Daniel Zint Dr.-Ing.

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RESEARCH FOCUS:

My research is centered in geometry processing, more precisely mesh generation for numerical and graphical applications. I am interested in all parts of the mesh generation pipeline: pre-processing and simplifying input data, generating triangle and quadrilateral meshes, post-processing with smoothing and topological optimization. During my PhD, I was working on the automatic generation of block-structured meshes that are used in ocean simulations based on the shallow water equations. Currently, I am focusing on meshing offset surfaces.

WORK HISTORY:

2023 - 2024 **Assistant Professor / Faculty Fellow**
New York University
- Research in geometry processing
- Teaching CS101 - Intro to Computer Science

2022 **Postdoctoral Researcher**
Inria Sophia Antipolis – Méditerranée
- Research on offset surfaces of discrete geometry

2017 – 2021 **Graduate Research Assistant (PhD Studies)**
Friedrich-Alexander-Universität Erlangen-Nürnberg
- Research on block-structured grid generation and surface reconstruction from point clouds
- Supervising theses of bachelor and master students
- Teaching assistant for lectures in computer graphics

2019 **Guest Lecturer**
Universidade Federal do Paraná in Curitiba, Brazil
- Teaching C++ in a compact course

2014 – 2015 **Student Trainee**
Siemens AG, Development Department of the automation software STEP 7
- Developing a demonstrator for the features of the C# API of STEP7
- Customer support for the C# API of STEP 7
- Developing an internal information visualization tool

EDUCATION:

2017 – 2021 **PhD in Computer Science**
Friedrich-Alexander-Universität Erlangen-Nürnberg
Supervised by Prof. Dr.-Ing. Harald Köstler and Prof. Dr.-Ing. Marc Stamminger
Thesis: Block-Structured Grid Generation for High Performance Ocean Simulations

2014 – 2017 **M.Sc. in Computational Engineering**
Friedrich-Alexander-Universität Erlangen-Nürnberg
Thesis: Mesh Partitioning for High Performance Simulation in Ocean Modeling
Specialization: Mechatronics, Numerical Simulations

2015 – 2016 **Erasmus semester**
Umeå University, Sweden

2011 – 2014 **B.Sc. in Mechatronics**
Friedrich-Alexander-Universität Erlangen-Nürnberg
Thesis: Aufbau eines Antennenmessplatzes mit automatischer Antennenausrichtung

RESEARCH EXPERIENCE:

2022 **Offset surfaces of discrete geometry**
Computing an offset to a given surface is a well-known problem from geometry processing. However, current methods are either very inaccurate or perform massive overrefinement. This project focusses on an adaptive approach that considers local and global intersections of the offset surface.

2020 – 2021 **3D reconstruction of female breasts from point clouds**
Models of female breasts are generated from scan data recorded with an iPhone. These models are used for volumetric measurement and further medical investigation. My task in this program was to write an automatic clean-up routine of the scan data and perform the volumetric measurement. This additionally requires an estimation of the thorax.

2016 – 2020 **DFG (German Science Foundation) Project: Fully generated adaptive higher-order methods for ocean modeling on block-structured grids**
The code generation framework ExaStencils, which performs high performance simulations on clusters and supercomputers, was extended to block-structured grids and applied to ocean simulations. My task in this project was to research the automatic generation of grids with quadrilateral block-structure based on an unstructured triangle grid. The block-structured grid consists of a prescribed number of blocks, while representing the domain correctly. Furthermore, I implemented the communication scheme for the blocks in ExaStencils.

TEACHING EXPERIENCE:

2023 - 2024 as professor: Intro to Computer Science
2017 – 2021 as instructor in practicals: Geometric Modeling, Geometry Processing, Applied Visualization, C++ Compact Course (at Universidade Federal do Paraná in Curitiba, Brazil)
2011 – 2017 as student teaching assistant: Statics and Mechanics of Materials, Dynamics of Solid Bodies, Machine-Oriented Programming in C, Mathematics Revision Course, Optimization for Engineers, Algorithmics of Continuous Systems

PEER REVIEWED PUBLICATIONS:

Zint, D., Maruani, N., Rouxel-Labbé M. & Alliez, P. (2023). Feature-Preserving Offset Mesh Generation from Topology-Adapted Octrees. *Computer Graphics Forum* (pp. 12).

