei, Feng Dong

University of Bedfordshire, United Kingdom

Web services provide remote access to distributed resources and processes through uniform interfaces. However, the latency associated with data transmission has meant that they are generally applied to non-interactive data processing. Interactive applications, in which many more user interactions and data transmissions are involved, are difficult to adapt to web service based frameworks, particularly if the interactive investigation involves large datasets. In medical imaging and visualisation, user interactions are generally a prerequisite for the detailed study and manipulation of data. As a result of major scientific initiatives, such as the Virtual Physiological Human, in which large data repositories are being set up at a variety of sites, it is becoming increasingly common for the data being investigated to be stored on a remote server. Consequently, it is

now highly desirable to develop a means by which web service based interactive visualisation can be applied to distributed medical data access and clinical collaboration. This paper presents a functional-level plug-in based architecture for interactive data visualisation via web services which is being implemented within the EC-funded ContraCancrum project.

Semi-supervised Tissue Segmentation of 3D Brain MR Images

Xiangrong Zhang^{1,2}, Feng Dong¹, Gordon Clapworthy¹, Youbing Zhao¹, Licheng Jiao²

¹Centre for Computer Graphics and Visualisation, University of Bedfordshire, United Kingdom; ²Key Laboratory of Intelligent Perception and Image Understanding of Ministry of Education, Xidian University, China

Clustering algorithms have been popularly applied in tissue segmentation in MRI. However, traditional clustering algorithms could not take advantage of some prior knowledge of data even when it does exist. In this paper, we propose a new approach to tissue segmentation of 3D brain MRI using semi-supervised spectral clustering. Spectral clustering algorithm is more powerful than traditional clustering algorithms since it models the voxel-to-voxel relationship as opposed to voxel-to-cluster relationships. In the semi-supervised spectral clustering, two types of instance-level constraints: must-link and cannot-link as background prior knowledge are incorporated into spectral clustering, and the self-tuning parameter is applied to avoid the selection of the scaling parameter of spectral clustering. The semi-supervised spectral clustering is an effective tissue segmentation method because of its advantages in (1) better discovery of real data structure since there is no cluster shape restriction, (2) high quality segmentation results as it can obtain the global optimal solutions in the relaxed continuous domain by eigen-decomposition and combines the pairwise constraints information. Experimental results on simulated and real MRI data demonstrate its effectiveness.

CardioAnalyser: A Software Tool for Segmentation and Analysis of the Left Ventricle from 4D MDCT Images of the Heart

Samuel Silva, Joaquim Madeira, Beatriz Sousa Santos, Augusto Silva
IEETA / DETI - University of Aveiro, Portugal

Cardiac angiography using multiple detector row computerized tomography (MDCT) scanners provides 3D data concerning the heart and, in particular, the left ventricle (LV), for different cardiac phases along one cardiac cycle. Exploring this data for LV function analysis is not an easy task, given the amount of data and time involved in segmenting (or revising results provided by automatic segmentation methods) up to 12 cardiac phases.

CardioAnalyser, a tool for 4D LV segmentation from MDCT data which provides a protocol to help perform LV segmentation of all cardiac phases available is presented. It uses an automatic segmentation algorithm along with a procedure which guides the user through the process. Its main goal is to reuse as much information as possible from one cardiac phase to the next in order to reduce segmentation time and the amount of user interaction.

Visualisation of Left Ventricular Dysfunction in the Virtual Pathological Heart

Xinyu Lin¹, Nigel Mcfarlane¹, Youbing Zhao¹, Gordon Clapworthy¹, Feng Dong¹, Alberto Radaelli²

¹University of Bedfordshire, United Kingdom; ²Politecnico di Milano, Italy

While there has been significant progress in the treatment of ischemic heart failure, it remains a significant health and economic problem worldwide. In this paper, we present the challenges of modelling ischemic heart failure and introduce a user-friendly software system that will be a sub-set of the Virtual Pathological Heart environment which is currently being developed under the FP7 VPH2 project. This will provide patient-specific computational modelling and simulation of the human heart to assist the cardiologist and the cardiac surgeon in defining the severity and extent of disease in patients with post-ischemic Left Ventricular Dysfunction. The proposed system will provide visualisation tools for

surgical assessment and planning: the registration and display of necrotic and hypo-kinetic regions; simulated surgical restoration (cutting and patching); and finally post-operative functional prediction (volume, shape and mitral valve regurgitation).

