

Annual Report 2020

FUNDED BY

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The SFB-TRR 161 "Quantitative Methods for Visual Computing" is a Transregional Collaborative Research Center. Partner institutions are the University of Stuttgart, University of Konstanz, Ulm University, and LMU München.

In this interdisciplinary research center, around 40 scientists in the fields of visualization, computer vision, computer graphics, human-computer interaction, multimedia linguistics, and applied psychology are working together to establish quantification as a key ingredient of visual computing research. We see quantification as a cornerstone to further advance visual computing as an established and maturing research field.



Dear readers, dear members and friends of the SFB-TRR 161

his is the first annual report for the second funding period, which started July 2019. We are very happy that we succeeded in obtaining funding for the second period and completing the first phase. In this context, we had a number of changes in the composition of projects and our team of researchers. We can look back to very successful projects of the first period and thank all researchers for their great work and enthusiasm they put into the SFB-TRR 161. At the same time, we are looking forward to inspiring new research with the new and updated set of projects. The first months of the new funding period were characterized by integrating the new projects and setting up collaborations. Now we are looking forward to productive joint work for the next years.

Over the last year, SFB-TRR 161 researchers continued to achieve excellent scientific results. We published more than 30 papers, including articles at top venues such as ACM CHI, IEEE VIS, IEEE TVCG, Eurovis, PacificVis, ACM ETRA, Graph Drawing and Network Visualization, Multimedia Tools and Applications, AutoUI, and ICPE. For their scientific work, our researchers received numerous awards and prizes.

EDITORIAL

Professors and PhD students also arranged three scientific workshops dealing with the topics of quantification and visual computing.

The Sars-CoV-2 pandemic has been affecting the SFB, as it has most of our daily lives. Due to social distancing, a number of planned SFB meetings - including our annual status seminar - had to be moved to virtual meetings. Likewise, scientific conferences were canceled or went virtual. However, as a Transregio we are already experienced with remote collaboration and, therefore, have a good basis to continue working together even under the difficult circumstance of the pandemic.

The upcoming status seminar will provide an opportunity to discuss means of how we can further strengthen the cohesion within our large team.

Therefore, I'm looking forward to our upcoming seminar and the next vear of SFB research.

Take care and stay healthy!

Damid Whistoff

Prof. Dr. Daniel Weiskopf, Spokesperson of the SFB-TRR 161

PATHBREAKING DECISIONS—THE WORK OF THE NEW PROJECTS

With the start of the second funding period, the work of our new research projects and task forces began. Consequently, the aim and research mission of the SFB-TRR 161 was pursued and at the same time realigned in some areas. Efforts are being made in the research areas of bridging quantitative and qualitative methods, immersion and its quantification, in-the-wild experiments, and machine learning. The work packages of the new funding period seem to be well designed, as they show first fruitful, profitable and connectible results.

Related research questions call for adapting tools and research infrastructure. The two new task forces took up their work and further developed structures that provide members of the SFB-TRR 161 access to data, benchmarks, and applications, as well as new methods. With this, the task forces continue to provide a basis for exchange and collaboration between the individual project groups.

In this report, we focus on the new projects, which compensate for completed projects of the first funding period. Each new project gives a brief report on what has been achieved so far and a short outlook on the next steps.

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Visual Attention Modeling for Optimization of Information Visualization



To integrate automatic quantification of spatio-temporal visual attention directly into the visualization design process without the need for any eye tracking equipment, the project takes inspiration from computational models of visual attention (saliency models) that mimic basic perceptual processing to reproduce attentive behaviour.

We have recently started to investigate visual attention modelling for optimisation of user interface notifications and are currently preparing an online user study. In the near future, with the new PhD student, we will then turn to information visualisations and, as a first step, conduct a large-scale crowd-sourcing data collection to develop and train deep saliency models.

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Sample attention map Graph-based visual saliency (GBVS).

Learning-Based Research Methodology for Visualization

We have conducted a series of Mechanical Turk user studies to support the research goals of Work Package 1, namely fine-grained models for class separability. In the main study, collected perceptual information of class separability in color coded scatterplots from overall 320 participants. Using this data we proceeded into building both regression and ordinal classification models in pursue of a true quantitative model of the human perception of class separation. The current results also suggest that a binary classification model for perception might be in fact well-placed for further modeling, but this is still work in progress.

We are currently in the process of aggregating and publishing our results. Throughout these studies, we have also hypothesized on different designs and perceptual information extraction in crowdsourcing, as well as user segmentation. The experience from designing and running these experiments also helped us to collect methodological best practices for running such types of studies online, insights that are particularly useful under the current pandemic situation that largely impedes classical lab studies. We might also publish these insights at some point.



Superimposed heatmap with geo-map layer

As the next step, we plan to use the developed models to support the goals of Work Package 2. We will use the models to automatically set scatterplot design parameters such as aspect ratio, point opacity, point size, point shape, and plot ordering. We also consider creating a multi-view perceptual sampling model to overcome the overdraw problem in scatterplots.

