186.175 Seminar aus Computergraphik
186.046 Seminar aus Visualisierung

SS 2021

Organizer: Hsiang-Yun Wu

Teaching staff: Aleksandr Amirkhanov, Nicolas Grossmann, Christoph Heinzl, Renata Raidou, Manuela Waldner, Hsiang-Yun Wu, and Eduard Gröller

Institute of Visual Computing&Human-Centered Technology
TU Wien, Austria
Last update: 10th March 2021
186.175 Seminar aus Computergraphik (by default)
186.046 Seminar aus Visualisierung
186.848 Seminar aus Medizinischer Informatik

You are requested to work on 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=35632

wu@cg.tuwien.ac.at

Important!!
Register your topic on TUWEL
Registration start: today
Registration due to: 12th March 2021, 23:59

Rank by your preference
Seminar

- Select a topic
- Submit list of literature
Literature List

- List of papers related to the topic
- Seminar subscription
- **20.03.2021**: List of literature submission deadline
- Approx. 10~15 papers in a list (pdf)
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

- **31.03.2021 (Wed) 11:00 - 13:00 (s.t.)**
  *Wie schreibt man eine wissenschaftliche Arbeit*  
  Professor Wimmer

- **13.04.2021 (Tue) 11:00 - 13:00 (s.t.) – Zoom Q&A from 13:00**
  *Forschung und wie sie funktioniert*  
  Professor Gröller

- **27.04.2021 (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)

22.04.2021: Report submission deadline (minimum 6 pages)
Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write report
- Write review
- Review paper of other student (or group of students)
- Fill out review form (will be sent by e-mail)
- **25.04.2021**: Receive a review form and a report from another student.
- **20.05.2021**: Review submission deadline
- **22.05.2021**: Receive two reviews (one from your supervisor and one from another student)
- 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

09.06.2021 (17:00): Submit on TUWEL
15 + 3 minutes

In English

Active discussion participation

10.06.2021, 9:00 s.t. – 17:00: Talks

on Zoom, Check the link on TUWEL
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
- 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)
- **18.06.2021**: Final report submission deadline
It is necessary to attend the 3 lectures to get a positive grade!

Grading criteria:
- 45% written report
- 30% presentation
- 15% review
- 5% attendance during the presentations
- 5% active discussion after the presentations
Report Grading

- 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
Grading Criteria

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

https://www.cg.tuwien.ac.at/courses/SeminarAusCG/SE/2021S

All the questions go here:

https://tuwel.tuwien.ac.at/course/view.php?id=35632

or

wu@cg.tuwien.ac.at
Topics 2021
1. Automatic Layout Generation

- Layout algorithms for computational composition of many media (text, images, etc.) into a single:
  - Magazine cover
  - Advertisement or banner
  - Poster …

[Hsiang-Yun Wu]

[Yin et al., MM 2013]

[Jahanian et al., IUI 2013]

[Liang et al., BigMM 2018]
2. Visualization of Bipartite / k-Partite Graphs

- Graph with vertices divided into two independent sets, such as people and affiliations, genes and conditions, actors and movies
- Which visualization techniques exist?
- How to explore a k-partite graph interactively?

[Hsiang-Yun Wu]

[Sun et al., BiSet, TVCG 2016]

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

- Immersive analysis of 3D graphs in virtual reality from the 90ies to now:
  - Rendering & graph layout
  - Embodied interaction & effective locomotion

[Osawa et al., 2000] [Drogemuller et al., 2017] [Kwon et al., 2016]
4. Cluster-Separation Measures
5. Automated Generation of Infographics

<table>
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<th>B. carrier</th>
<th>C. destination city name</th>
<th>D. departure delay (min)</th>
<th>E. arrival delay (min)</th>
<th>F. passengers</th>
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</tbody>
</table>

... ... ... ... ... ...

[Graphs showing statistical data and trends]
6. Hierarchical Aggregation for Information Visualization
7. The Use of Markerless Augmented Reality in Anatomical Education

Figure 1: An X-ray is augmented onto the user. The X-ray is simulated from a CT of the same person. The printed image is a real X-ray of the same person.

