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Sunday, November 19

Sunday, November 19 15:00 - 17:00 (America/Barbados)

Registration

Room: Foyer

Sunday, November 19 17:00 - 19:00 (America/Barbados)

Social Activity

Room: Foyer

Monday, November 20

Monday, November 20 8:30 - 9:00 (America/Barbados)

Registration (8:30-5:00)

Room: Foyer

Opening Ceremony

President, IEEE CTSoc, Welcome Address
VP Conferences, IEEE CTSoc, Presentation
General & Executive Chairs Presentations
Organizing Committee Chair Presentations

Room: First Citizen's

Monday, November 20 9:00 - 10:00 (America/Barbados)

Academic Keynote, Adam Dubrowski

Bridging the Gap: Empowering Non-Healthcare Students as Simulation Assistants in Simulation-Based Healthcare Education.

Room: First Citizen's

Chair: Andrew Hogue (Ontario Tech University, Canada)

Monday, November 20 10:00 - 10:30 (America/Barbados)

Morning Break

Room: Lunch Room

Demo Setup (10:00 am - 4:30 pm)

Training Room 3

Monday, November 20 10:30 - 12:15 (America/Barbados)

Session A - Full Papers

Room: First Citizen's

Chair: Bruno Bouchard (University of Quebec at Chicoutimi, Canada)

10:30 ***Safety Sense: Haptic Navigation for Emergency Responders in Obscured Visibility Environments…1***

Cassandra F Laffan (Toronto Metropolitan University, Canada); Robert Kozin and James Coleshill (Ryerson University, Canada); Brodie Stanfield and Michael Stanfield (IFTech Inventing Future Technology Inc., Canada); Alexander Ferworn (Ryerson University, Canada)

Emergency responders, specifically firefighters, run the risk of getting lost or disoriented in disaster environments due to situational chaos and low visibility. Our research aims to rectify this with a wearable haptic system. Using the lidar technology in Apple iPhones combined with path planning algorithms and haptics, we tracked a firefighter's pathway and calculated the most efficient egress path. Path directions were conveyed via haptic feedback, providing navigational guidance to a firefighter. This paper describes the experimental setup and preliminary results of our prototype haptic egress technology.

10:41 ***3DK-reate: Create your own 3D Key for distributed authentication in the Metaverse…7***

Federico De Lorenzis, Alessandro Visconti, Martina Marani, Erik Prifti, Camilla Andiloro, Alberto Cannavò and Fabrizio Lamberti (Politecnico di Torino, Italy)

The Metaverse is becoming a social and economic ecosystem in which users can meet each other, exchange personal data, and make transactions. In this respect, authentication can be easily forecasted to be one of the key aspects for the development of social, immersive Virtual Reality (VR) environments. Notwithstanding, there is still a lack of techniques that can authenticate the users while protecting their sensitive data and leveraging the intrinsic characteristics of VR experiences. In this scenario, the present paper introduces a novel authentication schema based on asymmetric cryptography. More specifically, the proposed approach supports the creation of breakout rooms in which only mutually authenticated users can access. Due to the adoption of the asymmetric cryptography schema, the users are requested to create and insert their personal and secret private keys. To this aim, the current paper proposes and investigates four different interfaces for creating and inserting the keys, leveraging the three-dimensionality of the immersive environment.

10:53 ***Introducing Inclusive Design by Showing the Effects of Impaired Environments on Neurodiverse Users…13***

Colin A Depradine (The University of the West Indies, Barbados)

This paper focuses on a study to determine the feasibility of the use of serious games, in a user-interface design course, to remove any barriers that students may initially have towards inclusive design by introducing accessibility issues that affect neurodiverse users. Each game highlights a difficult to understand experience that these users undergo when using an impaired user-interface. Neurodiverse users are often overlooked in the creation of software because of the stigma and misinformation that exists within society. Each game requires the completion of a single task in an inaccessible environment enabling students to experience the frustrations neurodiverse users experience when common accessibility mistakes are made.

11:05 ***Exploring the Impact of Menu Systems, Interaction Methods, and Sitting or Standing Posture on User Experience in Virtual Reality…19***

Jonathan Andersson and Yan Hu (Blekinge Institute of Technology, Sweden)

Virtual Reality (VR) has become an increasingly crucial aspect in both commercial and industrial settings. However, the user experience of the user interfaces and interaction methods in the VR environment is often overlooked. This paper aims to explore different menu systems, interaction methods, and the user's

sitting or standing posture on user experience and cybersickness in VR applications. An experiment with two menu systems and two interaction methods in an implemented VR application was conducted with 20 participants. The results found that traditional, top-down, panel menus with motion controls are the best combination regarding the user experience. Sitting posture provides less severe simulator sickness symptoms than standing.

