Seminar aus Computergraphik
186.175, WS 2018/19, 2.0h (3 ECTS)

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Important!

Register to course in TISS: to get news & updates

These slides will on the website after this meeting

Official registration: by submitting the literature list

Topics are presented and assigned here today

Seminar Goals

Practice selecting, reading and understanding

- Search and select papers relevant to your topic
- Summarize them as a state-of-the-art report
- Prepare a talk about your topic in the seminar

This permits in-depth familiarization with the topic

More in-depth/spezialized than Bachelor seminar!

If well done → can continue to master thesis ...

Tasks

- Submit a literature list (chosen with supervisor)
- Attendance of 3 lectures
- Meetings with supervisor: paper selection, discussion of papers, preparing talk slides
- Alternative: evaluate and compare algorithms
- Final talk in seminar

Literature List

- Analyze recent papers (select with supervisor)
- Study secondary literature to understand topic
- How to find relevant papers:
- SIGGRAPH Proceedings
- Google Scholar: find the right key words
- Survey papers, often-referenced papers
- Submits a list of 10+ papers per email to supervisor & me → official registration

State-of-the-Art Report (STAR)

- 8 pages per student, preferably in english
- Format in the style of a scientific paper
- Use LaTeX template on course website
- LaTeX tools and guides also on the website
- Submit the draft in PDF format, per email to supervisor+organizer
- Draft has to be complete and min. 8 pages!

Scientific Review

- You will get a draft of another student to review
- Typical conference review form (Eurographics)
- This helps author to improve the manuscript
- Guides on review writing on course website
- You will receive 2 reviews (student, supervisor)
- Improve final report according to reviews

Seminar Talk

- Prepare slides in advance, using template
- Each student talks for 15 minutes, english pref.
- 5 minutes discussion after each talk
- Focus is on overview/comparison of methods
- Present so that other students will understand it
- Active discussion is mandatory and is graded
- Submitted slides are presented on seminar PC

Grading

- Lecture attendance 5%
- Review: 20%
- Seminar slides+talk: 30%, discussion 5%
- Final report: 40%

- Late submission: 15% off per day, max. 1 week (this also concerns the draft!)

Important Dates

- 24.10. 23:59 Submit literature list (per email)
- 07.11. 13:00-15:00 Lecture Prof. Wimmer
- 21.11. 13:00-15:00 Lecture Prof. Purgathofer
- 22.11. 13:00-15:00 Lecture Prof. Gröller
- 17.12. 23:59 Submit report draft
- 07.01. 23:59 Submit review
- 28.01. 23:59 Submit slides
- 29.01. 08:00-13:00 Seminar talks
- 29.01. 23:59 Submit final report

Topic Presentation

- Now 15 topics will be presented
- After the presentation, please mark down at least 3 in order of preference (1, 2, 3, …)
- I will try to make a fair assignment of topics

1 Real-Time Ray-Tracing

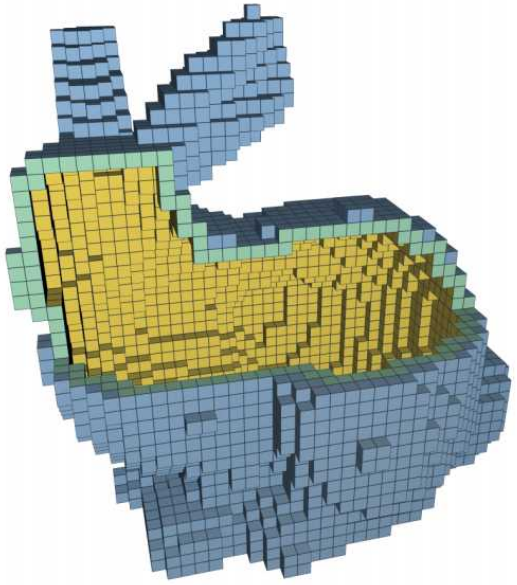
Analyze parallel ray-tracing systems which are capable of reaching real-time framerates!

