180.765 Seminar Wissenschaftliches Arbeiten

WS 2016/17
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Institute of Computer Graphics and Algorithms
Vienna University of Technology
Seminar

- Get an idea how scientific work is carried out (in Visualization / CG)
  - Practice to review literature and get familiar with a particular scientific topic
    - Selecting, reading and understanding
    - Summarizing and explaining (orally and written)
    - Comparing and discussing
  - Practice to give a talk
  - Active discussion participation
1. Select a topic
Select a Topic

- Topics will be presented today
- Topic abstracts are available at
  http://cg.tuwien.ac.at/courses/WissArbeiten/index.html
- Alone or in groups of 2
- Choose a topic and wait until it is confirmed
  mindek@cg.tuwien.ac.at

Topic Selection Deadline: **20.10.2016**
Seminar - Procedure

1. Select a topic
2. Submit a literature list
Submit a Literature List

- Meeting with Supervisor
- List of papers related to the topic
- Official subscription to the seminar!

- Literature List Deadline: **28.10.2016**
Seminar - Procedure

1. Select a topic
2. Submit a literature list
3. Attend 3 lectures
Attend 3 Lectures

- **13.10.2016, 15:00 - 17:00**
  Wie schreibt man eine wissenschaftliche Arbeit
  *Professor Wimmer*

- **9.11.2016, 13:00 - 15:00**
  Forschung und wie sie funktioniert
  *Professor Gröller*

- **30.11.2016, 13:00 - 15:00**
  Wie halte ich einen Vortrag
  *Professor Purgathofer*
1. Select a topic
2. Submit a literature list
3. Attend 3 lectures
4. Write a report
Write a Report

- State-of-the-Art Report
- Final Report: 6-8 pages (12-16 pages / group)
- In English
- Format as for a scientific paper
  - LaTeX (Template on the webpage)
- Regular Meetings with Supervisor

Seminar - Procedure

1. Select a topic
2. Submit a literature list
3. Attend 3 lectures
4. Write a report
5. Give a presentation
Give a Presentation

- Use institute’s PowerPoint template for presentations (template is on the webpage)
- In English
- 15 + 5 minutes
- Active discussion participation


In case of too many students, an additional presentation day will be announced and/or the length of the presentation will be adjusted. This will be communicated in advance.
1. Select a topic
2. Submit a literature list
3. Attend 3 lectures
4. Write a report
5. Give a presentation
Grading

- It is necessary to attend the 3 lectures to get a positive grade!

- Grading criteria:
  - 50% written report
  - 40% presentation
  - 5% attendance during the presentations
  - 5% active discussion after the presentations
Report Grading

- Grading criteria:
  - Structure, figures, ...
  - Language
  - Content
  - References

- Points will be deducted for:
  - Delayed submission
  - Page number below 6 (12)

- Plagiarism check!
“plagiarism involves the use of another person's work without full and clear referencing and acknowledgement”

http://www.usq.edu.au/library/referencing/what-is-plagiarism
Presentation Grading

- Grading Criteria
  - Content Expertise
  - Didactic / Preparation
  - Presentation Technique
  - Overtime
Important Dates

- **20.10.2016**: Select your topic
- **28.10.2016**: Submit your literature list
- Attend 3 lectures (in ICGA seminar room):
  - **13.10.2016, 15:00**: Wie schreibt man eine wissenschaftliche Arbeit
  - **09.11.2016, 13:00**: Forschung und wie sie funktioniert
  - **30.11.2016, 13:00**: Wie halte ich einen Vortrag
- **11.12.2016**: Submit draft report
- **12.12.2016**: Talks (in seminar room)
- **08.01.2017**: Submit final report

All submissions to mindek@cg.tuwien.ac.at
Topics 2016/2017
Astronomical Visualization

- Fascinating real-world imagery data
- Simulation results
- Extremely large scales of available data
- Both spatial and non-spatial data
Realistic Medical Rendering

- Clinical relevance
- Modeling of realistic material appearance
- Volume data available on various scales
- High quality data acquisition
Anatomical Landmarking

- Quantification of a shape with landmarks
  - Shape model
  - Change over time
- Interdisciplinary e.g.
  - Morphometrics
  - Medicine (well-defined points)
  - Anthropology etc.

Liang et al. 2013
Wiley et al. 2005

Haichao Miao
Artificial Neural Network Visualization

- Neural Network used as black-box
- Visualizing activity of to gain a better understanding

Rauber et al. 2016

Zeiler et al. 2014
..in different domains and at different scales:

- 3d modeling & animation
- industrial design
- architecture
- DNA origami

..come with different requirements and restrictions.
Animated Transitions in Data Visualization

- due to changes in:
  - visualization states
  - representation types
Integration of Spatial and Abstract Visualization

- spatial visualizations vs abstract visualizations
- integrated approach
Saliency in Graphics and Visualization

- Saliency describes how much an item stands out from its surroundings
  - Computational saliency models
  - Applications of saliency models in computer graphics and visualization

X-Ray Augmented Reality [Sandor et al., 2010]
Volume Visualization Enhancements [Kim et al., 2006]
Uncertainty Visualization [Feng et al., 2010]
How to analyze and visualize millions of data records (in real time)

- Clutter reduction techniques
- Efficient queries and data analysis

100,000 samples (overplotting!)

