Seminar in Scientific Writing 193.052, SS 2024, 2.0h (3 ECTS)

Stefan Ohrhallinger

Institute of Visual Computing and Human-Centered Technology (E193-02)

TU Wien

Important!

Register to course in TISS and TUWEL: to get news & updates

These slides will on TUWEL and institute website after this meeting

Official registration: by TISS (first phase of course)

Topics are presented today, assigned tomorrow on TUWEL

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

Less in-depth/specialized than subsequent Master seminar!

If well done → can continue to bachelor or 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: compare and evaluate algorithms
- Write a report
- Review a report from a colleague
- 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 to TUWEL → official registration

State-of-the-Art Report (STAR)

- 8 pages per student, must be in English
- Format in the style of a scientific paper
- Use LaTeX template on course website, can use Overleaf
- LaTeX tools and guides also on the website
- Submit the report in PDF format
- Report has to be complete and minimum 8 pages!
- NEW: We will use TurnItIn to automatically check for plagiarism

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 camera-ready report according to reviews

Seminar Talk

- Prepare slides in advance, using template
- Each student talks for 15 minutes, in english
- 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
- Slides presentation in the seminar room

Grading

- Lecture attendance 5%
- Review: 15%
- Seminar slides+talk: 30%, discussion 5%
- Report: 45% (NEW: 15% for report, 30% for camera-ready report)

- Late submission: 15% off task per day, so no points after 1 week (this also concerns the first report!)

Important Dates

- 24.03. Latest date you learn whether you passed phase 1
- 01.04. 23:59 Submit literature list (on TUWEL)
- 29.04: Lecture Prof. Gröller
- 20.03: Lecture Prof. Wimmer
- Recorded: Lecture Prof. Kaufmann
- 20.05. 23:59 Submit report
- 03.06. 23:59 Submit review
- 25.06. 23:59 Submit slides
- 26.06. 10:00-17:00 (if required) Seminar talks
- 26.06. 23:59 Submit final report

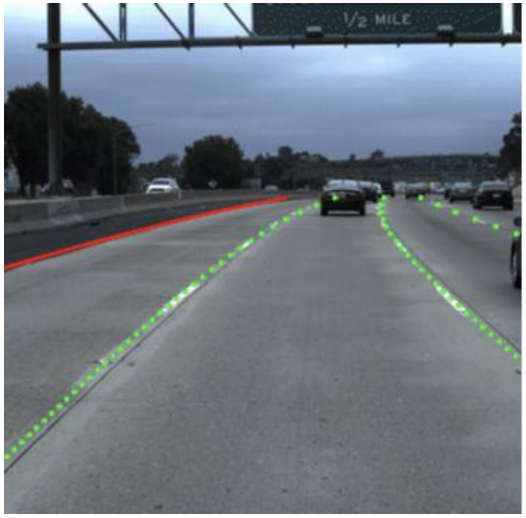
Topic Presentation

- Now 16 topics will be presented
- After the presentation, please mark down at least 3 in order of preference (1, 2, 3, …) and post your preferences in forum “Discussions” until the end of the day
- I will try to make a fair assignment of topics in case of conflicts and post them in forum “Announcements”

1 Street Lanes and Markings Detection

Detect all types of road markings governing traffic regulations:
Deep learning of location, pose, segmentation, and classify type

