CA2RE
Conference for Artistic and Architectural (Doctoral) Research

Uwe Rieger
arc/sec Lab, the University of Auckland
Real Time Reactive Architecture - A Fusion of Physical Materiality and Digital Information
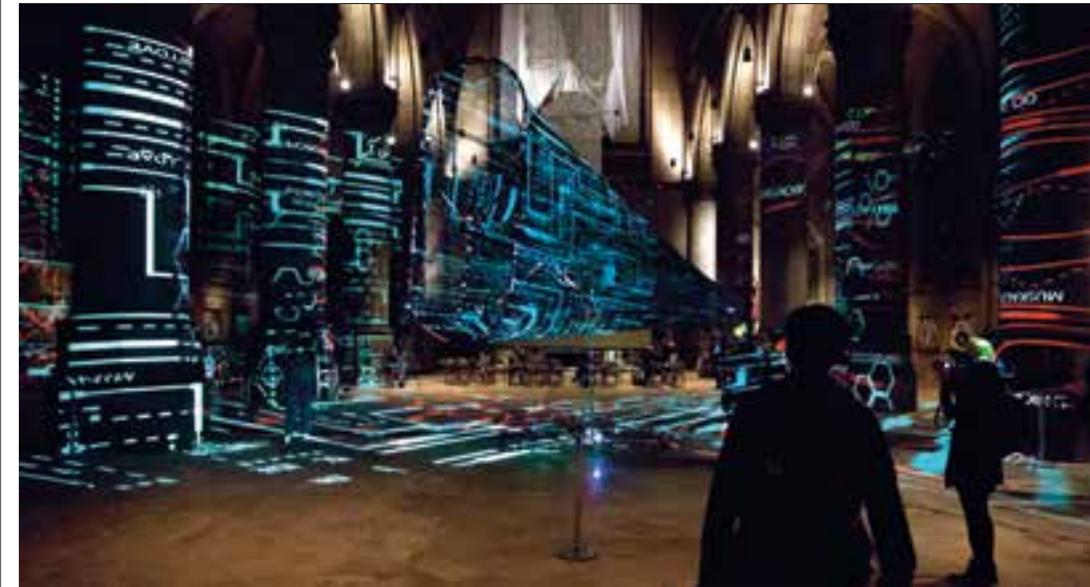
CA²RE BERLIN

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Rapid advancements in the sector of real-time computing, digital spatial technologies and mixed reality display devices enable designers not only to make data spatially visible, but also to connect digital information with physical properties. Research institutions such as the Tangible Media Group at MIT Media Lab have been laying the ground for concepts to merge data with matter in order to re-connect the digital world to the multimodal human senses[1]. From commercial side the desire to go beyond audio-visual presentation of data finds its reflection in latest gaming technology. The entertainment center, 'The Void` for example, combines VR technology with passive and active physical components to offer a new hyper reality experience[2].

The research on Real Time Reactive Architecture explores architectural applications of these strategies and technologies. The aim is to develop new conditions of buildings, which integrate data as a dynamic construction material. Core principle is the 1:1 calibration of physical and digital design. Both components are interlinked through a feedback loop consisting of three elements: a sensor system to monitor the physical environment, a real time processing system and digital output devices (Fig.4).

The topic is investigated through creative practice. Large-scale prototypes and interactive installations (Fig.1-3) are the driving vehicle for both, the exploration of tactile data and the demonstration of real time responsive environments. The underlying research question investigates functional and aesthetic design parameters for haptic-digital architecture and user interfaces.

Fig. 1 LightScale II generates a tactile data experience through projections on multi-layered mesh surfaces. (It combines a virtual environment with a 20-meter long carbon fiber construction, which freely oscillates in space (Photo by T. Mesic)
Rieger, U. *LightScale II*. 2017. Mixed media, 28 x 28 x 6 m, Cathedral Linz, Austria

Fig. 2 LightTank is an interactive cross reality installation that augments a space frame structure with holographic line drawings using an anaglyph projection technology on transparent screens. (Photo by author)
Rieger, U. & Liu, Y. *LightTank*. 2018. 8 x 8 x 6m, Ars Electronica Festival, Austria

Fig. 3 SINGULARITY blends data, dance, music and architecture in an interdisciplinary mixed reality performance. Marked with tracking devices, 3 dancers transform physical movement into mutable architectural volumes of illuminated haze particles. (Photo by K. Simon)
Rieger, U., Brown, C., Liu, Y., Soudan, J., Scoones, R., & Miao, Y. *SINGULARITY*. 2016. Mixed media, 14 x 14 x 5 m, Q-Theatre, Auckland, New Zealand

Fig. 4 Technical principle of Real Time Reactive Architecture (Drawing by author)

1. MIT Media Lab. "Group Overview ‹ Tangible Media – MIT Media Lab." https://www.media.mit.edu/groups/tangible-media/overview/.

2. THE VOID. "Step Beyond Reality." www.thevoid.com/.

ARENA   ELIA   Technische Universität Berlin   PEP

Uwe Rieger

Real Time Reactive Architecture
A Fusion of Physical Materiality and Digital Information

Rapid advancements in the sector of real-time computing, digital spatial technologies and mixed reality display devices enable designers not only to make data spatially visible, but also to connect digital information with physical properties. Research institutions, such as the MIT Media Lab, have been laying the ground for concepts to merge data with matter. Our desire and fascination to re-connect the digital world to the multimodal human senses finds its reflection in latest gaming technology. The entertainment center, 'The Void` for example, combines VR technology with passive and active physical components to offer a new Hyper Reality experience.

With a focus on architectural applications, my research on Reactive Architecture explores concepts for a new condition of buildings, which use data as a dynamic construction material. Specific to my approach is the development of large-scale interactive installations as the driving vehicle for both, the exploration of tactile data and the demonstration of real time responsive environments. The underlying research question investigates functional, programmatic and aesthetic design parameters for haptic-digital architecture and its user interaction.

The presentation for the CA2RE conference will consist of two parts. An oral presentation supported by images will give an overview of my recent experiments, introduce technical principals and discuss the preliminary findings.