Investigating the Trend of Virtual Reality-based Stroke Rehabilitation Systems

Prashant Prashun, Glyn Hadley, Christos Gatzidis, Ian Swain
Bournemouth University, United Kingdom

The existing techniques used for post stroke rehabilitation have sought to offer stroke survivors with upper extremity motor deficits a system for the practice and re-learning of motor tasks. Some studies suggest that the use of Virtual Reality technologies as an assistive technology in combination with conventional therapies can achieve improved results in post stroke rehabilitation. Despite the wealth of ongoing research attempting to build a virtual reality based system for upper extremity rehabilitation, there still exists a need for a training platform that would provide whole arm rehabilitation. In order to be practical this system should ideally be low cost and involve minimal therapist involvement. This paper describes some of the applications of virtual reality that have undergone clinical trials with patients suffering from upper extremity functional motor deficits. A brief description of VR technologies that are in place, providing benefits to the stroke patients with upper extremity motor and functional deficits, alongside a proof of concept of a whole arm rehabilitation platform is presented.

Session IV10_3.3: Design Visualisation

Chair: Hetherington, Robina, Open University, United Kingdom

Use of Multiple Shape Attributes in Information Visualization: Guidance from Prior Art and Experiments

Richard Brath

Oculus Info Inc., Canada

Multiple shape attributes can be used within information visualizations. Prior art from many fields and experiments inform what the attributes of shape are and the potential ways that we may effectively utilize shapes to represent multiple data values within an information visualization.

AmbientNEWS: Augmenting Information Discovery in Complex Settings Through Aesthetic Design

Nina Vesselinova Valkanova, Ayman Moghnieh, Ernesto Arroyo, Josep Blat

Universitat Pompeu Fabra, Spain

Nowadays professional journalists create and edit broadcasting materials inside newsrooms that are characterized by an intense and multivariate flux of information. Within these settings, the journalists have difficulties keeping up with the evolving geopolitical picture of events developing in the world and how it relates to the topics of their interest. In this paper we present AmbientNEWS, an ambient display that visualizes dynamic news content and informs professional journalists on the global picture of events. We argue that the conceptualization and design of its information aesthetics criteria can be grounded in user requirements, and subsequently engaged to augment the awareness of professionals in an environment that is highly crowded with information. We also discuss the evaluation process of ambient information visualization with a focus on aesthetic design aspects. We conclude by summarizing our findings and discuss future work.

From data to knowledge – Visualizations as transformation processes within the DIK continuum

Masud, Luca; Valsecchi, Fancesca; Ciuccarelli, Paolo; Ricci, Donato; Caviglia, Giorgio

politecnico di milano, Italy, INDACO Department, DensityDesign Research Group

Although we're surrounded – even in our everyday life – by many kind of visualizations, only a few of them are considered and studied academically, at least in the info-vis domain. Some authors advocates the need of a strictly functionalist and analytic approach to visualization.

Even though authors like Pousman, Danzinger, Lima and Vande Moere wrote about different kind of visualizations (casual info-vis, "information visualization for the people", information-aesthetics) there isn't still a common ground model to rely upon.

Since visualizations work with data, information and knowledge (as in some way it's hinted – though in a misleading way – by the main discipline's name: data-visualization, information-visualization, knowledge-visualization) we propose a framework based on the data-information-knowledge continuum.

