

Demos

SCIENTIFIC DEMOS

A Gaze-preserving Group Video Conference System using Screen-embedded Cameras

Kazuki Kobayashi, Takashi Komuro, Bo Zhang, Keiichiro Kagawa, and Shoji Kawahito

In this paper, we propose a system that presents a correct gaze direction of each user in a group-to-group video conference. It is known that gaze direction plays a significant role in face-to-face communication. However, in ordinary video conference system, there is a problem that gaze directions cannot be correctly transmitted to a user in the other side since the camera is placed on the top or bottom of the display. We propose a method to generate images of each person from an appropriate viewpoint position using Kinect and screen embedded cameras and present the images to the user. By estimating users' gaze directions and generate an image that is suitable for the user who looks at the person, it is possible to present an image suitable for each user even in group-to-group situation. We show demonstration of group-to-group video conference using the proposed system and show that the system can present suitable images to each user.

A playback tool for reviewing VR experiences

Thomas Lopez, Olivier Dumas, Fabien Danieau, Bertrand Leroy, Nicolas Mollet, and Jean-François Vial

Designing a VR content is a challenging task due to the complexity of the analysis of a user's experience. We propose a tool allowing a reviewer to record a user's movements when consuming a VR content, and to playback this experience. During the playback, the reviewer can visualize in real-time the visible objects to the user (within the field of view) or the interactive ones (within the workspace). Besides, the field of view and workspace of numerous devices can be simulated in

order to predict how the content would fit. In the demonstration, a user is first invited to experience a VR scene. Then he can watch his recorded experience from a reviewer point of view.

Cubely: Virtual Reality Block-based Programming Environment

Juraj Vincur, Martin Konopka, Jozef Tvarozek, Martin Hoang, and Pavol Navrat

Block-based programming languages are successfully being used as an alternative way of teaching introductory programming concepts. The success is in part due to the low barrier of entry and the visual game-like appeal fostering experimentation and creativity. Virtual reality (VR) presents a step further to even more immersive and engaging experience. In this demo, we showcase our project Cubely, an immersive VR programming environment in which novice programmers solve programming puzzles within a virtual world. The puzzles are similar to Code.org exercises, and the solution (program itself) is assembled by the programmer within the same virtual world using the cubes representing program instructions. The whole environment is templated to a theme of the popular Minecraft video game.

Gaze- and QoE-aware Video Streaming Solutions for Mobile VR

Pietro Lungaro, Konrad Tollmar, Ashutosh Mittal, and Alfredo José Fanghella Valero

This demo showcases a novel approach to content delivery for 360° video streaming. It exploits information from a connected eye-tracker embedded in the used VR HMD. The presented technology enables the delivery of high quality, in real time, around the users' fixations points while lowering the image quality everywhere else. The goal of the proposed approach is to substantially reduce the overall bandwidth requirements for supporting VR video experiences while delivering high levels of user perceived quality.

The network connection between the VR system and the content server is in this demo emulated, allowing users to experience the QoE performances achievable with datarates and RTTs in

the range of current 4G and upcoming 5G networks. Users can further control additional service parameters, including video types, content resolution in the foveal region and background and size of the foveal region. At the end of each run, users are presented with a summary of the amount of bandwidth consumed with the used system settings and a comparison with the cost of current content delivery solutions. The overall goal of this demo is to provide a tangible experience of the tradeoffs among bandwidth, RTT and QoE for mobile provision of future data intensive VR services.

LabDesignAR: Configuring Multi-camera Motion Capture Systems in Augmented Reality

Mehmet Aydın Baytaş, Asım Evren Yantaç, and Morten Fjeld

We present LabDesignAR, an augmented reality application to support the planning, setup, and reconfiguration of marker-based motion capture systems with multiple cameras. LabDesignAR runs on the Microsoft HoloLens and allows the user to place an arbitrary number of virtual "holographic" motion capture cameras into an arbitrary space, in situ. The holographic cameras can be arbitrarily positioned, and different lens configurations can be selected to visualize the resulting fields of view and their intersections. LabDesignAR also demonstrates a hybrid natural gestural interaction technique, implemented through a fusion of the vision-based hand tracking capabilities of an augmented reality headset and instrumented gesture recognition with an electromyography armband. The source code for LabDesignAR and its supporting components can be found online.

