Ieee vr 2020 papers

Monday, 23 March 2020 Tuesday, 24 March 2020 Wednesday, 25 March 2020 Thursday, 26 March 2020 Session 1: Avatar - Appearance Monday, March 23, 11:00 AM - 12:30 PM, Track 1 (Big Room 1) Effects of Locomotive Style and Body Visibility through Avatar Youjin Choi (KAIST), Yongmi Lee (KAIST), Sung-Hee Lee (KAIST) Abstract Conference: Teleprompter Allow users in different environments to interact with each other. However, in order to increase the effectiveness of these interactions, avatar movements need to be adjusted accordingly to take account of differences between user environments. Several movement styles can be used to achieve this speed change. This article discusses how different styles of avatar movement (speed, agility and sliding), body visibility levels (whole body and head-to-knee), and views (front and side views) affect human perceptions of natural movement, similarity with the user's locomotive and the degree of preservation of the user's intent. Manipulation of dolls in VR Michael Nichet (Georgia Institute of Technology, USA), Pierce McBride (Georgia Institute of Technology) Abstract: Archival stage objects aimed at applying and preserving puppet theater as a creative practice in VR. It includes 3D scanning and an interactive design for capturing dolls and their various control schemes from the archives of the Puppet Arts Centre. This document takes into account their design and execution in the VR-created dollhouse. It focuses on evaluation (n=18), comparing the interaction between non-experts and expert puppeteer. The data initially showed small differences, but a more detailed discussion shows different quality assessments of the puppet environment that support its VR value. The results suggest successful creative activation, especially among experts. The self-watting effect of virtual reality followers Mar Gonzalez-Franco (Microsoft Research), Brian Cohen (Microsoft Research), Eyal Ofek (Microsoft Research), Dalila Buren (Tohoku University), Antonella Masselli (Microsoft Research) Abstract: When you embody a virtual avatar in immersive VR apps, users are usually and feel in control of taranian movements. However, there are situations in which technology can reverse this connection, so an embodied avatar can affect the user's engine behavior without users noticing it. This is shown in retargeting applications for action and motor contagion experiments. This is where we discuss the effect of the S dirham. We review previous evidence and present new experimental results showing how, when the virtual body does not overlap with their physical body, users tend to unknowingly follow their avatar, filling the gap if the system allows it. Effects of capture avatars on social presence in immersive virtual environments SungIk Cho Cho University, South Korea), Seung-wook Kim (Korea University, South Korea), JongMin Lee (Korea University, South Korea), JeongHyeon Ahn (Korea University, South Korea), JungHyun Han (Korea University, South Korea) Abstract Conference: Recent achievements in 3D reconstruction and tracking technologies have made possible volume capture of the human body and performance in real time. However, in the field of human-computer interaction, no user survey works made with such volume capture avatars were reported. This article explores how a voluminous capture avatar affects users' sense of social presence in immersive virtual environments. Two experiments were done where an actor's volumetric capture avatar was compared to the actor captured in a 2D video and another 3D avatar obtained by pre-scanning the actor. The results of the experiment show that new volume capture techniques can be an attractive tool for many XR applications. Data modeling drive dominance traits for virtual characters using Tanta Analytics Tanmai Randaan (University of North Carolina), Aniket Bera (University of North Carolina), Emily Cuban (University of Tilburg), Kurt Gray (University of North Carolina), Dineto Manucha (University of Maryland) Abstract Newspaper: We present a data-driven algorithm to generate gaits from virtual characters with different dominant traits. Our formulation uses a user survey to create a data-driven dominance comparison between gait and dominance labels. We use our dominance to generate walking gaits for virtual characters who exhibit different dominant traits while interacting with the user. Furthermore, we extract gait characteristics based on known criteria in visual perception and psychology literature that can be used to identify the levels of dominance of each walking gait. We validate our mapping and perceived dominant traits from a second user survey in a fascinating virtual environment. Our gait classification algorithm can classify gait qualities with ~73% accuracy. We also present to you an application of our approach that simulates the interpersonal relationship between virtual characters. As far as we know, ours is the first practical approach to classifying gait dominance and generating dominance in virtual characters. Session 2: 3DUI - Selection/Study on Monday, March 23, 11:00 - 12:30, track 2 (Great Room 2) study of Bubble ray casting mechanism to improve the acquisition of 3D purpose in virtual reality Yiqin Lu (Department of Computer Science and Technology Tsinghua University; Key Laboratory of Universe Computers, Ministry of Education, Chun Yu (Department of Computer Science and Technology, Tsinghua University; Main Laboratory of Changing Computers, Ministry of Education, China), Tsinghua University; Key Laboratory of Penetrating Computers, Ministry of Education, China) Abstract at the conference: We are exploring a bubble mechanism for radiation work that dynamically resizes the beam selection range to acquire 3D target targets in virtual reality. Bubble mechanism identifies the target closest to the beam, with which users do not have to shoot exactly through the target. We design the selection criterion and visual feedback of the balloon and conduct two experiments to evaluate radiation processing techniques with a balloon mechanism in simple and complex tasks for acquiring 3D target objects. The results show that the mechanism of the balloon significantly improves radiation emanation in both performance and preferences, and the Bubble Ray technique with angular distance determination is competitive compared to other techniques for acquiring target technologies. Improving awareness obstacles to improving interaction in virtual reality Ivan Valentini (University of Genoa), Giorgio Ballestin (University of Genoa), Chiara Bassano (University of Genoa), Fabio Solari (University of Genoa), Manuela Chessa (University of Genoa) Abstract: Immersive VR is experienced through HMDs, while the user is physically present in a real, cluttered environment. We present a method for creating a virtual scenario composed of virtual objects with the same spatial occupancy of the respective real ones. The real scene is scanned to detect the position and boundaries of a box of objects and obstacles, then virtual elements of similar sizes are added. Two different techniques for detecting and grouping the structure are described and compared, taking into account also the sense of presence of users in relation to the standard technique. The method allows us to maintain real environmental awareness while maintaining a high level of immersion and sense of presence, and to achieve increased virtual interaction. Slicing volume: Hybrid 3D/2D multipurpose technique for selecting dense virtual environments Roberto A. Montano-Murillo (University of Sussex, Brighton, United Kingdom), Kyong Nguyen (Adobe Research, San Francisco, California, United States), Rubayah Habib Kazi (Adobe Research, In this paper, we offer Cut-Volume, a hybrid selection technique that allows both 3D mid-air interaction, and a metaphor for a 2D pen and tablet in VR. We evaluated our approach in highly clogged selection tasks and showed that our hybrid technique significantly improves the accuracy of selection compared to medium-selection of air only thanks to the added haptic feedback provided from the surface of the physical tablet. ENTROPIA: To the endless Surface Haptic displays in virtual reality using Rotating Props Victor Mercado (INRIA Rennes), Maud Marchal (INRIA Rennes), Anatole Lécuyer (INRIA Rennes) Journal Abstract: In this article, we suggest an approach to endless surface display. Our approach, called EN-type ROtating Propi approach (ENTROPiA), is based on cylindrical spinning of a feather attached to the robot's final effector, serving as a haptic meeting-type display (ETHD). This type of haptic display allows users to have unlimited, free surface contact provided by a robotic device so that users can touch the surface to touch. In our approach, the feeling of touching a virtual surface is given through an interactive technique that pairs with the sliding movement of the prop under the finger of users by tracking the location of their hands and establishing a path to be explored. This approach allows great movement for greater surface rendering, allows for very textured haptic feedback and takes advantage of the ETHD approach, which introduces great motion and drag/friction sensations. As part of our contribution, proof of concept is designed to illustrate our approach. A user survey was conducted to assess the perception of our approach, showing a significant performance to transform the feeling of touching a large flat surface. Our approach can be used to build large haptic surfaces in applications such as fast prototyping for automotive design. Session 3: View and Attention: Inauguration on Monday, March 23, 11 a.m. to 12:30 p.m., Record 3 (Studio 1): Anticipating CN-based gas in dynamic scenes Zhiming Hu (Beijing University, China), Shen China), Congyi Zhang (University of Hong Kong, China), Kangrui Yi (Beijing University, China), Gupping Wang (Beijing University, China), Dinesh Manocha (University of Maryland, USA) Journal Abstract: We conduct novel analyses of user behavior in the eyes of dynamic virtual scenes and, based on our analysis, present a new CNN model called DGaze for gaze in HMD-based applications. For the first time, we collect eye tracking data from 43 users in 5 dynamic scenes under free viewing conditions. We then perform a statistical analysis of our data and observe that dynamic positioning of objects, head rotational speeds and sensitive regions are related to user positions. based on our analysis, we present a CNN (DGaze) model that combines object position sequence, head speed sequence, and saliency features to predict users' position in the position of view. Our model can be applied to anticipate not only real-time positions, but also to look at positions in the near future and achieve better results than the previous method. In terms of actual forecasting, DGaze achieved a 22.0% improvement from the previous method in dynamic scenes and received an improvement of 9.5% in static scenes, based on the use of angular distance as a metric score. We also offer a variant of our model called DGaze_ET, which can be used to predict future positions with higher precision by combining accurate data from the past collected using eye tracking. We further analyze our CNN architecture and check the effectiveness of each component in our model. We apply DGaze to watch contingent and game, and also present the results of the user survey assessment. Targeting against attracting attention: Study on the effectiveness of central and peripheral cues in panoramic videos Anastasia Schmitz (University College London, United Kingdom), Andrew McQuarry (University College London, United Kingdom), Simon Julier (University College London, United Kingdom), Nicola Binetti (University College London, United Kingdom), Anthony Steed (University College London, United Kingdom) Abstract Conference: This study of mixed methods assesses the effectiveness of the use of central arrows and peripheral to draw attention in panoramic videos. The 25 adults wore an eye-tracker head display and were targeted to 14 goals in two videos. There are no significant differences in the number of signals followed, the time it takes to reach and monitor the user's goals, memory and engagement. However, participants' glances have travelled significantly greater distance to targets within the first 500ms after flickering compared to arrows. However, most users prefer the arrow, seeing it as more rewarding. Traditional attention paradigms may not be fully applicable to panoramic videos. A study of the impact of 360º film cuts in the attention of users Carlos Maranes (Universidad de Zaragoza), Diego Gutierrez (Universidad de Zaragoza), Ana Serrano (Universidad de Zaragoza) Abstract: The production of cinematic virtual reality content (VR) is still in its early exploratory phase. A key element in film editing is the use of cutting techniques to seamlessly move from one sequence to another. A major aspect of these techniques is camera control. However, in VR, users can freely explore around them 360º, potentially leading to many different experiences. We perform a systematic analysis of users' viewing behaviour across borders while monitoring 360º videos, and insights that could inform creators about the impact of redundancies in audience behaviour. Comparison of visual guiding approaches for 360°, image-based VR tours Jan Oliver Walgrün (HoroAfronesis, Department of Department State University), Mahda M. Bagher (ChoroPhronesis, 1999, 1999, Department of Geography, The Pennsylvania State University), Pejman Sajjadi (HoroAfronesis, Department of Geography, The Pennsylvania State University), Alexander Klippel (HoroFronesis, Department of Geography, The Pennsylvania State University) Abstract Conference: Mechanisms for directing the user visual attention to a particular point of interest play a crucial role in areas such as collaboration VR and AR , cinematic VR, and touring experiences in xR-based education. We report a study in which we compare three different visual guiding mechanisms (arrow, butterfly guide, radar) in the context of 360° imaging-based educational VR tour applications on real sites. A fourth condition without a guidance tool available was added as a baseline. We explore the question: How different approaches compare in terms of target information about participants' experiences and experience scores. SalBiNet360: Forecast of the salyness of 360° images with the local-Global Branched Deep Network Dongwen Chen (South Korean University of Technology, China), Chunmei Qing (South China University of Technology, China), Xiangmin Xu (South China University of Technology, China), Huansheng Zhu (South China University of Technology, China) Abstract: Predicting human visual attention on 360° images is valuable and essential for understanding user behavior. In this document we offer a local-global deep network for predicting 360° images (SalBiNet360). In the global deep sub-network, multiple modules with multiple large-scale presentation modules and a set-top box are used to integrate the functions. Only one multi-show contextual module and single-level decoder are used in the local deep subgrid to reduce duplication of local saliency maps. Finally, the soloist maps are generated by the linear combination of global and local maps of saliency. The experiments illustrate the effectiveness of the proposed framework. Session 4: Avatar - Perception Monday, March 23, 2 p.m. - 3:30 p.m. Tracking 1 (Big Room 1) Thresholds for detecting vertical gains in VR and drone-based teleprompt systems Keigo Matsumoto (University of Tokyo), Eike Langbehn (University of Hamburg), Takuji Narumi (University We examined vertical gains, a new redirection technique that allows us to purposefully manipulate the mapping of a user's physical vertical movements to movements in virtual space and remote space. This approach allows for a natural and more active physical control of a real drone. demonstrate the usability of vertical gains, we have introduced a drone wire and vertical redirection techniques for stretching and brazen use of vr devices are used. We two user studies to study the effective ranges of manipulation and its usability: one study using a virtual environment and one using telethropoieth drone video. Security-Utility Trade-off for Iris Authentication and Eye Animation for Social Virtual Avatars Brendan John (University of Florida), Sophie Jörg (Clemson University), Sanjeev Koppal (University of Florida), Eakta Jain (University of Florida) Journal Abstract: The visual behavior of virtual avatars is crucial for social presence and perceives eye contact during social interactions in Virtual Reality. The virtual reality headset is designed with integrated eye tracking to enable immersive virtual social interactions. This paper shows that infrared cameras used in eye tracking capture images of the eyes that contain the user's iris patterns. Since iris is the gold standard biometric, current technology puts the biometric identity of the user at risk. Our first contribution is a hardware solution based on optical defocus to remove irisometric from the flow of eye-tracking images. We characterize the performance of this solution with different internal parameters. Our second contribution is a psychophysical experiment with the same different task that examines users' sensitivity to virtual avatar eye movements when applying this solution. By setting detection thresholds, our findings provide a set of defocus parameters in which a change in eye movement would change in a conversational setting. Our third contribution is a peer-to-peer study to determine the impact of the parameters of the disfocus on perceived eye contact, attention, naturalness and truthfulness of the avatar. Thus, if a user wants to protect their biometric iris, our approach provides a solution that balances biometric protection while preventing their partner from understanding the difference in the user's virtual avatars. This work is the first to develop secure eye tracking configurations for VR/AR/XR applications and motivates future work in the area. Optical design for Avatar-user Coaxial Point of View Telepresence Kei Tsuchiya (University of Electro-Communications), Naoya Koizumi (University of Electro-Communications, JST PRESTO) Abstract Conference: We offer the avatar from VR space to real space with mid-air imaging technology. In this system, micro-mirror plates (MMA) display the mid-air image and optically transfer the camera to capture users from the position of the average aerial image. We assess the performance of image capture and optical specification of mm at. It was confirmed that the detection of faces works correctly on the captured video by adjusting the ISO sensitivity of the camera. In addition, we have developed a telepromper-action app called dual camera to output the captured video in HMD and control the direction of the camera's view. Andrew Best (University of North Carolina at Chapel Hill, USA), Sahil Narang (University of North Carolina at Chapel Hill, USA), Dinesh Manocha (University of Maryland, USA) Abstract Conference: Introducing a new approach to generating realistic verbal interactions between virtual human agents and user avatars in shared, interactive virtual environments. Sense-Plan-Ask, or SPA, expands its previous natural language planning and processing to allow agents to plan with uncertain information, address questions, and respond to dialogue with other agents and avatars to get the necessary information and fulfill their goals. Agents ask and answer questions. We demonstrate quantitative results by set of simulated indicators and detail the results of a preliminary user survey conducted to assess the plausibility of virtual interactions generated by SPA. Comparing the quality of highly realistic digital people in 3DoF and 6DoF: volumetric video case study Shishir Subramanyam (Centrum Wiskunde & Informatica), Jie Li (Centrum Wiskunde & informatica), Irina Viola (Centrum Wiskunde and Informatica), Pablo Cesar (Centrum Wiskunde & Informatica) Abstract: Dot clouds have emerged as a popular format for real-time 3D reconstructions like people's recovery for social virtual reality. In this study, we evaluated the effect of compression distortions on the visual quality of cloud digital people's point. We compare the performance of the upcoming cloud compression standard with an anchor. The test is conducted in two CONDITIONS for VR observation, which allow 3- and 6 degrees of freedom. To be best, this is the first work that evaluates the quality of dynamic points points in VR. The results show how the content of visual perception tested is influenced and how current datasets may not be sufficient to fully evaluate compression solutions. Monday, March 23, 2 p.m. - 3:30 p.m., Song 2 (Great Room 2) Ryan R. Strauss (Davidson College), Raguram Ramanuhan (Davidson College), Andrew Becker (Bank of America), Tabitha Peck (Davidson College) Journal Abstract: Redirected (RDW) rolls traditionally rely on human-designed logic. However, recent advances in reinforcement training (RL) have produced systems that surpass the human presentation of various control tasks. This article explores the potential of using RL to develop a new rdw steering jet algorithm. Our approach uses RL to train a deep neural network that directly prescribes the gains of rotation, translation and curvature to transform a virtual environment, taking into account the position and orientation in the tracked space. We compare our scientific algorithm with through simulated and real paths. We found that our algorithm intercepted centre-leading roads and found no significant difference in distance travelled on actual roads. We demonstrate that when modeled as a continuous control issue, RDW is a suitable domain for RL and moving forward, our common framework provides a promising path to an optimal RDW steering algorithm. Antong Cao (State Key Laboratory for Virtual Reality Technologies and Systems; Beihang University; Peng Cheng Laboratory, China), Lily Wang (State Key Laboratory for Virtual Reality Technologies and Systems; Beihang University; Peng Cheng Laboratory, China), Yi Liu (State Key Laboratory for Virtual Reality Technologies and Systems; Beihang University; Peng Cheng Laboratory, China), Voyku Popescu (Purdue University) Abstract: In this paper we propose a method of redirecting a feature-guided path that finds and takes into account the visual characteristics of 3D virtual scenes. A collection of independent and view-dependent VE visual features are retrieved and stored in the visual feature map. The navigation path is deformed to fit within the limits of the available physical space by optimizing the mass-spring transition system, according to distortion-sensitive factors derived from the visual function map. A new detail retention rendering algorithm is used to preserve the original visual details as the user navigates VE on the redirect path. Dynamic artificial potential fields for multiusers redirected pedestrian Tianyang Dong (Zhejiang University of Technology, China), Xianwei Chen (Zhejiang University of Technology, China),

