

About Visual Computing

Helwig Hauser,
UiB Dept. of Informatics,
<http://www.i.i.UiB.no/vis/>
2014-04-08



Today's Plan



- **Visual Computing** – books, education, events
- **Visual Computing Examples** – visualization, virtual reality, computer vision, perceptually-based rendering
- **Visual Computing** – selected centers
- **Visualization Research @ UiB**

Books about Visual Computing



Visual Computing Books (1)



- T. Kunii: **Visual computing: integrating computer graphics with computer vision** (Springer, 1992)
 - all aspects of computer graphics and its applications
 - integration of computer graphics with computer vision through data structures
- M. Gross: **Visual computing: the integration of computer graphics, visual perception, and imaging** (Springer, 1994)
 - Visual Computing addresses the principles behind "visual technology" and it is about the *integration of*
 - *Computer Graphics*,
 - *Visual Perception* and
 - *Imaging*

Visual Computing Books (2)



- Fr. Nielsen: **Visual Computing: Geometry, Graphics, and Vision** (Cengage Learning, 2006)
 - Introduction, Data Structures, Coordinates,
 - Images, Meshes, Animation, Randomization,
 - Higher Dimensions for «3D», Robustness

- Fr. Nielsen (ed.): **Emerging Trends in Visual Computing** (Springer, 2009)
 - Geometric Computing
 - Information Geometry and Applications
 - Computer Graphics and Vision
 - Information Retrieval
 - Medical Imaging and Computational Anatomy

Visual Computing Books (3)



- B. Preim, Ch. Botha: **Visual Computing for Medicine: Theory, Algorithms, and Applications** (Morgan Kaufmann, 2nd ed., 2013)
 - Acquisition, Analysis, and Interpretation
 - Visualization and Exploration
 - Advanced Visualization Techniques
 - Visualization of High-dimensional Data
 - ...

Visual Computing Education (1)



- Bachelor program in **Media Informatics and Visual Computing**
(TU Wien, Austria)
 - computer vision, computer graphics, visualization
 - augmented/mixed/virtual reality
 - human—computer interaction
 - ...
- Bachelor/Master program in **Visual Computing**
(RWTH Aachen, Germany)
 - computer graphics, game programming, virtual reality
 - computer vision, global illumination, geometric processing
 - ...

Visual Computing Education (2)



- Master program in **Computer Science, Visual Computing** track
(ETH Zürich, Switzerland)
 - VC connects the areas of computer graphics, computer vision, and geometry processing to classical disciplines such as optics, robotics, human-machine and interaction
- Master program in **Visual Computing**
(Konstanz, Germany)
 - create, process and analyse pictures
 - simulation, data analysis, visualisation and human computer interaction are combined
- Master program in **Visual Computing**
(Saarland, Germany)
 - acquiring, analysing and synthesising visual data
 - and related fields

Visual Computing Events (1)

- **ISVC: Int'l Symp. on Visual Computing**
(annually since 2005, ISVC.net)
 - computer vision
 - computer graphics
 - virtual reality
 - visualization

- **VCBM: Eurographics Workshop on Visual Computing for Biology and Medicine**
(bi-annually since 2008, VCBM.org)
 - computer graphics
 - visualization
 - computer vision
 - visual analytics
 - human computer interfaces

Visual Computing Events (2)

- **VCT: Visual Computing Trends**
(bi-annually since 2009, www.VRVis.at/about/events/vct)
 - VC is the discipline of computer science which deals with the
 - acquisition, representation,
 - manipulation, analysis,
 - synthesis and application
 - of visual information, i.e. images and image sequences in a spatial and temporal context.
 - VC has evolved from the methodological merging of
 - image processing,
 - computer vision,
 - computer graphics and
 - visualisation.

Examples from **Visual Computing**

from the Visual Computing Trends,
www.VRVis.at/about/events/vct
(most slides are online there)



Visual Computing Trends



- **VCT 2009**
 - computer vision (H. Bischof, TU Graz)
 - **scientific visualization** (Th. Ertl, Uni Stuttgart)
 - **augmented & virtual reality** (St. Feiner, Columbia)
 - graphics hardware (D. Luebke, NVIDIA)
- **VCT 2011**
 - **computer vision** (B. Schiele, MPII Saarbrücken)
 - visual analytics (P. Hanrahan, Stanford)
 - rendering (J. Stam, Autodesk)
 - geometric modeling (H. Pottmann, KAUST)
- **VCT 2013**
 - computer animation (M. Gross, ETH & Disney)
 - **perceptually-based rendering** (H. Rushmeier, Yale)
 - information visualization (B. Shneiderman, UMaryland)
 - multimedia interfaces (J. Jorge, TU Lisbon)