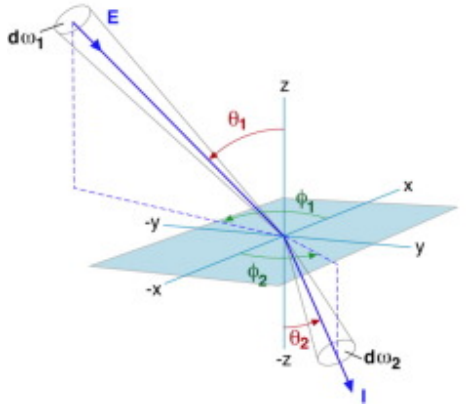
https://arxiv.org/pdf/2110.11867.pdf

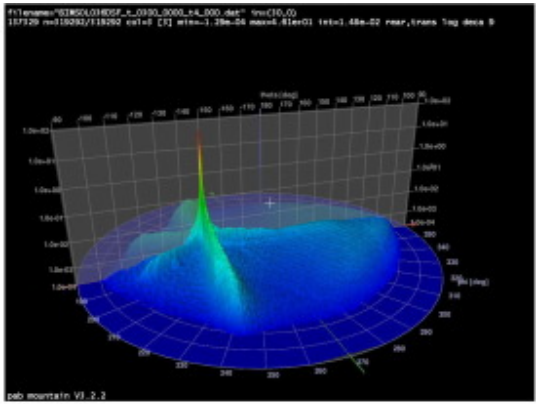


https://github.com/wvangansbeke/LaneDetection_End2End

2 Representation of Measured Materials

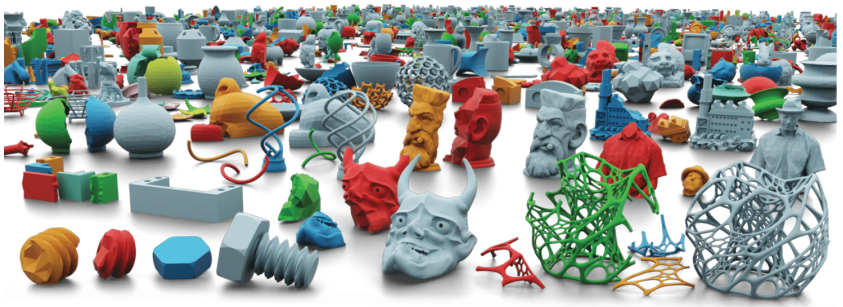
Conduct a survey of recent advances in the representation and application of measured materials



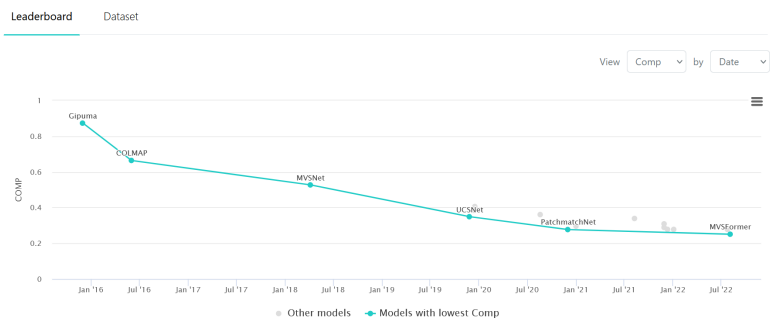


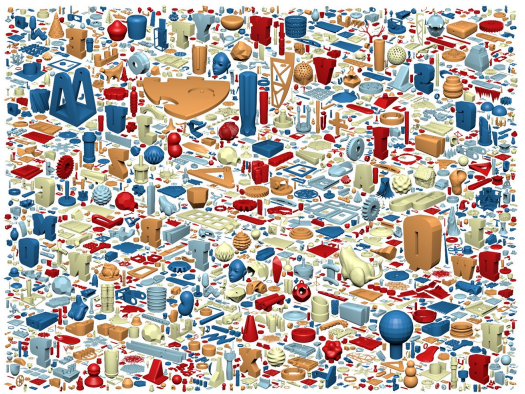
3 Datasets for Deep Learning

- Focus on 3D Reconstruction
- Sizes, Properties, Benchmarks



3D Reconstruction on DTU

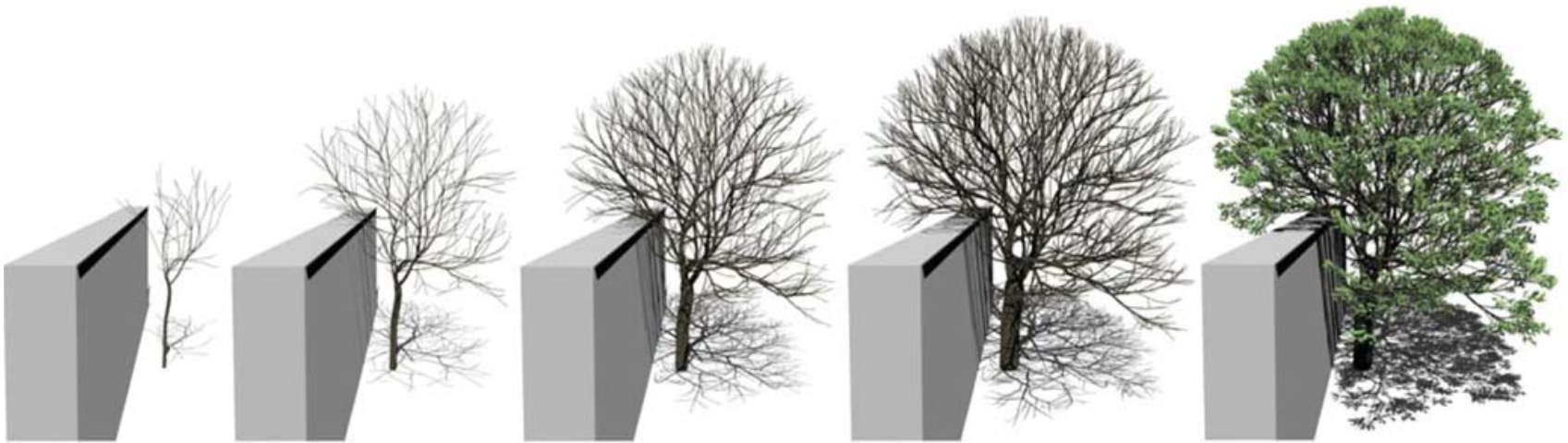




https://paperswithcode.com/sota/3d-reconstruction-on-dtu

4 Growth Models of Plants

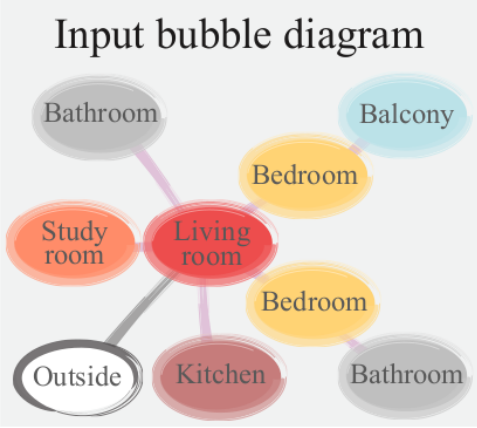
- Biologically-driven, physically-based
- All over its lifespan
- Procedural modeling vs. simulation