11:16 ***Analyzing Viewer Motivations and Engagement in Game Live Streaming through Eye Tracking…25***

Hsuan-Min Wang (National Yang Ming Chiao Tung University & Asia University, Taiwan); Chih-Chun Hsu and Chuen-Tsai Sun (National Yang Ming Chiao Tung University, Taiwan)

The purpose of designers developing games is to create experiences. However, with the development of technology, people have a new choice of playing games - watching Game Streaming. The live broadcast industry has developed rapidly in recent years. It combines game screens, chat rooms, and live host video viewing methods, allowing viewers to interact with live host and other audiences while enjoying the game process. Therefore, this study wants to explore what makes live viewers choose to watch others play games instead of playing games themselves, and how different types of viewers have different viewing experiences in the live viewing process. This research focuses on the audience, adopts an experimental method to record the process of subjects watching the live action with an eye tracker, and cooperates with the viewing motivation scale and the game experience questionnaire. Through follow-up interviews, explore the viewing behavior of different types of audiences, trying to understand what elements in the live game catch the audience's attention. The results show that the motivation for social interaction can clearly distinguish the audience's attention allocation on the game screen and the chat room, showing that the chat room is very important to the audience with this motivation; The motivation to acquire new knowledge will allow the audience to pay more attention to the game screen to receive more new information. Finally, this study also presents suggestions based on the results as a reference for follow-up research and live game management methods.

Presenter bio: Hsuan-Min Wang received the B.S. degrees in computer science from the Chung Hua University, Hsinchu, Taiwan, in 2007 and the M.S. degree of Information Technology from Queensland University of Technology, Brisbane, Australia, in 2011. He is currently working toward the Ph.D. degree in computer science at the National Yang Ming Chiao Tung University. His main research interests are game AI, player modeling, game design and learning in games.

11:28 ***Analysis of Instructional Techniques Influence on a Robot Assembly Task…30***

Brian Holtkamp and Chang Yun (University of Houston, USA)

As virtual reality (VR) has grown to become a common medium for training and entertainment, the techniques for communicating and instructing the user to perform a task within VR have been diverse and varied. Some of these techniques utilize familiar patterns such as dialogs and textual instructions, while others provide more VR-native interactions such as environmental cues or holograms.

In this study, each subject was tasked with assembling two robots from their constituent parts one piece at a time. The subject received the instruction through one of the following instructional techniques: an unchanging set of generic instructions, a dynamic line of text per part, an image of the robot highlighting each part's destination, and a hologram in the destination of where each part should be placed.

We conclude that no instructional technique offered a statistically significant increase in performance. While the hologram instructional technique was the overall preference of the population. Finally, the analysis of feedback shows promise that holograms would solve issues demonstrated in other instructional techniques.

11:40 ***Using Augmented Reality to Teach Empathy to Healthcare Providers and Caregivers of Persons Living with Dementia...N/A***

Claire M. Culver (Ontario Tech University, Canada); Gabrielle Hollaender (Ontario Tech University, Greece); Bill Kapralos (Ontario Tech University, Canada); Sina Karimi (York University, Greece); Eva Hava Peisachovich (York University, Canada); Bill Kapralos (Ontario Tech University, Canada); Don Sinclair and Celina Da Silva (York University, Canada); Adam Dubrowski (Ontario Tech University, Canada)

Empathy refers to the ability to understand another person's experiences or feelings. Research has shown that greater empathy by healthcare providers (HCPs) and informal caregivers leads to better care and improved patient satisfaction and outcomes for persons living with dementia (PLWD). However, few programs train HCPs to develop empathy and we are not aware of any programs specific to empathy training for informal caregivers of PLWD. We have begun development of the augmented reality (AR) education experience (AREduX), a proof-of-concept prototype that employs AR to simulate the physical and cognitive symptoms that PLWD experience. Using the latest AR and game development technology, we are creating a unique experience that provides simulating effects of dementia for training purposes with the goal of making HCPs and informal caregivers more empathetic to PLWD.

11:51 ***A Chatbot for an AR-Based Virtual Simulation...N/A***

Argyrios Perivolaris (University of Toronto, Canada); Bill Kapralos (Ontario Tech University, Canada); Eva Hava Peisachovich (York University, Canada); Adam Dubrowski (Ontario Tech University, Canada)

A chatbot can help create a more personalized virtual learning experience. In this late-breaking-work paper, we briefly discuss chatbots and their role in virtual learning environments (VLEs) with an emphasis on virtual simulations and serious games. We also briefly outline our plans to incorporate a chatbot into an augmented reality-based VLE (virtual simulation) for caregivers of persons living with dementia.