Solving Poisson's Equation on the Microsoft HoloLens

Anders Logg, Carl Lundholm, and Magne Nordaas

We present a mixed reality application (HoloFEM) for the Microsoft HoloLens. The application lets a user define and solve a physical problem governed by Poisson's equation with the surrounding real world geometry as input data. Holograms are used to visualise both the problem and the solution. The finite element method is used to solve Poisson's equation. Solving and visualising partial differential equations in mixed reality could have potential usage in areas such as building planning and safety engineering.

The Interactive SoundScape Renderer for Loudspeaker- and Headphone-Based Spatial Sound Presentation

Jens Ahrens, Matthias Geier, Peter Bartz, and Sascha Spors

We demonstrate the SoundScape Renderer (SSR), which is an open-source software package that performs realtime spatial sound reproduction based on various different loudspeaker-based methods as well as headphones. The implemented algorithms include wave field synthesis, amplitude panning Ambisonics, VBAP, and binaural reproduction amongst others. SSR comprises a TCP/IP interface that allows for its entire functionality to be controlled remotely. Any software running on any platform can connect to SSR and serve as a remote control. We present two such examples: 1) The BoomRoom, a system for mid-air direct interaction with virtual sound sources, and 2) and Android-based remote control that allows for interaction with SSR using the touch screen of a smartphone.

The Smart Pin: A Novel Object Manipulation Technique for Immersive Virtual Environments

Fabio Marco Caputo, Marco Emporio, and Andrea Giachetti

In this paper we describe a demo setup showing the potential usefulness of a novel single-handed manipulation technique designed to be used with immersive Virtual Environments. The technique allows manipulation control over objects in the scene through the use of a 3D widget (the Smart Pin) and separated control over single DOFs for translation and rotation actions. The goal is to provide an intuitive, easy-to-use and accurate way to perform simple manipulation tasks using only one hand supported by data acquired through user tests.

VEAAR - Virtual Environment for Archaeological Artefacts Restoration

Jiří Chmelík and Mikoláš Jurda

This demo presents a virtual environment for assembling archaeological artefacts from 3D scanned fragments. We have implemented a set of interaction techniques tailored to this specific task, allowing users to examine, manipulate and assemble fragments to obtain the original shape of the object.

The tool is developed and continuously tested by domain experts from the field of anthropology. The presented pilot user study confirms our initial expectation that the restoration process using a virtual environments can be significantly faster than restoration done in a desktop environment keeping the same level of assembly precision.

Walkable Self-Overlapping Virtual Reality Maze and Map Visualisation Demo

Sule Serubugo, Denisa Skantarova, Nicolaj Evers, and Martin Kraus

This paper describes our demonstration of a walkable self-overlapping maze and its corresponding map to facilitate asymmetric collaboration for room-scale virtual reality setups in public places.

DESIGN DEMOS

3D Gesture-Based Drawing Application for Mobile Platforms

Shahrouz Yousefi, Abraham Georgiadis, Yeray Real Delgado, Julio Chana, and Naresh Kant

In this demo a 3D Gesture-based Drawing application has been shown using our Software Development Kit (SDK). Our SDK is a lightweight toolkit incorporating a single-camera solution in Hand Tracking and 3D Gesture Analysis. The SDK enables developers to integrate detailed hand motion analysis in the development of Mobile Games and Applications and thereby introduces novel and intuitive methods of 3D interaction using gestures and hand motions. The demo shows the use of static hand pose recognition, finger tracking, and analysis of dynamic hand gestures for activation and manipulation of the content in a mobile VR application. The proposed solution behind this demo is based on a novel computer vision framework for extremely efficient (minimum 50 fps) and accurate gesture analysis for mobile platforms.

A Comparative Study of 2D and 3D Mobile Keypad User Interaction Preferences in Virtual Reality Graphic User Interfaces

Akriti Kaur and Pradeep Yammiyavar

Graphical User Interfaces (GUI) on mobiles involve user interaction of touch input on a 2D surface. With advances in Augmented/ Virtual Reality, possibilities of 3D GUIs will emerge. However, 3D GUIs do not have many design heuristics. This paper reports an experiment by collating quantitative and qualitative responses from 15 users, to explore usability problems that are likely to be encountered when a 2D interface element such as number keypad is replaced with a 3D element interface in Virtual reality. Would an interface with 3D elements perform better than the existing 2D GUIs is a moot research question? The results indicate user motivation towards using the interface inspired from 3D elements. The paper discusses issues of interaction in 2D and 3D virtual spaces with their possible implications for upcoming 3D VR environments.