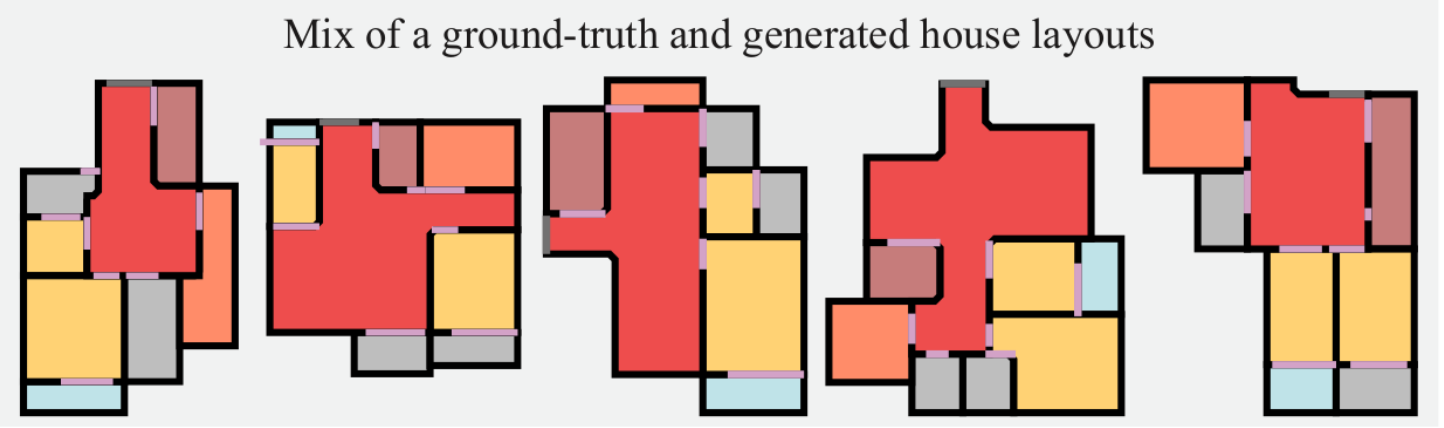


By Yi et al. from *Tree Growth modeling Constrained by Growth Equations* in Computer Graphics Forum 37 (2018)

5 Procedural Floor Plans

- Automated generation of Floor Plans
- Procedural vs. AI approaches
- Various levels of control

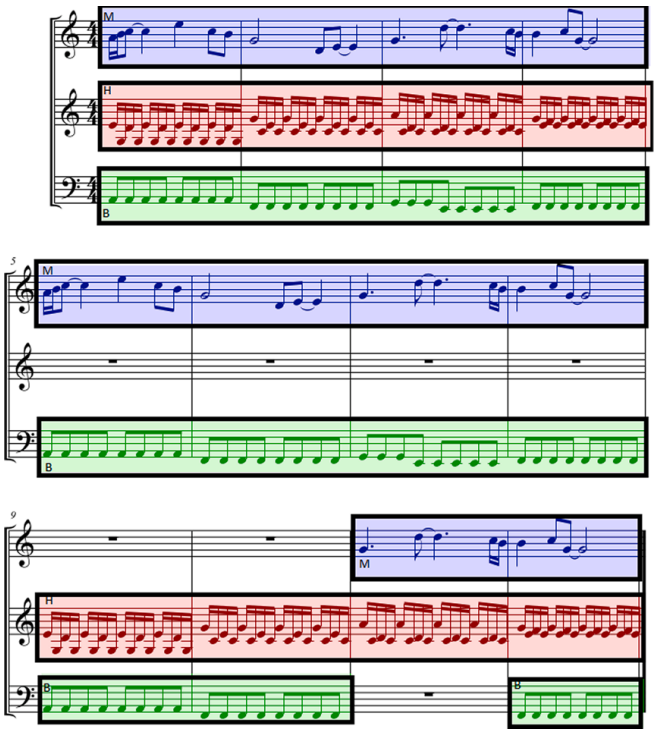




By Nauata et al. from *House-GAN++" Generative Adversarial Layout Refinement Network towards Intelligent Computational Agent for Professional Architects* at CVPR 2021