Visual Computing Centers (1)

- **Visual Computing Center**
(@King Abdullah University of Science and Techn., SA)
 - geometric modeling, geometry processing,
 - scientific visualization, virtual reality, rendering,
 - simulation, computational geometry & topology,
 - computer vision, and imaging science
- **Max Planck Center for Visual Computing and Comm.**
(in collab. with Stanford)
 - people detection & tracking, geometry & semantics,
 - geometry processing, applied geometry, discrete opt.,
 - topological and geometric computing, semantic reconstr.
 - ...



Visual Computing Centers (2)

- **Shenzhen Key Lab. for Visual Computing and Analytics**
(Shenzhen, China)
 - computer graphics, computer vision and visualization
 - 3D acqu./understanding/modeling, analytics/computing
- **Center for Visual Computing**
(@Ecole Centrale de Paris, France)
 - computer vision & 3D modeling
 - machine learning & optimization
- **Intel Visual Computing Institute**
 - acquisition, processing, transmission, and rendering/display of visual and associated data
- **Norwegian Color and Visual Computing Lab** (Gjørvik)
- **Visual Computing Forum, www.ii.UiB.no/vis/vcf**
(Bergen, UiB)

About Visualization Research @ UiB

At UiB's Dept. of Informatics,
<http://www.ii.UiB.no/vis/>



Visualization Research @ ii.UiB.no



The purpose of visualization is insight, not pictures!
– Ben Shneiderman, 1999

- **Still a relatively new group** at UiB Informatics, today 13 heads (2 faculty, 2 PostDocs, 4 PhD studs., *et al.*)






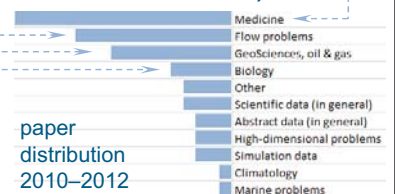
➤ **Application-oriented basic research** in visualization:

1. Researched **visualization methodology** (how to visualize)

- **Interactive Visual Analysis, nD data** (H. Hauser *et al.*)
- **Visual Knowledge Discovery, $3D$ data** (St. Bruckner *et al.*)
- **Illustrative Visualization** (I. Viola *et al.*)

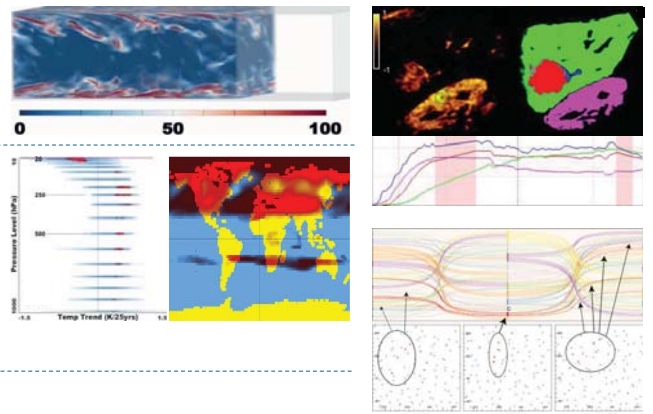
2. **Applications** at which this research is oriented (for whom)

-  ➤ **Medical Visualization** (partner in MedViz Bergen, *etc.*)
-  ➤ **GeoSciences / Oil & Gas** (*e.g.*, financed by Statoil's Akademiaavtale)
-  ➤ **Biology / Bioinformatics** (with CBU@ii *et al.*)
- **Fluid Dynamics** (in collab. with FFI.no, for *ex.*)
- **Engineering** (visual analysis of simulation data)



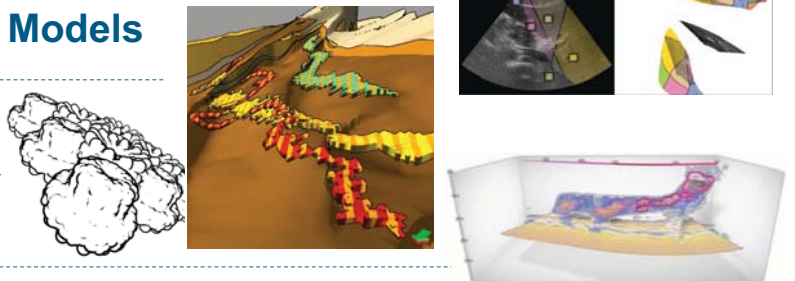
● Examples from Interactive Visual Analysis (IVA):