Yifan Song (Zhejiang University of Technology, China), Wenyuan Ying (Zhejiang University of Technology, China), Jing Fan (Zezung University of Technology, China) Abstract Conference: To solve the problem of collision caused by multiple users sharing the same physical space , this work presents a new strategy for walking with several users using dynamic artificial potential fields. It generates pushback to push users away from obstacles and other users, and uses gravity to draw users to an open or unobstructed space. Therefore, users not only get the repellent forces from the walls, but also get the repellent forces from other users and their future state. Data from human object experiments show that our method can reduce a user's potential resets by about 20%. Dong-Yong Lee (Yonsei University), Yong-Hun Cho (Yonsei University), Day-Hong Min (Yonsei University), B-Kwon Lee (Yonsei University) Abstract Conference: We offer a new predictive RDW algorithm to Optimal Target (MS2OT), which expands the existing S2OT method in a multi-user environment and different types of tracking space. MS2OT looks at pre-reset actions and uses more management targets than it does remuneration function. User locations and space tracking information are encoded as an image to be the status of the Q-Learning amplification learning model. MS2OT reduces the total number of resets compared to conventional RDW algorithms such as S2C and APF-RDW in a multi-user environment. Experimental results indicate that MS2OT can process up to 32 users in real time. Flaming hands in the virtual space: Recovery in Redirected Walking for direct interaction between two users Dae-Hong Min (Yonsei University), Dong-Yong Lee (Yonsei University), Yong-Hun Cho (Yonsei University), In-Kwon Lee (Yonsei University) Abstract Conference: For two users to meet in a virtual environment to realize realistic direct interaction, they must simultaneously meet each other in physical space. However, if the RDW algorithm is applied to each user independently, the relative positions and orientations of both users may be different in virtual and physical spaces. We present a recovery algorithm adjusting the relative position and orientation so that they become the same in both spaces. Once the restored state is reached, the two users can progress to meet and directly interact in virtual and physical spaces at the same time. Monday, 23 March, 14:00 – 3:30 p.m., 3 time (Studio 1) Alpaca: extensions for AR graphic extensions for web applications Tanner Hobson (University of Knoxville), Jeremiah Duncan (Department of Eecs, University of Tennessee, Knoxville), Mohamed Raji (Endeta Department, University of Tennessee, Knoxville), Idol Lu (University of North Carolina in Charlotte, Charlotte, North Carolina, Usa), Jian Huang , Knoxville, Tennessee , USA) Abstract Conference: In this work, we offer a framework to simplify the creation of augmented reality extensions (AR) for web applications without changing the original web applications. AR extensions developed using Alpaca appear as a web browser extension and automatically connect to a network object document (DOM) model with ar's SceneGraph model. We demonstrate our approach to the development of mixed space applications using three examples. With our extension, the creation and control of augmented reality devices become transparent, as if they were naturally part of the browser. Touch the wall: Compare virtual and augmented reality with conventional 2D-screen hand training systems Anl Ufuk Batmaz (Simon Fraser University, Canada), Aonnoy K Mufasim Fraser Union, Canada), Morteza Malekmakan (Simon Fraser University, Canada), Elham Sadr (Simon Fraser University, Canada), Wolfgang Stewartzlinger (Simons Fraer University, Canada) Canada) Abstract: We created an eye-hand coordination response test to explore user performance in virtual reality (VR), Augmented Reality (AR) and 2D touchscreen. VR and AR consist of mid-air and passive haptic feedback. The results showed that compared to AR, participants were faster and made fewer errors in 2D and VR. However, participants' performance performance is significantly higher in a 2D touchscreen. There is no significant difference between the two feedback conditions. The results show the importance of assessing accuracy and accuracy and assuming that AR headsets are not ready to be used for response time training systems Enlightening patients with augmented Reality Andreas Jakl (St. University of Applied Sciences, Polten, Austria), Anna-Maria Lyenthart (University of St. Poelten, Austria), Clemens Baumann (University of Applied Sciences St. Poelten , Austria), Ariane Jalefar (University of Applied Sciences St. , Austria), Alexander Schlager (University of Applied Sciences, Austria), Lucas Schofer (University of Applied Sciences St. Pölten, Austria), Francisa Bruckner (University of Applied Sciences, Austria) Abstract Conference: Sanctifying Augmented Reality Patients (EPAR) has developed an augmented reality prototype that helps strabism patients better understand the processes of examinations and eye surgeries. Through interactive storytelling, three target groups based on user personalities were able to adjust the level of information based on their interests. We did a 2-phase evaluation with 24 test sites, which resulted in an end result for usability of the system 80:0. For interaction guidelines on virtual 3D content, visual accents were considered sufficient. Overall, participants decided that the AR system as an additional tool could improve patient training in this area. Wenge Shu (Xi'an Jiaotong-Liverpool University), Hai-Ning Lebanon (Xian Jiaotong-Liverpool University), South Chen (Xi'an Jiaotong-Liverpool University), Xiang Li (Xi'an Jiaotong-Liverpool University), Kangyou Yu (Jiaotong-Liverpool University) Abstract Conference: Interaction with hands in mid-air is common in AR systems. Because AR HMD has a limited interaction tracking area, it's easy for users to move their hand out of that tracked area during interaction, especially in dynamic tasks. This study explores visual techniques for limiting awareness, focusing on translation tasks. First, we identified the challenges faced by users during interaction without information about the awareness. From the findings, we proposed four visual methods and evaluated them against baseline state without limit The results showed that visual methods help with dynamic interactions with medium air and their depends on the user. What about the Mentor? Effective visualization of the workspace at AR Telementoring Chengyuan Lin (Purdue University), Edgar Rojas-Munoz (Purdue University), Maria Eugenia Cabrera (Purdue University), Natalia Sanchez-Tmayo (Purdue University), Daniel Andersen (Purdue University) (University of Purdue), Juan Antonio Barragan Noguera (Purdue University), Ben Zarzaur (University of Indiana School of Medicine), Pat Murphy (Indiana University School of Medicine), Katherine Anderson (Indiana University School of Medicine), Thomas Douglas (Portsmouth Naval Medical Center) , Clare Griffis (Portsmouth Naval Medical Center), Juan Wax (Purdue University) Abstract: In AR tingling, the camera built into the headphones of a mint can convey the workspace to the remote mentor. However, as the mentored head moves, the visualization changes frequently and sharply. This document presents a method of stabilizing a high level of first-person video to ensure effective visualization of a mentor's workspace. The visualization is stable, complete, up-to-date, continuous, distortion-free and is displayed from the typical mentoring point of view. The method has significant advantages over unstibilized visualization for a number of tasks. Stabilization also showed good results in the context of surgical monitoring in strict settings. Session 7: Haptics Monday, March 23, 4pm - 5.30pm, Track 2 (Large Room 2) Tangible spherical proxy for object manipulation in augmented Reality Davidlmeyer (LMU Munich, Germany), Julia Dörner (LMU Munich, Germany), Andreas Butz (LMU Munich, Germany), Tobias Höllerer (University of California, Santa Barbara, United States) Abstract Conference: We explore how a familiar shaped object can serve as a physical object for object manipulation in AR. , portable sphere, we demonstrate how virtual objects can be selected, transformed and released. We present a detonless interactive technique suitable for the characteristics of the sphere. In one user survey (N = 30), we compared our approach with three methods based on the controller. As a used case, we focused on a compliance task that had to be completed in mid-air, as well as on a flat surface. The results show that our concept has advantages over two of the controller-based methods in terms of task execution time and user ratings. Our findings are under investigation for integrating tangible interaction into an experience in the field of leases. Pseudo Haptic Table Display and Mass Distribution During Virtual Reality Objects Rotation Run Yu (Virginia Tech, USA), Doug Bowman (Virginia Tech, USA) Journal Abstract: We offer and evaluate a novel mass display and mass distribution techniques for manipulating proxy-based objects in virtual reality. These techniques are specifically designed to generate haptic effects during rotation of the site. They rely on manipulating mapping between visual motion signals and kinesthetic force signals to create a sense of gravity that changes the perception of the properties of the mass of the object without altering physical authority. First we present a technique by which to show the mass of the object, replacing its rotational movement relative to its mass. A psycho-physical experiment shows that this technique effectively generates the right perceptions of the relative mass between two virtual objects. Next, we present two pseudo-haptic techniques designed to show the mass distribution of the object. One of them relies on manipulating the point of rotation, while the other adjusts the rotational motion based on the real-time dynamics of the moving object. An empirical study shows that both techniques can influence the perception of mass distribution, with the second technique being significantly more effective. Design and evaluation of interaction techniques dedicated to integrating haptic displays of type Encountered type into virtual environment Víctor Mercado (Univ Rennes, INSA, Inria, CNRS, IRISA), Maud Marchal (Univ Rennes, INSA, Inria, CNRS, IRISA), Anatole Lecleer (Univ Rennes, Inria, CNRS, IRISA) Abstract: In this document we present new interaction techniques (TT) dedicated to common haptic displays (ETH). The techniques are designed to deal with the problems that often occur for these devices. We offer a design space based on parameters defining the interactive process between the user and ETHD. Five techniques based on the design space were created. The usage scenario is designed to test these techniques on the coloring task on a wide surface. A user survey was conducted to assess the effectiveness of each IT. The results are in favor of techniques based on manual surface displacement, absolute position selection and intermittent interaction with contact. Performance and evaluation of touch-based interaction using electrovibraation feedback in the field of virtual environment Lu Zhao (Beijing Institute of Technology, China), Yue Liu (Beijing Institute of Technology; AICFVE of the Beijing Film Academy, China), Dejiang Yee (Beijing Institute of Technology, China), Zhuoluo Ma (Beijing Institute of Technology, China), Weitao Song (Beijing Institute of Technology, China) Abstract: We are exploring a new method of vr interaction based on electrovibration technology. The main idea is to incorporate a set of manipulation gestures and three types of electrolife into VR interaction to help users acquire different types of tactile perception in virtual manipulation. We present the assessment in which we compare the effectiveness of consumers, measured first in the legal task of the to evaluate different types of electrical vibrations, and then in a virtual office application to evaluate the interactive user interface. The results of our results show that significantly improved with electrovibratic feedback. Our work illuminates the potential of interaction through an electrodisplogate-based touchscreen in virtual environments. ThermiErglov: Pneumatic glove for thermal perception and identification of materials in virtual reality Shaoyu Cai (City University of Hong Kong, Hong Kong, China), Pingchuan Ke (City University of Hong Kong, Hong Kong, China), Takuji Narumi (Tokyo University, Tokyo, Japan), Canning Zhu (City University of Hong Kong, Hong Kong, China) Abstract Conference: Introducing ThermièreGlovska Pneumatic Glove, which provides thermal feedback for users , to support the haptic experience of various temperatures and materials in VR. The system consists of a glove with five inflatable airbags, two temperature chambers and a pneumatic closed-loop temperature control system. Our technical experiments have shown that the system can generate the thermal signals of different materials. Consumer perception experiments have shown that our system can provide five levels of heat sensation and support the identification of users of the material among foam, glass and copper. User studies of VR experience have shown that using TAGlove can significantly improve users' experience of presence. Session 8: Performance 1 Tuesday, March 24, 9:00 AM - 10:30 AM, Track 1 (Big Room 1) Tabita C. Peck (Davidson College), Laura E. Sockol (Davidson College), Sarah M. Hancock (Davidson College) Journal Abstract: A Common Goal of Human Object Experiments in Virtual Reality (VR) Research is evaluating VR hardware and software for use by the general public. A fundamental principle of human testing is that the sample included in a survey must be representative of the target population; Otherwise, the conclusions drawn from the findings may be biased and not be summarized for the population of interest. To assess whether the characteristics of vr study participants are representative of the general public, we examined the demographics of participants from human experiments in the IEEE Virtual Reality Report Compendium of 2015-2019. In the 325 relevant articles that presented 365 experiments involved in humans, we looked at whether this underappreciation could lead to deviations from the researchers' findings, then we did a meta-analysis and meta-regression to assess whether the demographics of the study participants were related to an overall result evaluated in the VR study: the change in training disease after head display VR exposure. As expected, participants in VR studies had small but significant increases in the disease. However, in the disease is systematically linked to the proportion of female participants. We discuss the negative effects of conducting experiments on non-representative samples and provide methodological recommendations that mitigate bias towards future VR studies. The impact of your avatar, Hand Collocation, and hand proximity to Incarnation and Stroop Interference Tabitha C. Peck (Davidson College), Altan Tutar (Davidson College) Diary Abstraction: Understanding the effects of hands proximity to objects and tasks is crucial for manual and near objects. Although avatars have been shown to be useful for various tasks in virtual environments, few studies have studied the effect of avatar hand proximity on working memory. This document presents between participants a user study study of the effects of self-avatars and the physical hand proximity of a common task working memory, cluster interference task. The results showed that participants felt embodied when there was self-resiliration on stage, and that the subjective level of impersonation decreased when participants' hands were not with the avatar's hand. Moreover, the physical location of the participant is significantly related to the disturbances in Stroop: proximal hands have led to a significant increase in accuracy compared to non-proximal hands. Surprisingly, Stroop's intervention was not mediated by the existence of an avatar itself or a level of incarnation. Avatar and sense of incarnation: studying the relative preference between appearance, Control and Point of View Rebecca Fribourg (Iria, Rennes, France), Ferran Argelget (Inria, Rennes, France), Anatole Len Len (Inria, Rennes, France), Ludovic Hoyet (Inria, Rennes, France) Journal Abstract: In virtual reality, a number of studies have been conducted to assess the influence of avatar appearance, avatar control and user perspective on the sense of incarnation (SoE) to virtual reality. However, such studies tend to explore any factor in isolation. This document aims to better understand the relationship between these three factors by conducting a subjective counterfactual experiment. In the presented experiment (n =40), participants had to match an optimal SoE avatar configuration (realistic avatar, whole body motion capture, first-person point of view), starting from a minimum SoE configuration (minimum avatar, no control, third-party perspective), by increasing the speed of each factor's level. The choice of the participants gives an idea of their preferences and perception on the three factors under consideration. In addition, the subjective coordination procedure was carried out in the framework of four different interaction tasks in order to cover a wide range of actions that an avatar can do within VE. The report describes an experiment at baseline (n=20) that used to determine the number and order of different levels for each factor before the subjective matching experiment (e.g. different degrees of realism ranging from abstract to custom visual avatars). The results of a subjective matching experiment indicate that perspective and control levels have been steadily increased by users before onset levels