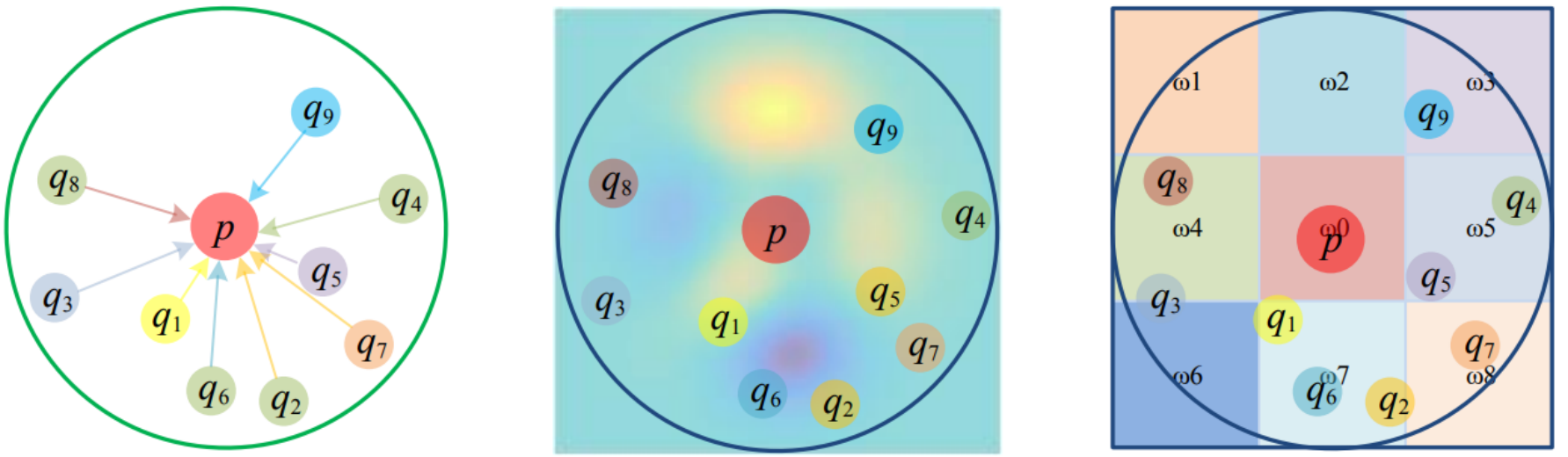
6 Generative Music Systems

- Various methodologies
- Interactive and adaptive
- Tools for Games, Videos etc.



By Plut and Pasquier from *Generative Music in Video Games: State of the Art, Challenges, and Prospects* in Entertainment Computing 33 (2020)

Defining convolutions is more complex in 3D, compared to images



(a) 3D neighboring points (b) 3D continuous convolution (c) 3D discrete convolution

Guo, Yulan & Wang, Hanyun & Hu, Qingyong & Liu, Hao & Liu, Li & Bennamoun, Mohammed. (2020). Deep Learning for 3D Point Clouds: A Survey. IEEE Transactions on Pattern Analysis and Machine Intelligence. PP. 1-1. 10.1109/TPAMI.2020.3005434.

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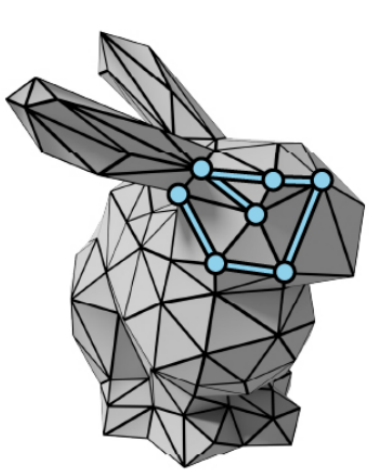
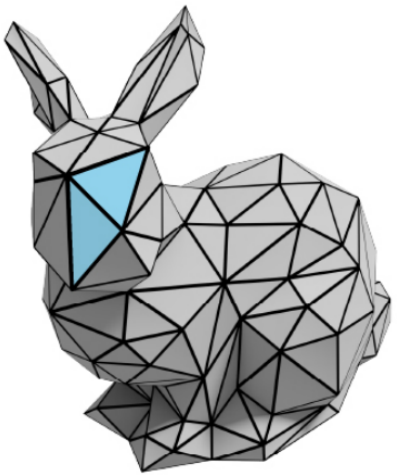
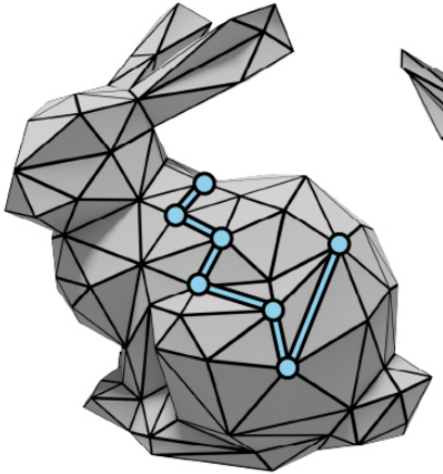