The Classic Aesthetic and the Poietic Elements of Information Design

Anna-Lena Carlsson

Mälardalens University, Sweden

In this paper I address two types of perspectives on the aesthetic that are of relevance for a discussion of contemporary information design. Firstly, the 'aesthetic' understood as aesthetic perception of beautiful form. Secondly, the 'aesthetic' recognized as the poietic activity, i.e. the production of an object, in which the reader/viewer also is takes part. I discuss them, in brief, in relation to questions of form and content, and I argue that aesthetic elements in some contemporary information designs cannot be understood as aesthetic perception of beautiful form. The aesthetic is still present, but as poietic, creative, elements.

Session IV10_3.4: Information Visualisation

Chair: Khosrowshahi, Prof. Farzad, Salford University, UK

Challenges of the Display Method: Time-based Digital Art in the Traditional Gallery

Jonathan Hounshell

East Tennessee State University, United States of America

In the traditional gallery experience, the frame around a painting—an element added after that fact—seldom detracts from the artwork. But, consider time-based digital art that only exists if the electronic hardware is present to display it. For artists working in this medium, often is the case where this equipment becomes a “frame” that will inadvertently dictate the size and/or quality of our artwork, sometimes to the point of distraction. Art may be limited to the pixel width of a div on a webpage, or lost in the encompassing plastic on a 17-inch cinema display with its tangle of wires and manufacturer logos. For digital artists whose intended outlet is the gallery setting, what inventive measures can we take to ensure that the artwork speaks for itself without the distraction of the display apparatus? At what threshold does the emphasis teeter away from the art toward the function of displaying the art?

This paper will seek to open discussion on these concerns and give an account of my own trial and error, action and reaction, resulting in one anomalous solution to these challenges. Over the course of three recent exhibitions, I have documented the display techniques of a singular series in my digital art. This array of time-based art images, all with the same matrix of content, ended up displayed in disparate fashions and in various environments. In turn, these environments were equipped with site-specific vehicles for digital display, each having their resulting drawbacks.

These problems lead me to contrive an experimental presentation method that borders the edges between painting, sculpture and time-based digital art. This paper will conclude by documenting the construction of this self-contained device—a sculpture-like art-object that houses all the necessary hardware for digital display without the encumbrance of seeing the

apparatus. As part of a collective exhibit at a well-established art museum, gallery visitors approached this device not as electronic hardware framing digital imagery, but instead as a mix-media art-object—one in which the digital content is just one of several media in the mix.

Incremental Idea Generation System: Indigen

Sheng-Han Chen, Teng-Wen Chang

National Yunlin University of Science and Technology, Taiwan

Cultural Heritage is quickly disappearing when time goes by. Cultural Heritage is a valuable knowledge of the mankind. Further, narratives of cultural heritage can help us to appreciate its culture and knowledge, and through visualization be able to deepen our understanding of knowledge. Visualizing the filtered knowledge: narratives, people not only receive or thinking, but also through convergence to gain further reflection of heritage. This paper will develop a narrative visualization system (called Indigen) that will apply the storytelling techniques for narrative visualization purpose. The information of Traditional Chinese garden will be used as the knowledge to test Indigen.

Guidelines to Visualize Vessels in a Geographic Information System

Dario Rodighiero

University of Milan-Bicocca c/o Joint Research Centre, European Commission

In information systems the data representation covers a great importance. In fact the visualization of information is the last point of contact between the user and the information system. This is the space where the communication takes place.

In real-time monitoring systems, this passage covers a great importance, especially for reasons related to the time and the transparency of relevant information. These factors are fundamental to vessel monitoring systems. This is the beginning where we start to define a guidelines man-

ual, act to help specialists of information visualization in the vessel monitoring field, and in the GIS field more in general.