12:03 ***VisualEyez - Assisting the Visually Impaired with Barbadian Banknote Detection...36***

Adrian Als, Tizelia Norville and Roshawn Layne (The University of the West Indies)

The International Agency for the Prevention of Blindness's Vision Atlas reports that there are 1.1 billion people globally with vision loss and this is expected to rise to 1.7 billion by 2050. Moreover, much of this vision loss is driven by inequality with higher rates occurring in low- and middle-income countries such as those within the Caribbean region. Four percent of the Barbadian population is estimated to be visually impaired (VI) and of this, one percent is totally blind. Although this is a small percentage, it represents over ten thousand people who have the right to live independently in an inclusive society. Until December 05, 2022, this right was inhibited by the lack of a mechanism for members of the VI community to distinguish among the various local banknotes. The introduction of unique tactile symbols on each denomination was welcomed by the community. However, as the older notes are still widely circulated, the issue persists. VisualEyez, an artificial intelligence (AI) mobile application was developed to address the matter. This application identifies the different denominations of Barbadian banknotes and communicates the detected value using either speech or vibration modes. In this work, the Systems Usability Survey (SUS) instrument was employed on a purposive sample of 6 members from the Barbados Association for the Blind and Deaf (BABD) to quantify the user experience (UX). Results showed an average rating of 79.6 which indicates that users are very satisfied with the application. Speech was the generally preferred operating mode, with vibration mode being preferred in public spaces. This research shows that the VisualEyez application will be beneficial to those who are blind or visually impaired.

Session A - Short Papers & Late-Breaking Work

Room: Goddard's Room

Chair: Yannick Francillette (University du Quebec à Chicoutimi & LIARA, Canada)

10:30 ***The Digital Comic as a Study Tool for Caribbean Computer Science Students: A Pilot Study...42***

Curtis Gittens (The University of the West Indies, Cave Hill Campus, Barbados); Mechelle Gittens (University of the West Indies, Cave Hill, Barbados); Verna Knight (The University of the West Indies Cave Hill Campus, Barbados); Ian Wade (Freelance Illustrator, Barbados)

Despite the proven efficacy of digital comic books (digital comics for short) as an educational tool in various instructional settings across North America and Europe, there is a noticeable lack of studies examining their impact within the English-speaking Caribbean context. This paper aims to fill this gap by exploring digital comics in a West Indian educational setting, specifically in tertiary-level Computer Science in Barbados. The findings from our pilot study, present a complex picture. While students generally viewed comics positively and agreed on their potential as effective learning tools, the majority did not actually use the comic book for studying. Furthermore, these students did not report a better understanding of the subject compared to those who used traditional study materials.

Monday, November 20 12:15 - 13:00 (America/Barbados)

Lunch

(Participants are asked to make their own arrangements for this lunch break)

Monday, November 20 13:00 - 13:45 (America/Barbados)

Industrial Keynote: David Canton

The Legal and Ethical Issues of AI

Room: First Citizen's

Chair: Curtis Gittens (The University of the West Indies, Cave Hill Campus, Barbados)

Monday, November 20 13:45 - 15:15 (America/Barbados)

Demos and Lightning Talks Session A

Room: Goddard's Room

13:45 ***Development of a Safe Gaming and Anti-Hate Serious Game...48***

Hana Hadzifejzovic (John Howard Society of Ottawa, Canada); Colt Morell and Tom Scholberg (BGCO, Canada); Barbara Perry (Ontario Tech University, Canada); Ahmed Jama and David Obrien (Yorktown Family Services, Canada); Kim McCalpin (John Howard Society of Ottawa, Canada); Andrew McKenzie (Yorktown Family Services, Canada); Alvaro Uribe-Quevedo and Andrew Hogue (Ontario Tech University, Canada); Jessica Ripley (Ottawa Police Service, Canada); Rosa Sposato (York Regional Police, Canada)

The online gaming culture is a venue that hate groups exploit to recruit and promote hateful narratives.

The adoption of video games and the connectedness provided by online platforms provide a space for hate groups to gather and coordinate violence. This paper presents a multi-stakeholder approach to develop an anti-hate serious game to teach youth about hate through coping mechanisms, relatable experiences, and decision-making articulated in a storyline based on a curriculum focused on understanding emotion, increasing digital literacy, and familiarizing with stereotypes. A preliminary study comprised a pre- and post-test assessment regarding, in addition to session assessments, all focused on how the experience was perceived in terms of the serious game effects. While a small number of participants due to COVID-19 physical restrictions limited the sample size, from our preliminary results, both the youth and facilitators positively received the serious game and highlighted its benefits in terms of engagement and providing tools to better deal with online hate narratives.

14:00 ***MYdata: Designing A Feminist Tool for Self-Tracking Data Art...N/A***

Sarah Schoemann, Jo Jackley and Drew Smuniewski (College of Charleston, USA)

This paper presents MYdata, a novel personal informatics and data-art making tool. Inspired by the data feminist design principles embedded in designers Stephanie Posavec and Georgia Lupi's acclaimed data-art project and book Dear Data, MYdata is a mobile app, that allows users to explore self-tracking for both personal reflection and creative self-expression. This paper situates MYdata in the tradition of data visualization and a growing body of data-art and, more specifically, self-tracking data-art by discussing the work of contemporary artists in the space. An overview of the design of the MYdata platform is offered and samples of work made with MYdata by our first author representing the tensions of the post-partem experience through personal data are discussed.