Lim et al. 2018
Gong et al. 2019



Hanocka et al. 2019
Liu et al. 2020

Feng et al. 2019
Hertz et al. 2020



Lahav et al. 2020

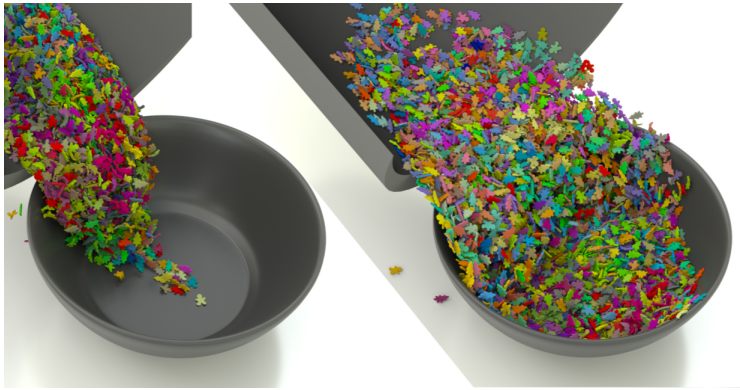
Sharp et al. 2020

… and even more so on triangular meshes.

Rana Hanocka and Hsueh-Ti Derek Liu. 2021. An introduction to deep learning on meshes. In ACM SIGGRAPH 2021 Courses (SIGGRAPH '21). Association for Computing Machinery, New York, NY, USA, Article 18, 1–27. https://doi.org/10.1145/3450508.3464569

8 GPU-accelerated simulation

developer.nvidia.com/flex



A Massively Parallel And Scalable Multi-GPU Material Point Method, Wang, et. al (SIGGRAPH 2020)

Implicit FEM and fluid coupling on GPU for interactive multiphysics simulation, Allard et al., SIGGRAPH 2011

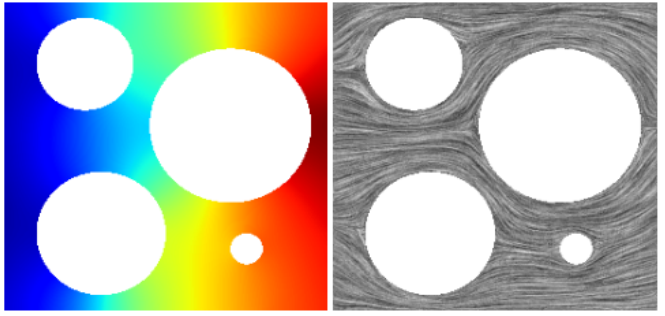
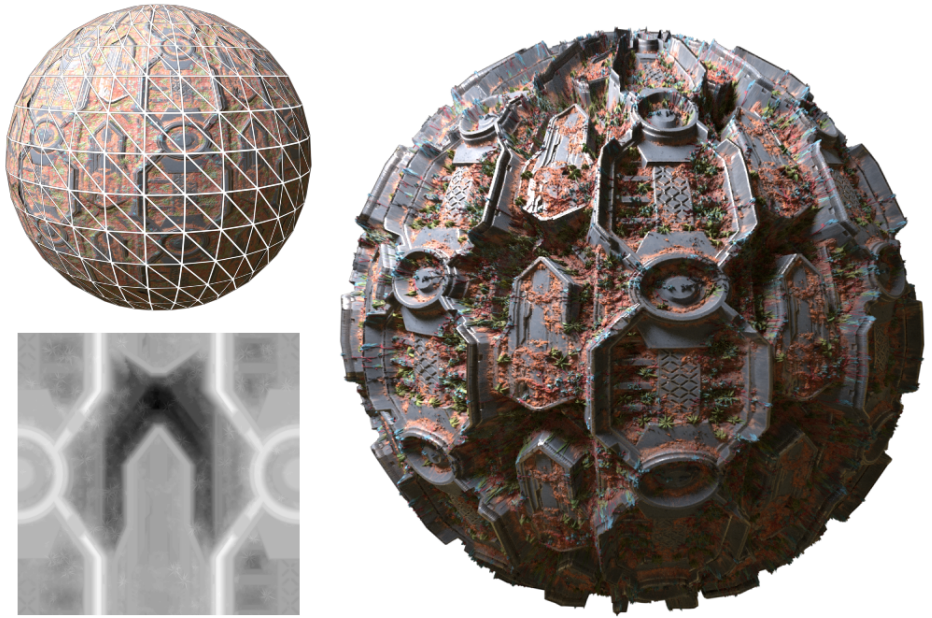


Fig. 9. Potential flow reconstruction from the velocity boundary condition.