- What can be parallelized? And how?
- Which data structures are used (Bounding volume hierarchies)
- Analyze different approaches and frameworks

- Describe recently introduced APIs/frameworks (Nvidia RTX, DirectX12 Ray-Tracing)

2 GPU Voxelization Algorithms

- Voxelized representation of a 3D scene
- GPU algorithms (not offline algorithms)
- Different voxelization approaches
- Applications of voxelized 3D scenes

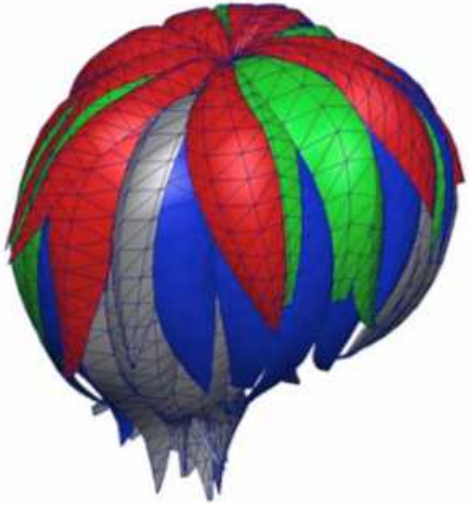


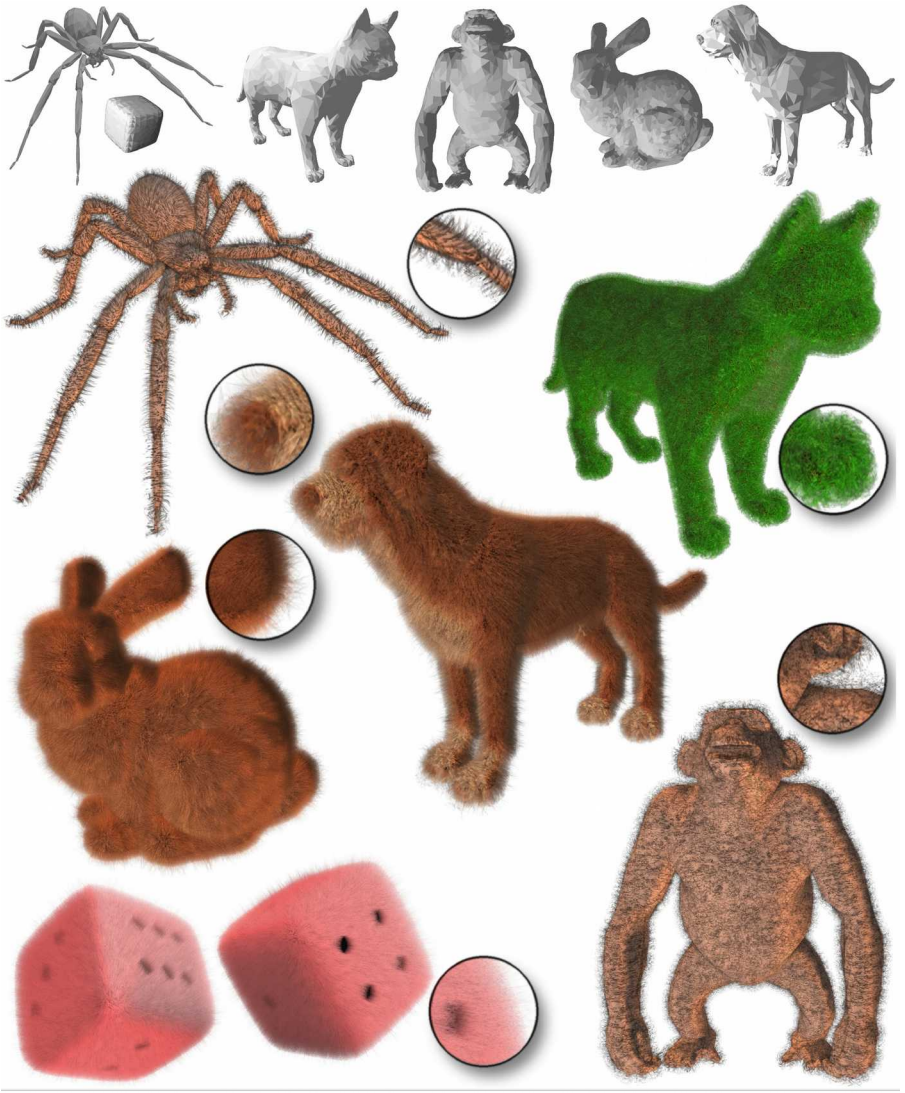
3 Ray-Tracing Hardware

- provide an overview of specialized ray-tracing hardware in research and industry