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Adaptive Algorithms for Graph Views and View Transitions



B06





From a schematized (top to a georgraphically accurate public transit network map (bottom)

B07 Computational Uncertainty Quantification

To account for insufficient or faulty measurements in subsurface flow models co-efficients of the modeling equation are assumed to be stochastic. Additionally, fractures in the medium call for discontinuities in the coefficients. The stochasticity has to account for the structure of the subsurface being far from homogeneous, resulting in a wide variety of sample solutions. To calculate quantities of interest of the solution, e.g. moments, sample averages are used.

ALENEX '20.

In this project, so far, we have developed a version of a continuous-/ multilevel Monte Carlo Finite Element method. The fundamental advantage of a multilevel approach is a drastic reduction in computational time compared to standard methods, achieved by a special sampling strategy on a hierarchy of different discretization grids. The novel algorithm sorts samples according to the structure of the stochastic discontinuities that dictates the numerical resolution, leading to a samplewise discretization on stochastic Finite Element spaces. The decision can be made adaptively by the algorithm or by an informed user based on a visualization of the discretizing grid.

We are hoping to achieve an optimal method for a large class of random structures.

In a next step, we will proof optimality of the algorithm and perform a thorough numerical analysis. As all Monte Carlo algorithms this approach is not limited subsurface flow models but may be used in various applications where partial differential equations with stochastic discontinuities occur.

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RESEARCH

- In the first year, we focused on parametrized simplification and schematization approaches for embedded graphs, in particular transportation networks.
- We developed a novel graph-driven approach to create octilinear metro maps which takes a variety of visualization aspects into account and allows smooth trade-offs between all of them.
- Furthermore, we introduced the novel problem of polyline bundle simplification (parametrized by an error tolerance threshold), which takes visual consistency of the simplification into account.
- We proved hardness for this problem and developed approximation algorithms. In ongoing research we test the practical applicability of our theoretical results. In another line of research, we transferred the idea of stipple drawings to trajectory simplification with very promising results.
- The current goal is to make this approach also feasible for graphs of arbitrary structure without losing theoretical guarantees on the sampling density.
- Finally, we started to also consider unembedded input graphs and developed the first practical optimal algorithm for grid embeddding, which is an important building block for various visulizations.
- Based thereupon, we hope to extent theoretical and practical results on grid morphing to more general graph families.
- The respective results were published at EuroVis '20, SWAT '20, W2GIS '20 and

sto





Samples of discontinuous stochastic coefficients and their sample-adapted discretization

Quantifying Interactions with Adaptable Multisensory Systems

In the first months of the second funding period, the Second, we started implementing studies for research of project C05 proceeded in three different directions:

First, we ran experiments to understand the determinants of mutual adaptation between a user and a user-adaptive system, which is the core focus of WP1. Our results show that, even in simple scenarios, interaction with an adaptive system can result in complex behavior. While there are aspects that will need further investigation, a first article to be submitted to a scientific peer-review journal is currently under preparation.

investigating the role of different sensory modalities in mutual adaptation, in particular including the haptic modality (WP2). In the initial phase, it emerged that we can benefit from looking at interactions with other human agents, therefore, we plan to include this aspect in the future research.

Lastly, we have been in touch with several groups within the SFB to set up collaborations for the upcoming months.



and an adaptive multisensory system (right).

User-Adaptive Mixed Reality

We investigated relevant display parameters for One of the papers [Draxler et al. 2020], which deals with blending AR/VR elements and how they influence the use of blended AR to support language learning, measurable physiological activity. In particular, we has been awarded an Honorable Mention at CHI 2020. have focused on two application domains, namely Another paper [Benz, Riedl and Chuang 2019] adwearable computing and in-vehicle environments.

Also, we have implemented several AR/VR scenarios for our application domains and technical implementations involve synchronizing physiological measurements with AR/ VR manipulations.



Example of a MR workspace enabling gradual blending between the physical and virtual environment.

For WP1, we have developed non-visual modalities efit from online assessments of task engagement and (e.g., tactile displays) to redirect user attention.

For WP2, we have investigated how the rate of information can influence in information processing as measured with EEG.

We are currently setting up AR/VR scenarios with EMG sensing to support fluid social interactions, which will contribute to WP4.

We have published three papers and supervised three theses [see list of publications, pp. 24-25].

dresses how different display presentation modes can

induce physiological discomfort and another addresses how presentation rate can result in information processing load as measured with EEG [Kosch et al. 2020]. We have identified a

few viable scenarios and application domains that would ben-

distraction vulnerability. Next steps will go into developing some of these

further to develop online metrics for manipulating AR and VR blends.

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Datasets, Benchmarks, and Replication Force A

Task

The aim of the TF-A is to collect and re(de)fine procedures and standards for experiments and studies, such that datasets or generation methods are persistently maintained and characterized, benchmarks are established, and replication can be and is performed. The technical foundation for this will mainly be provided by the INF project with its work package 1 on Research Data Management. Therefore, the activities in the TF-A during the first year were focusing on the technical and legal boundary conditions to initiate the transition from local storage resources to centrally managed data repositories.

First experiments were performed in DaRUS, the data repository of the University of Stuttgart which is based on a Dataverse installation.

Quite some effort went into developing a data management plan, which is the prerequisite for a compliant data collection.

