186.175 Seminar aus Computergraphik
186.046 Seminar aus Visualisierung

SS 2020

Organizer: Hsiang-Yun Wu

Teaching staff: Aleksandr Amirkhanov, Nicolas Grossmann, Christoph Heinzl, Tobias Klein, David Kouřil, Haichao Miao, Peter Mindek, Renata Raidou, Manuela Waldner, Hsiang-Yun Wu, and Eduard Gröller

Institute of Visual Computing & Human-Centered Technology
TU Wien, Austria
Last updated: 11th Match 2020
186.175 Seminar aus Computergraphik (by default)

186.046 Seminar aus Visualisierung
  - Send me a message that you plan to register Seminar aus Visualisierung

186.848 Seminar aus Medizinischer Informatik
  - Send me a message that you plan to register Seminar aus Medizinischer Informatik
  - You are requested to select a medical related topic
Seminar

Get an idea how scientific work is carried out (in 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
- Write a review on a paper
- Practice to give a talk
Select a topic
■ Students can work alone or in groups of 2
■ State-of-the-Art
■ TUWEL: https://tuwel.tuwien.ac.at/course/view.php?id=21472
■ wu@cg.tuwien.ac.at

**Important!!**
Register your topic on TU WEL
Registration start:
  12th March 2020, 10:00
Registration due to:
  26th March 2020, 23:59

*First come first serve*
Select a topic

Submit list of literature
List of papers related to the topic

Seminar subscription

26.03.2020: List of literature submission deadline

Approx. 10~15 papers in a list (pdf, no specific template)
Seminar

- Select a topic
- Submit list of literature
- **Attend 3 lectures**
  - All three lectures will be held in the seminar room of institute 186
Attend 3 Lectures

- **01.04.2020 (Wed) 11:00 - 13:00 (s.t.)** (Online recording will be provided)
  
  *Wie schreibt man eine wissenschaftliche Arbeit*  
  Professor Wimmer

- **21.04.2020 (Tue) 11:00 - 13:00 (s.t.)**
  
  *Forschung und wie sie funktioniert*  
  Professor Gröller

- **13.05.2020 (Wed) 11:00 - 13:00 (s.t.)**
  
  *Wie halte ich einen Vortrag*  
  Professor Purgathofer
Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write the report
- State-of-the-Art report
- Final report: 8 pages (16 pages / group)
- In English
- Regular meetings with supervisor
- Format as for a scientific paper
  - LaTeX (Template on the webpage)
- **20.04.2020**: Report submission deadline (minimum 5 pages)
Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write report
- Write review
Review

- Review paper of other student (or group of students)
- Fill out review form (will be sent by e-mail)
- **25.04.2020**: Receive a review form and a report from another student.
- **18.05.2020**: Review submission deadline
- **22.05.2020**: Receive two reviews (one from your supervisor and one from another student)
Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write report
- Write review
- Refine report
Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write report
- Write review
- Refine report
- Give a talk
Use the institute format [Candidate for new Powerpoint template 16:9](https://www.cg.tuwien.ac.at/resources/onTalks/)

Format: PDF or PowerPoint

A Mac machine with Microsoft PowerPoint installed (avoid using *.avi for videos)

**17.06.2020 (17:00)**: Submit on TUWEL
Talk

- 20 + 5 minutes
- In English
- Active discussion participation

**18.06.2020, 9:00 s.t. – 18:00**: Talks

- **9:00 - 12:00** in the [seminar room 186 (Favoritenstr. 9-11 / 5.floor)](#)
- **13:00 - 17:00** in the [seminar room ZEMANEK (Favoritenstr. 9-11 / EG)](#).
Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write report (draft version)
- Write review
- Refine report
- Give a talk
- Submit final version
Report

- State-of-the-Art report
- 8 pages (16 pages if working in a group)
- In English
- Format reports in the style of a scientific paper
  - Use LaTeX (template is on the webpage)
- **21.06.2020**: Final report submission deadline
It is necessary to attend the 3 lectures to get a positive grade!

Grading criteria:
- 40% written report
- 30% presentation
- 20% review
- 5% attendance during the presentations
- 5% active discussion after the presentations
Anyway...
Grading criteria:
- Structure, figures,…
- Language
- Content
- References
- Checklist

Practical Tips and Tricks for Paper Writing
https://www.cg.tuwien.ac.at/research/publications/2010/groeller-2010-PTT/groeller-2010-PTT-.pdf
Points will be deducted for:

- Delayed submission
- Page number below 8 (16 in a group)
- Plagiarism check!
“plagiarism involves the use of another person's work without full and clear referencing and acknowledgement”

http://tim.thorpeallen.net/Courses/Reference/Citations.pdf
Presentation Grading

Grading Criteria

- Content Expertise
- Didactic / Preparation
- Presentation Technique
- Overtime
All the information is here:

https://cg.tuwien.ac.at/courses/SeminarAusCG/

All the questions go here:

https://tuwel.tuwien.ac.at/course/view.php?id=21472

or

wu@cg.tuwien.ac.at
Topics 2020
Visualization and uncanny valley
Aesthetic visualization
Virtual and augmented reality has come to stay and is used in many application domains. AR and VR feature the potential to boost data analysis through more intuitive insights and more intuitive interactions; the transfer of the spatiality is intuitive and probably more effective than when rendering the same scene on a 2D monitor. Virtual and augmented reality have the potential to help in a variety of tasks such as quality control / parts inspection, the characterization of the micro-structure of materials, or the visualization of atomic structures. Your task is to provide an overview on the state of the art regarding methods in virtual and augmented reality: where these be used to support material science tasks, what are their benefit, what are their limitations.
When directly visualizing (potentially multi-variate) volume datasets, a transfer function is required. Current tools for this purpose are often unintuitive; its often not clear how changes in the transfer function will affect the resulting visualization; using volume visualization tools therefore first requires a certain experience by the user, as well as often a trial and error approach to color the volume in the desired fashion. Recently, methods have emerged that simplify this process, or provide guidance to the user. Your task is to provide a survey on the state of the art of methods guiding users in setting up transfer functions for volume visualization.

Source: Zhou and Hansen, Transfer Function Design based on User Selected Samples for Intuitive Multivariate Volume Exploration
Real-time Transparency

- Research and summarize various approaches that have been suggested to solve transparency in real-time rendering systems.
Research what methods can be used to achieve realistic look and behavior of fluids like water or smoke.

Find out which of these methods are used in publicly available physics libraries like nvidia FleX.
- What does abstraction mean in the context of visualization?

- For exploration and analysis of data

Understanding Comics by Scott McCloud

Structural Molecular Abstraction
[v. d. Zwan et al. 2011]
Modeling 3D environments in Virtual Reality

Gravity sketch

Google Blocks
Visualization of Bipartite / k-Partite Graphs

- Graph with vertices divided into two independent sets, such as:
  - Social networks: people and interest groups
  - Biology: genes and conditions
  - Movies: actors, movies, directors

[Sun et al., BiSet, TVCG 2016]

[Streit et al., Furby, BMC Bioinformatics 2014]
Visualization of Networks in Virtual Reality

- Immersive analysis of 3D graphs in virtual reality from the 90ies to now:
  - Rendering & layout
  - Interaction & navigation

[Osawa et al., 2000]  [Drogemuller et al., 2017]  [Kwon et al., 2016]
Animated Visual Storytelling

provided some intriguing matrices, which let me model a day as a time-varying Markov chain. The simulations below come from this model, and it’s kind of mesmerizing.

At 4:00am

Each dot represents a person, color represents the activity, and time of day is shown in the top left. An arrow shows change in activity per frame shown.
Parallel Coordinates

Nicolas Grossmann
Using Physicalization for Medical Visualization

Opportunities and challenges for data physicalization [Jansen et al.

Vol2velle: Printable Interactive Volume Visualization [Stoppel et al. 2017]
Visual analytics and rendering for tunnel crack analysis [Ortner et al. 2016]

Applying Visual Analytics to Physically-Based Rendering [Simons et al. 2019]
DSLs in Visualization

- DSL = Domain-specific language
- How to incorporate domain knowledge in a language
Procedural Animation
Network Visualization for Biological Pathways

**Challenge:**
- Layout simplification and arrangement
- Scalability, complexity, and usability
Machine Learning in Graph Visualization

**Challenge:**

- Formulation for machine learning technique
### Topics 2020

| 1) | Visualization and uncanny valley |
| 2) | Aesthetic visualization |
| 3) | Visualization Techniques for AR/VR Applications in Material Science |
| 4) | Guidance Methods for Transfer Function Specification |
| 5) | Real-time Transparency |
| 6) | Real-Time Methods for Fluids Simulation |
| 7) | Abstraction in Visualization |
| 8) | 3D Modeling in Virtual Reality |
| 9) | Visualization of Bipartite / k-Partite Graphs |
| 10) | Visualization of Networks in Virtual Reality |
| 11) | Animated Visual Storytelling |
| 12) | Parallel Coordinates |
| 13) | Machine Learning in Computer Graphics |
| 14) | Special Effects in Computer Graphics |
| 15) | Using Physicalization for Medical Visualization |
| 16) | Visual Analytics for Rendering |
| 17) | DSLs in Visualization |
| 18) | Procedural Animation |
| 19) | Network Visualization for Biological Pathways |
| 20) | Machine Learning in Graph Visualization |

**Important!!**
Register your topic on TU WEL  
Registration start:  
12th March 2020, 10:00  
Registration due to:  
26th March 2020, 23:59
Thank you.

Projects:
https://www.cg.tuwien.ac.at/courses/projekte/

wu@cg.tuwien.ac.at