4 Rendering Hair and Fur

- provide an overview of algorithms and models for rendering hair and fur



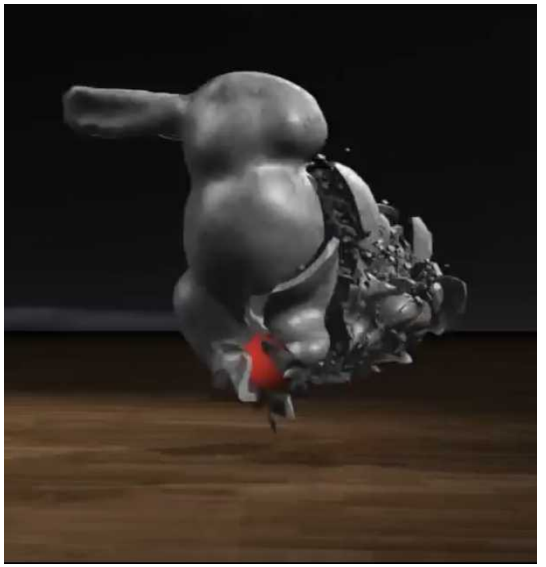


Survey of different approaches

- Procedural model-based
- Fluid-based
- …

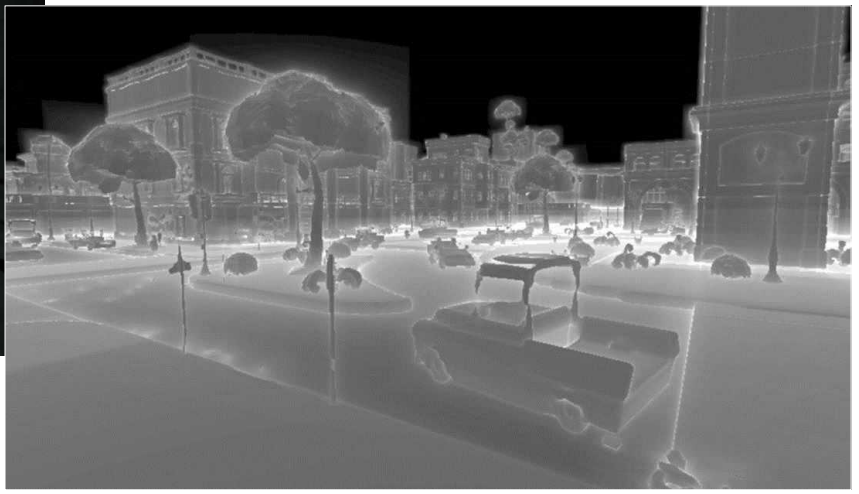
6 Fracturing

- Destruction of objects
- Static methods
  - Fast
  - Careful preparation
  - Implausible
- Dynamic methods
  - More realistic
  - Simplifies model preparation
  - Compute-intensive



7 Signed Distance Field Rendering

- Conduct a survey on signed distance field rendering.