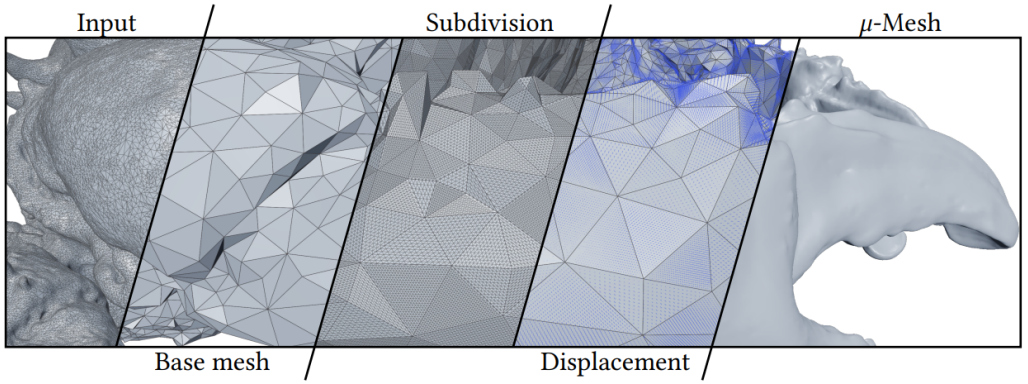
A Practical Walk-on-Boundary Method for Boundary Value Problems, SIGGRAPH 2023

9 Displacement Mapping for Ray Tracing

Displacement maps are straightforward to rasterize,
but nontrivial to ray trace

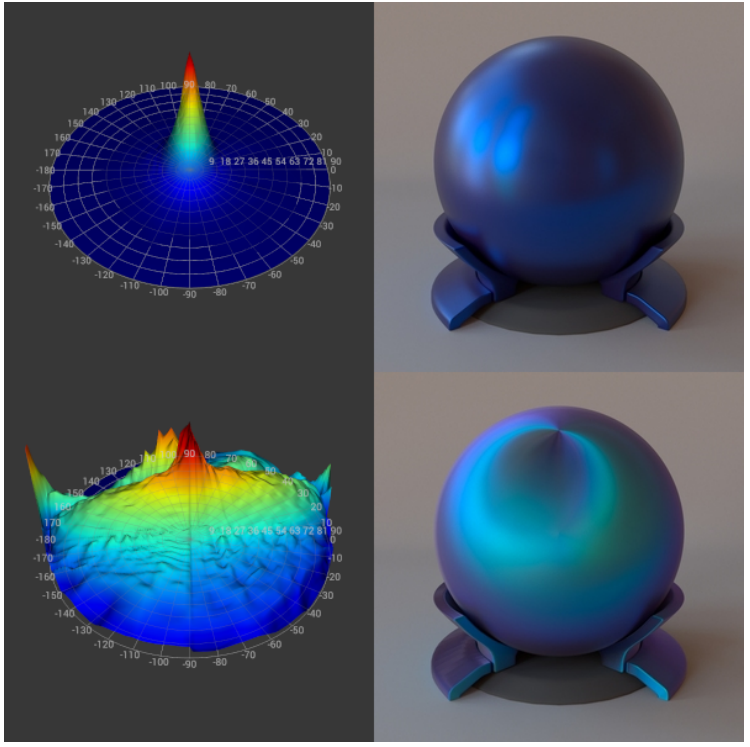


Thonat, Theo "Tessellation-Free Displacement Mapping for Ray Tracing"
ACM Transactions on Graphics (TOG). Vol. 40. No. 6. ACM, 2021.

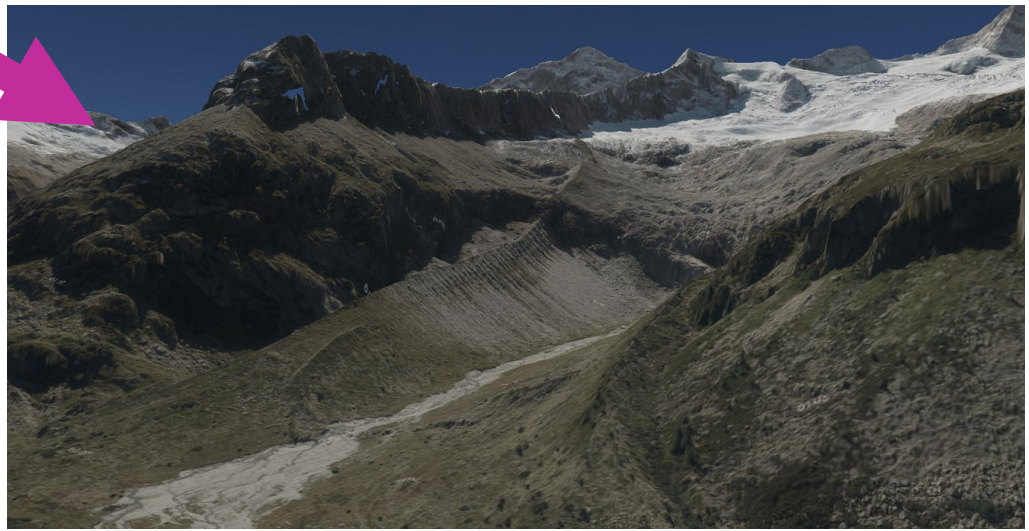


Maggiordomo, Andrea, et al. “Micro-Mesh Construction" *ACM Transactions on Graphics (TOG)*. Vol. 42. No. 4. ACM, 2023.

