

HDI²4D

Human-Digital Content Interaction
for Immersive 4D Home Entertainment

5th

NZ/KOREA
Workshop
Nov 2017

Presentation Details

Session 1

Augmented & Mixed Realities

Session Chair

Prof. Neil Dodgson - VUW

Title

An Overview of Mixed-Reality Research at the HIT Lab NZ

Presenter

Prof. Robert W. Lindeman - HIT Lab NZ

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Abstract

In this talk, I will give an introduction to the research conducted across the Reality-Virtuality Continuum at the Human Interface Technology Lab at the University of Canterbury.

Our applied research is significantly externally funded by companies and other organisations looking to employ VR and AR technologies to support human effort. Examples will be given, along with pointers to ways to engage with the Lab.

Title

Gamification of Life - The AR Intrusion

Presenter

Taylor Carrasco - MIXT

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Abstract

Our lives are about to be interrupted in an intrusive way nearing sensory overload. Daily activities, even the mundane, are about to be gamified beyond the point of recognition, with the conformation of our lives being transformed in all aspects.

In the last 20 years, more change in advertising methods has occurred than the previous 2000 years. With the coming advancements in AR wearable technology, IoT, and object recognition - brands will come to recognize the potential in supplementing our routines with their products to make them more engaging, fun, and memorable.

Presenter Bio

Taylor has a Bachelor of Science in Visual and Game Programming specializing in Artificial Intelligence. He forged much of his career with FarmVille, Mafia Wars, and Zynga Poker, and Weta Digital. After 15 films with Weta, he wrote the Game Art and Development diploma as Head of Faculty for Game Art and Development at ACG Yoobee. A conversation with Taylor is likely to encourage big, bold ideas backed by data.

Title

Reconstructing Depth from mono 360 video based on the camera motion

Presenter

Joonsuk Park - Hongik University

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Abstract

In this research, we calculate the pseudo depth information from 360 images which does not know the camera information. We analyze camera motion vector from mono 360 videos and calculate continuity of the pseudo depth information. Furthermore, we add spatial information to the pseudo depth information such as camera trajectory.

Title

MR360: Mixed Reality Rendering for 360° Panoramic Videos

Presenter

Lohit Petikam - VUW

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Abstract

We present MR360, a system that provides interactive mixed reality (MR) experiences using 360° panoramic videos shown in head mounted displays (HMDs). MR360 provides the illusion of interacting with objects in a video, which are actually 3D virtual objects seamlessly composited into a live 360-video background.

Image based lighting (IBL) is perceptually optimized to provide fast and believable results using the 360-video as the light source. We detect regions of most salient lights in the 360-video to cast realistic shadows. Real-time differential rendering then achieves a seamless composite between the virtual objects and the real-world background. Our demo has been integrated into both Unreal Engine 4 (UE4) and Unity, and showcases a unique MR experience in 360-videos using a heterogeneous user interface combining Vive or Oculus Rift controllers and Leap Motion hand tracking.

Session 2

VR & 4D Interaction

Session Chair

Prof. Young J Kim - Ewha Womans University

Title

H-Wall: Encountered-type Haptic Display for VR Environment using Per-plane Reachability Maps

Presenter

Yaesol Kim - Ewha Womans University

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Abstract

We show a novel encountered-type haptic system, H-Wall, to enable haptic feedback using a 7-DoF manipulator suitable for simulating indoor VR environments, which are characterized and confined by a set of vertical walls and doors. At runtime, our system tracks hand motion using an RGBD sensor and

locates its configuration. Then, the robotic manipulator plans a trajectory for the end-effector, attached to a rectangular rigid board, to make a contact with the hand to deliver a sense of touch, as long as the perceived hand contact force is substantial. The force feedback is generated in a passive sense that the rigid board, corresponding to a vertical wall, holds its position as long as the perceived hand contact force is substantial. In order to address the issue of limited workspace, we also propose a new reachability map, called perplane reachability maps, which is optimized to answer whether passive haptic feedback can be generated by a manipulator when the user touches a vertical wall at a given orientation. These maps are generated offline using optimization and are looked up at runtime to see if the haptic feedback can be realizable or not. We also provide a gesture-based locomotion strategy to explore the large VR space. We implement our system using a KUKA IIWA R800 robot and the Kinect sensor, and successfully demonstrated to provide an illusion to the user in a virtual environment with touch sensation to the surrounding environment.