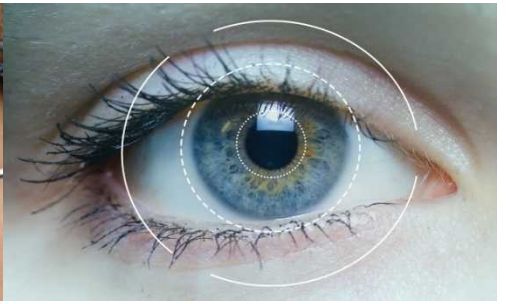


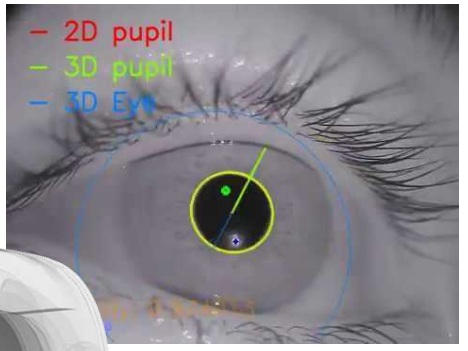
8 Sound Rendering

- Conduct a survey on sound rendering techniques.

9 Eye Tracking

- Applications
  - Medical applications
  - Behavioral science
  - Foveated rendering, VR / AR
- Algorithms / Methods
  - fixation identification [1]
- Hardware [2]



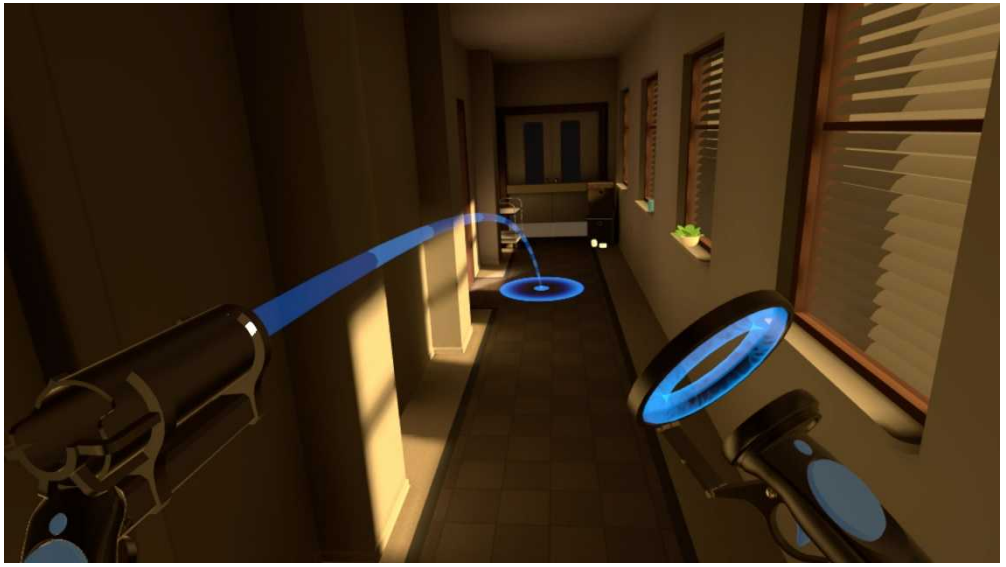


[1] Salvucci, D.D. and Goldberg, J.H., 2000, November. Identifying fixations and saccades in eye-tracking protocols. In *Proceedings of the 2000 symposium on Eye tracking research & applications* (pp. 71-78). ACM.

[2] Kassner, M., Patera, W. and Bulling, A., 2014, September. Pupil: an open source platform for pervasive eye tracking and mobile gaze-based interaction. In *Proceedings of the 2014 ACM international joint conference on pervasive and ubiquitous computing: Adjunct publication* (pp. 1151-1160). ACM.