14:15 ***Guitar-For-All - A Programmable Single Touch Synthetic Guitar...N/A***

Nitheezkant R (International Institute of Information Technology, Bangalore); Barath S Narayan (International Institute of Information Technology, Bangalore, India); Madhav Rao (International Institute of Information Technology - Bangalore, India); Ketaki Srikrishna Tamhanakar, Neha Srikrishna Tamhanakar and Srinivasan M (International Institute of Information Technology, Bangalore, India)

Fretting a guitar is a physically demanding and painful task. A guitar with single buttons for entire chord patterns is desirable for every beginner and recreational guitarist. It makes the guitar more accessible for individuals with disabilities and makes it easier for therapeutic purposes. Towards achieving this goal, a synthetic guitar was designed using a microcontroller to map the strings to the corresponding notes based on the chosen chord and further generate sound using MIDI synthesizers. The designed synthetic guitar was evaluated towards its functionality of generating single notes and chords, and the timing characteristics are also reported to showcase the real-time usage of the proposed Guitar-For-All synthetic system.

14:30 ***A Proposal of Code Amendment Problem for Game Programming Study...N/A***

Htoo Htoo Sandi Kyaw and Keiichi Kaneko (Tokyo University of Agriculture and Technology, Japan); Nobuo Funabiki (Okayama University, Japan)

C programming has been a fundamental subject for many university students. To assist C programming education, we have developed a C Programming Learning Assistant System (CPLAS). In CPLAS, all of the available programming problem topics cover fundamental topics from the textbook. However, it is still lacking in the topic of game programming although game development is an engaging and effective approach to learning C. Therefore, we propose the Code Amendment Problem (CAP) to study how to develop games by C. We generated a CAP instance for a well-known snake game and applied

to 14 students. The results from the students show that CAP is applicable to studying introductory game programming with C.

14:45 ***A Comparison of Interfaces for Learning How to Play a Mixed Reality Handpan...54***

Gavin Gosling (Ontario Tech University, Canada); Ivan-Teofil Catovic (Mulvey & Banani International, Canada); Ghazal Bangash, Daniel MacCormick and Loutfouz Zaman (Ontario Tech University, Canada)

In the realm of music therapy, Virtual Reality (VR) has a long-standing history of enriching human experiences through immersive applications, spanning entertainment games, serious games, and professional training in various fields. However, the untapped potential lies in using VR games to support mindfulness through music. We present a new approach utilizing a virtual environment to facilitate learning how to play the handpan - an instrument in the shape of a spherical dish with harmonically tuned notes used commonly in the sound healing practice of mindfulness. In a preliminary study we compared six interfaces, where the highlighted path interface performed best. However, participants expressed preference for the standard interface inspired by rhythm games like Guitar Hero.

15:00 ***VR Rhythm Game Featuring Audience Participation...60***

Van Khôi Lê and Adrien Villars (Enseirb-Matmeca, France); Febri Abdullah (Ritsumeikan University, Japan); Mustafa Can Gursesli (Università degli Studi di Firenze, Italy); Xiao You (Ritsumeikan University, Japan); Sergio Roman Lara Espinosa de los Monteros (Japan International Cooperation Agency, Japan); Ruck Thawonmas (Ritsumeikan University, Japan); Victor Fernandez Cervantes (Canada); Eleni Stroulia (University of Alberta, Canada)

This study presents a virtual reality (VR) game with a mechanic that allows audiences to take participation. It has been previously shown that VR games offer better immersion, as well as improved enjoyment for the player. By introducing audience participation we aim to investigate the extent to which an audience becomes emotionally invested while observing and providing support to a VR game player. To achieve that, a preliminary experiment was conducted to measure the enjoyment of the player and the audiences. In addition to the enjoyment, the audiences' social interaction was also evaluated. The results show the potential of the audience participation mechanic in a VR game for the enjoyment of the player and the audiences. In addition, the results show that the proposed mechanic successfully promotes the audience's social interactivity.

Session B - Full Papers

Room: Goddard's Room

Chair: Cassandra F Laffan (Toronto Metropolitan University, Canada)

13:45 ***Eyetracking correlated in the Matching Pairs Game...64***

Mustafa Can Gursesli, Federico Calà, Pietro Tarchi, Lorenzo Frassineti and Andrea Guazzini (Università degli Studi di Firenze, Italy); Antonio Lanata (University of Florence, Italy)

The video games industry has made available frameworks and methodologies that can support many applications in education, medical assessments, and rehabilitation programs. This study proposes a gamified approach based on Matching Pairs (MP) game to evaluate memory skills and performance in a cohort of 18 healthy subjects. An eye-tracking (ET) device was adopted to acquire the participants' gaze patterns while playing three consecutive instances of the card memory game. Eye gaze data has been analyzed

to extract eye movements and velocity. Moreover, a statistical analysis was carried out to investigate possible differences in eye dynamics between trials, and a correlation analysis was performed between game statistics (i.e., total score, time, number of flipped cards) and ET-related parameters. Results showed that the maximum eye velocity differed between the first and second trials and eye movements (i.e., saccade and fixation count) and velocity significantly correlated with game duration and the number of flipped cards, respectively. These preliminary outcomes highlight possible relationships between eye dynamics and mental mechanisms for memory recall strategy. Furthermore, this study explored the feasibility of the proposed strategy to be applied to elderly or fragile people to contrast cognitive decline.