A New Paradigm for Visualization and Generating Grid Geometry Art and Beyond

Hsin Hsin Lin

INFOTECH Research & Consultancy, Singapore

Conventionally, a grid generator requires either an explicit or implicit description about the boundary vertices, boundary lines and boundary faces to define the geometry. In 2006, the author has developed the Interactive Web based Grid Geometry Construction process [1] to create and generate 2D ubiquitous platform independent, highly scalable, paintbrush, pixel and vector free geometry art. In 2008, she has established a new paradigm -- basically, a fundamental medium for visualization, development, creation and delivery tool for generating grid geometry art and beyond. With exceptions, the result is instantly Web-enabled. She demonstrates the results of the deployment of this image editor free tool by presenting an array of instant conceptualization and artistic realization of an "image" as an arrangement of a uniform $m \times n$ grid of colored cells formed within a set of finite orthogonal grids. Beyond which, this paper presents a wide-ranging display of non-orthogonal and soft-edged image free2) images.

Keywords: ubiquitous, platform independent, high scalability, image free, paintbrush free, pixel free, vector free, grid geometry art, instant visualization, web-enabled, resource optimization, eco-computing in digital media

Session IV10_3.5: Information Visualization - Evaluation

Chair: Bueno, Dr. Renato, Federal University of São Carlos, Brazil

Visualising Virtual Learning Environments: Case Studies of the Website Exploration Tool

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¹Universitat Pompeu Fabra, Spain; ²The University of Edinburgh;

³Barcelona Media - Innovation Centre

In this paper we describe the long term evaluation of the Website Exploration Tool (WET), an exploratory system for visualising web data, through the assessment of two Virtual Learning Environments (VLE). VLEs provide log files that can be studied with web mining techniques to understand the behaviour of the students and consequently improve the pedagogy. However, statistical metrics are not always easy to interpret to the educators, which suggests the need to develop novel approaches for the easy discovery of usage patterns. The integration of WET in the two VLEs gave us the opportunity to conduct two long-term case studies that supported the evaluation of the visual approaches used in our tool. Our main contributions are the description of the benefits of such approaches for the analysis of VLEs as well as recommended features for supporting this task, and a summary of the main findings from our case studies.

Evaluating Climate Visualization-An Information Visualization Approach

Jimmy Johansson, Tina Neset, Björn-Ola Linnér

Linköping University, Sweden

To meet the growing demand of communicating climate science and policy research, the interdisciplinary field of climate visualization has increasingly extended its traditional use of 2D images and techniques from the field of scientific visualization to include information visualization for the creation of highly interactive tools for both spatial and abstract data.

This paper provides an initial discussion on the need and design of evaluations for climate visualization. We report on previous experiences and identify how evaluation methods commonly used in information visualization can be used in climate visualization to increase our understanding of visualization techniques and tools.

A Guide to Scientific Evaluation in Information Visualization

Camilla Forsell

Linköping University, Sweden

This paper addresses some fundamental and practical issues that should be considered when pursuing evaluation studies in Information Visualization. The main focus is on quantitative experimental research but the general information applies to all kinds of studies. The purpose is to increase awareness of what constitutes a sound scientific approach to evaluation and to point out common pitfalls and mistakes during the phases of such study. These phases cover how to plan, design, conduct and analyse the outcome of an evaluation and finally how to report in a way that enhances readability, provides details relevant to the outcome and that allows replication. The paper could be used as a guide when conducting evaluation and it could also be helpful when reviewing publications since the same rules apply.

Supporting the analytical reasoning process in maritime anomaly detection: evaluation and experimental design

Maria Riveiro, Göran Falkman

Informatics Research Centre, University of Skövde, Sweden

Despite the growing number of systems providing visual analytic support for investigative analysis, few empirical studies include investigations on the analytical reasoning process that needs to be supported. In this paper, we present an approach to evaluate the ability of certain visual representations from an integrated visual-computational environment to support the completion of representative tasks. The problem area studied is the detection and identification of anomalous vessels and situations while monitoring maritime traffic data.

This paper presents: (1) a brief review of current evaluation methodologies within information visualization and visual analytics, (2) an analysis of operator's analytical reasoning process (derived from field work in maritime control centers and a literature review on analytical reasoning theories), (3) a list of representative tasks for usability evaluation and (4) an approach to evaluate the use of normal behavioral models representations during the detection process.