when it comes to improving SoE. Second, several configurations are identified with an equivalent SoE as the one that is felt in the optimal configuration, but differ between tasks. Taken together, our results provide valuable insights into which factors to prioritize to improve SoE to avatar in various tasks, as well as for configurations that lead to soe execution in VE. Avatar effect the appearance of the thresholds for detecting Remapped Hand movements Nami Ogawa (University of Tokyo), Takuji Narumi (University of Tokyo), Michitaka Hirose (University of Tokyo) Journal Abstract: Techniques for interacting with hands in virtual reality often use visual domination over proprioception to reb physical hand movements on different movements. However, when the shift between virtual and physical hands increases, the latch of virtual hand movements is hardly self-recording and users are aware of the reming. Interestingly, the body's sense of self-recognition is called a sense of body ownership (SoBO) in the field of psychology, and the realistic avatar, the stronger the SoBO. Therefore, we assumed that realistic avatars (i.e. human hands) could encourage self-perception of remometric movements better than abstract avatars (i.e. spherical pointers), making reproduction less noticeable. In this paper, we present an experiment in which participants repeatedly performed movements with their right hand while applying different amounts of horizontal shifts. We measured the thresholds for detecting the reaction for each combination of directions of movement (left or right) and avatar appearances (realistic or abstract). The results showed that realistic avatars increased the detection threshold (i.e. decreased sensitivity) by 31.3% of abstract avatars when applying the left shift (i.e. when the hand moved in the direction of movement from the middle line). Moreover, the proprioceptive drift (i.e. shifting the self-expanding localization to the avatar) is larger with realistic left-shift avatars, indicating that visual information was given greater in integrating the visu-proprioceptics into realistic avatars. Our findings quantify that realistic avatars can make it less noticeable to map larger discrepancies between virtual and physical movements and can potentially improve a wide variety of manual techniques without changing the mapping itself. Session 9: 3DUI- Manipulating Manipulation March 24, 9 a.m. - 10:30 a.m., 2nd Aisle (Big Room 2) of motor work in virtual 3D manipulation of Alexander Kulik objects (virtual reality and research visualization, Bauhaus-Universität Weimar), Andre Kunort Virtual Reality and Visualization Research, Bauhaus-Universität Weimar (), Bernd Froehlich (Virtual Reality and Visualization Studies, Bauhaus-Universität Weimar) Journal Abstraction: The Law of Fitts facilitates approximate comparisons of the implementation of the target acquisition in various settings. Conceptually, the difficulty index in manipulating a 3D object with six degrees of freedom can also be calculated, allowing comparison of the results of different studies. However, preliminary experiments often reveal much worse results than might be expected on this basis. We argue that this discrepancy stems from confusing variables and shows how Fitts laws and related methods of research can be applied to isolate and identify relevant engine performance factors in 3D manipulation tasks. The results of the official user survey (N=21) show a competitive performance in line with the Fitts model and provide empirical evidence that simultaneous 3D rotation and translation can be useful. Transfer of coordination skills to the impractical hand in immersive environments Shan Xiao (College of Information Science and Technology, Jinan University, Guangzhou, Guangdong, China), Xupeng Ye (College of Information Science and Technology, Jinan University, Guangzhou, China), Yakiu Guo (College of Information Science and Technology, Jinan University, Guangzhou, China), Boyu Gao (College of Information Science and Technology, Jinan University, Guangzhou, China), Ginny Long (College of Information Science and Technology) , Jinan University, Guangzhou, China) Abstract Conference: We are conducting a well-designed study that systematically examines the effects of visualizations on two-manic interaction training. The results show that performing and seeing a two-person task or performing a unilateral task and seeing two-person actions is better than performing and seeing a unilateral task or not performing a task and seeing a two-person action. Another contribution is that the second experiment yields results indicating that the presentation of higher fidelity positively influences the performance of the unilateral task and the two-manic visualization. Precise and realistic capture and manipulation in Virtual Reality without feedback Thibauld DELRIEU (CEA-LIST) Abstract: The main contribution of this document is to improve the existing method, which combines a virtual kinematic hand with a visual hand tracking system. Here we apply help based on virtual springs between virtual hands and the virtual object. The aid shall be on the basis of an analysis of the usual criteria for feasible or not. The proposed method was validated in a controlled experiment that showed that our help improves the speed and accuracy of the pick and place task, which includes a comprehensive set of objects sized for precision. Furthermore, consumer feedback shows a clear preference for the current approach in terms of naturalness and effectiveness. 3D User Interaction Comparative Analysis: How to Move Virtual Objects in Mixed Reality Hyo Kang (University of Florida), Jung-hye Shin (University of Wisconsin-Madison), Kevin Ponto (University of Wisconsin-Madison) Abstract: This study explores three interaction techniques, including looking at a pinch, touching and grabbing, and interacting the world in miniature. Overall, comparative analysis shows that WIM has provided the best usability and performance of the task from other techniques studied. We conducted in-depth interviews and analyzed the gestures of the participants. Analysis of gestures shows that the shapes of the furniture, as well as its perceived characteristics such as weight, largely determine the instinctive form of interaction of the participant's hand. Based on these findings, we present design proposals that can help 3D interaction designers develop a natural interaction with mixed reality hands. The manipulation of virtual realities Chen (University of Toronto, Canada), Rabbi Balakrishnan (University of Toronto, Canada), Tovi Grossman (University of Toronto, Canada) is an attractive paradigm of interaction in VR and AR. However, a restriction of free entry lies in the ambiguous effect of interaction, as the same gesture performed on a virtual object can invoke different operations. We present an experimental analysis of a set of clarification techniques in VR, comparing three input methods (head view, speech and steppe) combined with three different times to resolve ambiguity (before, during and after interaction). The results show that using a look for clarification during interaction with the object achieves the best performance. Session 10: Crowds and perception Tuesday, March 24, 9am-10.30am Track 3 (Studio 1) Effects of interacting with a crowd of emotional virtual people of affection and nonverbal behavior of users Matias Volonte (Clemson University, USA), Yu Chun Hsu (National Chiao Tung University, Taiwan), Quan-yu Liu (Chuo Tung National University, Taiwan), Joseph P. Meser (Clemson University, USA), Sai Keung Wong (National University of Chiao Jung, Taiwan), Quan-yu Liu (National Chiao Tung University, Taiwan) , Joseph P. Meser (Clemson University, USA), Sai-Keung Wong (National Chiao Tung University) , Taiwan), Sabarisch V. Babu (Clemson University, USA) Abstract: We looked at the effects on users on interaction with a virtual human crowd in a fascinating virtual reality environment. We developed a crowd model based on the agent rich properties including eye sight, facial expression, body movement, and verbal and nonverbal behavior. The scenario is a virtual market in which consumers had to collect specific elements. In an interdisciplinary design, users interacted with a virtual human crowd that showed opposing valent emotional expressions. There are four design conditions between objects, including different combinations of emotional expressive characters performing verbal and nonverbal behavior. We reported our findings with an in-depth analysis. The effects of the size of the virtual audience on social anxiety during speaking to the public authorities in Hamburg, Germany, Melik Berk Balci (University Medical Center Hamburg-Ependorf, Germany), Frank Steinicke (Universität Hamburg, Germany), Simone Kyun (University Medical Center Hamburg-Ependorf, Germany), Jürgen Galinat (University Medical Center Hamburg-Ependorf, Germany) Conference: Presenting the adaptation of the Trier Social Stress Test (TSST) to study the effects of different numbers of virtual people (VHs) on perceived social anxiety (SA). In addition, we compare results with in vivo TSST with 3 real audiences. 24 participants participated in this experiment. As a result, physiological arousal can be observed when inducing VR, which causes SA, but still less than in vivo TSST. Also, subjective measures showed a high state of anxiety experienced during the experiment. The effect of virtual audience size can only be observed in heart rate (HR), as the virtual audience size of 3 VHs triggered the highest HR responses, which differed significantly from the size 6 and 15 audience. Analysis of pedestrian behavior in Augmented Reality - Proof of concept Philippe Maroon (Technical University of Munich, Germany), Andre Dietrich (Technical University of Munich, Germany), Lorenz Prasch (Technical University of Munich, Germany), Sonia Schneider (Technical University of Munich, Germany) Abstract: This document presents a new approach to augmented reality simulator on a walking simulator. With this simulator, the participant experiences virtual vehicles augmented to a real scenario, allowing safe and controlled testing in a realistic environment. In inter-study design, 13 participants had a scenario for accepting gaps with virtual vehicles, while 30 participants had the same scenario with real cars in the same environment. The results showed similar, but also compensated for behavior under both conditions. However, augmented reality has been shown to be a promising tool for walking research, but there are also limitations depending on the case of use. Eye-Gaze Crowd Activity: Impact of Virtual Reality and Density Florian (Inria Rennes France), Inria Rennes France, Anne-Hélène Olivier (M2S Lab, Inria France, France), This paper explores the neighborhood for interaction, that is, the set of people who influence our movement as they walk in the crowd. We created a virtual reality (VR) study that uses motion and eye data and their connection to the neighborhood for interaction. The study was divided into two experiments. The former appreciated the VR-induced bias of eye movement as he strolled down a busy street. The second experiment examined the influence of crowd density on eye movements. Our results show that increasing density does not affect the frequency of eye fixation, but causes a shift in the direction of movement. Determining the peripersonal boundaries of space and their plasticity in relation to the subject and characteristics of the agent in an immersive virtual environment, Lorna Buck (Vanderbilt University, USA), Sohee Park (Vanderbilt University, USA), Bobby Bodenheimer (University of Vanderbilt, USA) Abstract: In this work, we explore the range of space (PPS) or functional distance reach, in virtual reality. Naturally, the boundaries of PPS in the real world are modulated by different contextual factors. We completed two studies using multisensory stimuli to determine the boundaries of PPS and examined whether PPS in a compelling virtual environment behaves consistently with real-world discoveries and can be changed by object and virtual agent interactions. We found that the boundaries are consistent with those in the real world and are responsive to object and agent interactions. These discoveries have potential implications for the design of virtual environments. Session 11: Cooperation Tuesday, March 24, 1:30 - 15:00, Track 1 (Great Room 1) Extended virtual teleportation for high-fitrusion Telecollaboration taehyun Rhee (Centre for Computing Innovation, University of Victoria Wellington, Stephen Thompson (Centre for Computing Innovation, University of Victoria Wellington), Daniel Medeiros (Centre for Information Innovation, University of Wellington), Rafael dos Anjos (Centre for Computer Media Innovation , Victoria Wellington University) , Abstract of Telecollaboration Magazine involves teleportation of a remote collaborator to another real environment where their partner is located. They play an important role in resolving relevant spatial references in remote collaboration. We present a new asymmetric platform, Advanced Virtual Teleportation (AVT), which provides high-sterility telething through a remote VR user (VR-Traveler) in a real collaborative space to interact with a local AR user (AR-Host). AVT uses a 360° video camera (360-camera) that live streaming of all directed scenes over a network. The remote VR-Traveler, which watches the video in the VR headset, experiences a live presence and a joint presence in the actual collaborative space. VR-Traveler's movements are captured and transmitted to a 3D avatar screened on the 360th camera, which can be seen on the AR-Host display. Visual and audio signals for each contributor are synchronized in a mixed reality (MRC-space) collaborative space where they can interactively edit virtual objects and collaborate in the real environment using real objects as a reference. High fidelity, real-time rendering of virtual objects and seamless mixing in the real scene allows unique scenarios for using mixed reality. Our working prototype has been tested with a consumer survey to assess spatial presence, joint presence and user satisfaction during telecolloboration. Possible uses of AVT have been identified and proposed to guide future use. Consumer study on one-to-one-to-very-mixed reality collaboration Geonsun Lee (Korea University, South Korea), HyeongYeop Kang (Kyung Hee University, South Korea), JongMin Lee (Korea University, South Korea), JungHyun Han (Korea University, South Korea) Abstract: In a to many mixed reality environment where several local users wearing headphones wearing AR headphones are monitored by an expert from Shirley HM , we evaluated three view sharing techniques: 2D video, 360 video and 3D model, with 2D video. Their performances were compared in two different collaborative scenarios based on search and assembly. In the first scenario, a local user performs a search and assembly. In the second scenario, two local users are dedicated roles, one to search and others to assemble. The results of the experiment showed that the 3D model, augmented by 2D video, was time-efficient, usable, less demanding and most preferred in one to many mixed collaborations of reality. Optimization and manipulation of contextual mutual spaces for multi-user virtual and augmented reality interaction Mohammad Keshavarzi (University of California, Berkeley), Alan Y. Yang (University of California, Berkeley), Vogen Co (University of California, Berkeley), Louisa Kaldas (University of California, Berkeley) Abstract Conference: Spatial calculations are physically limited by the geometry and semantics of the user's local environment. This limitation is heightened in distant scenarios for interaction with multiple users, where finding common virtual land, physically accessible to all participants, becomes a challenge, especially if they are not aware of the spatial environments of other users. In this document, we enter which can find the optimal virtual setup space for interaction with multiple users, where spaces for remote rooms users can be different Sizes. The frame recommends additional movement of surrounding furniture, which expand the size of the mutual space with minimal physical effort. Design and initial evaluation of VR-based immersion and interactive architectural design discussion system Ting-Wei Hsu (National University Chiao Tung, Taiwan), Ming-Han Tsii (Feng Chia University, Taiwan), Sabarysh V. Babu (University of the United States, USA), Pei-Hsien Hsu (National University Chan Tchau, Taiwan), Hsuan-Ming Chang (Chant Chan National University, Taiwan), Wen-Shie Lin (National University of Shyao Tun, Taiwan), Jung-Hongang (National Chinung University) , Taiwan) Conference Abstract : In this report, we developed a discussion system for the VR architecture that keeps members discussing the model and changing patterns during the discussion. Members communicate through voice, object manipulation, and sketching. Several tools have been developed to improve the sense of presence and effectiveness of the discussion. A return mechanism has been developed to help the user quickly return to a previous state of discussion to make some changes or start a new direction of discussion. We have conducted a user survey and reviews show that the system is effective and useful to support the discussion on designing the architecture. Multi-Window 3D Interaction for Collaborative Virtual Reality Andre Koonert (University of Weimar), Tim Weissker (University of Weimar), Bernd Fröhlich (University of Weimar), Alexander Kulik (Weimar University) Journal Abstract: We present a new virtual reality system that offers multiple immersive 3D views in large 3D scenes. The physical setting consists of two synchronised multi-consuming 3D displays: a countertop and a large vertical projection screen. These displays offer different presentations of the shared 3D scene. The wall display lends itself to the egocentric examination at 1:1, while the desktop table allows allocentric examination. In addition, portable 3D portals facilitate personal stage exploration, comparison of views and exchanges with others. Our developments allow seamless 3D interaction between these independent 3D views. This requires simultaneous presentation of user input in different viewing contexts. However, the resulting interactions cannot be performed independently. The application must coordinate interactions and resolve any uncertainties in order to ensure plausible effects. We analyze and document the challenges of seamless 3D interaction in multiple independent review windows, offer high-level software design to realize the necessary functionality and apply the design of a set of interaction tools. Our setup was tested in an official user survey, which revealed benefits of the joint 3D data survey with multiple views in terms of user preferences, comfort and Productivity. Session 12: 3DUI - Navigation - Interfaces and chair Tuesday, March 24, 1:30 - 3:00 PM, Trail 2 (Big Room 2) Tim Menzner (University of Applied Sciences and Arts), Travis Geslane (University of Applied Sciences and Arts), Alexander Corte (University of Applied Sciences and Arts), Jens Grubert (University of Applied Sciences and Arts) Summary: Virtual Reality (VR) enables the study of large information spaces. In physically confined spaces, such as planes or buses controlling or mid-air interaction in mobile VR can be challenging. Instead, the input space on and above touch-enabled devices, such as smartphones or tablets, can be used to interact with VR in these spaces. We compared one above surface technology interaction with traditional 2D surface input to navigate large plane information spaces, such as maps in a controlled user survey (n = 20). The surface interaction technology we offer leads to significantly better performance and user preferences compared to pinching to zoom and swiping to flipper when navigating in planned information spaces. Real Walking in Place: HEX-CORE-PROTOTYPE Omnii-Nimble Treadmill Ziyao Wang (School of Automation, Southeastern University), Haikun Wei (School of Automation, Southeastern University), Kanjian Zhang (School of Automation, South-Tay), Liping Xie (School of Automation, Southeastern University) Abstract Conference: Locomotion is one of the most important problems in virtual reality. The real walking experience is the key to immersing myself in exploring the virtual world. The multi-pointed treadmill is an effective