Presenter bio: Mustafa Can Gursesli received his master's degree in Clinical Psychology from Bergamo University, Italy, in 2020. He worked in Emerging Technologies Lab as an assistant researcher at Tampere University, Finland. He is currently pursuing his Ph.D. study at Information Engineering, at the University of Firenze and working in Virtual Human Dynamics Laboratory. Mustafa Can Gursesli is a member of the IEEE Entertainment and Gaming (ENT) Technical Committee. His research interests are Clinical Psychology, Game Studies, Social Psychology, Artificial Intelligence, and Computer Vision.

14:15 ***Volumetric Kombat: a Case Study on Developing a VR Game with Volumetric Video…70***

Andrew Hogue (Ontario Tech University, Canada); Andrei Boiko (Abertay University, United Kingdom (Great Britain))

This paper presents a case study on the development of a Virtual Reality (VR) game using Volumetric Video (VV) for character animation. We delve into the potential of VV, a technology that fuses video and depth sensor data, which has progressively matured since its initial introduction in 1995. Despite its potential to deliver unmatched realism and dynamic 4D sequences, VV applications are predominantly used in non-interactive scenarios. We explore the barriers to entry such as high costs associated with large-scale VV capture systems and the lack of tools optimized for VV in modern game engines. By actively using VV to develop a VR game, we examine and overcome these constraints developing a set of tools that address these challenges. Drawing lessons from past games, we propose an open-source data processing workflow for future VV games. This case study provides insights into the opportunities and challenges of VV in game development and contributes towards making VV more accessible for creators and researchers.

14:45 ***Automated Difficulty Assessment Model for Platformer Games: A Comprehensive Approach…76***

Yannick Francillette (Université du Québec à Chicoutimi, Canada); Hugo Tremblay (University of Quebec at Chicoutimi (UQAC), Canada); Bruno Bouchard (University of Quebec at Chicoutimi, Canada); Simon Lescieux, Mathis Rozon and Jules Linard (University of Quebec at Chicoutimi (UQAC), Canada)

In general, a video game offers a seamless progression in gameplay difficulty, starting with easy levels that allow players to grasp the basic mechanics of the game, and gradually introducing more challenging obstacles as they progress. The success of a game title heavily relies on its ability to provide a well-balanced difficulty curve and a satisfying sense of progression. Designing a game entails a complex and time-consuming process that involves extensive playtesting. One promising approach to address this challenge is the utilization of software tools capable of automatically evaluating the difficulty of game levels. In this paper, we present a comprehensive model for automatically assessing the difficulty levels of platformer games. Our model is based on the formal calculation of static danger zones within levels and the analysis of enemy movement patterns using simulated pheromones. To validate our model, we implemented it and conducted tests using the complete set of levels from the original Mario Bros game. The paper includes a detailed presentation of the model, the tools developed, and a comparative analysis showcasing the computed results.

Monday, November 20 15:00 - 15:30 (America/Barbados)

Afternoon Break

Room: Lunch Room

Monday, November 20 15:30 - 16:30 (America/Barbados)

Lecture Session C

Room: Goddard's Room

Chair: Colin A Depradine (The University of the West Indies, Barbados)

15:30 ***Visualization of Brain States by EEG Signals Measured during VR gameplay for Evaluation of VR games...82***

Tatsuya Yoshii, Shion Nakagawa and Ryota Horie (Shibaura Institute of Technology, Japan)

In recent years, a method called neuromarketing, which more accurately explains consumer decision-making processes and mechanisms by complementing existing consumer survey methods with results obtained from brain activity measurements, has been attracting attention. Furthermore, as XR technologies such as VR, MR, and AR become more familiar to us, it can be said that the need for quantitative product evaluation using brain waves as a complement to evaluation is also increasing with the development of the VR game market. However, there is a problem that brain wave measurement during movement such as VR gameplay has large artifacts, or so-called noise. In this study, in order to enable product evaluation from brain waves even under body movement, we visualized brain activity areas from brain waves measured during VR dance gameplay with large body movement and created a video that can observe the transition of brain activity according to game progress from the results. For artifact removal algorithm, we used artifact subspace reconstruction (ASR) and independent Component Analysis (ICA). For visualization of brain activity areas, we used exact low resolution brain electromagnetic tomography analysis (eLORETA). The video was created by synchronizing the results of eLORETA analysis with game sound and video of player's play taken with smartphone. As a result, it was confirmed that activation of the auditory cortex, visual cortex, motor cortex, and prefrontal cortex due to gameplay could be observed from the video.

