

# Colloquium Computer Science

# CS & BME

It is a pleasure to invite you to the colloquium for our Professorship in Computer Science at Graz University of Technology. The public part will be a scientific talk (titles below), and a discussion with the audience.

Monday, 26th February 2024 | Showroom Data House -

**Aichholzer Oswin:** "Combinatorial reconfiguration in plane graphs - an overview "

26<sup>th</sup> February 2024 | 10:00 h | Sandgasse 36 EG (DHEG136E)

Abstract: Reconfiguration is the process of changing a structure into another - either through continuous motion or through discrete changes. We will concentrate on plane graphs and discrete reconfiguration steps of bounded complexity, like exchanging one edge of the graph for another edge. This operation is usually called a flip, and the flip graph is defined as the graph having a vertex for each configuration and an edge for each flip. Three questions are central: studying the connectivity of the flip graph, its diameter, and the complexity of finding the shortest flip sequence between two given configurations. We will give an overview of several classic and new results, as well as long-standing open problems in this area.

**Gruss Daniel:** "The Foundations of Sustainable Security: A Microarchitecture Perspective "

26th February 2024 | 11:00 h | Sandgasse 36 EG (DHEG136E)

Abstract: Every day our systems receive multiple patches against security vulnerabilities. Each of these patches comes with its costs that stack up in an unsustainable way. One of these patches was our KAISER patch against the Meltdown vulnerability we published in 2018. In 2030, a single patch of this gravity could drive up global electricity consumption by 0.5%. We will look at some security issues inside processor microarchitectures and how we can address them. We will understand why the patches are necessary and why they are expensive. Finally, we will discuss how fundamental changes in how we design systems could yield alternatives more sustainable, both in terms of energy consumption and creating systems with inherent strong secure properties.

**Kalkofen Denis:** "Mixed Reality User Manuals"

26<sup>th</sup> February 2024 | 13:00 h | Sandgasse 36 EG (DHEG136E)

Abstract: User manuals are an indispensable supplement to many products. Traditional user manuals commonly use 2D images and videos to depict the actions required to perform a task. However, following

traditional user manuals may be challenging because they commonly lack interactivity with the objects and the viewpoint, which causes its user to mentally map the depicted actions from 2D image space into they current 3D environment. It is known that this can impose an additional mental load. Mixed Reality (MR) user manuals can overcome these issues by presenting interactive instructions or animations 3D registered to the user's field of view. This talk reviews the building blocks of MR user manuals at the intersection of computer graphics, computer vision, and human-computer interaction. More specifically, it outlines components for authoring, visualization, rendering, interaction, and display of user manuals in a 3D MR environment.

## Pammer-Schindler Victoria: "Interactive Systems Design from a Socio-technical and Learning Perspective"

26<sup>th</sup> February 2024 | 14:00 h | Sandgasse 36 EG (DHEG136E)

Abstract: Could technology make us smart(er)? My vision is that computer technologies and our digitalised culture and environment contribute towards humans' be(coming) competent, and at the very least not hinder us in this. Designing systems that support competent and engaged humans in doing their work and living their lives has been part of the HCI agenda for quite some time, even as different foci were apparent at different times in HCI history. In my own research, I have taken two approaches to contribute to this very broad vision: Firstly, I have worked on designing technology that directly facilitates learning in relation to other human activities, and have been asking what are the limits of AI to support human learning? In this talk, I will show recent results on how conversational agents can facilitate reflective learning. Secondly, I have started working more broadly on the question of what are design patterns such that interactive systems facilitate, and at least not hinder, lifelong learning, given that many of our interactions with each other and the world are digitally mediated. Towards this goal, I am now working on developing the support for (lifelong) learning as a design goal and evaluation metric for evaluation technology; and will share recent research results and next steps.

## Steinberger Markus: "Cloud-native Rendering "

26<sup>th</sup> February 2024 | 15:00 h | Sandgasse 36 EG (DHEG136E)

Abstract: With cloud computing becoming ubiquitous, it appears as virtually everything can be offered /as-a-service./ However, real-time rendering in the cloud forms a notable exception, where the cloud adoption stops at running individual game instances in compute centers. In this talk, we explore whether a cloud-native rendering architecture is viable and scales to multi-client rendering scenarios. To this end, we propose world-space and on-surface caches to share rendering computations among viewers placed in the same virtual world. We discuss how caches can be utilized on an effect-basis and demonstrate that a large amount of computations can be saved as the number of viewers in a scene increases. Caches can easily be set up for various effects, including ambient occlusion, direct illumination, and diffuse global illumination. Our results underline that the image quality using cached rendering is on par with screen-space rendering and due to its simplicity and inherent coherence, cached rendering may even have advantages in single viewer setups. We show that various other effects can benefit from caching and combining our approach with neural techniques can be highly efficient. Building on top of our research, cloud-native rendering may be just around the corner.

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*Computer Science & Biomedical Engineering*