way to ensure natural walking within VR in the room. This article features a new multi-pointed treadmill called HEX-CORE-PROTOTYPE (HCP). The principle of synthesis and decomposition of speed applies to the formation of a multidirectional field of speed. Our system can provide a full degree of freedom and real walking experience on the spot. Compared to the best system, the height of HCP is only 40% of it. VR Bridges: Simulating smooth uneven surfaces in VR Hristina Vasilevska (TU Vienna, Austria), Balint Iston Kovacs (TU Ween, Austria), Hannes Kaufmann (TU Wilhelm, Austria) Abstract: Passable smooth uneven surfaces are inherent in reality, but extremely devoid of VR. In this document, we focus on human height and oblique perception of simulated uneven surfaces with multisensory stimulation. Our results show that the use of a curved shovel creates a convincing illusion of an uneven surface significantly higher than physical, especially in multisensory stimulation. The use of a flat is less realistic and leads to massive height and inclination. However, if the concave support cannot be used, a flat support for the Explore around - The impact of separating gaze and the direction of travel in seated and ground-based virtual reality using the torso-focused management Daniel Zielasko (Human-computer interaction, University of Trier), Yuen C. Law (School of Computer Technology, Costa Rica Institute of Technology), Benjamin Weyers (Man-Computer Interaction, University of Trier) Abstract Conference: Inclination is shown several times to be a suitable virtual travel technique when sitting. The most commonly used management method is staring/pointing the head. However, this does not allow to inspect the environment regardless of the direction of travel. The change in the steering aimed at the torso allows the latter and, moreover, takes nothing from the natural nature of the oblique metaphor. We empirically studied the impact of this freedom in a ground scenario and supplemented the conditions with a virtual method aimed at the body, then crossed all with devices-based management conditions. NaviBoard and NaviChair: Limited translation combined with full rotation for effective virtual locomotive Thinh Nguyen-Vo (Simon Fraser University), Bernhard Rike (Simon Fraser University), Wolfgang Sturzlinger (Simon Franzer University), Duc Min Pham (Simon Fraser University), Ernst Cruyff (University of Applied Sciences in Bonn-Geig) Journal Abstract: Walking has always been considered the gold standard for navigation in virtual reality exploration. Although full rotation is no longer a technical challenge, physical translation is still limited through limited tracked areas. While rotating information is important, the usefulness of the translation component is not yet clearly related to mixed results in previous work. To overcome this gap, we conducted an experiment with a mixed method to compare four levels of translation signs and control: none (using a trackpad on the HTC Vive translation controller), tilting the upper body (sitting on NaviChair, tilting the upper body to a locomotive), the whole body tilting / stepping (standing on a platform called NaviBoard, tilting on one body or stepping on one leg of the navigation center) and full translation (physical The results show that translation signs and control have a significant impact on various measures, including task performance, task load and simulator disease. While participants performed significantly worse when using a controller without embodied translational signs, there was no significant difference between NaviChair, NaviBoard and actual walking. These results show that translational motion and control systems from the low-cost interface can provide sufficient sensory information to maintain spatial updating, spatial awareness and movement in VR, although future work will need to explore how these changes are other tasks and scenarios may or may not be summarised. Session 13: Visual Comfort Tuesday, March 24, 13:30 - 15:00, Track 3 (Studio 1) Repetitive improvement of visual comfort for casual stereoscopic photography Yuzhen Niu (College of Mathematics and Computer Science, Fuzhou University, China), Qingyang Zheng (College of Mathematics and Computer Science, Fuzhou University, China), Wenxi Liu (College of Mathematics and Computer Science, Fuzhou University, China), Wenjon Guro (College of Mathematics and Computer Science) Fuzhou University, China) Conference summary: In this document, we are interested in random stereoscopic photography, which allows ordinary users to create a stereoscopic photo taken with a hand-held monoculum camera. To cope with geometric limitations and inequality in captured pairs of images, we present a rough to fine frame. In the rough stage we offer a single method of reinforcement of learning, in which the created stereo image changes and is evaluated in the expression visual comfort. Furthermore, in order to further improve the visual comfort of the stereoscopic image produced in the rough stage, we are introducing another independent repetitive network to refine its inequality. Visualization and evaluation of the parameters of the ergonomic field of vision in the first-person virtual environment Tobias Gunther (Technical University of Dresden, Germany), Inga-Lisa Hilgers (Technical University of Dresden, Germany), Rainer Grize (Technical University of Dresden, Germany), Martin Schmauder (Technische Universität Dresden, Germany) Abstract: Especially in the field of mechanical engineering, market pressure for small and medium-sized enterprises (SMEs) is increasing due to faster development and more complex projects However, standards and ergonomic safety rules must be observed. In recent years, various apps have been introduced to help users understand and meet the awkward requirements. However, time-consuming tools are mainly for ergonomics experts and often make it difficult for engineers from SMEs. We present to you a fascinating concept that allows inexperienced users to quickly evaluate the ergonomic field of vision parameters presented by easy-to-understand visualizations. The decision shall be compared with standard market and scientific approaches. Zubin Choder (University of Central Florida, Orlando, Florida, United States), Kangsoo Kim (University of Central Florida, Orlando, Florida, United States), Ryan Schubert (Synthetic Reality Lab, University of Central Florida, Orlando, Florida, Usa), Gerd Bruder (SREAL, University of Central Florida, Orlando, Florida, Usa), Greg Welch (SREAL, University of Central Florida, Orlando, Florida, USA) Abstract: In Social Virtual Reality (VR) Abstract: In Social Virtual Reality (VR) the Big Head technique is one of the most common using more of the visual space on the display to easily transmit facial social cues with a slightly enlarged head scale. In this paper we present a human study to understand the impact of an increased or reduced head scale in social VR on the participants' ability to perceive facial expressions, as well as their sense of comfort and a sense of unpre predictor. We examined two scaling methods and compared them in terms of perception thresholds and user preferences over different distances. We discuss the implications and guidelines for practical applications that aim to use VR-enhanced social cues. Austin Erickson (University of Central Florida), Kangsoo Kim (University of Central Florida), Gerd Bruder (University of Central Florida), Gregory F. Welch (University of Central Florida) Abstract Conference: In this article, we present a human study exploring the correlations between color mode and ambient lighting in terms of visual acuity and fatigue of VR HMD. We compare two color schemes characterized by light letters on a dark background (dark mode), or dark letters on a bright background (light mode), and show that the dark background in dark mode provides a significant advantage in terms of reduced visual fatigue and increased visual acuity in darkened virtual environments of current HMD. Study of differences in visual discomfort, sparked by the long-term immersion between the virtual environment and the physical environment Jie Guo (MRAD of the Beijing Institute of Technology, China), Dongdong Weng (MRAD of the Beijing Institute of Technology, China), Hui Fang (MRAD of the Beijing Institute of Technology, China), Zhenliang Zhang (MRAD of the Beijing Institute of Technology, China), Jiamin Ping (MRAD of the Beijing Institute of Technology, China) , Yue Liu (MRAD of The Beijing Institute of Technology) , China), Yongtian Wang (MRAD of the Beijing Institute of Technology, China) Abstract: To explore the effects of visual discomfort caused by long-term immersion in a virtual environment (VE), we did a comparative study to assess users' visual discomfort in an 8-hour working rhythm and compared the differences between ALL and the physical environment. The results showed that VE affects visual fatigue the most compared to the physical environment. The results also showed that the student's size was negatively associated with subjective visual fatigue, and long-term display-based work only affected the maximum response of the participants in the accommodation. This work is a supplement to the necessary but under-explored area of visual fatigue in long-term immersion in VE. Session 14: Perception "" "Manipulation" Tuesday, March 24, 3:30 p.m. - 5 p.m., Song 2 (Big Room 2) Detect scaling interactions with hands in virtual reality: Effects of Motion Direction and the complexity of tasks Shaghayegh Esmaeili (University of Florida, United States), Brett Benda (University of Florida, USA), Eric D. Ragan (University of Florida, United States) Conference Abstract: In VR, while the easiest use of the tracked hand supports a one-to-one mapping between the physical and virtual worlds, some cases may benefit from changing this mapping through scaled or redirected interactions. It is important to know to what extent re-approachment techniques can be applied to scaled interactions without users detecting the difference. We expand preliminary studies of redirected hand techniques by examining users' perception of scaled hand movements and assessing thresholds for detecting different types of hand movement. We conducted two experiments with 2AFC design to assess the thresholds for detection of remons. The impact of multisensory stimuli on confidence levels for perception-cognitive tasks in VR Sungchul Jung (University of Canterbury, NZ), Andrew L Wood (University of Canterbury, NZ), Simon Hoermann (University of Canterbury, NZ), Pramuditha L Abhayawardhana (University of Canterbury, NZ), Robert W Lindeman (University of Canterbury, NZ) Abstract Conference: We investigate the effects of multi-sensory stimuli, namely visual, audio, two types of tactile (floor vibration and wind) and smell in terms of confidence levels of the task of finding and reconciling , which requires a combination of sensory and cognitive work in a virtual environment. We measured the level of presence when participants visited virtual locations with different combinations of sensory reviews. Our results show that our multisensory VR system is superior to a typical VR system (vision and audio) in terms of the user's sense of presence and preference. However, the subjective level of trust is higher in a typical VR system. Haodong Liao (Center for Future Media, School of Computer Science and Engineering, University of Electronic Sciences and Technology of China, China), Ning Xie (Center for Future Media, School of Computer Science and Engineering, University of Electronic Sciences and Technology of China, China), Huiyuan Li (School of Life Sciences and Technology, University of Electronic Sciences and Technology of China, China), Yu Lihang (Center for the Future Media) , School of Computer Science and Engineering, University of Electronic Sciences and Technology of China, China), Jianping Su (Center for Future Media, School of Computer Science and Engineering, University of Electronic Sciences and Technology of China, China), Feng Jiang (Center for Future Media, School of Computer Science and Engineering, University of Electronic Sciences and Technology of China, China), Weipeng Huang (Center for Future Media , School of science and and University of Electronic Science and Technology of China, China), Heng Tao Shen (Center for Future Media, School of Computer Science and Engineering, University of Electronic Sciences and Technology of China, China) Abstract Conference: In this article, we divide external zeitgebers into visual and auditory zeitgeers. We then combine these zeitgebers with attention-oriented cognitive load to investigate their impact on time assessment and presence, especially in III. We offer a data-based method to build a multimodal predictive equation for determining time and presence. We also design a complex application and validate the predictive equation. Our functionality model can guide the VR app's design in terms of judging the length of time and user presence, as well as achieving a better experience of VR users. Think twice: The influence of immersion in the in-game decision-making process in virtual reality Sebastian Oberdörfer (University of Würzburg, Germany), David Heydrich (German Aerospace Center (DLR), Germany), Mark Erich Latoschik (University of Würzburg, Germany) Abstract: Broken decisions leads to an inability to distinguish between advantageous and unfavorable options. We investigated whether and how immersion influences decision-making using a VR-based realization of the Iowa Gambling Task (IGT). Participants are challenged to draw cards from four different decks, of which two are advantageous. The selections and selections made serve as a decision-making measure for a participant during the task. We compared the effects of immersive decision-making between IGT-based IGT desktop realization with high immersion rate and high vr immersion rate. Our results revealed significantly less favorable solutions when completing the VR version. Austin Erickson (University of Central Florida), Gerd Bruder (University of

Central Florida), Pamela J. Wisniewski (University of Central Florida), Gregory F. Welch (University of Central Florida) Abstract Conference: We present a consumer study to assess the relationship between the virtual stimuli presented at AR-HMD and the feeling of duration and temperature. In particular, we are examining two independent variables: the apparent temperature of the stimulus, which may be hot or cold, and the location of the stimulus, which may be in direct contact with the user, in indirect contact with the user, or in direct and indirect contact at the same time. We are exploring how these variables affect the perception of body temperature and the environment, with participants assessing the time while monitoring the virtual stimulus and answering subjective questions about body temperature and the environment Session 15: 2:00: 2 Wednesday, March 25, 9:00 - 10:30 AM, Track 1 (Big Room 1) Engagement in the selection of virtual reality studies Difeng Yu (University of Melbourne, Australia), Qiushi Zhou (University of Melbourne, Australia), Benjamin Tag (University of Melbourne, Australia), Tilman Dingler (University of Melbourne, Australia), Eduardo Veloso (University of Melbourne, Australia), Jorge Goncalves (University of Melbourne, Australia) Abstract Conference: Selection studies are before and are needed for VR research. However, due to the annoying and repetitive nature of many such experiments, participants may become alienated during the study, which is likely to influence the results and conclusions. In this work, we study the postponement of the participant in VR selection experiments and how this problem affects the results. In addition, we evaluate the benefit of four engagement strategies to keep participants engaged during VR selection surveys and to explore how they affect user performance. Based on our findings, we distill several design recommendations that may be useful for future VR selection studies or user tests in other areas where similar repetitive features are used. Effects of virtual hand representation on interaction and incarnation in HMD-based virtual environments using Christos Lougiakis controllers (National and Kapodistria University of Athens & ATHENA Research Center, Greece), Akrivi Katifori (National and Kapodistrian University of Athens & ATHENA Research Centre, Greece), Maria Russou (National and Kapodistrian University of Athens, Greece), Ioannis-Panagiotis Ioannis (ATHENA Research Center, Greece) Abstract: Expanding the work of Argelaguet et al. in 2016, we examine the effects of virtual hand statements, in this case with the help of controllers. We created an experiment in which users perform the task of moving a cube on a table with and without obstacles (Brick wall, barbed wire, electric current), interacting inside a fascinating virtual environment using three images: sphere, controller, hand. The results show that no significant differences have been identified in the sense of agency, but consumer performance in the field is significantly worse and, in the case of positioning, has surpassed the others. Moreover, the Hand generated the strongest sense of ownership and it was the favorite performance. Using face animation to increase avatar illusion and self-determination and self-identification Mar Gonzalez-Franco (Microsoft Research), Anthony Steed (Microsoft Research), Steve Huogendijk (Microsoft Research), Eyal Ofek (Microsoft Research) Journal (Microsoft Research) Abstract: Through Virtual Reality Avatars (VR) we can achieve the illusion that the avatar replaces our body: the avatar moves as and we see it from a first-person perspective. Self-likeness, the process of defining representation as a challenges because a key factor is that we see and have agency in our own HMD because face tracking is cumbersome or error-prone. However, limited animation is easily achieved on the basis of speaking. We examine the avatar level, i.e. by believing that the face photo is its own face, with three levels of facial animation: (i) one in which the facial expressions of avatars are static, (ii) one in which we implement synchronous lip movement, and (iii) one in which the avatar presents additional face animations with which they sync with the lips. , with blinking, designed by a professional animator. We measure self-determination using a facial morphing tool that transforms from the participant's face to the face of a gender-matching avatar. We find that the self-limiting avatar code can be increased by pre-baked animations, even when they are not photorealistic or resemble the participant. Comparative assessment of the review and self-placement of walkability to a realistic sliding door in real and immersive virtual environments Ayush Bhargava (Key Lime Interactive), Hannah Solini (Department of Psychology, Clemson University), Katherine Lukaitis (Department of Psychology, Clemson University), Jeffrey Bertrand (Clemson University Center for Workforce Development), Andrew Robb (School of Computer Technology, Clemson University), Christopher Pagano (Department of Psychology, Clemson University) , Sabarys Babu (School of Computing, Clemson University) Abstract: Virtual reality simulations require users to make spontaneous judgments about simonesia such as crossing obstacles, passing through gaps, etc., that are affected by our self-distribution in the virtual world. As standalone avatars become popular, it is important to explore how different judgments on tolerable possibilities are affected by their presence. In this work, we examine the effects of self-handling in the body on patency convictions for sliding door in VR and compare it to the real world. The results show that convictions for omission are more conservative in VR. However, the presence of an avatar itself does not significantly affect judgments made in VR. Reducing task load with an embodied intelligent virtual assistant to improve performance in co-making Kangsoo Kim (University of Central Florida), Celso de Melo (US Army Research Laboratory), Thal Noruzi (University of Central Florida), Gerd Bruder (University of Central Florida), Gregory Welch (University of Central Florida) Abstract: In this paper, we investigate the effects of intelligent virtual assistant (IVA) impersonation on decision-making. In study participants performed a desert survival task under three conditions: (1) performing the task only, (2) (2) with an uprooted voice