15:40 ***Cheating in eSports: Problems and Challenges...88***

Altin Gjonbalaj, Jiaxing Chen, David Demicco and Aravind Prakash (Binghamton University, USA)

Cheating in competitive eSports is pervasive. We present a study and discussion of challenges surrounding defenses against cheating with the intent to provide valuable information for game developers.

In gaming, attackers (cheaters) have complete control over their system including software and hardware. This high attack surface area is further compounded by resistance among users towards invasive solutions, privacy issues, and low tolerance for performance loss. Our discussion includes details of both attacks and defenses created in this environment: How they work, what they are used for, and how users (both normal players and cheaters) interact with them. For attacks we present a common example illustrating how an attacker can read, use, and modify arbitrary game data structures at runtime. For defenses we discuss design principles and trade-offs in greater detail, providing an examination of the differences between types of defenses and the issues they create.

15:50 ***A Framework for Presence Maintenance: Evoking Synesthesia and Empathy in Cinematic Virtual Reality...94***

Hua-Hsiang Chen and Hsiao-Yue Tsao (National Taipei University of Technology, Taiwan)

As VR films have evolved from traditional 360-degree films into 6DoF cinematic virtual reality (CVR) storytelling experiences, CVR authors are now striving to pursue engaging content with a narrative arc that elevates emotional engagement. However, in most CVR content, the audience's positioning has not been properly addressed, reducing them to invisible observers and resulting in a failure to maintain presence throughout the movie. Inspired by Shin's two-tiered process of immersion model, this paper presents a presence maintenance framework in the production of the VR cinema The Midnight Rendezvous. The framework incorporates elements of mise-en-scène and the mechanism of synesthesia to accentuate narrative and technical immersion, leverages the viewer's head movements to evoke proprioceptive involvement, and arouse emotional responses toward the protagonists. We believe that if a viewer is able to vicariously engage in the character's role, their feelings of presence can be sustained, which is the point we'll verify in future experiments.

16:00 ***A Systematic Review of Caribbean Digital Serious Games for Education…98***

Paul A. Walcott (The University of the West Indies, Barbados)

Serious games (SGs) support learning and are used in sectors such as health care and education. Increasingly, these games are being viewed as important given their ability to improve engagement, enjoyment and learning. Despite their potential benefits however, there has been no systematic review of Caribbean SGs for education. This paper reports the results of a systematic review of digital SGs for education over the period 2013-2022. A total of 12 papers were identified and their analysis revealed that, (1) SGs studies have been conducted in Trinidad and Tobago, Barbados, Jamaica, Grenada, Haiti, St. Vincent and the Bahamas; (2) SGs research has been conducted at the nonformal, primary, secondary, tertiary, and adult learner educational levels across the Caribbean; (3) Science, Technology and Mathematics has been the primary focus of SGs research in the Caribbean; (4) over half of the papers reviewed used quasi-experimental one-group pretest-posttest research designs or case studies; and, (5) improvements in learning, engagement and enjoyment through the use of SGs have been reported. It can be concluded that Caribbean SGs research is emerging, however a regional agenda is required to promote further research and the adoption of SGs. This could lead to an improvement in the academic achievement of students across the region.

16:10 ***Student Motivation in Augmented Reality-Enhanced Gamified STEM Learning Settings…104***

Jennifer Tiede and Silke Grafe (University of Würzburg, Germany); Eleni Mangina (University College Dublin, Ireland)

Against the background of the research-based assumption that student motivation is a key factor for successful teaching and learning processes, the following paper presents results from a study evaluating the role of student motivation in Augmented Reality (AR)-enhanced gamified STEM learning settings. In the study, an international sample of 1988 primary school students and 91 teachers used an AR-enhanced gamified STEM learning app (intervention group) or traditional teaching and learning approaches (control group). Student motivation and performance were assessed in a pre and post test design and teachers' opinions were recorded using online surveys. The results indicate that students and teachers in the intervention group considered the motivational impact of the AR-enhanced gamified app significantly higher, compared to the ratings for alternative media in the control group. The product-moment correlation between motivation and further variables, such as student attitudes and self-efficacy, showed significant, medium strong results which are comparably high in intervention and control group. Only in the intervention group, motivation and learning achievement were correlated. Students and teachers in the intervention group tended to agree on the motivational impact of the study phase while a correlation

between the opinions of teachers and students in the control group could not be confirmed. Overall, the study provides evidence of the pedagogical usefulness of AR-enhanced gamified STEM learning applications in terms of supporting student motivation, based on findings from a large international sample.

Presenter bio: Dr. Jennifer Tiede is a research fellow at the department of School Pedagogy, University of Würzburg (Germany), where she mainly works in international research projects in the field of media pedagogy. She specializes in research on media-related educational competencies of preservice teachers and teacher educators, in the benefits and challenges of AR and VR in education, in the evaluation of pedagogical interventions on an international level and in game-based learning and gamification.