Next, the data management plan will be rolled out requesting detailed information from all projects about their data. Analysis of the answers will allow a more systematic investigation of usage patterns and best practices within the SFB-TRR 161 eventually leading to standards, guidelines and benchmarks.

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RESEARCH

Task Force B

User Testing

In Task Force B we have started a survey on the needs for behavioural methods and the testing of human participants.

As task force leaders, Priscilla Balestrucci and Marc Ernst, went to visit the collaborating groups at the University of Konstanz where we organized an bilateral afternoon workshop assessing requirements for human testing and the ethical concerns involved.

Our work was interrupted by the lockdown due to the Covid-19 pandemic.

To this end, as testing humans in the laboratory was not possible during the pandemic, we started a survey on how to address human experiments with online studies instead and we plan to write an article for helping all groups and the wider community with remote and virtual experimentation when testing human participants.

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SARS-COV-2 PANDEMIC

The Sars-CoV-2 pandemic affects not only everyday and social life, but also the research done within the SFB-TRR 161.

Around the world scientists collaborate, share their results, and communicate in new ways. We observe a new dynamic in many research infrastructures, which could in some sectors lead to lasting changes. Our researchers started interdisciplinary projects and cooperations to help with their expertise. In teams they try to find answers to pressing questions related to the coronavirus pandemic. This is a list of these projects and activities, our researchers are participating in.

CORONAVIS

ONLINE TOOL SHOWING INTENSIVE CARE BED CAPACITIES OF HOSPITALS AND REGIONAL INFECTION RATES

Screenshot from the online tool CoronaVis showing intensive care bed capacities in Germany

CoronaVis is an interactive online tool for visualizing up-todate hospital capacities and the number of new infections within Germany. Oliver Deussen, Daniel Keim, Jochen Görtler, and Matthias Kraus are part of a team of 15 participants from the chairs of Data Analysis and Visualization (AG Daniel Keim) and Visual Computing (AG Oliver Deussen) in Constance, who developed the platform in consultation with chief physician Hans-Joachim Kabitz from Constance hospital.

The online application allows doctors to obtain an overview of the intensive care bed situation of German hospitals. Data displayed is gathered from the DIVI Intensive Care Register, the Robert Koch Institute (RKI), and the German Hospital Federation (DKG). Currently the bed-status (occupied, limited, and available) for 975 hospitals in three categories: Intensive Care Unit (ICU) low care, ICU high care, and Extracorporeal Membrane Oxygenation (ECMO), is displayed.

An additional feature displays the number of new infections within the last seven days per 100.000 inhabitants for a region. Like this it can be seen easily, which region reached the limit of 50 new infections per week, which was set by the German government.

CoronaVis was mentioned in several articles (online and print), broadcasts, and social media. Among them some well known publications like Spiegel Online, Südkurier, Augsburger Allgemeine, and SWR 4.

Resource: https://coronavis.dbvis.de/

Participating researchers:

Oliver Deussen (A01, A04) Daniel Keim (A03) Jochen Görtler (A01) Matthias Kraus (A03)

NEW IT INFRASTRUCTURE FOR THE CONSTANCE HOSPITAL



Oliver Deussen and Jochen Görtler have built up the IT infrastructure for the Constance hospital.

This includes

- overview

- nurses and doctors

Participating researchers: Oliver Deussen (A01, A04) Jochen Görtler (A01)

»Seeing more and more Covid-19 patients coming is a clear reminder of the importance of our work done here. It is stressful, but also very exciting, because otherwise one would hardly have the chance to work in a clinic in a state of emergency, so to speak, directly at the front line. « — Oliver Deussen

OF COVID-19

The aim is to establish a knowledge repository on mechanisms of COVID-19 as a broad community-driven effort.

The knowledge repository contains relevant databases, literature and datasets, as well as a collection of other relevant content repositories and resources.

The COVID-19 Disease Map is an assembly of molecular interaction diagrams, established based on literature evidence. The focus is on host-pathogen interactions, specific to the SARS-CoV-2 virus.

The knowledge repository will support the research community and improve the understanding of the disease toward the development of efficient treatment.

Resource: https://covid.pages.uni.lu/map_curation

Participating researchers: Falk Schreiber (D04, INF)

RESEARCH

app for medical SWAT team deployment planning and occupancy

- video server for medical training material

Microsoft Teams provisioning

- introduction of the internal messenger Beekeeper

configuration of tablets for communication between Covid-19 patients,

COVID-19 DISEASE MAP

CREATED FROM KNOWLEDGE REPOSITORY ON MECHANISMS

SFB-TRR 161 SCIENTISTS AT INTERNATIONAL CONFERENCES & WORKSHOPS

The SFB-TRR 161's scientists are well connected to the scientific community. They present their research results and exchange ideas and knowledge with visual computing experts at many events around the world. In this way the exchange of thoughts is both, representative for the SFB-TRR 161's work and inspiring for our researchers.



SIGGRAPH Asia 2019 — Brisbane, Australia Conference and Exhibition on Computer Graphics and Interactive Techniques in Asia



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RESEARCH

Automotive UI 2019 - Utrecht, Netherlands Conference on Automotive User Interfaces

and Interactive Vehicular Applications

11 — IEEE VIS 2019 — Vancouver, Canada IEEE VIS 2019 consisted of IEEE Visual Analytics Science and Technology (VAST), IEEE Information Visualization (InfoVis), and IEEE Scientific Visualization (SciVis).