An overview over the latest techniques to render measured materials



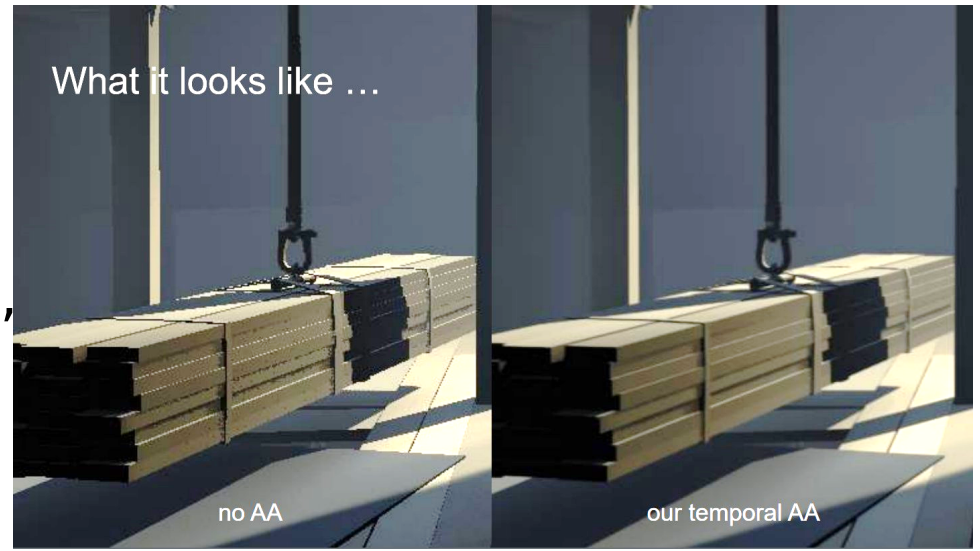
11 Outdoor photo registration and photogrammetry



(own work)

12 Temporal Anti-Aliasing and Upsampling Techniques

- Analyze the state of the art in Temporal Anti-Aliasing (TAA) techniques
- Different approaches, e.g. Adaptive Ray Tracing, etc.
- Also cover the related(!) field of upsampling techniques
- I.e. render in a lower resolution => upsample
- Techniques like, e.g., AMD's FidelityFX™ Super Resolution
- Learning-based Techniques like, e.g., NVIDIA DLSS
- Describe connections, interactions, and interdependencies between TAA and upsampling techniques
- Describe the latest techniques



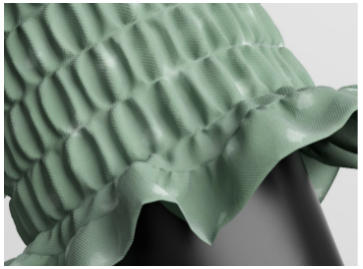
Lasse Jon Fuglsang Pedersen, PLAYDEAD, Temporal Reprojection Anti-Aliasing in INSIDE

Conduct a survey on point cloud compression techniques

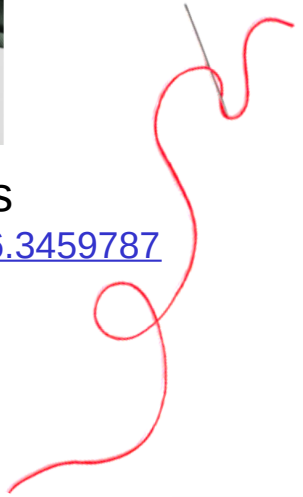
(a) Original (b) **c6** (D1 69.59dB, 0.194 bpp) (c) G-PCC Trisoup (D1 65.87dB, 0.188 bpp)

Quach et al. "Improved Deep Point Cloud Geometry Compression" *MMSP '20*. IEEE, 2020.

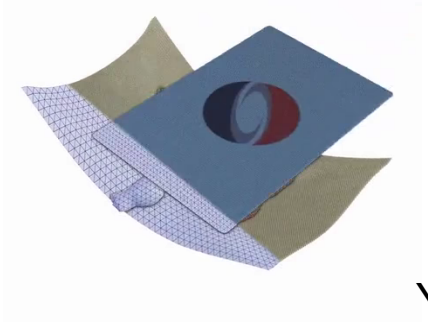
14 Cloth Simulation and Rendering

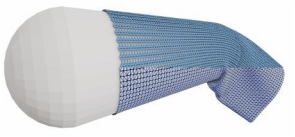
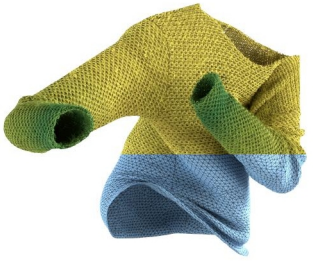



GPU-based simulation of wrinkles
https://dl.acm.org/doi/pdf/10.1145/3450626.3459787