assistant and (3) working with an embodied assistant. Our results show that both assistant conditions resulted in higher performance when performing the task yourself, but interestingly, the task load with an embodied assistant is significantly lower than with the uprooted assistant. We discuss the findings with implications for effective and efficient cooperation with IVAs, while emphasizing the increased social presence/wealth of the incarnated assistant. Session 16: Applications - Training and Simulation Wednesday, March 25, 9:00 - 10:30 Track 2 (Large Room 2) Automatic Synthesis of Virtual Wheelchair Training Scenarios Wanwan Li (George Mason University), Javier Talavera (George Mason University), Amilcar Gomez Samayoa (George Mason University), Jyh-Ming Lien (George Main University), Lap-Fai Yu (George Mason University) Abstract Conference: In this book we propose an optimization-based approach to automatically generating virtual learning scenarios in virtual reality wheelchairs. Our approach automatically creates a realistic layout of stage furniture, as well as a learning path that the user has to go through by controlling a simulated wheelchair. The training properties of the road, namely, the desired length, the degree of rotation and narrowness, are optimized so as to achieve the desired training effects. We assessed to validate the effectiveness of the proposed approach. Users showed an improvement in wheelchair control skills in terms of skills and precision after training. Real-time VR Simulation of laparoscopic cholecystectomy based on parallel positioning dynamics in GPU Junjun Pan (state key laboratory for virtual reality technology and systems, Beihang University, Peng Cheng Laboratory), Leiyu Zhang (state key laboratory for virtual reality technologies and systems, Beihang University), Peng Yu (State Key Laboratory for Virtual Reality Technology and Systems, Beihang University, Peng Cheng Laboratory), Yang Shen (Faculty of Education, Beijing Normal University), Haipeng Wang (Beijing Aerospace General Hospital), Aimin Hao (Beihang University, Pen Cheng Laboratory), Hong Qin (Department of Computer Science, Stony Brook University) Abstract Conference: VR-based medical training have significantly changed the training regime of surgeons. It can simulate the operation from visual, auditory and tactile aspects. This document presents a positioning-based VR simulation framework (PBD) for cholecystectomy. To accelerate the deformation of organs, the limitations of PBD are solved in parallel with an algorithm for coloring graphics. There is also a model for biothermal conductivity and a hybrid multi-model method of binding to improve the realism of electrocution of adipose tissue. Finally, is evaluated by a number of digestive surgeons who can offer great help in improving surgical skills. Physics-based Virtual Reality Simulation Framework for Neonatal Endotrachal Intuition Xiao Xiao (George Washington University), Shang Zhao (George Washington University), Yang Meng (George Washington University), Lyme Soher (Children's National Health Systems), Xiaoke Zhang (George University), James Hahn (George Washington University) Abstract: Neonatal Endarcheal Intubation (ETI) is a complex procedure. Low success rates of intubation for paediatric residents indicate that the current training regime is insufficient to achieve positive patient outcomes. In this report we offer a fully interactive physics-based virtual reality (VR) simulation framework for neonatal ETI, which turns the training of this medical procedure into a completely immersive virtual environment where both visual and physical realism is achieved. The results of the validation of a group of neonatologists are presented, indicating that VR is a promising platform for effective training of healthcare professionals for this procedure. Analysis of usability and availability of virtual reality simulator (VOR) during laparoscopic surgery training Meng Li (University of Technology in Delft, Netherlands; Xian Jiaotong, China), Sandeep Ganni (Delft University of Technology, Netherlands; GSL Medical College, India), Jeroen Ponten (Katarina Hospital, Netherlands), Armagan Albayrak (Delft University of Technology, Netherlands), Anne-Françoise Rutkowski (Tilburg University, Netherlands), Jack Jacomovich (University of Delft, Netherlands); Katharina Hospital, Netherlands) Abstract Conference: Immersive Virtual Reality (VR) simulation laparoscopy is emerging to improve the attractiveness and realism of surgical procedural training. This study analyzes the usability and availability of virtual operating room (VOR) setup by evaluating the user and identifies the main elements for immersion in surgical training. Thirty-seven surgical specialists performed a simulated cholecystectomy, then evaluated the system using questionnaires and an interview. IOR has shown the potential to become a useful tool for providing immersive training during the simulation of a laparoscopic procedure. The future development of the user interface, vor environment, team interaction and customization should lead to an improvement of the system. VR Disability Simulation reduces implicit bias toward people with disabilities Tanvir Chowdhury (University of Texas), Sharif Mohammad Shahnewaz Ferdous (University of Texas), John Quills (University of Texas) Journal Abstract: This report explores how virtual reality (VR) Disability Simulation (DS) affects the call of information and implicit association of participants with disabilities (PwD). Indirect attitudes are our different concepts or stereotypes (e.g. race) that we may or may not know. Previous research has shown that owning ownership of a dark-skined body reduces implicit racial bias. We assumed that a DS with a tracked Head Mount Display (HMD) and a wheelchair interface would have a significantly greater effect on the participants' information call and their implicit association with PwD than the desktop monitor and gamepad. We conducted a 2x2 experiment between subjects in which participants had a VR DS that taught them facts about multiple sclerosis (MS) with display factors (HMD, desktop monitor) and interface (gamepad, wheelchair). Participants took two Implicit Association (IAT) tests before and after having DS. The results of our research show that participants in an immersive HMD state performed better than participants in their non-immersion in their desktop task. In addition, the tracked HMD and wheelchair interface had significantly greater effects on the implicit association of participants to PwD than the desktop monitor and gamepad. Session 17: Visual displays -devices 1 Wednesday, March 25, 9:00 - 10:30 AM, Track 3 (Studio 1) Factor: Modulator of One Space Light Occlusion- enabling optical reality display Brooke Krajancich (Stanford University, USA), Niš Padmanaban (Stanford University, USA), Gordon Wetzstein (Stanford University, USA) Journal Abstract: Occlusion is a powerful visual sign that is crucial for depth perception and realism in optically visually augmented reality (OST-AR). However, existing OST-AR systems with an add-on overlay physical and digital content with beam harvesters– an approach that does not easily support mutual clogging, resulting in virtual objects that appear translucent and unrealistic. In this work we offer a new type of occlusion-capable OST-AR system. Instead of an additive combination of the real and virtual worlds, we use a single digital micromirameter (DMD) to combine the corresponding light paths in a multiplier way. This unique approach allows us to simultaneously block the incident with light from the physical scene by pixel, while modulating the light-emitted led to display digital content. Our technique is based on mixed binary/continuous factoring algorithms to optimize the time for multiplexing binary DMD models and their corresponding LED colors for an approximate target augmented reality (AR) scene. In simulations and with a prototype wall display, we demonstrate the rigid oculus, plausible shadows and also stare at the optimization of this new display mode, which requires only one spatial light modulator. ThinVR: Heterogeneous microlen arrays for compact, 180 degrees FOV around eye displays displays Ratcliffe (Intel Labs, USA), Alexey Supikov (Intel Labs, USA), Santiago Alfaro (Intel Labs, USA), Ronald Azuma (Intel Labs, USA) Journal Abstract: Today's virtual reality (VR) displays are dramatically better than the displays offered 30 years ago, but today's displays remain as large as their predecessors in the 1980s. Also, almost all custom VR displays today provide a 90-110 degree field of view (FOV), which is much less than the FOV of the human visual system, which extends beyond 180 degrees horizontally. In this article, we offer ThinVR as a new approach to simultaneously dealing with bulk and limited FOV on head-worn VR displays. ThinVR allows the head worn VR display to provide 180 degrees horizontal FOV in a thin, compact form factor. Our approach is to replace traditional large optical means with a curved microlens range of heterogeneous lenses to order and put them in front of a curved display. We found that heterogeneous optical substances are crucial for the operation of this approach, since over the wide FOV, many lenses are considered by the central axis. We developed a custom optimizer to design heterogeneous lenses to provide enough eye box while reducing distortions. Contributions include analysis of the design space for curved microlenses, application of physical prototypes and assessment of image quality, eyebox, FOV, reduction of volume and pupil distortions. To our knowledge, this is the first work to demonstrate and analyze the potential for curved, heterogeneous microlen arrays to enable compact, wide factories worn by FOV VR displays. Illuminated focus: Increasing vision through spatial defocus through focal glasses and high-speed spotlight Tatsuyuki Ueda (Osaka University), Daisuke Iwai (Osaka University), Tabomi Hiraki (Osaka University), Kosuke Sato (Osaka University) Abstract: Realizing new vision this article offers a technique illuminated focus that spatially defocuses real appearances, regardless of the distance from the user's eyes to the observed real objects. With the proposed technique, part of a real object in an image looks blurred, and the fine details of the other part at the same distance remain visible. We apply electric focus-Tunable lenses (ETL) such as glasses and a synchronized high-speed projector as lighting for a real scene. We periodically modulate the focal lengths of the glasses (focal cleaning) of more than 60 Hz, so that one wearer cannot perceive modulation. Part of the scene that focuses is illuminated by the projector when it is in focus on the user's eyes, while another part to make it look blurred is illuminated when out of focus. As the basis of our control over spatial focus, we build models for predicting the distance from ETL within the retina of the user. Based on the blur, we discuss design guidelines to effectively illuminate the time and scope of focal cleaning. We also model the visible size of a real scene, changed by the focal length of modulation. This leads to an unwanted visible seam between focused and blurred areas. We solve this unique problem by gradually mixing the two areas. Finally, we demonstrate the feasibility of our proposal by applying different applications to increase vision. To standardized classification of foveated displays Josef Spjut (NVIDIA Corporation), Ben Budaud (NVIDIA Corporation), Jongyun Kim (NVIDIA Corporation), Trey Greer (NVIDIA Corporation), Rachel Albert (NVIDIA Corporation), Michael Stengel (NVIDIA Corporation), Kaan Akşit (NVIDIA Corporation), David Luebke (NVIDIA Corporation) Journal Abstract: Emergent in the head mounted display design is a desire to use the limitations of the human visual system. in order to reduce the calculation of , communication and display of workload in systems with limited form factor. Fundamental to this reduced load is the ability to align the resolution of the display with the acuity of the human visual system, along with the consequent need to monitor the eye's gaze as it moves, a process referred to as foveation. A display that moves its contents along with the eye can be called Foveated Display, although this term is often used to describe displays of uneven resolution that try to mimic human visual acuity. That is why we recommend a definition of the term Foveated Display, which adopts both interpretations. Furthermore, we include a simplified human visual function model for acuity distribution (ADFs) at different levels of visual acuity, in wide areas of vision, and offers a comparison of this ADF with resolution distribution function of foveated display to assess its resolution in a certain direction. We also offer taxonomy that allows the field to compare and compare different aspects of optical displays in a display and optical technology-agnostic way. Computational phase-modulated Eyeglasses Yuta Itoh (Tokyo Institute of Technology), Tobias Langlotz (University of Otago), Stephanie Zollman (University of Otago), Daisuke Iwai (University of Otago), Kiyokawa Kiyoshi (NAIST), Toshiyuki Amano (University of Vacyama) Journal Abstract: We present computer phase-modulated eye treatment of eye glasses, a visible optical system that modulates the user's view using Spatial Light Modulators (PSLM). PSLM is a programmable reflective device that can selectively slow down or slow down incoming light rays. As a result, PSLM works as a computer device for dynamic lens. We demonstrate our modulated glasses with one pslm or dual PSLMs and the concept can implement various optical operations, including focus correction, bi-focus, image change, and field of view manipulation, namely optical zoom. Compared to other programmable optics, the calculation phase modules of the glasses have the advantage in terms of their flexibility. It also introduces some prototype focus-cycle applications where the lens is dynamically optimized based on the distances of objects observed by a camera on stage. We also discuss implementation, applications, but also discuss the limitations of current prototypes and the remaining issues to be addressed in future research. Session 18: Perception "" "Wednesday's cooperation, March 25, 11:00 AM - 12:30 PM, Track 1 (Great Room 1) Asymmetric effects of Ebbinghaus Illusion on Depth Judgments Hunter Finney (Hi5 Lab), Computer &Informatics Science", University of Mississippi), John Adam Jones (High Fidelity Virtual Environments Lab), Computer and Information Sciences, University of Mississippi) Abstract : The Ewinghouse illusion affects the perceived disk size closed by anolu from larger or smaller disks. Although many have seen consistent effects of the illusion of perception size, there have been mixed results in studying its effect on action-based tasks. We present a study using a virtual environment to study the effect of illusion on depth. We found that, according to the Ebbinghaus Court of Auditors, their sentences were asymmetrically affected. Large configurations of the anolula do not affect distance sentences, while small configurations of anolules lead to underestimation of distances. Austin Erickson (University of Central Florida), Thal Noruzi (University of Central Florida), Kangsu Kim Kim (University of Central Florida), Joseph J. LaViola Jr. (University of Central Florida), Gerd Bruder (University of Central Florida), Gregory F. Welch (University of Central Florida) Journal Abstract: Augmented reality (AR) facilities have the ability to facilitate collaboration for slaughtered and remote users by increasing and sharing their virtual points of interest in each user's physical space. Looking at is an important communication replica during interaction with the person, increasing the physical space with the focus of each user's attention through various visualizations such as beam, frustration, and cursor has been studied in the past to improve the quality of interaction. Understanding the focus of each user's attention is error-prone, as they must rely on the user's gaze and in-depth information on the purpose of calculating the endpoint of the of the user. This information is calculated by respectively tracking eyes and depth cameras, which introduces two sources of error in the shared experience of the gaze. Depending on this, the error size and type of visualization, extended view may mislead the user during collaboration, rather than enhancing interaction. In this paper, we present a study of human themes to understand the effects of eye tracking errors, errors in camera depth precision, and to monitor user experience visualization and subjective experience during a joint task with a virtual human partner, where users were asked to identify a goal in a dynamic crowd. We simulate seven different levels of eye tracking error such as horizontal shifting of the intended point of view and seven different levels of depth accuracy errors that make a point appear in front of or behind the intended point. In addition, we look at four different visualization styles for shared viewing information, including an extended beam that passes through the target and extends to a fixed length, a shortened beam that stops when the target point of view is reached, a preview of the cursor that appears at the target point of view, and a combination of cursor and cross-beam display modes. Live semantic 3D perception of augmented reality LEI HAN (HKUST, Hong Kong, China), TIAN ZHENG (Tsinghua University, China), YINHENG ZHU (Tsinghua University, China), LAN XU (HKUST, HongKong, China), LU FANG (Tsinghua University, China) Journal Abstract: Semantic understanding of 3D environments is crucial for both the unmanned system and the human included virtual/augmented reality (VR/AR) name experience. Spatially diluted convolution, taking advantage of the immediate dilutedness of 3D point data in the cloud, makes high-resolution 3D convolution networks that are stretched with state-of-the-art results of 3D semantic segmentation problems. However, comprehensive calculations limit the practical use of semantic 3D perception of VR/AR applications in portable devices. In this document, we find that the performance problem lies in the disorganized access of the memory of the diluted convoy steps, i.e. the points are stored independently on the basis of a predefined vocabulary that is ineffective due to the limited memory band of parallel computing devices (GPU). With the understanding that the dots are continuous as 2D surfaces in 3D space, a convolution scheme is offered at short distance for the reuse of adjacent points within each spatially organized piece. An efficient multi-layer adaptive thermonuclear fusion is also available to use the spatial consistency of 3D data to further reduce computational weight. Quantitative experiments on public datasets that our approach works at $11\times faster than previous approaches with competitive accuracy. By simultaneously implementing a semantic and geometric 3D reconstruction of a portable tablet device, we are dismantling a immersion platform in AR. Lauren Buck Buck University, USA), Timothy McNamara (Vanderbilt University, USA), Bobby Bodenheimer (Vanderbilt University, USA) Abstract Conference: Navigation and way of determining roads are often performed collectively. Yet most studies devoted to this behavior and the acquisition of spatial knowledge more generally focus on the individual. In this report, we extend the investigation of these topics to baghdadi. In particular, we focus on how well individuals are taught and by dyads between subjects (knowledge of the study). Our experiment was conducted in a shared virtual environment and we report on the technical issues of conducting such a joint experiment, such as choosing a mode of movement and providing the whole body of the self-contained avatars. Our findings suggest that dydydys thrives on people gaining knowledge of the study. Design and evaluation of interactive visualization of small multipert data in immersive spaces Jiazhou Liu (Monash University, Australia), Arnaud Prouzeau (Monash University, Australia), Barrett Ens (Monash University, Australia), Tim Dvier (Monash University, Australia) Abstract: Exploring the adaptation of traditional 2D small multiperse visualization of 3D spaces. We use metaphor shelves and look at the design space in several dimensions of layout and interaction. We demonstrate a prototype system and perform two