EUROVIS²⁰¹⁹ Eurovis 2019 – Porto, Portugal



21^{III} EGNIGTC CONFERENCE ON VISUALIZATION PORTO | PORTUGAL | 3-7 JUNE

EGEV 2020 - virtual **Eurographics & Eurovis**

VINCI 2019 — Shanghai, China

International Symposium on Visual Information **Communication and Interaction**

SWAT 2020 — Tórshavn, Faroe Islands

Scandinavian Symposium and Workshops on Algorithm

EUROCG 2020 - virtual

36th European Workshop on Computational Geometry (followed by a PhD School)

First International Workshop on New Interfaces for Programming (organized for <Programming> 2020 conference. Conference and presentations canceled; papers will be published).

WORKSHOPS



DANIEL WEISKOPF BOARD OF DIRECTORS MEMBER EXC 2120 INTCDC

Daniel Weiskopf is Board of Directors member of the Cluster of Excellence 2120 INTCDC "Integrative Computational Design and Construction for Architecture."

"The Cluster aims to lay the methodological foundations for a profound rethinking of the design and building process and related building systems by adopting an integrative computational approach based on interdisciplinary research encompassing architecture, structural engineering, building physics, engineering geodesy, manufacturing and system engineering, computer science and robotics, social sciences and humanities. ...[It] aim[s] to bundle the internationally recognised competencies in these fields of the University of Stuttgart and the Max Planck Institute for Intelligent Systems [...]."

[from INTCDC website: www.intcdc.uni-stuttgart.de]

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OLIVER DEUSSEN CO-SPEAKER EXC 2117

Oliver Deussen is co-speaker of the Cluster of Excellence 2117 "Centre for the Advanced Study of Collective Behaviour." The cluster is dedicated to data-based research on collective behaviour, from swarm intelligence of animal groups and human decision-making processes to economic networks. The cluster is a collaboration between the University of Konstanz and the co-located Max Planck Institute of Animal Behavior.

The research cluster utilizes state-of-the-art sensor systems such as the spacebased ICARUS module for tracking animal movements and will be located in the cutting-edge "Centre for Visual Computing of Collectives" (VCC) that is currently being built in Constance. The cluster draws on expertise from the fields of biology, psychology, physics, economics as well as computer science.

CW

OLIVER DEUSSEN DOING SABBATICAL

Oliver Deussen is doing his sabbatical between March and September 2020. Visits to numerous universities in France and the UK were planned to collaborate on joint projects in the area of expressive and non-photorealistic rendering, real-time stylization of 3D scenes, and robots and arts, including artistic methods and robotic painting.

The sabbatical was interrupted by measurements and restrictions related to the coronavirus pandemic. While doing his sabbatical, Oliver Deussen helped building up a new infrastructure for the Constance hospital, which was needed due to the pandemic and the expected rise of Covid-19 patients in April 2020.

cw/lk



HANNAH BOOTH GUEST RESEARCHER

Hannah Booth (University of Manchester) was visiting researcher with Miriam Butt and Christin Beck (formerly Schätzle). She examined how techniques from visual analytics could be used in corpus-based investigations of language change as well as in the annotation of uncertainty in linguistic data. Following her research stay, she took up a teaching and research position in the group of Miriam Butt.

CW



THOMAS ERTL DIRECTOR AND SPOKESPERSON OF CLUSTER OF EXCELLENCE SIMTECH

The Stuttgart Cluster of Excellence SimTech consists of two EXC's. With the kick-off of the new SimTech EXC 2075 "Data-integrated Simulation Science" in July 2019, Thomas Ertl became a principal investigator of EXC 2075 and director and spokesperson of the Cluster of Excellence SimTech.

As there is an increasing amount of available data which needs to be processed, simulations gain more and more importance. Information through simulation should increasingly contribute to decisionmaking. This ongoing change calls for new simulation methods (e.g. modeling and computation), which make simulations become more precise and reliable.

KIN CHUNG KWAN FIRST EXTERNAL RESEARCH SCHOLAR

Kin Chung Kwan, based in Hong Kong, is the first external research scholar of the SFB-TRR 161. He worked in the field of HCl and nonphotorealistic rendering. He researched the feasibility of using smartphones with augmented reality to help users create virtual digital arts in the real world, such as 3D sketching and character animation. In April 2020, he started in project A04, led by Oliver Deussen.