16:20 ***Implementation of Adapting Gamification Framework in a Mixed Reality Application...110***

Areej Reda Banjar (University College Dublin & Umm Alqura University, Ireland); Sarah Alturkistani and Mutahira Lone (University College Cork, Ireland); Thomas Costa and Abraham Campbell (University College Dublin, Ireland); Tamara Vagg (University College Cork, Ireland)

In recent years, the integration of gamification and mixed reality has gained significant attention in various domains, including education. The potential of gamification to enhance motivation in educational settings has been widely acknowledged. Aims: This study seeks to evaluate the effectiveness and impact of a mixed reality application on students' motivation. We aim to ascertain the reliability and validity of the instruments including the developed MR applications, to explore the differences in student motivation when interacting with a gamified mixed reality environment versus a non-gamified mixed reality environment, and to investigate the relationship between the use of mixed reality technology and the enhancement of student motivation. method: The application is developed using an iterative design process in the rapid application development. the prototypes has been essential for MR application improvement and testing. This study is a quantitative study To evaluate the effectiveness of the developed gamified mixed reality application, the study employed the Reduced Instructional Motivational Material Survey (RIMMS) as an assessment tool. Results: The study indicates that dental students generally had a positive outlook towards the use of mixed reality applications in learning dental morphology. The students' perceptions did not significantly differ across different groups. The study also found strong and significant correlations among the variables of attention, relevance, confidence, and satisfaction

Monday, November 20 16:30 - 17:30 (America/Barbados)

Panel Session: PlayTropic

Room: First Citizen's

Monday, November 20 17:30 - 20:00 (America/Barbados)

Conference Evening Reception Provided by the Conference for all fully registered attendees.

Room: Walcott Warner Theatre Terrace

Tuesday, November 21

Tuesday, November 21 8:30 - 9:00 (America/Barbados)

Registration (8:30-5:00)

Room: Foyer

Tuesday, November 21 9:00 - 9:45 (America/Barbados)

Academic Keynote Claude Turner: LUCID: An In-Depth Visualization and Broadcast System for Cybersecurity Competitions

Room: First Citizen's

Tuesday, November 21 10:00 - 10:30 (America/Barbados)

Morning Break

Room: Lunch Room

Demos Setup (10:00 am - 4:30 pm

Training Room 3

Tuesday, November 21 10:30 - 12:15 (America/Barbados)

Session D: Serious Ges & Gification - Full Papers

Room: First Citizen's

Chair: Alberto Cannavò (Politecnico di Torino, Italy)

10:30 ***On performing vestibular damage assessment and therapy using virtual reality: lessons learned...116***

Ambika Bansal (Centre for Vision Research, York University, Canada); Gita Mikal and Shehzad Surya (Physiomobility Health Group, Canada); Laurence Roy Harris (Centre for Vision Research, York University, Canada); Michael Jenkin (York University, Canada)

Virtual and augmented reality-based devices have been proposed for a range of assessment and treatment tasks, but how well are they accepted by clinicians and their patients? To investigate this question a prototype VR-based tool was developed for vestibular damage assessment and treatment. Designed to be used primarily within an in-person clinical setting, this tool was developed with the long-term goal of also supporting inhome independent and supervised treatment. Mock treatment and assessment sessions were held with non-clinical patients and the operational and patient experiences evaluated qualitatively through post-session questionnaires. Participants found the process engaging although there were concerns over hygiene, especially in light of the COVID pandemic. Clinicians felt that a VR-or AR-based approach could be effective, especially if it engaged patients in supervised, at-home exercises.

Session E: Interactive Media – Full Papers

Room: Goddard's Room

Chair: Adrian Als (Supervisor, Barbados)

10:30 ***Branching Out: An Analysis of Mass-Audience Interactive Videos after Bandersnatch...122***

Genyu Zhang and Richard Lachman (Toronto Metropolitan University, Canada)

While branching interactive narratives have a long creative history, the high-profile release of Black Mirror: Bandersnatch by Netflix led to renewed interest in the form. This paper analyzes four subsequent mass-media branching video-form narratives, assessing user-response, creator choices, and the creative potential for future releases.

Presenter bio: Dr. Richard Lachman directs the Zone Learning network of incubators for Toronto Metropolitan University, and Reserach Development for The Creative School faculty. He is an Associate Professor, Digital Media in the RTA School of Media, and also serves as a Technology and Creative Consultant for entertainment and software-development projects. Lachman completed his doctorate at UNE in Australia studying software recommendation-engines, did his undergraduate work in Computer Science at MIT, and holds a Master's degree from the MIT Media Lab's "Interactive Cinema" group. He was part of a startup acquired by Mattel, ending as Lead Designer and Lead Engineer for the Petz software with over 3 million units shipped worldwide. His areas of research include digital storytelling, technology ethics digital documentaries, augmented/locative/VR experiences, mixed realities, and collaborative design thinking.