10 Locomotion in VR

- Player movement in VR
- Re-Routing
- Teleports
- Motion sickness



- Investigate ways on how to create 3D-models from 2D-images

(a) 2D-image
(b) Wireframe-structure
(c) 3D-representation

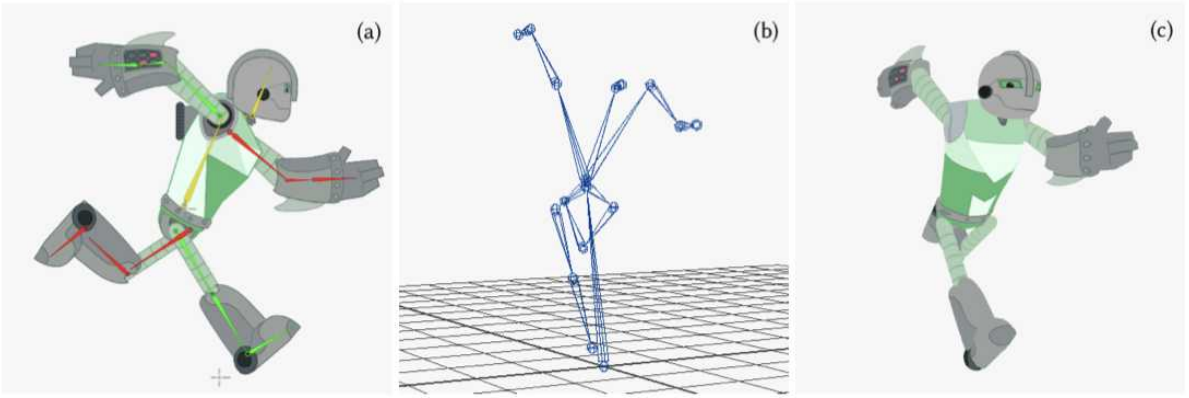


Image courtesy: Barbieri, Simone, et al. "3D content creation exploiting 2D character animation." *ACM SIGGRAPH 2018 Posters*. ACM, 2018.

12 Immersive Data Visualization

- Research most recent trends and developments
- The survey should also include
  - graph exploration
  - on-site visualizations

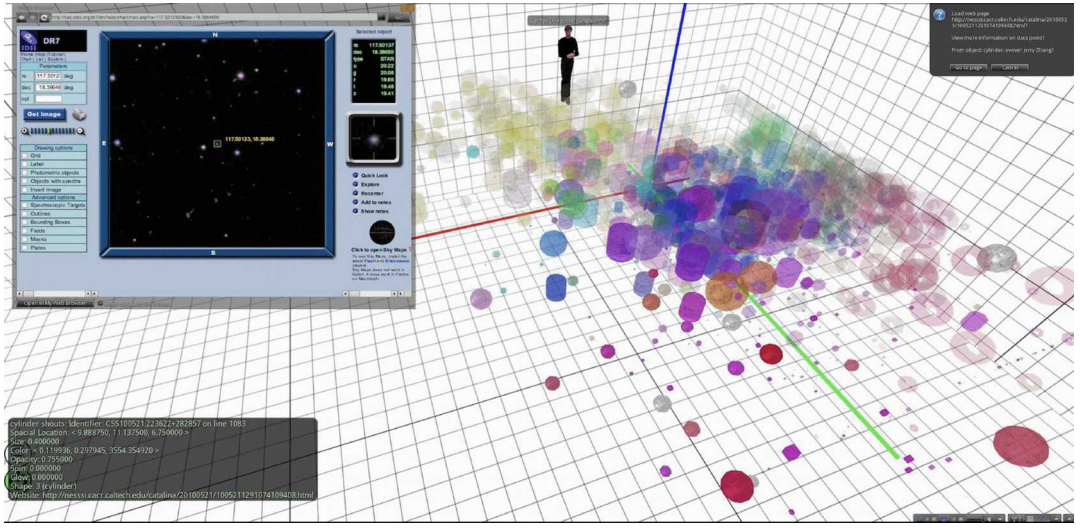
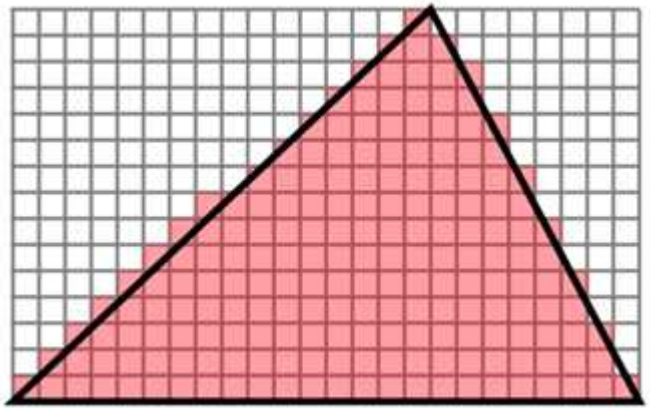
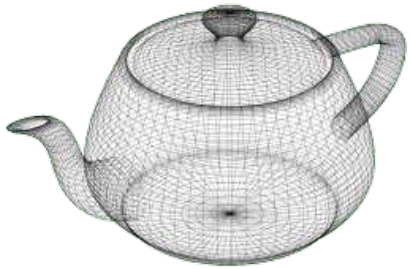