PERSONNEL CHANGES

Since September 2019

NEW ARRIVALS

- Cedric Beschle (Stuttgart, B07)
- Francesco Chiossi (Munich, C06)
- Jesse Grootjen (Munich, C06)
- Sabrina Jaeger (Constance, DC)
- Leon Kokkoliadis (Stuttgart, Ö)
- Matthias Kraus (Constance, A03)
- Kin Chung Kwan (Constance/Hong Kong, A04)
- Lukas Mehl (Stuttgart, B04)
- Peter Schäfer (Constance, B06)

PEOPLE

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ALUMNI

- Erika Bäcker (Stuttgart, Manager)
- Daniel Klinkhammer (Constance, C01)
- Huy Viet Le (Stuttgart, C04)
- Daniel Maurer (Stuttgart, B04)
- Jens Müller (Constance, C01)
- Ulrike Pfeil (Constance, C01)
- **Romina** Poguntke (Stuttgart, C02)
- Marc Spicker (Constance, A04)
- Patrick Tutzauer (Stuttgart (D01)
- Alexander Wender (Stuttgart, A06)

AWARDS

VALENTIN BRUDER RECEIVED BEST SHORT PAPER AWARD



June 2019

Valentin Bruder received the Best Short Paper Award 2019 for his publication "Voronoi-Based Foveated Volume Rendering" at the EuroVis 2019 in Porto. His approach substantially improves rendering performance with barely

perceptible changes in visual quality by utilizing the difference between foveal and peripheral view.

Project B04

Stuttoart

D04 RESEARCHERS RECEIVED BEST SHORT PAPER AWARD



June 2019

Michael Aichem, Karsten Klein, and Falk Schreiber received the Best Short Paper Award for their coauthored publication "TEAMwISE: Synchronised Immersive Environments for Exploration and Analysis of Movement Data" at the VINCI 2019 in Shanghai. The paper

presents their framework for collaborative analysis of geospatial-temporal movement data with a use-case in collective behavior analysis. It supports the concurrent usage of several program instances, allowing to have different perspectives on the same data in collocated or remote setups. It was developed in collaboration with the Max Planck Institute of Animal Behavior.

Project D04

Constance

THOMAS ERTL AND DANIEL KEIM ELECTED AS MEMBERS OF VIS ACADEMY



October 2019

At the IEEE VIS conference in Vancouver, Thomas Ertl and Daniel Keim were inducted to the newly founded IEEE Visualization Academy (Vis Academy).

Induction into the Vis

Academy is a high and prestigious honor in the field of visualization. The Vis Academy describes itself as the 'visualization technology hall of fame' or the 'visualization fellows assembly.' The inductees are the top research leaders in the field of visualization.

THOMAS ERTL RECEIVED VISUALIZATION CAREER AWARD

Visualization Career Award

the

seminal research in volume



Photo: Bon Adriel Aseniero.

rendering, flow visualization, parallel and hardware accelerated graphics, large datasets, interactive steering, and visual analytics; and for leadership in developing and sustaining the visualization research community.

After having received the Technical Achievement Awards of Eurographics and IEEE VGTC in 2006 and the Distinguished Career Award of Eurographics Association in 2016, Thomas Ertl is now the only visualization researcher who has been acknowledged for his research contributions and academic career from European and international organizations.

Project A02

Stuttgart

opening

SFB-TRR 161 RESEARCHERS WON SCIVIS CONTEST

October 2019



Christoph Schulz, Steffen Frey, Daniel Weiskopf, and Thomas Ertl were part of a team of researchers from the Visualization Research Center (VISUS) that won the SciVis Contest at IEEE VIS 2019. The team was awarded for their

work "Visual Analysis of Structure

MegaMol visualization of structure formation in cosmic evolution. Image: VISUS.

Formation in Cosmic Evolution" with which they analyzed the generation of structure in the

cosmic evolution of the universe over the last 5 million years. In their work, they used the MegaMol visualization platform. MegaMols' main feature is the interactive visualization of large, time-dependent particle data sets as well as the flexible composition of complex visualization approaches from reusable modules.

Projects A01, A02, B01

Stuttgart

AWARD



During the IEEE VIS opening session, Kuno Kurzhals received the Honorable Mention Award of the IEEE VGTC VPG (Visualization Pioneers Group) for his dissertation "Visual and video data."

October 2019

Kurzhals is a former scientist of project B01 at the University of Stuttgart. His dissertation deals with the visual analysis of video data and gaze data. The combination of his results with other methods has promoted the detailed study of how visualization techniques are perceived by users.

Project B01

Stuttgart

THOMAS ERTL AND STEFFEN FREY RECEIVED HONORABLE MENTION AWARD

November 2019



Thomas Ertl and Steffen Frey were among the authors who received the Honorable Mention Award for their publication "The Impact of Work Distribution on In Situ Visualization: A Case Study" at the International Conference for High Performance Computing, Networking, Storage and Analysis (SC 19) in Denver.

Project A02

Stuttgart

ANDRÉS BRUHN RECEIVED PUBLICATION PRIZE

January 2020



Andrés Bruhn received the Publikationspreis der Universität Stuttgart at the Research Day 2020. The SFB-TRR 161 publication

"Combining Shape from Shading and Stereo: A Joint Variational Method for Estimating Depth, Illumination

and Albedo" (together with Daniel Maurer-SFB-TRR 161 alumni – Yong Chul Ju and Michael Breuß), was awarded as outstanding research achievement at the University of Stuttgart.