Session BuiltViz10_3.6: Sustainability in Built and Rural Environments (1)

Chair: John Counsell, University of Wales Institute, Cardiff, UK

Affective qualities of an urban environment on a desktop computer

Joske Houtkamp, Mike Junger

For communication of design plans, city councils and other local governments require that 3D models are developed quickly, at minimum expense, and can be made available online. Users, generally citizens, increasingly expect that the models are photorealistic and a truthful representation of the future situation. Despite the advancements in graphics in recent years, the budget, the platform available, and the requirements of use are restraining factors for the visual quality of a 3D model. The question of the validity of models for assessment of urban development plans is therefore increasingly relevant [1].

In this empirical field study we compared the affective qualities of a 3D model designed for online assessment and communication of urban development, with those of the urban environment in reality. The model was considered more pleasant, more modern and more uniform than the area in reality. This can be explained by specific characteristics of this type of model, such as the lively colours and the clean surfaces

Human Perception, Virtual Reality and the Built Environment

Angie Johnson, Emine Mine Thompson, Kenny Coventry

Recent research indicates that Virtual Reality (VR) as a communication tool to convey design intent and construction methodologies in the built environment sector has been utilized to varied degrees. Currently, the effectiveness of VR has been demonstrated from conception to the final stages of projects, yet its potential within the Built Environment has still to realised, despite a variety of successful demonstrations. There is concern that the current utilisation of VR compromises its full potential, unsurprisingly, as environmental representations focus predominantly on the visual modality, regardless of the multi sensory nature of the spatial experience. In addition, there is a distinct paucity of research exploring the complex interaction of environmental design and the user, such as the role of attention or conceptual interpretation. This paper aims to identify the issues concerning the utilization of VR models to aid communication for the Built Environment with specific reference to human perception issues.

The Management of Sharing, Integrating, Tracking, and Maintaining Data-sets, is a New and Rather Complex Task.

James Harty, Richard Laing

With the improved uptake of Building Information Modelling (BIM) new issues are emerging. As James O Johansen rightly said the integration and collaborative nature of BIM is indeed proving to be an awesome endeavour. Prime in these tasks is how it is presented to the various stakeholders, in tailor made views to reflect their demands and requirements.

This filtering of the model has both tremendously positive aspects but conversely larger issues of ownership and custodianship have not to date been satisfactorily resolved. There is a major role for proper management here, which has not been appropriately identified. Initially there was a clarion call to architects to adopt this role and a few years ago this seemed to return the lead role to this fragmenting profession.

But patently they are neither prepared nor keen to take on this role. Constructing architects however do seem to want this discipline which can

raise their profile and possibly lead to professional recognition and prestige.

Session IV10_3.7: Cultural Heritage Knowledge Visualisation - II

Chair: Kenderdine, Dr. Sarah, City University; Museum Victoria, Hong Kong S.A.R. - China

Ancestral Forces in Contemporary Indigenous Australian Women's Art: 3 Case Studies of Multi-Dimensional Cultural Heritage Knowledge Visualization

Jenefer Marquis, Theodor G Wyeld

Flinders University, Australia

The transition from ephemeral, ceremonial art to more permanent acrylic-on-board paintings has made Australian Aboriginal art more accessible to the public than ever before. However, early examples contained secret/sacred motifs and stories - knowledge recorded in the paintings that was only made available to initiates. In turn, this prompted contemporary Australian Aboriginal artists to hide, camouflage or remove the sensitive material from their work. It is only recently, through inter-gender and inter-cultural collaborations between contemporary Indigenous Australian artists and non-indigenous ethnographers and anthropologists, that the full ramifications of this transition are becoming apparent. This paper discusses 3 cases

Re-Writing Recent History: developing a National reconciliation pedagogy using a video game for school age children.