[Blum 2016, mirracle]
8. Style Transfering

[Image of various artistic styles, including realistic scenes and abstract paintings, with references to Gatys 2016]
9. Visualizing Dynamical Systems in Biology

[Amirkhanov et al. 2019]
10. Texturing: Past and Present

- Conduct a survey of the **history** and the **state of the art** in **texturing**

[Image of various texturing examples]

Conduct a survey of the state of the art in molecular VR

https://dl.acm.org/doi/fullHtml/10.1145/3388536.3407891
Conduct a survey of the state of the art in post processing

13. Text and Image Labeling in AR

**Challenge:**
- Combinatorial complexity
- Optimization
14. Visualization of Knowledge Graphs

Challenge:

Formulation for machine learning technique
15. Sport Analytics

- Tactic development
- Education and training
- Visualization

with dribbler loss  without dribbler loss
The testing or exploration of components or products over long distances (remote analytics) is of high importance in industry. By supporting or guiding the analysis on-site by a remote expert, a strong cost reduction can be achieved by eliminating the need for experts on-site and thus enabling much faster decision making. Multidimensional data which has a physical reference, i.e. from material structures, can rarely, or only to a limited extent, be evaluated on desktop monitors using standard 2D visualization techniques. This requires new immersive visualization and interaction techniques that realize efficient remote collaboration or telepresence between off-site experts and on-site technicians. Your task is to provide an overview over the state-of-art methods which can be used to enable a Remote Analysis in AR/VR applications.


17. Tracking and Visualization of Features

Feature tracking and visualization has long been an important topic in the field of time-varying volume visualization, and its objective is to identify features and determine the correspondence between them in adjacent time steps. Tracking the evolutionary process of features not only has the potential to improve understanding scientific phenomena, but also to lead to new insights into the mechanisms underlying evolutionary events. Feature tracking algorithms aim at identifying the temporal evolution of features in a series of raw data snapshots, as XCT scans of in situ experiments or time-varying multidimensional datasets. In order to trace or understand the evolution of the features, a visualization of their changes is necessary.

Your task is to provide an overview over the state-of-art methods for feature tracking and visualization techniques which help the users to identify and interpret their evolution.
In recent years, augmented and virtual reality have gained attention, due to head-mounted displays and mobile devices supporting such immersive environments becoming more and more affordable. Immersive analytics systems implemented on such devices are increasingly used, also in the analysis of large volumetric data, such as acquired from magnetic resonance imaging or X-ray computed tomography. Volumetric datasets are acquired and analyzed in a wide variety of domains, such as the medical sciences, biology, or in material sciences. Immersive analytics systems require new visualization and interaction paradigms, when compared to traditional desktop computer systems; in the context of the immersive analysis of volumetric data, this applies for example for tasks such as refining the viewing parameters, or analyzing data derived from the volumetric data. Your task is to provide an overview over the state-of-the-art of immersive analytics methods for exploring volumetric data.
19. Neural Volume Rendering

(a) Capture Process  (b) Input  (c) Nerfie  (d) Nerfie Depth

https://dellaert.github.io/NeRF/
20. Visualization of Dynamical Systems
21. Visualization of Text in Voynich Manuscript

Folio 68

Folio 48

Some common Voynichese syllables

8AM 40 89 OE

goekain octhey

octhey ocphy
1) Automatic Layout Generation
2) Visualization of Bipartite / k-Partite Graphs
3) Visualization of Networks in Virtual Reality
4) Cluster-Separation Measures
5) Automated Generation of Infographics
6) Hierarchical Aggregation for Information Visualization
7) The Use of Markerless Augmented Reality in Anatomical Education
8) Style Transferring
9) Visualizing Dynamical Systems in Biology
10) Texturing: Past and Present
11) Molecular VR
12) Post Processing
13) Text and Image Labeling in AR
14) Special Effects in Computer Graphics

14) Visualization of Knowledge Graphs
15) Sport Analytics
16) Visualization & 3D Interaction Techniques for Remote Analysis in AR/VR Applications
17) Tracking and Visualization of Features
18) Immersive Analytics for Volumetric Data
19) Neural Volume Rendering
20) Visualization of Dynamical Systems
21) Visualization of Text in Voynich Manuscript

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Thank you.

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

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