Project B04

Stuttgart

Projects A02, A03

Constance, Stuttgart



AWARDS

KUNO KURZHALS RECEIVED BEST DISSERTATION FIVE SFB-TRR 161 PROJECT LEADERS RECEIVED AMINER MOST INFLUENTIAL SCHOLAR AWARD 2020 March 2020



Most Influential Scholar Award

Project leaders Thomas Ertl, Daniel Keim, Michael SedImair, Albrecht Schmidt, and Daniel Weiskopf have received the AMiner AI 2000 Most Influential Scholar Award 2020.

Annually, the world's top-cited and therefore most influential scholars within their subfield of artificial intelligence research over the past ten years are awarded by AMiner, an academic search system, which indexes expert profiles and publications.

The top 10 scholars are named as Al 2000 Most Influential Scholars and the top 11-100 are awarded as Al 2000 Most Influential Scholars Honorable Mention.

Our project leaders received awards in following subfield categories:

Visualization:

Al 2000 Most Influential Scholar (Top 10): Daniel Keim Al 2000 Most Influential Scholars Honorable Mention Award (Top 30): Daniel Weiskopf, Michael Sedlmair, and Thomas Ertl

HCI:

Al 2000 Most Influential Scholars Honorable Mention Award (Top 100): Albrecht Schmidt

Projects A01, A02, A03, A08, B01, C06 Stuttgart, Constance, Munich

BEST PAPER AND HONORABLE MENTION AWARDS AT CHI 2020

May 2020

Two SFB-TRR 161 contributions to the virtual CHI 2020 conference received awards.

A Best Paper Award was given to SFB-TRR 161 members Michael SedImair, Kuno Kurzhals (alumni) for "A View on the Viewer: Gaze-Adaptive Captions for Videos."

Albrecht Schmidt and Lewis L. Chuang received an Honorable Mention Award for their publication "Augmented Reality to Enable Users in Learning Case Grammar from Their Real-World Interactions ."

Projects A08, C06

15 —

Stuttgart, Munich

NEW LECTURE SERIES STARTED IN NOVEMBER

In winter term 2019/20, we continued our Lecture Series with six renowned international speakers. The SFB-TRR 161 invited colleagues from the field of Quantification in Visual Computing to give a talk related to the research done within the SFB-TRR 161. In addition, meetings in various constellations were organized in order to exchange knowledge and enable research insights.

The new Lecture Series started in November, 2019.



INVITED SPEAKERS

We invite researchers well-known to the visual computing community. The guests give talks on topics related to the scientific work carried out within the SFB-TRR 161. Talks are followed by a discussion with all SFB-TRR 161 members. Sometimes guests stay several days with one of our researchers, who organizes additional informal meetings, presentations, and demos in order to exchange knowledge. Since September we had lively and fruitful discussions with:





Compression



Systems



Michael Krone (University of Tübingen) Molecular Visualization meets Immersive Analytics



17 —

Sebastian Bosse (Fraunhofer Heinrich Hertz Institute, Berlin) Psychophysiological Assessment of Perceived Quality: Towards an **Objective Measurement of Subjective Quality of Experience**

Raouf Hamzaoui (DeMontfort University) Model-Based Optimized Bit Allocation for Video-Based 3D Point Cloud

Jeffrey Heer (University of Washington) Agency + Automation: Designing Artificial Intelligence into Interactive

YOUNG ACADEMICS

NEW DOCTORAL SPEAKERS



Left: Michael Aichem (Photo: Bela Gipp); Right: Florian Friess.

In July 2019, Michael Aichem (D04) and Florian Friess (INF) were elected the two new doctoral speakers. The speakers are not only responsible for representing the PhD students of the SFB-TRR 161, but strenghthen their community and improve their skills by organizing events, like doctoral retreats and workshops.

RESEARCH STAYS ABROAD

PhD students are strongly encouraged by the SFB-TRR 161 to do research stays abroad. The SFB-TRR 161 offers the doctoral candidates administrative assistance and grants financial support, necessary to pay for travel, accommodation, and fees. With such a research stay the doctoral candidates are able to broaden their horizons. They are given the chance to work with other renowned researchers in the field of visual computing and to gain experience in intercultural communication.

4 NEW DOCTORAL CANDIDATES

Four doctoral candidates, accepted in Constance and Stuttgart, started working in the SFB-TRR 161.

Cedric Beschle, B07 Francesco Chiossi, C06 Lukas Mehl, B04 Peter Schäfer, B06

DISPUTATIO

Congratulations to Daniel Maurer (B04), who successfully defended his dissertation "Adaptive Algorithms for 3D Reconstruction and Motion Estimation."

SHORT-TERM FELLOWSHIPS

The SFB-TRR 161 does not only offer collaboration opportunities to renowned scientists, but also to talented PhD students from other institutions. With shortterm fellowships, students can stay as guests within a project of one of the SFB-TRR 161 partners. The fellowship offers international early career researchers the chance to conduct limited-term research, thus enriching the internationalization of the Transregio. After completing the fellowship, they may apply for a full-length doctoral employment.