Zint, D., & Grosso, R. (2022). **Resolving Non-Manifoldness on Meshes from Dual Marching Cubes**. *Eurographics 2022 - Short Papers*.

Zint, D. (2021). **Block-Structured Grid Generation for High-Performance Ocean Simulation**. *PhD Thesis*

Zint, D., Grosso, R., Aizinger, V., Faghih-Naini, S., Kuckuk, S. & Köstler, H. (2022). **Automatic Generation of Load-Balancing-Aware Block-Structured Grids for Complex Ocean Domains**. *Proceedings of the 2022 SIAM International Meshing Roundtable.*

Grosso, R., & Zint, D. (2021). **A Parallel Dual Marching Cubes Approach to Quad Only Surface Reconstruction**. *The Visual Computer, 1-16*.

Zint, D., & Grosso, R. (2021). **A Hybrid Approach to Fast Indirect Quadrilateral Mesh Generation**. *Numerical Geometry, Grid Generation and Scientific Computing* (pp. 281-294).

Zint, D., & Grosso, R. (2021). **On the Link Between Mesh Size Adaptation and Irregular Vertices**. *Proceedings of the 16th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications - Volume 1: GRAPP* (pp. 67-74).

Zint, D., Grosso, R., & Lunz, F. (2020). **Discrete Mesh Optimization on Surface and Volume Meshes**. *28th International Meshing Roundtable (IMR)*, Buffalo, New York, USA.

Grosso, R., & Zint, D. (2020). **Parallel Reconstruction of Quad Only Meshes from Volume Data**. *Proceedings of the 15th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications - Volume 1: GRAPP* (pp. 102-112).

Faghih-Naini, S., Kuckuk, S., Aizinger, V., Zint, D., Grosso, R., & Köstler, H. (2020). **Quadrature-free discontinuous Galerkin method with code generation features for shallow water equations on automatically generated block-structured meshes.** *Advances in Water Resources*, *138*, 103552.

Zint, D., Grosso, R., Aizinger, V., & Köstler, H. (2019). **Generation of Block Structured Grids on Complex Domains for High Performance Simulation**. *Computational Mathematics and Mathematical Physics 59.12* (pp. 2108-2123).

Zint, D., & Grosso, R. (2018). **Discrete mesh optimization on GPU**. *International Meshing Roundtable* (pp. 445-460).

A W A R D S :

2021 **Best Poster Award – The PASC21 Conference** for the poster: Code Generation for quadrature-free Discontinuous Galerkin Discretizations of the Shallow-water Equations

2021 **Best Paper Award - 16th International Conference on Computer Graphics Theory and Applications (GRAPP/VISIGRAPP)** for the paper: On the Link Between Mesh Size Adaptation and Irregular Vertices

2020 **Best Paper Award - 15th International Conference on Computer Graphics Theory and Applications (GRAPP/VISIGRAPP)** for the paper: Parallel Reconstruction of Quad Only Meshes from Volume Data

C O - S U P E R V I S E D B A C H E L O R A N D M A S T E R T H E S E S :

Master Theses:

- Untersuchung von topologischen Fehlern und effiziente Implementierung der Dual Marching Cubes Methode – Philipp Gürtler
- Boundary Simplification for Coarse Mesh Generation – Elgiz Bagcilar
- Discrete Surface and Volume Mesh Optimization – Damian Swientek

Bachelor Theses:

- Unstructured High Resolution Ocean Mesh Generation – Julian Stahl
- Isotropic Quadrilateral Simplification and Remeshing – Andreas Hoh
- Simplification of Complex Boundaries in Grid Generation – Prasanna Kandipan
- Alternative Approaches to Triangle Merging – Christopher Mohr
- Efficient Implementation of Discrete Mesh Optimization for Tetrahedral Meshes – Florian Lunz
- Blossom Quad im Vergleich zu anderen Quad-Meshing Algorithmen – Kevin Hollweg
- Analyse der cross-field basierten Quad Mesh Generierung – Philipp Gürtler

P R O G R A M M I N G E X P E R I E N C E :

C++, CUDA	expert
Java, Scala, Javascript, Python	advanced
C#, Matlab	intermediate

LANGUAGES:

German (native language), English (expert), French (beginner), Spanish (beginner), Swedish (beginner)

REFERENCES:

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