<http://graphics.ewha.ac.kr/hwall>

Title

Hand gesture-based interaction in a 360 VR movie

Presenter

Humayun Khan - Ewha Womans University

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Abstract

Among various different VR techniques applicable for movie production, 360-degree panorama video is most actively adopted. In 360 degree movies, the viewer is completely surrounded by a spherical video background and has control over the perspective in the spherical space. There could be various ways to improve movie watching experience in 360-degree movies. For example, prior work has investigated how does showing the viewer's body inside the 360 movies affect on movie watching experience. Taking this to the next step, my research explores how adding interactivity to a 360 VR cinematic environment affects the user's sense of presence and embodiment. It also examines whether interacting with the cinematic environment using realistic computer graphics (CG) hands differ from viewing your own real hands fused with the virtual world.

In my talk, I will give an overview of how real hand interactivity can be added in VR world. I will also briefly discuss the user experiment we conducted to study the effect of interactivity on the sense of presence and embodiment.

Title

Artistic Pen Drawing on an Arbitrary Surface using an Impedance-controlled Robot

Presenter

Daeun Song - Ewha Womans University

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Abstract

We present a semi-autonomous robotic pen-drawing system that is capable of creating pen art on an arbitrary surface with a varying thickness of pen strokes but without reconstructing the surface explicitly. Our robotic system relies on an industrial, seven-degree-of-freedom (7DoF) manipulator that can be both position- and impedance-controlled. We use a vector-graphics engine to take an artist's pen drawing as input and generate Bezier spline curves with varying offsets. In order to estimate geometric details of the target, unknown surface, during drawing, we rely on incremental and adaptive sampling on the surface using a combination of position and impedance control. Then, our control algorithm physically replicates this drawing on any arbitrary, continuous surface by impedance-controlling the manipulator. We demonstrate that our system can create visually-pleasing and complicated artistic pen drawings on general surfaces without explicit surface-reconstruction nor visual feedback.

<http://graphics.ewha.ac.kr/SSK>

Session 3

VR Experiences

Session Chair

Prof. Rob Lindeman - HIT Lab NZ

Title

Bringing Cinema Studies to VR: Film Phenomenology and Synaesthesia

Presenter

Miriam Ross - VUW

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Abstract

In current VR practice, there is significant emphasis on creating fully immersive experiences by utilising all the body's senses. Recent technological experiments have included adding smell, taste and full bodied haptic feedback. There has been less attention to how we can use the tools already available in screen media, particularly cinema, to make the viewer feel as if more of their senses are engaged. This presentation will discuss how theories from cinema studies, particularly film phenomenology and synaesthesia, can aid the design of VR experiences, whether they have interactive, 6-degrees-of-freedom features, or are 360-degree videos. It will draw upon the VR experience Richie's Plank VR to provide examples of good practice.

Presenter Bio

Dr Miriam Ross is Senior Lecturer in the Film Programme at Victoria University of Wellington. She works with new technologies to combine practice-based methods and traditional academic analysis. She is the author of *South American Cinematic Culture: Policy, Production, Distribution and Exhibition* (2010) and *3D Cinema: Optical Illusions and Tactile Experiences* (2015) as well as publications on film industries, mobile media, virtual reality, stereoscopic media and film festivals.

Title

Creating Empowering, Empathic Experiences in VR

Presenter

Meredith Meyer-Nichols - *Wrestler*

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Abstract

The emergence of VR has opened up a new realm of opportunity in the types of experiences we can create. In this presentation, I'll talk about why it's important to create positive, empowering experiences that create empathy, and describe some examples of how *Wrestler* is doing this in our current projects.