Binned Parallel Coordinates
[Novotny and Hauser, 2006]

Heatmap of 50,000+ geographic locations
[Liu et al., 2013]
Multi-dimensional data can be hard to visualize.

Use feature space transformations or projections to simplify.

How to maintain structure, patterns etc?
In Situ visualization is visualization during the simulation

- Measurements from thousands of sensors
- Issues with petabytes of data management and I/O
Text and Document Visualization

- Transform text into spatial representation
  - Thematic patterns
  - Relationships between documents
  - ...

Sebastian Sippl
Visualization of data related to security

- Crime intelligence
- IP traffic
- Botnet activity
**DSLs in Visualization**

- **DSL = Domain-specific language**
- **How to incorporate domain knowledge in a language**

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<th>source code and libraries</th>
<th>expert programmer</th>
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<td>data flow modules</td>
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</tbody>
</table>

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**slangs**

- renderer
- ...
- ...
- resources

**vislang runtime**

**program editor**

```c
void updateRendering(float x) {
    // use slang renderer
    using renderer:
        focus = value > x;
    using;
}
//assign trigger
float x -> updateRendering(x);
```

**interactive interpretation and visualization**

- $x = 0$
- $x = 0.05$
- $x = 0.1$
- $x = 0.2$
Volume Editing & Annotation

- Live Wire \ Surface
- Graph cuts
- Reeb Graphs
Volume Manipulation

- Physical-based manipulation
- Skeleton-based manipulation
- Feature-aligned manipulation
Implicit surfaces

- Representations
- Rendering
- Usage
Visualization Systems

- Visualization tools
- Libraries
- Plug-in architectures
Illustrative Shading Techniques
Smart Visibility Techniques
Molecular Visualization

- Use of different representations
- Real-time rendering
- Visual analysis of cavities
- ...

Mathieu Le Muzic
Uncertainty Visualization

- Positional uncertainty
- Data uncertainty (errors)
- Uncertainty representations
  - Volume rendering
  - Noise
  - Animations
  - Points with offset
  - …
Parameter Visualization

- Parameter exploration
- Stability analysis (with respect to parameters)
- Multi-dimensional data
  - Hyper slice
  - Parallel coordinates
  - Projecting parameter space
  - …
Procedural Plant Modeling

- Algorithmic botany
- Simulating branching structures (trees, roots)
- Procedural texturing (barks, etc)
Procedural Content Generation

- 3D models
- Landscapes
- Textures
1. Astronomical Visualization
2. Realistic Medical Rendering
3. Anatomical Landmarking
4. Artificial Neural Network Visualization
5. Computer Aided Design
6. Animated Transitions in Data Visualization
7. Integration of Spatial and Abstract Visualization
8. Saliency in Graphics and Visualization
9. Big Data Visual Analytics
10. Structure Preserving Projection
11. Extreme Scale In Situ Visualization
12. Text and Document Visualization
13. Security Visualization
14. Performance Visualization
15. DSLs in Visualization
16. Volume Editing & Annotation
17. Volume Manipulation
18. Implicit Surfaces
19. Visualization Systems
20. Illustrative Shading Techniques
21. Smart Visibility Techniques
22. Grammar-based Computer Graphics and Visualization
23. Molecular Visualization
24. Uncertainty Visualization
25. Parameter Visualization
26. Procedural Plant Modelling
27. Procedural Content Generation
A very short introduction to LaTeX

LaTeX
A very short introduction to LaTeX

- Document markup language
  - „programming“ a text document
- Similarities to HTML
- No WYSIWYG
- Most convenient to use a LaTeX distribution and a LaTeX IDE (integrated development environment)
A very short introduction to LaTeX

- First install a LaTeX Distribution
  - MiKTeX (for Windows)

- Then a LaTeX IDE
  - TeXnicCenter
  - Texmaker
  - LEd
A very short introduction to TEXnicCenter

- Extract the archive `acmsiggraph.zip`
- In TeXnicCenter open `template.tex`
  1. Select LaTeX=>DVI=>PDF output profile
  2. Select LaTeX=>PS output profile
     - Convert PS to PDF using Adobe Distiller
  3. Select LaTeX=>PDF output profile (pdflatex)
     - For eps images use `\usepackage{epstopdf}`
A very short introduction to LaTeX

- Work with 2 files:
  - A `.tex` file for the text
  - A `.bib` file for the bibliography which is used by the citations command `\cite`
Questions?

http://www.cg.tuwien.ac.at/courses/WissArbeiten/index.html