consumer studies comparing the effect of curvature magnitude on users' ability to perform comparisons and task analysis trends. Our results show that with fewer multiples, a flat layout is more resultable. With an increase in the number of multiples, this performance difference is reduced. However, semicircular layout is more preferred by users than full-circular and flat layouts. Friday, March 25, 2010 - 12:30 Track 2 (Great Room 2) Transport through virtual environment: Effects of road scale and environmental scale on spatial update Jonathan Kelly (Iowa State University, USA), Alec Ostrander (Iowa State University, USA), Alex Lym (Iowa State University, USA), Lucia Skull (Iowa State University, USA), Stephen Gilbert (Iowa State University, USA) - but virtual environments (V) often exceed the available pedestrian space. Teleportation has become a common user interface in which the user seeks a laser pointer to indicate the desired location, and sometimes orientation, in VE before being transported without self-diagnosis. This study assesses the impact of rotary self-taste on spatial updating of teleportation efficiency and whether the importance of rotational signs varies between motion scales and environmental scale. Participants completed a task of completing a triangle by two paths for outgoing output unmarked origin of the road. Rotary self-movement reduces overall errors at all levels of motion scale and environmental scale, although it also introduces a slight deviation to proper rotation. The importance of rotating self-learning is exaggerated when navigating large triangles and when the environment has been large. Navigating a large triangle in a small VE led participants to the surrounding sights and boundaries, which led to greater dependence on piloting (navigation based on landmarks) and therefore reduced - but not eliminated - the impact of rotating self-capture signs. These results show that rotary self-powered signs are important in transporter and that navigation can be improved by piloting. Tim Weisker (Bauhaus-University Weimar, Germany), Pauline Bimberg (Bauhaus-Universität Weimar, Germany), Bernd Froehlich (Bauhaus-Unveristät Weimar, Germany) Journal Abstract: We analyzed the space for designing group navigation tasks in distributed virtual environments and presented a framework consisting of group formation techniques, division of responsibilities, navigating together, and eventually dividing again. To improve collaborative navigation, our work focuses on expanding the multi-ray jumping technique, which allows to regulate the spatial formation of two distributed users as part of the target specification process. The results of the consumer quantitative survey show that these adjustments lead to significant improvements in the joint journeys of two users, as evidenced by more efficient road sequences and lower task loads imposed on the navigator and passenger. In a qualitative expert review involving all four stages of group navigation, we confirmed the effective and efficient use of our equipment in a more realistic usage scenario and concluded that remote collaboration benefits from the smooth transition between individual and group shipping. Space Bender: support for natural walking through overturned virtual environment manipulation Adalberto L. Simeone (KU Leuven, Belgium), Nils Christian Nilsson (Aalborg Copenhagen, Denmark), Andre Zener (DFKI, Germany), Marco Spicher (DHfPG, Germany), Florian Daiber (DFKI, Germany) Abstract: Space Bender is a natural technique for room VR. It is based on the idea of excessive manipulation of the virtual environment by bending geometry when the user comes close to a physical limit. We compared the space bender to other similar techniques: stop and reset and teleport, in a task requiring participants to go 100 m away. The results showed that Space Bender was significantly faster than Stop and Reset and preferred the teleportation technique, the potential of apparent manipulation to facilitate natural walking. Study effects of and globally fixed annotations for virtual reality navigation James Dominic (Clemson University), Summary of Andrew Robb (Clemson University) : In this paper we compare screen-fixed annotations that remain fixed in the user's field of vision, and the global annotations that are associated with specific places in the world. We also looked at three different navigation levels: destination tags, space visualization maps, and path markers showing the optimal route to the destination. We held the in-house seminar in which participants navigated a virtual environment until they completed a secondary task. Our results show that the world's fixed annotations are no better in nature than on-screen annotations; instead, it is important to take into account both the type of annotation and what information it displays. Magic Carpet: Fidelity interaction for flyingity in VR Daniel Medeiros (University of Wellington), Antonio Sousa (University of Lisbon), Alberto Raposo (University of Rio de Janeiro), Joarquim Jorge (University of Lisbon) Journal Abstract: Locomotive in a virtual environment is currently a difficult and unnatural task to perform. Typically, researchers tend to create ground-floor metaphors to limit the degree of freedom (DoFs) while driving. These limitations allow interactions that accurately emulate the human gait to ensure high accuracy of interaction. However, flying allows users to reach certain locations in a virtual scene more expeditiously. Our experience shows that high interaction loyalty techniques can also improve the flying experience, although they are not innate to humans as they require simultaneous control of additional DOFs. We contribute to Magic Carpet, a flying approach that combines sub-full body performance to avoid imbalance and cyber anxiety. This design space makes it possible to view the direction of direction and speed control as two separate phases of travel, thereby enabling techniques with higher fidelity of interaction. To validate our design space, we developed two additional studies, one for each of the travel phases. In this document, we present the results of both studies within the Magic Carpet design space. To this end, we applied both objective and subjective measurements to determine the best techniques in our design space. Our results show that this approach allows high loyalty techniques to improve the user experience. Session 20: Preview on Wednesday, March 25, 11 a.m. - 12:30 p.m., Trail 3 (Studio 1) Graphic perception of immersion in Matt Whitlock (University of Colorado - Bullder), Stephen Smart Colorado - Boulder), Daniel Alberi Szafir (University of Colorado - Boulder) Abstract Conference: Immersion in Analytics (IA) uses virtual and augmented reality for visual analysis. Empirical studies of data visualization interpretation usually focus on data analysis in traditional desktop environments rather than immersive environments. This study explores how people interpret data visualizations in different display types with five visual channels: color, size, height, orientation, and depth. We found that stereo viewing solves some of the challenges of visualizations in 3D space, and that while AR displays promote increased navigation, they reduce performance with color-based visualizations. Our results provide guidance on how to customize visualizations to different displays. Study of models of immersion in virtual reality Andre Zenner (German Artificial Intelligence Research Center (DFKI), Achmayon Makhsadov (German Artificial Intelligence Research Center (DFKI), Sören Klingner (German) Artificial Intelligence Research Center (DFKI), David Liebemann (German Artificial Intelligence Research Center (DFKI), Germany), Antonio Krüger (German Artificial Intelligence Research Center (DFKI), Germany) Journal abstract: In many professional domains , the relevant processes are documented as abstract process models, such as event-driven circuits (EPC). EPCs are traditionally visualized as 2D graphics and their size varies according to the complexity of the process. Although process modelling experts are used to interpret complex 2D EPC, in certain scenarios such as vocational training or education, also inexperienced novice users in interpreting 2D EPC data face the challenge of learning and understanding complex process patterns. To communicate the knowledge of the process in an effective but motivating and interesting way, we offer a new virtual reality interface (VR) for non-expert users. Our proposed system transforms the study of randomly complex EPCs into an interactive and multisensory VR experience. It automatically generates a virtual 3D environment from a process model and allows users to explore processes through a combination of natural walking and teleportation. Our immersive interface uses the main game in the form of a logical gabbot to motivate users to interact with the virtual process. The generated user experience is entirely new in the field of data immersion and is supported by a combination of visual, auditory, vibrotactyl and passive haptic feedback. In a user survey with N= 27 novice users, we evaluate the effect of our proposed system to understand the process model and user experience by comparing it to a traditional 2D interface on a tablet device. The results show a trade-off between the effectiveness and interest of the evaluated by the novel hints until a significant decrease in model understanding performance has been identified using the proposed VR Our investigation highlights the potential of multi-sensor VR for less time-critical domains of professional applications, such as employee training, communication, education and related scenarios focused on user interest. Real and virtual mismatch environment Causes agitation and alters movement behavior Christos Mousas (Purdue University), Dominique Cao (Purdue University), Alexandros Collias (University of the Aegean Sea), Banafsh Rekabdar (Southern Illinois University) Abstract Conference: This paper investigates whether the discrepancy between a real and virtual environment can affect the arousal and behavior of movement in participants. One baseline and four non-compliance conditions were tested that investigated different types of non-compliance. The participants' electrodermal activity and walking movements were filmed to assess potential changes in their arousal and movement behavior. The results showed significant differences in electrodermal activity and the movement behavior of participants, especially when walking in a virtual environment that was not similar in both appearance and physical limitations. It has also been found that correlated electrodermal activity with movement behavior. Simultaneous measurement of movement time to photon latency and Latency Jitter Jan-Philippe Stauffert (University of Würzburg, Germany), Florian Nibbling (University of Würzburg, Germany), Mark Erich Latoschik (University of Würzburg, Germany) Summary: Latency in Virtual Reality (VR) applications can have numerous harmful effects. Latency is usually reported as an average. This average is taken during certain specific test intervals with the target system, often separated into significant aspects of the final target scenario. This article introduces an apparatus that can determine frame MTP latency to capture dynamic MTP latency in addition to the commonly reported average latency values. Unlike previous approaches, the system does not rely on HMD to be attached to an external apparatus, can be used to evaluate any simulation setting and can be extended to continuously measure runtime delay. Automated geometric registration for multiprojector displays for random 3D forms using indiscriminate devices Mahdi Abbaspour Tehrani (University of California), M. Gopi (University of California), Aditi Majumder (University of California) Journal Abstract: In this article we present a fully automated and scalable multidesigner registration system that allows completely unallocated projectors and cameras of random shapes. Our method assesses the parameters of multiple uncaled tiles or overseed projectors, the parameters of the observation chambers, the shape of the 3D geometry and geometrically registers the projectors on it. This is achieved without using the if part of the surface is visible with only one camera. The method uses a fully automatic approach for cross-correlation and cross-checking of device parameters and geometric ground shape, resulting in an accurate registration of any geometry that does not need accurate pre-calibration of each of the non-calibrated devices using physical models or fid civilizations. The calculation of the projector parameters allows for rapid calibration of the system in the face of projector movements, reassessing only the parameters of the moved projector and not the entire system. Thus, our work can allow for easy deployment of spatially enlarged realities of different sizes (from small tables to large immersive environments), different shapes (interior-looking or outward-looking in) and different configurations (tiles or oversused), using the same suggested method. Session 21: Comfort and Load Wednesday, March 25, 2 p.m. – 3:30 p.m., Track 1 (Great Room 1) The effect of the outbreak of VR disease limitation Isaiah Berhe Adhamom (University of Nevada, Reducing the Field of Vision of Users during vrocomtion locomotive is an effective strategy to reduce visual vestibular conflict and VR disease. without taking into account the user's gaze. This can lead to users looking at the limiter while they are still exposed to a peripheral optical flow that nefares the effectiveness of the FOV limiter. We compared a fire-retardant line that moves with the user's gaze to a fixed FOV limiter, and although no significant difference in VR disease has been found, the eyes of users are more dispersed. Hakim Si-Mohammed (Inria, Univ. Rennes, CNRS, IRISA), Katarina Lopez-Diaz (Institute of Neural Engineering, Graz University of Technology), Maria Duarte (Faculty of the University of Lisbon), Ferran Argelaguet (Inria, Univ. Rennes, CNRS, IRISA), Camille Junnett (CLLE, Université de Toulouse), Géry Casiez (CRIStAL, Univ. Lille, Inria), Gernot Müller-Putz (Institute of Unstable Engineering, Graz University of Technology), Anatole Lequeer (Inria, Unv. Rennes, CNRS, IRISA), Reinhold Scherer (SCEEE , University of Essex) Summary Conference: When there are errors, a specific brain model that is associated with potential errors can be observed in EEG users. This document examines the presence of errors when virtual reality users face 3 types of errors: tracking and feedback errors and background anomalies. Our experiment with 15 participants exposed three types of errors in performing a selection and placement task in VR, showing that only tracking errors are obvious erthies. Moreover, the accuracy of the classification of these vices is about 85%. This represents a first step towards automatic rowing detection in VR, paving the way for self-correcting VR/AR applications. Introducing a mental stress assessment to design virtual reality learning scenarios Tiffany Luong (IRT b<>com, Cesson-Sevigne, France; Rennes, Iria, CNSS, IRISA, Rennes, France), Ferran Argele Inria, CNRS, IRISA, Rennes, France), Nicolas Martin (IRT b<>com, Cesson-Sevigne, France), Anatole Lécuyer (Univ Rennes, Inria, CNRS, IRISA, Rennes, France) Abstract: In this paper we propose to consider mental workload (MWL) to design complex training scenarios involving multiple tasks in VR. The approach is based on the MWL assessment made by each potential task configuration in the training application to generate scenarios that can modulate the user's MWL over time. It is illustrated with a VR flight training simulator based on multi-Attribute Task Battery II. A first user study (N=38) was conducted to evaluate MWL. This assessment is then used to generate 3 training scenarios to induce different levels of MWL over time. A second user study (N= 14) confirmed that the proposed approach was able to trigger the expected MWL over time for each learning scenario. Comparative assessment of the effects of motion control on cyberspace in immersive virtual environments Roshan Venkatakrishnan (Clemson University, USA), Rohit Venkatakrishnan (Clemson University, USA), Ayusz Bhargava (Key Lime Interactive, USA), Katherine Lukayts (Clemson University, USA), Hannah s (Clemson University, USA), Matias Volonte (Clemson University, USA), Andrew Robb (Clemson University, USA), Wen-Chieh Lin (National Chiao Tung University, Taiwan), Yun-Xuan Lin (National Chiao Tung University, Taiwan), Sabarish V. Babu (Clemson University, USA) Abstract Conference: Lower costs of consumer-grade virtual reality (VR) made the technology increasingly available to consumers around the world. However, cyber activity remains one of the biggest obstacles to the widespread adoption of VR, making it increasingly important to explore the factors that influence its occurrence. For this cause, we tried to look at how the presence of control affects the cyber state of IVE. The results of our experiments show that simply providing control is not necessary to alleviate the disease, but can even increase it. This seems indicative of the importance of correctness of the feedback of the control metaphor for easing the cyber skirmishes. Structural approach to modeling equations to understand the relationship between control, cyberspace and virtual reality presence Венкатакронин (Clemson University, USA), Roshan Venkatakrishnan (Clemson University, USA), USA), Anaraky (Clemson University, USA), Matias Volonte (Clemson University, USA), Bart Knijnenburg (Clemson University), Sabarish V. Babu (Clemson University) Abstract Conference: The commercialization of virtual reality (VR) devices makes the technology increasingly available to users around the world. Despite the recent success of VR, it has not yet been widely accepted and achieved its ultimate goal - convincingly simulating real life as an experience. In this work, we use modeling of a structural equation in an attempt to build a framework that explains the relationship between virtual motion control, load, cybernetics, simulation, perceived time and presence. Our structural model explains why traffic control can be an important factor to consider when addressing vr challenges and realizing its ultimate goal of simulating reality. Session 22: New interfaces and displays Wednesday, March 25, 2 p.m. to 3:30 p.m., Track 2 (Big Room 2) HiPad: Entering text for head-mounted displays using haiyan jiang circular touchpads (Beijing Institute of Technology), Dongdong Weng (Beijing Institute of Technology); AICFVE of the Beijing Film Academy) Abstract Conference: Entering text into virtual reality (VR) is currently a common activity and a challenging problem. In this article, we introduce HiPad, using a circular touchpad with a circular virtual keyboard to support the introduction of one-handed text into mobile heads mounted displays (HMD). This technique introduces text from a common manual controller with a circular touchpad for HMD and dispels the word based on the sequence of keys pressed by the user. Survey results show that novices can achieve 13.57 words per minute (WPM) with VE-layout and 11.60 WPM with TP-layout using HiPad 6-key. Entering the Corps: Improved decision-making through Advanced Environment Matthew Timmerman (U.S. Navy), Amela Sadagic (Naval Postgraduate School), Cynthia Irvine (Naval Postgraduate School) Abstract Conference: The day-to-day management of complex computer networks aboard Navy ships typically includes multiple sessions during which a team presents a set of information and discusses decision-making issues. As an alternative to a set of two-dimensional drawings that are difficult to understand, we developed and implemented an augmented reality (AR) system that allowed a small team to visualize a 3D model of the ship and its computer networks. The results of this empirical study offer early impressions of the benefits and challenges of AR's approaches to small team decision-making in real high-stakes scenarios. Virtual odour environment using olfactory indication and fluid computational dynamics simulation Takamichi Nakamoto (Tokyo Institute of Technology, Japan), Hirasawa (Tokyo Institute of Technology, Japan), Yukiko Hanyu (Tokyo Institute of Technology) Technologies) Japan) Abstract Conference: We have developed the virtual olfactory environment where the user is looking for a source of smell. Its environment is prepared