Presenter Bio

Meredith Meyer-Nichols is Senior AR/VR Producer at *Wrestler* a Creative Video and AR/VR Agency, where she is focused on creating and producing engaging experiences for an inclusive and global audience. Previously a Producer and Executive Producer of visual effects and virtual, augmented and mixed reality, she has 15 years' experience producing ground-breaking visual effects and creative technology both in New Zealand and internationally. Her credits comprise some the biggest movies of the past decade including *Avatar*, *The Adventures of Tintin*, *Guardians of the Galaxy*, *Star Wars: The Force Awakens*, and *Beauty and the Beast*. Meredith's specialities include Visual Effects, Virtual, Augmented and Mixed Reality, Virtual Production / Performance Capture.

Title

CanvoX : High-Resolution VR Painting for Large Volumetric Canvas

Presenter

Yejin Kim - Ewha Womens University

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Abstract

With virtual reality, digital painting on 2D canvases is now being extended to 3D spaces. Tilt Brush and Oculus Quill are widely accepted among artists as tools that pave the way to a new form of art - 3D immersive painting. Current 3D painting systems are only a start, emitting textured triangular geometries. We advance this new art of 3D painting to 3D volumetric painting that enables an artist to draw a huge scene with full control of spatial color fields. Inspired by the fact that 2D paintings often use vast space to paint background and small but detailed space for foreground, we claim that supporting a large canvas in varying detail is essential for 3D painting. Technically, our canvas is represented as an array of deep octrees of depth 24 or higher, built on CPU for volume painting and on GPU for volume rendering using accurate ray casting. In CPU side, we design an iterative algorithm to refine or coarsen octree, as a result of volumetric painting strokes, at highly interactive rates, and update the corresponding GPU textures. Then we use GPU-based ray casting algorithms to render the volumetric painting result. We explore precision issues stemming from ray-casting the octree of high depth, and provide a new analysis and verification.

<http://graphics.ewha.ac.kr/canvox>

Title

Untethered Interactive 360 - making VR accessible

Presenter

Jessica Manins - ProjectR

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Abstract

Jessica is leading a revolutionary project that puts interactive 360 into the homes of consumers.

Her company Mixt has been exploring the hardware capability of standalone headsets to enable high quality VR experiences including interactivity within a 360 environment.

With no complex setup, cameras or sensors and a much lower price point than traditional headsets on the market their research shows the wireless android-powered headsets can deliver realistic immersive experiences with the integration of 3D digital assets into real world 360 video footage.

Presenter Bio

Jessica Manins is the cofounder of PROJECTR, centre for virtual and mixed reality and CEO of AR/VR creative studio Mixt. She helped establish The New Zealand VR/AR Association and worked with MBIE to create a paper on the economic benefits of virtual and augmented reality as it applies to businesses in New Zealand.

She is leading a research and development project using Virtual Reality for the relief of pain, anxiety and fear which goes into clinical trials later this year. This world-first application is the first collaborative project being run through the PROJECTR research lab in collaboration with Victoria University, Mixt and Park Road Post.

As a leading voice in the tech sector for women in NZ, Jessica is involved in a number of initiatives to support female entrepreneurs and is a finalist in the Wellingtonian of The Year Awards in the Science and Technology category.

Session 4 **VR & Beyond**

Session Chair

Dr. Gun Lee - *University of South Australia*

Title

Cinematic 360 Production, A Case Study: The Good, the Bad, and the Ugly

Presenter

Raqi Syed - *VUW*

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Abstract

An overview of successes, challenges, and pain points in the production of my VR short titled “The Girl Who Sat by the Door.” The focus will be on recapping pre-prod, prod, and post-prod practices in order to understand how we can develop efficient pipelines for cinematic VR.

Title

Beyond Visualisation: Creating Digital Tools for Architectural Design

Presenter

Tane Moleta - VUW

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Title

Overview of Research at VCG lab CG, VR/MR, and Perception

Presenter

Andrew Chalmers & Kieran Carnegie - VUW

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