Image courtesy top+left: Donalek, Ciro, et al. "Immersive and collaborative data visualization using virtual reality platforms." *Big Data (Big Data), 2014 IEEE International Conference on*. IEEE, 2014.

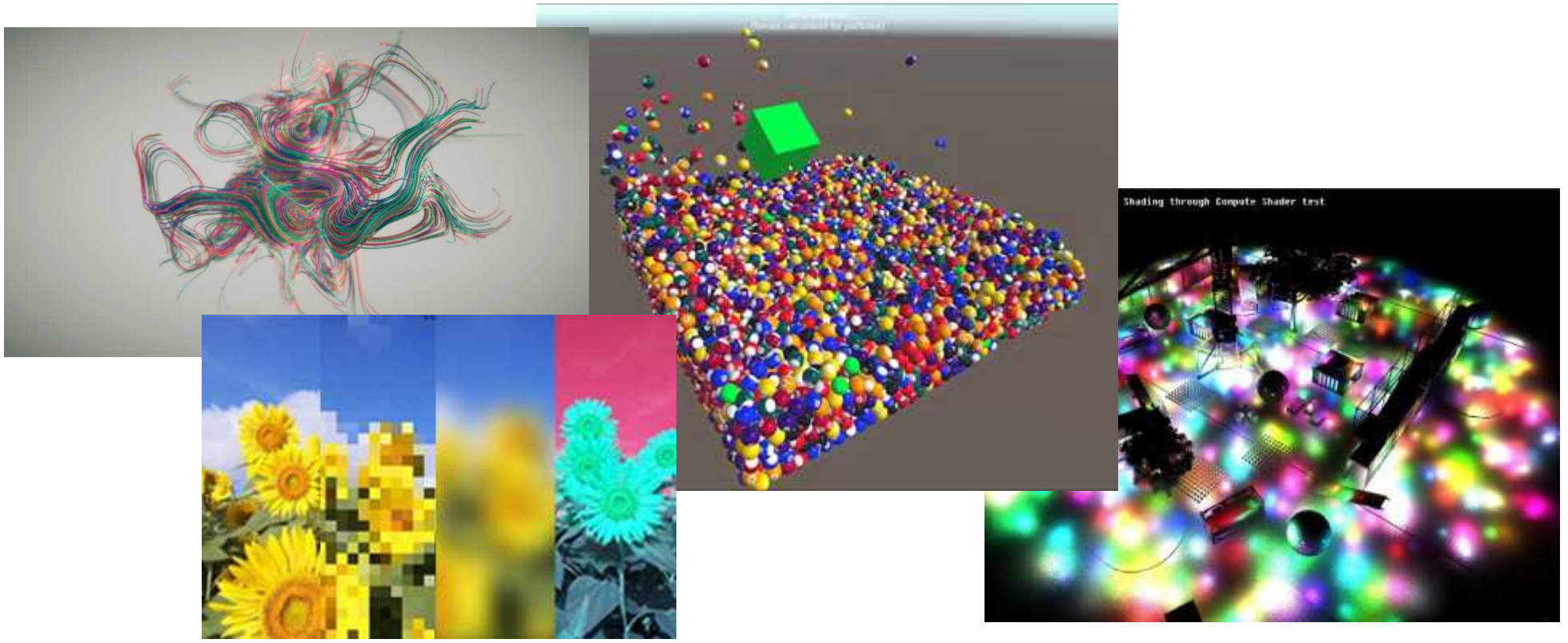
- e.g. Rendering with C++ or CUDA





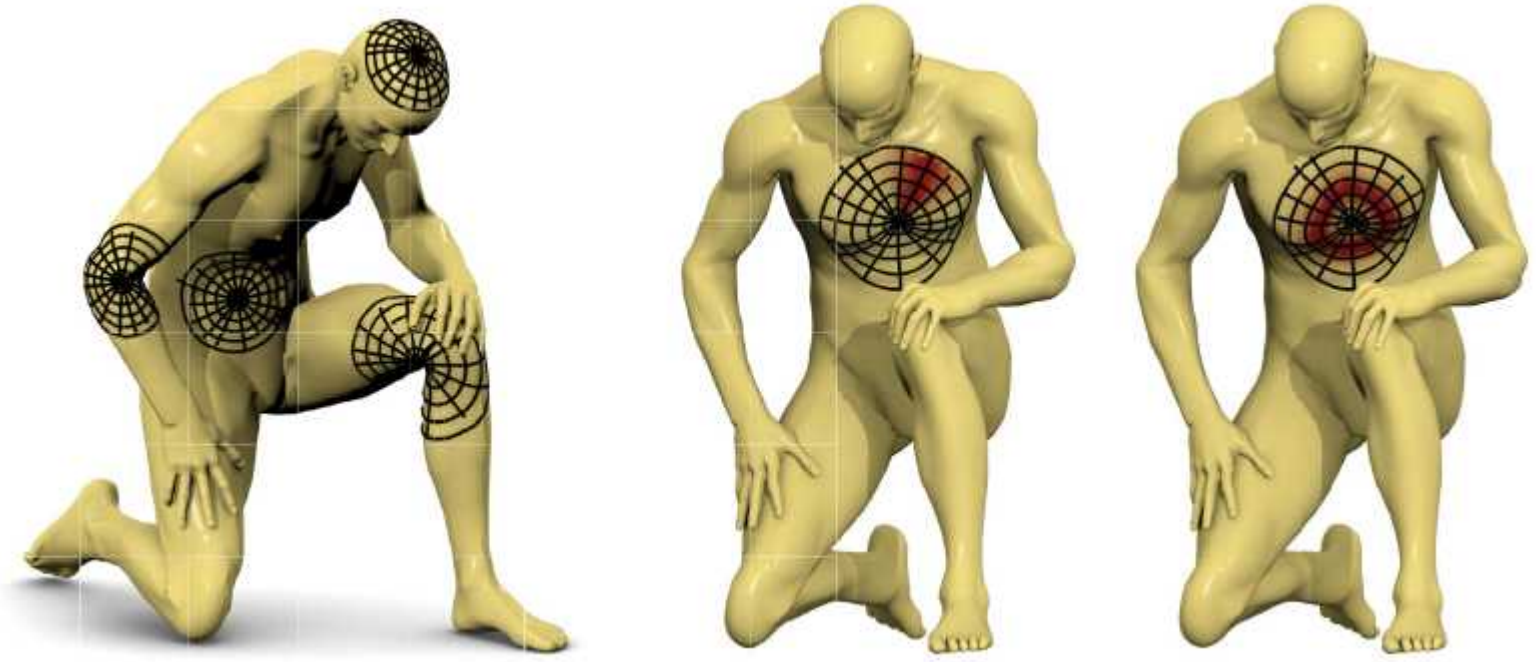
14 Compute Shaders in Rendering

- More flexible and powerful than regular shaders
- Research use cases and Algorithms, e.g.
  - Particles, Image Processing, Physics, Visibility Culling, Lights, Mesh Generation, etc.



15 Deep Learning in Geometry

- Convolution on graphs+surfaces instead of images
- Applications to: shape analysis, but also other fields such as social networks, finance, brain functions



Topic Assignment

- Please mark at least 3 topics in order of preference (1, 2, 3, …), with your name, email and student number
- Hand in the sheet
- Then I will assign the topics on the spot

Questions?

- Get in contact with your supervisor ASAP
- Discuss literature list with your supervisor
- Submit the list (to both me and supervisor) per email by 24.10.