Short-term fellowships, completed since September 2019:

Xingija Pan (PhD student) Chinese Academy of Science, Institute of Automation Project A04, Constance

Xin Zhao (PhD student) Cardiff University, School of Computer Science and Informatics Project A05, Constance



VDL at the University of Utah. Photo: Jochen Görtler

CLAYTON (MELBOURNE), AUSTRALIA

From January to March 2020, Sabrina Jaeger (D04) visited the Immersive Analytics Lab (IA Lab) of Prof. Tim Dwyer and Prof. Kim Marriott at the Monash University in Clayton. She continued her research on perception of networks in virtual reality starting further studies on perception of networks in stereoscopic environments. Based on an earlier publication, she built a prototype to re-investigate the findings with new devices (head mounted displays). The gained experience can be useful to further develop SFB-TRR 161 applications, e.g. the functional brain activity data analysis. User studies are planned.

Her stay was funded by the MEiN-Program of the University of Konstanz and the equal opportunities funding of the Transregio.



ETH Zurich main building. Source: Wikimedia Commons **ZURICH, SWITZERLAND** In early 2020, Christoph Schulz (A01) visited the Social Networks Lab at the ETH Zurich. Together with Ulrik Brandes he worked on the visualization of network ensembles.

The researched topic represents a continuation of the joint research work between SFB-TRR 161 projects A01 and B02 from 2017. In 2017, members of these projects published a joint paper on probabilistic graph layout for uncertain network visualization (doi: 10.1109/TVCG.2016.2598919). The latest results publication is pending.

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YOUNG ACADEMICS

UTAH, USA

From June to September 2019, Jochen Görtler (A01) from Constance visited the Visualization Design Lab (VDL) at the University of Utah. The VDL is embedded in the University's Scientific Computing and Imaging Institute (SCI). During his stay he collaborated with numerous SCI researchers, among them leaders Prof. Miriah Meyer and Prof. Alexander Lex. As a direct result a paper with coauthors from both research groups on capturing and modelling user intent was submitted to EuroVis 2020. In addition they deployed a prototype—which consists of a client-server architecture with an interactive visualization system on the frontend and a prediction system in the backend-to Amazon AWS.



Melbourne Skyline. Photo: Sabrina Jaeger.

OUTREACH

FEATURE STORY FORMAT LAUNCHED

In June 2020, the first issue of INSIGHT was published.

INSIGHT is planned as a bimonthly feature story format and aims to give a brief, concise impression of a researcher and his research to a general interested public. It highlights a particularly interesting aspect of the research done within the SFB-TRR 161. This aspect is contextualized with regard to the larger research program.



Print layout of the new feature story format INSIGHT.

INSIGHT is adressed to colleagues, a generally interested readership and journalists. It is published in the Visual Computing Blog (www.visualcomputing.org) and promoted on the homepage of the SFB-TRR 161. Additionally, it is advertised via social media (Twitter) and a digital version in PDF format is made available.

INSIGHT will hopefully contribute to the reputation of the SFB-TRR 161 by making people curious about its research in an interesting and entertaining way, increasing public visibility, and thus, leading to retention and activation.

lk

For more information visit: www.visual-computing.org/insight

VISUAL COMPUTING BLOG

If you make a trip, then you'll experience something this classical quote is true for a researcher's life as well. Since the beginning of the second funding period we published ten blog posts. Most of them are reports from researchers either coming from foreign universities to visit SFB-TRR 161 groups, or from the Transregio doing research stavs abroad. They tell us about their work and their experiences at a different university.

Among them are external researchers

Xingija Pan (Chinese Academy of Science), Hannah Booth (Ghent University), Boris Sotomayor-Gomez (Universidad Austral de Chile), and Xin Zhao (Cardiff University).



Hannah Boot visiting Miriam Butt's project D02

Two internal PhD students from Constance-Sabrina Jaeger and Jochen Görtler—visited foreign universities and shared their experiences with us.



Sabrina Jaeger in Australia. Photo: Sabrina Jaeger.

In addition, graduate Christin Beck reported about her PhD thesis "Dative Subjects: Historical Change Visualized," our BOGY candidates Malte Eggers, Simon Kloos, Nathanael Schweizer and Barbara Zimmermann wrote down their impressions of their week at VISUS in Stuttgart, and Katrin Angerbauer and Cristina Morariu told us about Jeffrey Heer's Visit from a PhD student's perspective.

With the launch of the new feature story format INSIGHT, the first blog post of this series was published in June 2020.

Many thanks to all authors and their contributions! We are sure there are a lot more blog posts to come that will be all worth reading.

CW

PUBLIC EVENTS

The SFB-TRR 161 organized several public events. These events offer the possibility to learn about visual computing and computer science in general. They additionally enable us to communicate the research conducted in the SFB-TRR 161. Unfortunately, in 2020 some scheduled events had to be cancelled due to the measurements related to the coronavirus pandemic.



Learining about algorithms with LEGO bricks.

Seminarcourse "Algorithms"

The Informatiktag is offered every year at the University "Phase 1: Think of an algorithm that uses the least possible number of LEGO[®] bricks to build a wall with the of Stuttgart and is aimed at pupils interested in length of n." Michael Aichem used these kind of brain computer science and software technology. In lectures teasers to introduce the art and complexity of dynamic and workshops at participating institutes pupils get to programming to a group of 13 school children from the know current research topics of computer science and Gymnasium Überlingen who visited the University of can inform themselves about the corresponding study Konstanz in December 2019. After another three more courses offered at the University of Stuttgart. complex tasks, the group had learned why one method The SFB-TRR 161 organized a tour through the may lead to an exponentially increasing runtime visualization laboratory at the Visualization Research whereas another method is usable for a modern high-Center (VISUS). At the high-resolution powerwall the speed navigations app. visiting pupils were diving into the colorful world of visualization while a great variety of visualizations from different departments were shown. After a O&A session the pupils were quided through the technical rooms.