Belinda MacGill, Theodor G Wyeld, Faye Blanch

Flinders University, Australia

Australian Aboriginal people have suffered ignominy through British policies and practices since the legal conquest of their land in 1788. They have been historically and socially misrepresented on the premise of their

race alone. Recent attempts at reconciliation have come some way towards a shared culture. However, the national curriculum has not been effective in promoting reconciliation as an important part of a student's education. As a pedagogical tool for advancing notions of reconciliation a game was developed. The pedagogical goal of the game is for students to experience notions of trust, empathy and collaboration – core to notions of reconciliation. Initial evaluation of the game suggests these goals are being met. The game provides a vehicle for notions of reconciliation to be broached in way school-age children can engage with the concepts at a familiar level (in a game). It promotes reflection on their own role in the reconciliation process.

Embodying Affect: The Stolen Generation, The history Wars and PolesApart by Indigenous New Media Artist R E A

Christine Judith Nicholls

Flinders University Adelaide Australia, Australia

In her 2009 new media artwork PolesApart, Australian Aboriginal artist r e a, of the Gamilaraay people in northern New South Wales, explores issues relating to the Stolen Generations of Aboriginal children. Based on the personal experiences of her grandmother and great aunt as 'stolen children', the work's familial dimension is amplified by r e a's enactment of the role of the protagonist fleeing from forced servitude. This paper looks at PolesApart in the broader context of the interrelated phenomena of the stolen generations and the so-called 'history wars'. It is posited that the power, immediacy and affective dimensions of (moving) visual imagery have been instrumental in effecting a shift of Australians' knowledge about and attitudes to the stolen generations (and its historical implications), and taking the subject from the margins into the mainstream. It is further argued that this has been made possible by the capacity of the moving image to 'embody affect' (see Rutherford 2003), enabling many more Australians than previously to appreciate the ramifications of this prolonged episode in Australian history on present day Aboriginal lives, and to develop a sympathetic understanding of the phenomenon as lived experience that is integral to our shared cultural heritage. In turn this broader social knowledge has contributed to Australians' receptiveness to

the official Apology issued to members of the stolen generations by Prime Minister Kevin Rudd in Federal Parliament (13th February 2008). It would also appear that the popular reception of mainstream stolen generation-themed movies may have influenced contemporary audiences' openness to non-mainstream new media work such as *Rea's PolesApart*. *Rea* uses the vehicle of her own body in *PolesApart* to demonstrate that the personal is inescapably political, and vice versa.

Session IV10_3.8: GeoAnalytics

Chair: Andrienko, Dr. Gennady - Fraunhofer Institute Intelligent Analysis- and Information Systems (FHG IAIS), Germany

GeoVisualisation of SAPO search activity

Ana Isabel Veloso, Rui Raposo, João Costa, Óscar Mealha

University of Aveiro, Portugal

The objective of this paper is to report on the research inherent to the conceptualisation and prototyping of an Information Visualisation system centred on the task of conveying meaning to user interaction data collected by the SAPO Broker web service. SAPO Broker, a real-time monitoring application that collects data regarding activity within the SAPO Web Portal, collects a large set of data with the main purpose of assisting visualisation and analysis of tasks linked to georeferenced web searches performed on the portal.

The research and its results were guided according to two major challenges:

- i) design an appropriate visual metaphor capable of appropriately integrating the collected data for a specific target audience, technology set and context of use;
- ii) design intuitive and relevant interaction tools able to assist this particular data analysis.

Extracting Events from Spatial Time Series

Gennady Andrienko, Natalia Andrienko, Martin Mladenov, Michael Mock, Christian Poelitz

Fraunhofer Institute Intelligent Analysis- and Information Systems (FHG IAIS), Germany

An important task in exploration of data about phenomena and processes that develop over time is detection of significant changes that happened to the studied phenomenon. Our research is focused on supporting detection of significant changes, called events, in multiple time series of numeric values. We developed a suite of visual analytics techniques that combines interactive visualizations on time-aware displays and maps with statistical event detection methods implemented in R. We demonstrate the utility of our approach using two large data sets.