using the calculations of fluid dynamics. In addition, we developed a wearable olfactory display composed of multiple micro dispensers and saw device. Wearable olfactory olfactory screens are attached under a head mount display to present the smell quickly. We made the virtual environment of the two-storey building, where four rooms were located on each floor. One user searched for the source of the smoke smell, simulating the fire at an early stage. Half of users can reach the correct source locations. Reading 3D surfaces in Virtual Environments Chunxue Wei (University of Melbourne), Difeng Yu (University of Melbourne), Tilman Dingler (University of Melbourne) Conference Abstract: While text tends to lead quite static life on paper and screens, virtual reality (VR) allows readers to interact with it in a new way, as the reading surface is no longer limited to a 2D plane. We conducted two user studies in which we examined text that was depicted on various surface shapes in VR, including aircraft, spheres and cylinders, and evaluated their impact on readability and overall reading experience. Our research reveals the impact of axis angles and sees box widths on reading convenience, speed and distraction, and ends with insights into text rendering on 3D objects in VR. ReViVD: Exploring and filtering trajectories in a fascinating environment using 3D Shapes François HOMPS (Ecole Centrale de Lyon), Johan BUGIN (Ecole Centrale de Lyon), Romain VUILLEMOT (Ecole Centrale de Lyon) Abstract Conference: Introducing VRT, a tool for researching and filtering large tragic-based data using virtual reality. VrT's novelty consists in using simple 3D shapes — such as domes, spheres, and cylinders — as queries for users to select and filter groups of trajectories. Based on this simple paradigm, more complex queries can be created by combining pre-created selection groups through a system of user-created boolean operations. We demonstrate the use of VRT in different areas of application, from GPS positioning to simulated data (e.g. turbulent particle flows and traffic simulation). Our results show the ease of use and expressiveness of 3D geometric shapes in a wide range of exploratory tasks. Session 23: Evaluation methods Wednesday, 25 March, 14:00 - 15:30 Track 3 (Studio 1) Design and evaluation of pump maintenance training in VR Case Simulation in Grundfos Frederik Winther (University of Aarhus, Denmark), Ravindran (University of Aarhus, Denmark), Kasper Paabl Svendsen (University of Aarhus, Denmark), Tiare Feuchtner (University of Aarhus, Denmark) Abstract: Encouraged by technological progress, more and more they should consider VR to train their workforce. This raises the need to understand the potential and limitations of VR training and to identify best practices. In pursuit of this, we have developed a VR training simulation for use in Grundfos involving a task for consistent repair. We evaluated this simulation in a user survey with 36 participants, comparing it to two traditional forms of training (pairing and video training). The results of our evaluation support that VR training is effective in teaching the maintenance task procedure. However, traditional approaches with practical experience still lead to significantly better results. Animals in a Virtual Environment Hemal Naik (Max Planck Institute for Animal Behavior, Center for advanced study of collective behavior, University of Konstanz, Münchenchen Technical University), Renaud Bastien (Max Planck Institute for Animal Behavior, Center for Advanced Study of Collective Behavior, Konstanz University), Nassir Ivab (Technical University of Müchen), Iain Plan Institute (Max Plan For Animal Behavior, Center for Advanced Study of Collective Behavior, University of Konstanz) Journal Abstract: The main idea in the XR (VR/MR/AR) application is to digitally stimulate one or more sensory organs (e.g. visual, auditory and olfactory) of the user in an interactive way to achieve immersion in the experience. Since the early 2000s, biologists have been using Virtual Environments (VE) to study mechanisms of behaviour in non-human animals, including insects, fish and mammals. They have become reliable tools for studying vision, cognition and sensory control in animals. In turn, the knowledge gained from the study of such behaviors can be harnessed by researchers who design biologically inspired robots, smart sensors and multi-agent artificial intelligence. The VH for animals is becoming a widely used application of XR technology, but such applications have not been reported in the technical literature related to XR. Biologists and computer scientists can benefit greatly from the deepening of interdisciplinary research in this emerging field, and together we can develop new methods of fundamental research in the field of behavioral sciences and engineering. To support our argument, we present this review, which provides an overview of animal behaviour experiments conducted in virtual environments. Assessing virtual reality experiences through participants Maria Murcia-Lopez (Facebook, UK), Tara Collingwoode-Williams (University of Gaultsmiths in London, UK), William Steptoe (Facebook, UK), Raz Schwartz

(Facebook, UK), Timothy J. Gentle (Facebook, USA), University of Barcelona, Spain) Abstract: When building apps virtual reality have to choose between different configurations of experience. We are expanding the framework for how these factors contribute to the quality of participants' experience in an indicative assessment. We look at four factors related to the expressiveness of an avatar. Participants had the opportunity to spend a budget to change factors to improve their quality of experience. A Markov matrix and probabilities of a factor present at a given level are calculated on the final configurations of the participants. We present this work as an extended contribution to evaluating people's reactions to immersive virtual environments. Measuring a person's confidence in a virtual assistant using the physiological sensation in virtual reality Kunal Gupta (University of Auckland, New Zealand), Ryo Hajika (University of Auckland, New Zealand), Yun Suen Pai (University of Auckland, New Zealand), Andreas Duenser (Data61, CSIRO, Australia), Martin Lochner (Data61, CSIRO, Australia), Mark Billinghurst (University of Auckland, New Zealand) Abstract: Through our research , we report on a new methodology for investigating a user's confidence in hearing aid in a virtual reality search task (VR) based on , at high and low cognitive load and at different levels of agent accuracy. We collected physiological sensory data, subjective data and a behavioral measure of trust. Our results show that our personalized VR environment allows researchers to measure and understand people's confidence in virtual agents using matrices, and both cognitive exertion and agent accuracy play an important role in confidence formation. We discuss the implications of research and guidance for future work. Grzeskowiak Fabien (INRIA Rennes, France), Babel Marie (INRIA Rennes, France), Brunei Julien (INRIA Rennes, France), Petter Julien (INRIA Rennes, France) Summary: This article explores the use of VR to study human-robot interactions during navigational tasks. In our case, not only human perception is concerned, but also that of the robot, which must be simulated in order to perceive the VR world. The contribution of this document is double. It first provides a technical solution to perform human robot interactions in navigational tasks via VR. We then evaluate a simple interaction task that we reproduce in real and virtual settings to make the first assessment of the importance of biased bias introduced with the use of VR. Session 24: Visual displays - devices 2 Thursday, March 26, 9:00 - 10:30 a.m. Song 1 (Big Room 1) TEllipsoid: Ellipsoid Video Conferencing System Display Accurate Gaze Direction Taro Ichii (Tokyo Institute of Technology, Japan), Hironori Mitake (Tokyo Institute of Technology, Japan), Shoichi Hasegawa (Tokyo Institute of Technology, Japan) Abstract Conference: We offer Telepion, ellipsoid display for the video conferencing system . not only to realise the exact the convenience and identity of the person. The display consists of an ellipsoid screen, a small projector and a convex mirror, in which the mounted spotlight projects the portrait of a distant participant onto the screen using a convex mirror. The portrait was taken from the photos taken from 360 degrees around the participant. The presentation of the look is carried out by designing the 3D model of the eyeballs on a virtual ellipsoid screen. Physically inspired deep light evaluation by homogeneous material object for mixed reality lighting Jinwoo Park (KAIST, Republic of Korea), Hunmin Park (KAIST, Republic of Korea), Sung-eui Yoon (KAIST, Republic of Korea), Woontack Woo (KAIST, Republic of Korea) Journal Abstract: In Mixed Reality (MR), increasing virtual objects consistently with real lighting is one of the key factors that provide a realistic and immersive user experience. To this end, we offer a new method based on deep learning to evaluate high dynamic range (HDR) lighting from one RGB image to a reference object. In order to obtain illumination of the current scene, previous approaches have placed in this scene a special camera that can interfere with the immersion of the user, or analyze the reflected lights from a passive light probe with a specific type of material or known shape. The proposed method does not require any additional attachments or strong preceding signs and is intended to predict illumination from an image of a observed object with a wide range of homogeneous materials and shapes. To solve this unauthorized problem of opposing imaging, three consecutive deep neural networks are used based on physically inspired design. These networks perform end-to-end regression to gradually reduce dependence on material and shape. To cover different conditions, the proposed networks are trained for a large synthetic data set generated by physically based rendering. Finally, reconstructed HDR lighting allows realistic image-based lighting of virtual objects in MR. Experimental results show the effectiveness of this approach compared to state-of-the-art methods. The document also offers some interesting MR applications in indoor and outdoor scenes. Casual Testero: Casual Capture of Stereo Panoramas with Spherical Structure-by-Motion Lewis Baker (University of Ottago, New Zealand), Steven Mills (University of Ottago, New Zealand), Stephanie Zollman (University of Ottago, New Zealand), Jonathan Shover (California Polytechnic University, USA) Abstract: Manual shooting of stereo panoramas involves rotating the camera in a rough circular path to acquire a dense picture of the scene However, most existing pipeline structures of motion fail when trying to reconstruct trajectories due to the small baseline between the We appreciate a spherical motion structure for the reconstruction of manual stereo panoramas. The spherical restriction introduces strong regulation of the motion structure process, making it suitable for the use of stereo panorama shooting with a manual device. We demonstrate the effectiveness of a spherical motion structure for random shooting of high-resolution stereo panoramas and validate the results with a user survey. Measuring the visual latency system by cognitive latency of video surveillance through AR devices Robert Gruen (Microsoft Research), Eyal Ofek (Microsoft Research), Anthony Steed (Microsoft Research, University College London), Ran Gall (Microsoft Research), Mike Sinclair (Microsoft Research), Mar Gonzalez-Franco (Microsoft Research) Abstract Conference: Measuring visual Latency in VR and AR devices is becoming more complex as many of the components will affect others in multiple cycles and ultimately affect human cognitive and sensory perception. In this document, we present a new method based on the idea that the performance of people on a fast motor task will remain constant and that any additional delay will correspond to the latency of the system. We ask users to complete a task in video viewing devices to compare latency. We also calculate the latency of systems using hardware measurements to mark a bench. The results show that measurement through human cognitive performance can be reliable and comparable to hardware measurement. LiveDeep: Online Viewport Live Virtual Reality Predictions, streaming using Deep Learning Xiandong Feng (Rutgers University, USA), Yao Liu (SUNY Binghamton, USA), Shen Vee (Rutgers University, USA) Abstract: This paper introduces a new approach to predicting visual port for live VR streaming to reduce bandwidth consumption. We offer a VR streaming lifelong approach to deep learning, namely LiveDeep, to create an online model for predicting visibility and conducting a real-time conclusion. LiveDeep includes (1) an alternative online data collection schedule, labelling, training and conclusions to fit for poor data training; and (2) a mixture of hybrid neural network models to adapt to the inaccuracy caused by a model. We evaluate LiveDeep using a public data set to move virtual reality data, including 48 users and 14 VR videos. Session 25: Follow-up Thursday, March 26, 9am - 10.30am, Song 2 (Big Room 2) Poorly controlled rival training for 3D human poses assessment by Point Clouds Zihao Zhang (Institute of Computer Technology, Chinese Academy of Sciences; University of the Chinese Academy of Sciences), Lei Hu Computing Technologies, Chinese Academy of Sciences; Academy of Sciences), Syaaming Day (Key Laboratory for Human Computer Computing) Chinese Academy of Sciences), Shihong Ia (Institute of Computational Technology, Chinese Academy of Sciences; University of China Academy of Sciences) Journal Abstract: In this work, we study the cloud point-based 3D human posture predicting problem. Previous methods have tried to solve this problem or treat dot clouds as 2D depth maps or as 3D cloud points. However, direct use of a convolution neural network of 2D depth maps can lead to loss of information about 3D space, while it is well established that processing 3D point clouds takes a long time. To solve this problem,instead of relying solely on 3D cloud points or 2D depth maps, we find a way for 3D human posture evaluation by combining the two 2D posing regression methods and 3D deep learning methods. Given the estimated 2D posture, we use hierarchical PoineNet to perform 3D posture regression. It is relatively difficult to collect enough 3D marked data to train a reliable model. That is why we train the regression network in a poorly controlled way of competitive training, using both fully marked data and poorly marked data. Thanks to the adoption of 2D and 3D information, our method can accurately and efficiently calculate a 3D human posture from a single depth map/dot clouds. Experiments on ITOP data and dataset Human3.6M show that our method can outperform state-of-the-art methods. 3D hand Tracking in the presence of excessive motion blur Gabyong Park (KAIST, Republic of Korea), Antonis Argyros (University of Crete and FORT, Greece), Juyoung Lee (KAIST, Republic of Korea), Woontack Woo (KAIST, Republic of Korea) Journal Abstract: We present a sensor-fusion method that uses camera depth and agiroscope to track arm articlication in the presence of excessively fuzzy movements. In the case of slow and smooth hand movements, existing methods assess the hand quite accurately and steadily, despite the challenges associated with the high dimensions of the problem, self-docuations, single appearance of hand parts, etc. However, the accuracy of the assessment of the manual position decreases significantly for fast moving hands, because the depth image is strongly distorted due to motion blur. Moreover, when the hands move quickly, the actual posture of the hand is far from what is expected in the previous frame, therefore the assumption of time continuity, on which the tracking methods are relied upon, is invalid. In this article, we track fast-moving hands with a combination of gyroscope and depth camera. As a first step, we calibrate a depth chamber and gyroscope attached to a hand so as to identify their time and pose their offsets. Then, we warm the information for rotating the calibrated with a model-based hierarchical particulate filter. A series of quantitative and qualitative experiments show that the proposed method is presented more accurately and better in the presence of motion blur, movement, compared to state-of-the-art algorithms, especially in the case of very fast hand rotations. Fibar: embedding optical fibers in 3D printed objects for active markers in dynamic projection mapping Daiki Tone (Osaka University), Daisuke Iwai (Osaka University), Shinsaku Hiura (University of Hyogo), Kosuke Sato (Osaka University) journal abstract: This paper presents a novelty active dynamic projection marker (HR) that emits a lightning-fast model of infrared light (IR) representing its ID. to fabricate a projection with optical fibers that can guide infrared light from LEDs attached to the bottom of the object. The opening of the fiber optic is usually very small; is therefore imperceptible to projection observers and can be placed on a highly curved part of the projection surfaces. Moreover, the working range of our system can be larger than previous methods based on markers, since flashing patterns can theoretically be recognized by a camera placed a wide range of distances from markers. We offer an algorithm for automatic marker placement to spread multiple active markers on the surface of the projection object so that its posture can be reliably calculated using captured images from random directions. We also offer an optimization framework for determining the routes of optical fibers in such a way that collisions of the fibers can be avoided, while minimizing the loss of light intensity in the fibers. Through experiments conducted with three factory-produced objects containing highly curved surfaces, we confirmed that the proposed method can achieve accurate dynamics of dynamic PMs in a significantly wide working range. SPLAT: Spherical localization and tracking in large spaces Lewis Baker (University of Ogo, New Zealand), Jonathan Ventura (California Polytechnic State University, USA), Stefanie Zollmann (University of Ottago, New Zealand), Steven Mills (University of Ottago, New Zealand), Tobias Langlotz (University of Ottago, New Zealand) Abstract: In Augmented Reality (AR) interfaces, it is essential to track camera movement to overlay graphics in the user view. However, in many external scenarios, the user maintains a static position that primarily performs rotations, while simultaneous localization and mapping (SLAM) methods typically require significant translation movement. In this document, we present a SLAM method that combines a spherical movement structure and stable 3D tracking. We show that our method can track more reliably than ORB_SLAM2 in large spaces. We are discussing this issue in the context of the deployment of an AR interface for live events in stadiums and external environments. Deep soft Critiques for markerless volumeless sensor alignment Vladimios Sterzentsenko (Information Research and Technology Thessaloniki, Greece), Alexandros Doumanoglu (Institute of Information Technology, Hellas Research and Technology Centre, Thessaloniki, Greece), Spyridon Thermos (Information Institute of Technology, Hellas Research and Technology Centre, Thessaloniki, Greece), Nikolaos Tsiul (Institute of Information Technology, Hellas Research and Technology Centre, Thessaloniki, Greece), Dimitrios Zappolas (Institute of Information Technology, Hellas Research and Technology Centre, Thessaloniki , Greece), Petros Darras (Institute of Information Technology, Greece), Petros Darras (Institute of Information Technology and Technology), , Hellas Research and Technology Centre, Thessaloniki, Greece) Abstract Conference: In this work we improve the assessment of data matching without marking in order to achieve a more stable and flexible spatial alignment of the multisensor. In particular, we include geometric limitations on a segmentation-based model and bridge the intermediate task of classifying dense with the target assessment of targets. This is achieved by a soft, differentiatable forecast analysis that legitimizes segmentation and achieves a higher degree of extra calibration in advanced positioning sensor configurations, while being unlimited from