Augmenting a 3D print of a prostate to support physician-patient communication

Sebastian Weiß

In urology, explaining pathologies and their possible treatment / outcomes often shows to be difficult because the organs in question are not visible. The status quo for patient-physician interaction is to use 2D prints of MRI and / or CT scans and annotate them with arrows, comments, etc. It has been shown, however, that understanding their own situation enables the patient to better take part in their treatment, improving the physiological outcome. By combining a 3D print of a propped-up prostate with an augmented reality (AR) enabled iOS application we aim to convey required information in a more simple to understand manner by making the affected organs visible. Furthermore, such an application can be used to simulate or demonstrate possible treatments and their outcomes.

Touching The Void - An Approach of Tangible Virtual Reality Experience

Danli Hu

Touching the Void is an interactive experience about spatial recognition and sensory perception. It displays virtual objects on a physical pedestal and uses vibration gloves to create the haptic sensation when the audience interacts with the virtual object. The data of user's finger position is tracked by a LeapMotion embedded in the pedestal, then fed to Arduino to activate the corresponding vibration motors beneath fingertips. The project investigates how can an audience form the impression of an object in their mind without the physical agent of it in reality. Therefore, the object takes on a presence when it is being interacted with by people who are wearing the haptic gloves. By limiting and distorting the sensory input, the audience's cognition of a space has changed. It signifies a space which is neither not-empty nor not-full, and raises the discussion of reconstructing the reality.

Zelige Door on Golborne Road: a Multisensory Interface for Socially Engaged Art and Heritage Practice

Alda Terracciano, Mariza Dima, Marina Carulli, and Monica Bordegoni

This demonstration offers the opportunity to explore a multisensory digital interface resulting from the project 'Mapping Memory Routes of Moroccan Communities in London'. This is a digital arts and heritage project produced by ALDATERRA Projects with the support of Heritage Lottery Fund, the Centre for Critical Heritage Studies and Politecnico di Milano. The living heritage of members of Moroccan migrant communities is shared through an artwork composed of a digital interactive sensorial map of Golborne Road (also known as Little Morocco), which includes physical objects related to various aspects of Moroccan culture, each requiring a different sense to be experienced (smell, taste, sight, hearing, touch). Augmented Reality (AR) and olfactory technologies have been used to superimpose prerecorded video material and smells to the objects. As a result, the neighbourhood is represented as a living museum of cultural memories expressed in the form of artefacts, sensory stimulation and narratives of citizens living, working or visiting the area.

INDUSTRY DEMOS

EduChem VR – Gamifying Chemistry Education with VR

Jonas Boström

Despite its incredibly wide importance Chemistry is currently not seen as an attractive school subject. It's often considered dull, dry and difficult to understand. This has led to a steady decline of students in many countries across the globe [1].

The vision of our start-up, EduChem VR [2], is to reverse that and engage more students in Chemistry by creating virtual reality content. We believe that easily accessible smartphone apps are the means to educate and motivate students to discover the fascinating world of atoms and molecules. With the recent technology advances in mobile virtual reality we develop user-friendly and easily accessible smartphone VR apps for systems like Google Cardboard and Samsung GearVR.

How Virtual and Augmented Reality Can Improve Attention in the Classroom and Awaken a Student's Curiosity for Learning

Nils Andersson

EON Reality is the world leader in Virtual Reality (VR) and Augmented Reality (AR) based knowledge transfer for industry and education. EON Reality believes that knowledge is a human right and should be available, accessible, and affordable for every human on the planet. To carry this out, EON Reality, since 1999, has developed the de-facto standard for Augmented Reality and Virtual Reality based knowledge transfer software that supports devices from mobile phones to large immersive domes.

EON Reality provides an agnostic approach in its AVR platform (Augmented Virtual Reality) by integrating many standard business solutions with its own VR and AR platform.

LIAA (Lean Intelligent Assembly Automation) is an EU funded project where EON Reality provide MR with HoloLens for shop floor workers at factories with collaboration between humans and robots. A live demo of this will be presented.

Case study of the possibility to support challenges at Volvo GTT AMT with Virtual Reality

Per Andersson, Johan Anreasson, Björn Johansson, Liang Gong, and Mikael Andersson

A novel VR tool for collaborative planning of manufacturing process change using point cloud data

Liang Gong, Jonatan Berglund, Dennis Saluääär, Björn Johansson