Exploring new ways of integration, visualization and interaction with Geotechnical and Geophysical Data

Vítor Manuel Andrade Gonçalves^{1,2}, Paulo Dias², Fernando Almeida³, Beatriz Sousa Santos²

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³Geosciences Department Univ. Aveiro, Portugal

This paper presents some work aimed at exploring new ways of integrating, visualizing and interacting with geotechnical and geophysical data that may be more rich and interactive than those offered by most current Geographic Information Systems (GIS). Some visualization techniques enabling simultaneous visualization of the several data types available in our case study are proposed. Moreover, methods were developed to guide experts while defining layers and other relevant geological structures. The work is still in an early stage and its main goal has been assessing the validity and adequacy of the proposed techniques to the specific geotechnical and geophysical data under consideration.

SessionIV10_3.9: Information Visualisation

Chair: Wyeld, Dr. Theodor G, Flinders University of South Australia, Australia

<Keynote Lecture>

Oncology Lifeline – A Timeline Tool for the Interdisciplinary Management of Breast Cancer Patients in a Surgical Clinic.**Brian Drohan**

Massachusetts General Hospital, United States of America

The multidisciplinary approach to breast cancer treatment in a comprehensive breast center model can deliver a high standard of care for the patient, but it also generates a wide range of patient data that are typically left as disparate silos, and not organized or analyzed for any clinician to help with patient care. We have developed a method for the synthesis of radiology, surgery, pathology, medical oncology, and genetics information from a patient medical history in a timeline paradigm with elements of clinical decision support and quality indicators to help with decision making. A model for structuring data from the many disparate sources was developed to support enriched probing interactions. Summary views of the current knowledge from each discipline were also tightly integrated. To support the surgical management workflow, the prototype lifelines were integrated into existing clinical software, incorporating all the relevant events, decisions, and data elements.

<Keynote Lecture>

Information is Beautiful

David McCandless, <http://www.informationisbeautiful.net> , London UK

In an age of info overload, visualized information has incredible potential to help us understand and navigate a fast-moving, fast-changing world.

The demand for clear, beautiful, condensed designed information has never been greater. The use of visual forms of information is a rising trend across many disciplines: science, design, journalism and web. At the

same time, daily exposure to the web is creating a incredibly visually-literate population. Could the two be linked?

David will explore the exciting potential of this merging of design, information, text and story. And the strange - and often wonderfully unexpected - things are that happen when you visualise data, knowledge and ideas. Using examples from his new book and blog, he'll share thoughts on what makes a successful information visualisation and journalistic tips, especially for researchers, on how to zero in on interesting data and subjects. And, admitting that his book is as full of mistakes as it is successes, he'll also go through some of the common pitfalls, traps and FAILS that dog this young design form.

Finally, he'll share what he loves about the form, unveil some new work and reveal the ways designing information has forced him to reconsider his own ideas and views of the world.

Biography of speaker: David McCandless

David McCandless is a London-based author, data-journalist and information designer, working across print, advertising, TV and web. His design work has appeared in over forty publications internationally including The Guardian, Wired and Die Zeit. Recently, he has championed the use of infographics and data visualisations to explore new directions for journalism and design - and to discover new stories in the seas of data swamping and surrounding us. His blog and book Information Is Beautiful are dedicated to visualising ideas, issues, knowledge, data - all with the minimum of text. <http://www.informationisbeautiful.net> | @infobeautiful