the number of volume capture system sensors. Session 26: Visual rendering on Thursday, March 26, 9:00 AM - 10:30 AM, Track 3 (Studio 1) Underwater Underwater Species Xiaoxu Meng (University of Maryland, College Park), Ruofai Dew (Google LLC), Amitabh Varshney (University of Maryland, College Park) Newspaper Summary: Optimising performance is crucial for a wide range of virtual reality (VR) applications. To reconcile interactive frame rates, they become an important technique for restructuring frames with consistently higher force-display resolutions on their head. Here we present a simple but effective technique to further reduce the cost of fermented rendering using eye dominance – the tendency of the human visual system to prefer the perception of the scene from one eye to the other. Our new eye-dominant approach, guided by the eye eye, which does this, makes the stage at a lower fan level (a higher level) for the dominant eye than not the dominant eye. Compared to traditional foam formations, the EFR can be expected to provide superior rendering while maintaining the same level of visual quality perception. Accelerated stereo rendering with hybrid reprocection rasterization and adaptive ray-weiss Germany), Martin Mishjak (TH Köln, Germany), Arnulf Führmann (TH Köln, Germany), Mark Erich Latoshik (University of Würzburg, Germany) Abstract Conference: This book presents a hybrid rendering system that combines classical rasterization real-time ray tracking to speed up stereoscopic rendering. The system redesigns the The left half of the stereo image pair in the right perspective, using forward network distortion technique and identifying the resulting reprocition errors, which are then effectively solved by adaptive real-time beam tracking. The system achieves a significant increase in performance, has a negligible impact on quality and is suitable even for higher rendering solutions. The anguly dependent on spatial resolution in virtual reality shows Ryan beams (Food and Drug Administration, USA), Brendan Collins (Food and Drug Administration, USA), Andrea S. Kim (Food and Drug Administration, USA), Aldo Badano (Food and Drug Administration, USA) Abstract: We compare two methods for characterizing angular dependence of spatial resolution in displays mounted on the head of virtual reality (HMDs) by measuring the line propagation response (LSR) in the field of vision (FOV) of the device. Multi-scale simulation method of liquid with Trapped Air under a particle-based framework Sinuo Liu (University of Science and Technology Beijing, China), Ben Wang (University of Science and Technology Beijing, China), Xiaojuan Banya (University of Science and Technology Beijing, China) Abstract Conference: In this book we offer a multi-scale particle-based simulation method to achieve a realistic and effective air-liquid simulation. A uniform generation rule is available depending on kinetic energy and the difference in speed between fluid particles. Then two dynamic speed-based models are created for different dimensions of air materials respectively. Brown movement of small air materials is achieved by schilk random function. The interaction and transport of air between large air materials is achieved by a reverse diffusion equation and a new function of the high-end core. Experimental results show that the proposed method can improve the fidelity and richness of fluid simulation. Where to show? How interface position affects comfort and time to switch tasks on Glanceable interfaces Samat Imamov (Virginia Tech, USA), Daniel Monzel (Virginia Tech, USA), Wallace Lages (Virginia Tech, USA) Abstract Conference: Critical solution when designing screens for view information is the place of content. However, no study has been done to systematically evaluate the world-locked content position, given both cognitive and physiological limitations. We created a scenario that mimics the context shift between a real global task and an information display. Our results show that the time to change discomfort and context increases as the information is displayed far from the position of the task. We also found that medium-range content, although they were also faster with long-range content. Session 27: Audio Thursday, March 26, 11:00 - 12:30 PM, Track 1 (Big Room 1) Superhuman Hearing - - Prototyping artificial hearing: A case study of interactions and sound beaming Michel Geronazzo (Aalborg University, Denmark), Luis S. Vieira (Khora VR, Denmark), Niels Christian Nilsson (Aalborg University, Denmark), Jesper Udesen (GN Audio A/S), Stefania Serafin (Aalborg University, Denmark) Journal Abstract: Directivity and gain in microphone systems for hearing aids or hearing aids allow users to enhance in acoustic information from the source of interest. This source is usually placed directly in front. This function is called acoustic radiation formation. This study aimed to improve user interaction with radiation formation through a virtual prototype approach in immersive virtual environments (RE). Eighteen participants participated in experimental sessions consisting of a calibration procedure and a selective hearing task for pairing voice calls. Eight simultaneous speakers are placed in one aechoic environment in two virtual reality (VR) scenarios. The scenarios are a purely virtual scenario and a realistic 360 degree audio-visual recording. Participants were asked to find an individual optimal parameterization for three different virtual beam beams: (i) a guided head, (ii) an eye-guided, and (iii) a new interaction technique called dual beamogener, where the guide head is combined with additional manually directed radiation formation. None of the participants was able to complete the task without a virtual radiation machine (i.e. in normal hearing mode) due to the high complexity introduced by the design. However, participants were able to correctly pair all speakers using all three suggested interaction metaphors. The provision of superhuman auditory abilities in the form of acoustic beam-ray forms guided by head movements leads to statistically significant improvements in pairing time, suggesting that the task is the relevance of interaction with multiple points of interest. Stage audio playback through deep acoustic analysis Genyu Tang (University of Maryland), Nicholas J. Bryan (Adobe Research), Dingzeyu Li (Adobe Research), Timothy R. Langlois (Adobe Research), Dinesh Manocha (University of Maryland) Journal Abstract: We present a new method for capturing the acoustic characteristics of rooms in the real world using raw materials devices, and use the captured features to generate similar sources with virtual models. Given the captured audio and approximate geometric pattern of a room in the real world, we present a new learning-based method to assess its properties of acoustic materials. Our approach is based on deep neural networks that calculate the time of reverberation and alignment of the room from the recorded audio. These estimates are used to calculate the properties of the reverberation of the premises using a new material optimization target. We use the expected characteristics of the acoustic material for audio audio geometric sound and highlight the presentation of very real scenarios. We are also conducting a user survey to assess the similarity of our recorded and our audio. EarVR: Using ear bites in virtual reality for deaf and hearing-impaired people Mohammedreza Mirzai (Vienna University of Technology, Austria), Peter Kahn (Vienna University of Technology, Austria), Hannes Kaufmann (Vienna University of Technology, Austria) Abstract: Virtual reality (VR) has great potential to improve the skills of people with deaf and hard-to-hear people. Most VR apps and devices are designed for people without hearing problems. Therefore, DHH individuals have many limitations when using VR. Adding special features to a VR environment, such as subtitles or haptic devices, will help them. Previously, it was necessary to design a special VR environment for DHH individuals. We present and evaluate a new prototype called EarVR, which can be mounted on any computer or mobile VR Head-Mounted Display (HMD). EarVR analyzes 3D sounds in a VR environment and finds the direction of the sound source closest to the user. It notifies the user of the direction of sound using two vibromotors placed on the user's ears. EarVR helps DHH individuals complete sound VR tasks in any VR app with 3D audio and an option to turn off background music. Therefore, DHH individuals can use all VR applications with 3D audio, not just those applications designed for them. Our user study shows that DHH participants were able to complete a simple VR task significantly faster with EarVR than without. The completion time of DHH participants was very close to the participants without hearing problems. Also, it shows that DHH participants were able to complete a complex VR task with EarVR, while without it, they could not complete the task even once. Finally, our qualitative and quantitative assessment among DHH participants shows that they prefer to use EarVR and encourages them to use VR technology more. Outdoor sound distribution based on adaptive FDTD-PE Shiguang Liu (Tianjin University), Jin Liu (Tianjin University) Abstract Conference: We offer an adaptive FDTD-PE method to simulate sound propagation in 3D scenes taking into account atmospheric inhomogeneity and the influence of the earth. In the simulation, the ground is considered a porous environment of a certain thickness and the stage is categorized into several 2D planes. In addition, a new encoding method is designed to process sound pressure data through the functional connection. Finally, an effective method of displaying sound with this coding representation is developed to perform uralization in the frequency domain. Experiments have shown that our method can realistically simulate the propagation of the sound of with much higher speed and lower memory. Session 28: 28: : Safety, Education, Architecture, Thursday Traffic Control, March 26, 11 a.m. - 12:30 p.m. Trail 1 (Big Room 1) Exploring eye visualization techniques to identify distracted students from the educational VR Yitoshee Rahman (University of Louisiana at Lafayette, Lafayette, Louisiana, United States), Sarker Monojit Asish (University of Louisiana at Lafayette, Lafayette, Louisiana). Fisher (University of Louisiana, Lafayette, Louisiana, USA), Ethan Charles Bruce (University of Louisiana at Lafayette, Lafayette, Louisiana, United States), Aaron K. Kulschersch (University of Louisiana at Lafayette, Lafayette, Louisiana, USA), Christo Videodeath with built-in eye trackers can be used in VR-based education, in which a live teacher leads a group of students. Eye tracking can allow for a better understanding of students' activities and behavior. For a real-time look, the teacher's VR environment can show the student's gaze. These visualizations will help identify students who are confused/distracted, and the teacher can better direct them to focus on important subjects. We present six eye visualization techniques for a teacher's perspective in VR and present a user survey to compare these techniques. Presence, mixed reality and risk-related behavior: Study of safety measures Sogand Hasanzadeh (Virginia Tech, USA), Nicolas Polis (Virginia Tech, USA), Jesus M. de la Garza (Clemson University, United States) Journal Abstract: Immersive environments have been successfully applied to a wide range of safety trainings in high-risk domains. However, very few studies have used these systems to assess the risk behaviour of construction workers. In this study, we examined the feasibility and usefulness of providing passive haptics in a mixed reality environment to cover the behaviour of risk-takeers, identify at-risk workers and propose injury prevention measures to counter excessive risk-taking and risk-compensating behaviour. In the mixed environment in a cave-like system, our subjects installed herpes zoranbi on the (physical) sloping roof of a (virtual) two-storey apartment building in the morning in a suburban area. Through this controlled, intra-site experimental project, we exposed each object to three experimental conditions by manipulating the level of safety interference. Subjective worker reports, physiological signals, psychophysical reactions and reaction behaviors are considered promising measures of presence. The results show that our mixed reality environment is an appropriate platform for triggering behavioural changes in various experimental risk perception and risk-taking of workers in risk-free conditions. These results demonstrate the value of immersive technology for the study of natural human factors. Health and Safety of VR Use by Children in Educational Case Robert Rausenberger (Phoenix Consumer Research Center, Exponent, Inc.), Brandon Barakat (Phoenix Consumer Research Center, Exponent, Inc.) Conference Summary: This study explores the potential health and safety effects of children's use of short-term virtual reality (VR) in an educational scenario. Thirty children participants (age 10-12 years) used VR for 30 minutes daily on five consecutive days. Various optometric, psychophysical and self-reflective comfort measures were collected. There is no empirical evidence that short-term use of VR in an educational environment by children aged 10 to 12 years results in adverse visualizations, spatial representation or results, or that it causes undue nausea, oculomotor discomfort or disorientation. Design and evaluation of an air traffic control support tool with 2D and 3D visualizations Gernot Rottermanner (St. University of Applied Sciences ,St. Mylen Craiger (University of Applied Sciences St. Puelten, St. Poelten, Austria), Marcus Wagner University of Applied Sciences Poelten, St. Poelten, Austria), Michael Iber (University of St. Poeln, St. Pölten, Austria), Karl-Herbert Rokitansky (University of Salzburg, Institute of Computer Science , Aeroprope research, Salzburg, Austria), Kurt Esbacher (University of Salzburg, Institute of Computer Science, Space Studies, Salzburg, Austria), Volker Grantz (Often AGis , Vienna, Austria), Volker Settgast (Fraunhofer Austria Research GmbH, Vienna, Austria), Peter Judmaier (University of Applied Sciences St. Poelten, Austria) Abstract: Air Traffic Control Officers (ATCOs) are specialized workers responsible for monitoring and guideing aircraft in their airspace. This task is highly visual and is mainly supported by 2D visualizations. In this document, we developed and evaluated an application for visualization of air traffic both in orthographic (2D) and in perspective (3D). A user survey was then carried out to compare these two types of representations in terms of awareness, workload, productivity and user acceptance. The results showed that the 3D view resulted in both a higher level of awareness and less load than the 2D view. However, this implementation is not in line with the opinion of the Study in the field: Desktop comparison, immersive virtual reality and real field trips for the education of STEM Jiayan Zhao (State University of Pennsylvania, USA), Peter LaFemina (State University of Pennsylvania, USA), Julia Carr (State University of Pennsylvania, USA), Peimman Sajjadi (The Pennsylvania State University, USA), Jan Oliver Walgrün (The Pennsylvania State University, USA), Alexander Klippel (Pennsylvania State University, USA) Abstract Conference : With immersion in virtual reality (iVR) the entry of basic, virtual field excursions (VFTs) are increasingly considered an effective form of training in STEM disciplines such as geosciences. However, few studies have studied the effects of VFTs in technology-based STEM education. We report a study that divides an introductory geoscience course into three groups, with the first two groups experiencing CNG on the desktop or in iVR, while the third group went on an actual field trip. Our findings show positive learning effects of VFTs and provide evidence that VFT geology does not need to be limited to IVR settings. Session 29: AR - Perception Thursday, March 26, 11:00 AM - 12:30 PM, Track 3 (Studio 1) ARCHIE: User-focused framework for testing augmented reality apps at Wild Sarah Lehman (Temple University), Haibin Ling (Stony Brook University), Chiu Tan (Temple University) Abstract: Introducing ARCHI, a framework for testing augmented reality apps in the wild. ARCHIE collects user data submission data and on-site system state to help developers identify and debug issues important for testers. It also supports testing multiple versions of apps (profiles) in one rating, prioritizing those versions that the tester finds more attractive. We implemented four test cases and used them to look at ARCHIE overhead costs and context switching costs. We demonstrate that ARCHIE does not provide significant costs for AR applications and introduces a top 2% cost processing when switching between large groups of test accounts. The paradox of realisticity For users with scaling and down in a virtual environment Matti Pouke (University of Oulu, Finland), Katherine J. Mimnau (University of Oulu, Finland), Timo Oyala (University of Olulu, Finland), Steven M. LaValle (University of Oulu, Finland) Abstract: This document identifies a new phenomenon: when users interact with simulated objects in a virtual environment where the user is much smaller than usual , there is a mismatch between the expected and correct convergence of physics on this scale. We explored perceived realism in a virtual reality experience in which the user was 10th. and four objects performed a task to interact with objects in two physical simulations. In one objects behave exactly according to physics, which would be correct on this reduced scale. In the other condition, objects behave as if there was no scaling. We found that a significant majority of consumers preferred the latter condition. The role of distance viewing and feedback on judgments on synonyms in augmented reality Holly Gagnon (University of Utah, USA), Dunn On (Vanderbilt University, USA), Keith Heiner (University of Utah, USA), Janine Stefanucci (University of Utah, USA), Sarah Kram-Reger (University of Utah, USA), Bobby Bodenheimer (University of Vanderbilt, USA) Abstract: The effectiveness of Augmented Reality (AR) that they can act on virtual objects as if they are real. We looked at the effects of visual distance (associated with virtual features observed in the field of visibility) and verbal feedback on observers' judgment of going through an AR opening using Microsoft Hololens. Passing through the estimates is closer to the actual width of the shoulder when viewed at close range compared to a more distant viewing point. Verbal feedback reduces the error of attempts at the distance. The results have implications for ways to improve the accuracy of court decisions to grant permits in AR. Fayu Lu (Virginia Tech, United States), Shakiba Babari (Virginia Tech, United States), Lee Lisle (Virginia Tech, United States), Yuan Li (Virginia Tech, USA), Doug Bowman (Virginia Tech, USA) Abstract: Enriched Realities Worn Out (AR HWDs) have the potential to help personal computers and obtain daily information. In this study, we propose an interaction analysis with a view to accessing information in AR HWDs. In a short analysis, secondary information is located on the periphery of vision to remain unobtrusive and can be accessed with a quick glance when needed. We have proposed two new hands-free interfaces under the paradigm, using head-turning or a glance to access information. We evaluated them in two dual task scenarios together with hud basic technique. Influence the perspective of dynamic tasks in virtual reality navy (University of Bath, UK), Emonn O'Neill (University of Bath, UK) Abstract: Users can increasingly navigate and perform tasks in a virtual environment (VE). These movements and tasks are usually presented in the IC using either a first-person perspective (1HR) or a third-party perspective (3PP). In virtual reality (VR), 1PP is almost universally used. 3PP may be presented as self-centered or allocentric. However, there is little empirical evidence that may be better suited to dynamic tasks in particular. This article compares the use of 1PP, 3PP and allocentric 3PP for dynamic tasks in VR. Our results show that 1PP provides the best spatial perception performance of several dynamic tasks. This advantage is less pronounced as the task becomes more dynamic.

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