- **IVA of Flow Simulation Data**
(with nat.&int'l partners)
- **IVA of Medical Perfusion Data**
(with nat.&int'l partners)
- **IVA of Climate Simulation Data**
(with nat.&int'l partners)
- **IVA of Bioinformatics Data**
(with N. Reuter *et al.*)



● Examples from Illustrative Visualization:

- **Illustr. Vis. of Medical Ultrasound Data**
(with nat. partners)
- **Illustr. Vis. of Geological Models**
(with nat. partners)
- **Illustr. Vis. of Molecules**
(with nat. partners)
- **Illustr. Vis. of Fish**
(with nat. partners)



Visualization PhDs from UiB



Daniel Patel (Oct. 2009):
Expressive Vis. & Rapid Interpr. of Seismic Volumes



Jean-Paul Balabanian (Jan. 2010):
Multi-Aspect Vis.: from Linked to Integrated Views



Johannes Kehrer (May 2011):
IVA of Multi-faceted Scientific Data



Ove Daae Lampe (Nov. 2011):
IVA of Process Data



Armin Pobitzer (June 2012):
IVA of Time-dependent Flows



Paolo Angelelli (June 2012):
Visual Expl. of Human Physiology



Veronika Šoltészová (Oct. 2012):
Perception-Augmenting Illumination



Åsmund Birkeland (May 2013):
Ultrasonic Vessel Vis.: From Extraction to Perception



Endre Lidal (May 2013):
Sketch-based Storytelling for Cognitive Problem Solving



Çağatay Turkey (Nov. 2013):
Interactive Visual Analysis of High-dimensional Data



Thank you!



Questions?

University of Bergen | Faculty of Mathematics and Natural Sciences | Department of Informatics | Visualization Group

INSTITUTT FOR INFORMATIKK
> Visualisering

You are here: Department of Informatics > Visualization Group

Visualization

- > about
- > team & contact info
- > research
- > publications
- > projects
- > teaching
- > seminars
- > resources
- > network
- > events
- > links

News:



2013-12-13

VCF+MedViz Seminar: Prof. Jos Roerdink!



MedViz and VCF have worked together for organizing the last seminar of 2013. We will host a remarkable speaker, Professor Jos Roerdink (Bernoulli Inst. for Mathematics and Univ. of Groningen), whose talk is entitled *Brain Patterns: from EEG Coherence Networks to Prediction of Neurodegenerative Diseases*.

All the details can be found on our seminar page.

Questions to vcf.bergen@gmail.com

Outlook:

upcoming!

2012-09-05

VCF Seminars

Our series of seminar, the Visual Computing Forum, is currently ongoing. All the details can be found in the dedicated [seminars section](#) and on our pages our pages on [Facebook](#) and [Google+](#).

Questions to vcf.bergen@gmail.com

2010-08-30

Interested in CG/Vis.-related Job Announcements?

Helwig Hauser is sharing job announcements that he receives on a dedicated page: [Job Offers shared by HH](#).

Alternatively (or in addition), you can follow HH on Twitter, also.

Questions to Helwig.Hauser@UiB.no

2013-11-22

New Ph.D. from the VisGroup: Cagatay Turkey!

We congratulate our colleague Cagatay Turkey who has successfully defended his PhD thesis on November 22. His thesis is entitled *Integrating Computational Tools in Interactive and Visual Methods for Enhancing High-dimensional Data and Cluster Analysis*.

We would also like to thank Jean-Daniel Fekete, Jörn Kohlhammer and Peter Filzmoser, who entertained us for the rest of the day with three very interesting talks.

More details can be found in the [flyer](#) and in the official announcement.

Questions to Helwig.Hauser@UiB.no



2013-11-08

VCF23: Geographic Visualization

This Friday, Cagatay Turkey (Visualization Group, UiB) will give an overview of visualization techniques targeted at the geographical domain. The talk, which is also Cagatay's trial lecture, will take place on Nov. 8., from 10.15 to 11.15. All the details are summarized on our [seminar page](#)!

Questions to vcf.bergen@gmail.com



2013-10-30

www.ii.UiB.no/vis