DIGITAL ART GALLERY

online exhibition

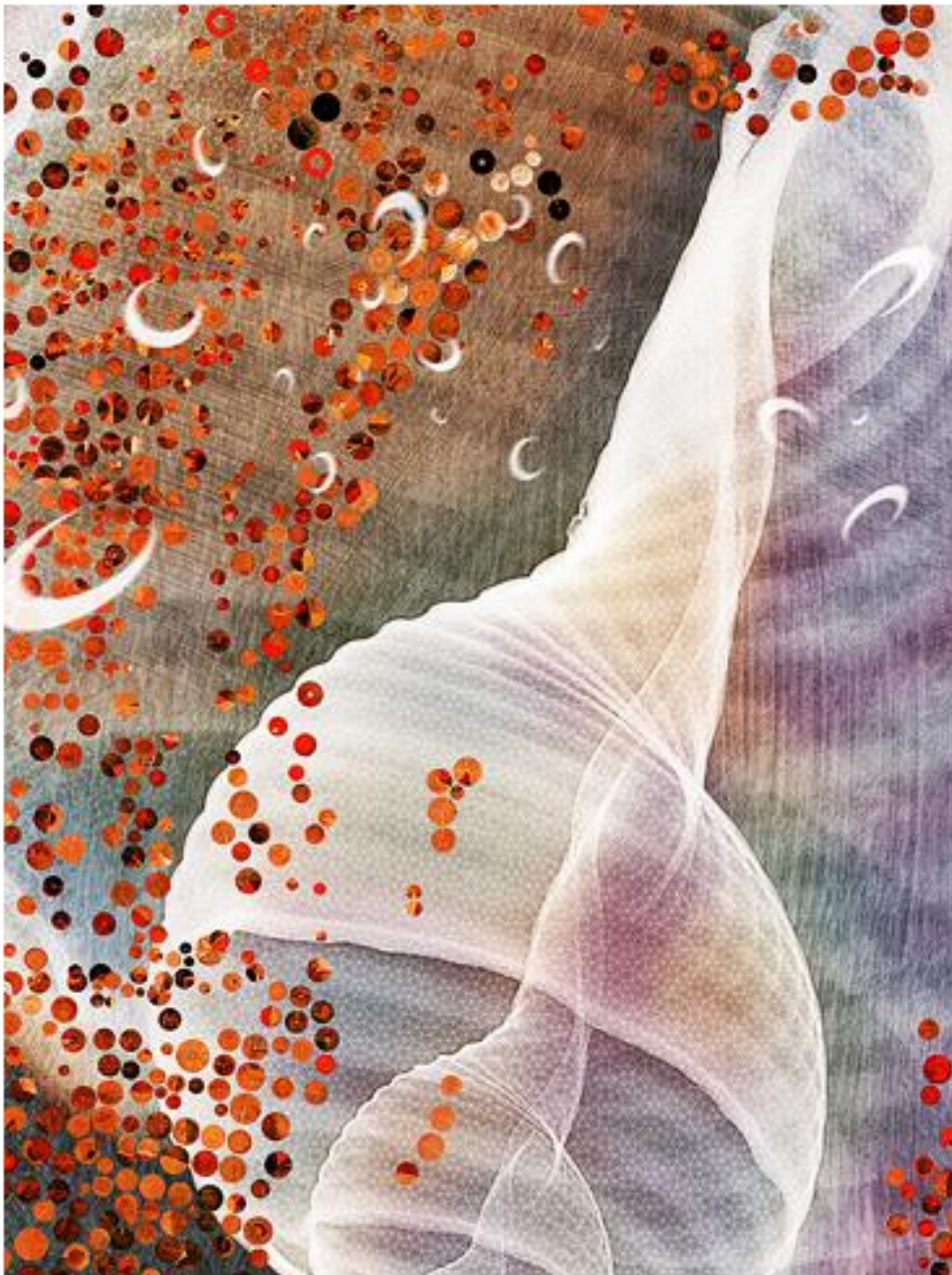
July 2010 ~ June 2011

VIRTUAL GALLERY VENUE

www.graphicslink.co.uk/DART.htm

© Jing Zhou is an interdisciplinary artist, designer, and professor of art in New Jersey, USA

This image is part of the "Ch'an Mind, Zen Mind" series. Drawn inspirations from the space-time uncertainty principle in String Theory and Quantum Mechanics, the symbolic elements in this image represent different energies: the earth, mankind, and this ever-changing universe. As all life originates from water, the x-ray image of a spiral tun shell in this image signifies the earth and Mother Nature. Indicating human civilizations and irregularities of nature, hundreds of colourful wave-like dots are actually part of the desert irrigation from the Middle East. Horizontally flowing cross the space, many crescent shapes symbolize the uncertain state of subatomic particles.



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