Robust collisions
https://mmacklin.com/sdfcontact.pdf

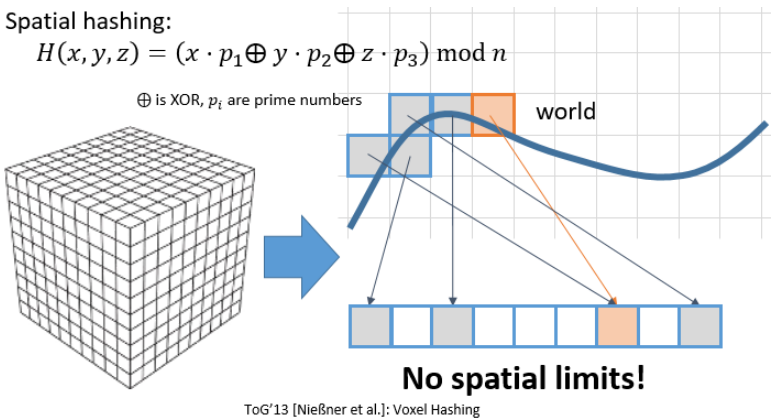


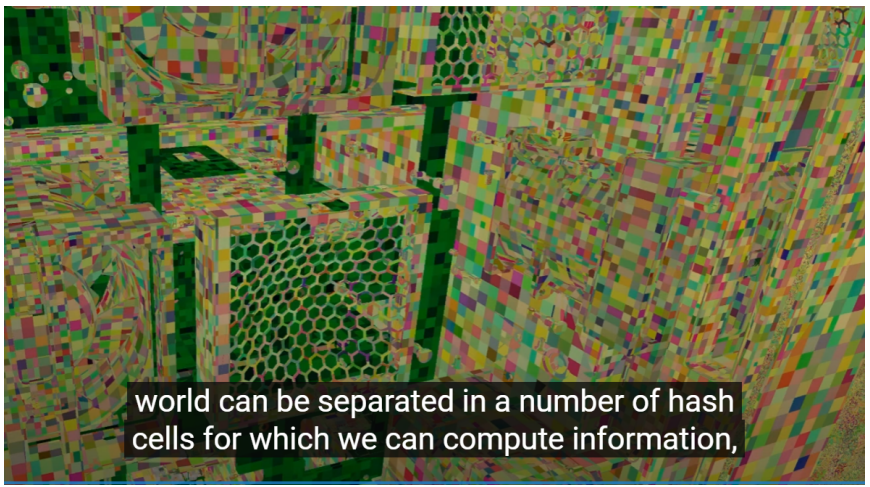




Yarn Deformations
https://visualcomputing.ist.ac.at/publications/2021/MADYPG/

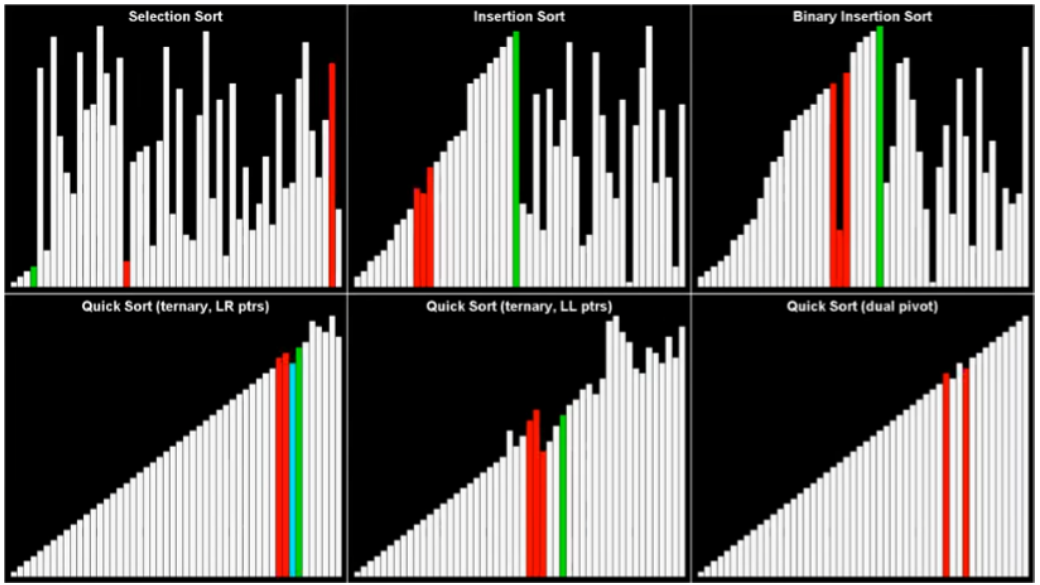
15 Spatial Hashing

- Space Partitioning with hash maps
- Huge (“infinite”?) “sparse grid” instead of quadtree, octree, ...
- Hash map entries for occupied space (cells)
- O(n) lookup of geometry around given world coordinate
- Investigate algorithms, use cases, etc.





- Overview over various sort algorithms
- Advantages, Limitations, Performance, ...



https://www.youtube.com/watch?v=BeoCbJPuvSE

Questions?

- Get in contact with your supervisor ASAP
- Discuss literature list with your supervisor
- Submit the list to TUWEL by 1.4.