Canceled Events

Girls' Day 2020 (Constance and Stuttgart) Tag der Wissenschaft (Stuttgart)

WEBSITE RESTRUCTURED

With the beginning of the second funding period the SFB-TRR 161 website was restructured. Besides the content update for ongoing projects, the pages for new projects and an archive for completed projects were set up. The landing page got a new layout and the subsections "Research Aim" and "Graduate School" were content and structure wise extended.

Publications

Being the main visible output of SFB-TRR 161's research, the appearance of publications on the website was revised. Missing publications were added to the publication database PUMA and all publications were edited in terms of consistency. To make the content easily accessible for the visitors of the website, the abstract, doi, and link has been added to each publication. Finally, we decided to treat the list of all publications as part of the "Research" section.

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LabTour at VISUS during the Informatiktag 2020.

Informatiktag 2020



Twitter is used by the SFB-TRR 161 to share latest news with the public and to exchange with the scientific community and actors of the national and international interdisciplinary research landscape. Among many others, our content has been retweeted by the German Research Foundation (DFG) and Research in Germany, an initiative by the Federal Ministry of Education and Research (BMBF), maintained together with the German Academic Exchange Service (DAAD).

OUTREACH

RISING DEMAND FOR INTERNSHIP CONTINUES

In Germany, every high school student of the 9th and 10th grade is supposed to do an internship (BOGY). The aim of the BOGY is to identify possible future occupational fields. We offer such an internship in Stuttgart and Constance, and give children and young adults an insight into our research.

22 The pupils stay five days in one of our partner institutions, get a glimpse of working in academia, and discuss with our PhD students.

In Stuttgart, we designed a new schedule for the BOGY, during which, pupils learn programming in C++, hardware programming (Arduino[®]), 3D modulation, and visualization. The schedule was set up together with Matthias Braun, Andres Lalama, and Tobias Rau from VISUS.

The demand for an internship at the SFB-TRR 161 is continuously rising. We already received over 70 applications in 2020, which doubled the number of applications of the last year.

Four pupils already stayed in February for a BOGY in Stuttgart. Two more BOGY periods with six pupils in total were scheduled for 2020. Due to the measurements against the spread of the coronavirus, the second BOGY period had to be canceled. We hope to host at least three more pupils for a BOGY in winter 2020. With this, we would double the amount of BOGYs at the SFB-TRR 161 in comparison to 2019.



High school student Malte Eggers during demo of a HoloLens® with PhD students.



 $\mbox{Arduino}^{\ensuremath{\$}}$ micro used for hardware programming in Stuttgart.



Help pupils to think independently: Hardware programming with Arduino[®] micro, RGB LED, and servo engine. Result after the first day of the internship. Photo: Malte Eggers.

»Die angewandte Autodidaktik funktionierte überraschend gut, und so wurde uns indirekt auch schon gezeigt wie meistens in der Informatik gearbeitet wird:

Wenn man etwas nicht kennt oder nicht weiß, recherchiert man selbst nach einer Lösung und versucht sich so das Wissen selbst anzueignen.«

Malte Eggers, Simon Kloos, Nathanael Schweizer
& Barbara Zimermann

MEDIA COVERAGE



2020

Uni Konstanz entwickelt ihr Corona-Hotspot-Tool weiter Singener Wochenblatt, 18.05.2020.

Diese Internetseite zeigt, welche Krankenhäuser noch Kapazitäten haben Augsburger Allgemeine; 21.04.2020.

Belegung von Intensivbetten: Ein Tool aus Konstanz soll Klarheit bringen *Schwäbische Zeitung*, 11.04.2020.

Wie viele Intensivbetten sind verfügbar? Lungenärzte im Netz, 10.04.2020.

Wie Karten Leben retten sollen *Spiegel Online*, 10.04.2020.

Deutsche entwickeln Karte für Intensivbetten *BLICK.CH*, 08.04.2020.

Neues Corona-Tool macht Intensivbetten in Deutschland sichtbar Badische Neueste Nachrichten, 03.04.2020.

Visualization tool enables doctors to get an overview of critical care bed capacities *news-medical.net Life Sciences*, 02.04.2020.

Konstanzer Forscher entwickeln Corona-Landkarte *SWR4, BW Regional*, 01.04.2020.

Corona-Krise-Wie eine Webseite im Kampf gegen Virus helfen kann Südkurier, Nr. 76, 31.03.2020.

2019

Datenvisualisierung – Bedeutsam für die Wissenschaft und die Wirtschaft *WiWi News*, 05.12.2019.

KI ist erst einmal ein relativ vager Modebegriff *gis.Business*, 14.10.2019.

Im Bilde: KI-Spitzenforschung und Unternehmergeist forschung leben, 01.05.2019.

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OUTREACH

PUBLICATIONS

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