11:22 ***Courting Contraceptives, A Sexual Health Dating-Sim for College-Aged Players Who Menstruate...128***

Sarah Schoemann, Beth Sundstrom, Jo Jackley, Henry Smith, Maddie Reed and Barbara Condron (College of Charleston, USA)

Courting Contraceptives is a first person, "dating-sim" style digital game designed by a team researchers in computer science as well as communications and public health. The game aims to educate women and people who menstruate between the ages of 18 and 30 about a variety of methods of contraceptives available to them.

Tuesday, November 21 12:15 - 13:15 (America/Barbados)

Lunch

Tuesday, November 21 13:15 - 14:15 (America/Barbados)

Industry Session (online) Thomas Winkley, Unity Technologies How to utilize Unity for basic prototyping Lighting with Unity

Room: Goddard's Room

Tuesday, November 21 14:15 - 15:15 (America/Barbados)

Session F – Short Papers

Room: Goddard's Room

Chair: Sina Schmidt (University of Potsdam, Germany)

14:15 ***Digital Preservation of Experiences in Virtual Worlds: Using Metaverse Worlds to Preserve VR Research Worlds...133***

Abraham Campbell (University College Dublin, Ireland); Loane Becel and Charlotte Cornuez (ISIMA, France)

Over 20 years after Second Life's debut, marking the first metaverse concept, the term has evolved beyond a buzzword. Many virtual worlds now have mature APIs for various applications, imbuing the term with real meaning as more than just a marketing term for online virtual worlds. During this same period, the use of 3D worlds for academic research has become much more prevalent. These worlds tend to have very ethereal existences, exploring one area of human-computer interaction and not engineered in any way for longevity due to being built.

This paper is part of a trilogy of short papers exploring this topic, aimed at different audiences. This middle paper is aimed at game developers and academics to start a discussion of how it could be possible to preserve research within metaverse platforms such as VRChat or built from the ground up for these

platforms. Metaverse platforms, of course, can be just as ethereal, but in the future, if such platforms became mainstream, they would potentially still offer a longer period of accessibility.

The paper reports on the recreation of a VR experience designed to explore the effect of immersive experiences on changing people's opinions on climate change, and a second VR experience was written just for this paper to explore the conversion process starting with an application. These examples are used to illustrate the process, and a performance test is conducted to show the impact of using the VRChat API, which from these tests, demonstrates it is not a significant bottleneck in terms of performance, could limit some UI interactions options for the researcher, and ultimately does create applications that could be easier to share with the community.

Presenter bio: Dr. Abraham Campbell is an Assistant Professor for University College Dublin(UCD) Ireland, who is current teaching as part of Beijing-Dublin International College, a joint initiative between UCD and BJUT. Abraham coordinates UCD's VR lab which examines the use of Augmented Reality and Virtual Reality to explore tele-presence applications to allow true distance learning. He is a funded investigator for the CONSUS SFI centre and a collaborator on the EU funded AHA - AdHd Augmented project.

14:35 ***Guitar-For-All - A Programmable Single Touch Synthetic Guitar...137***

Nitheezkant R and Barath S Narayan (International Institute of Information Technology, Bangalore, India); Madhav Rao (International Institute of Information Technology - Bangalore, India); Ketaki Srikrishna Tamhanakar, Neha Srikrishna Tamhanakar and Srinivasan M (International Institute of Information Technology, Bangalore, India)

Fretting a guitar is a physically demanding and painful task. A guitar with single buttons for entire chord patterns is desirable for every beginner and recreational guitarist. It makes the guitar more accessible for individuals with disabilities and makes it easier for therapeutic purposes. To achieve this goal, a synthetic guitar was designed using a microcontroller to map the strings to the corresponding notes based on the chosen chord and generate sound using MIDI synthesizers. The designed synthetic guitar was evaluated towards its functionality of generating single notes and chords, and the timing characteristics are also reported to showcase the real-time usage of the proposed Guitar-For-All synthetic system.

14:55 ***A Proposal of Code Amendment Problem for Game Programming Study in C Programming Learning Assistant System...N/A***

Htoo Htoo Sandi Kyaw and Keiichi Kaneko (Tokyo University of Agriculture and Technology, Japan); Nobuo Funabiki (Okayama University, Japan)

C programming has been a fundamental subject for many university students. To assist C programming education, we have developed a C Programming Learning Assistant System (CPLAS). In CPLAS, all of the available programming problem topics cover fundamental topics from the textbook. However, it is still lacking in the topic of game programming although game development is an engaging and effective approach to learning C. Therefore, we propose the Code Amendment Problem (CAP) to study how to develop games by C. We generated a CAP instance for a well-known snake game and applied to 14 students. The results from the students show that CAP is applicable to studying introductory game programming with C.

Tuesday, November 21 15:00 - 15:30 (America/Barbados)

Afternoon Break

Room: Lunch Room

Tuesday, November 21 15:30 - 16:30 (America/Barbados)

Session G – Short Papers

Room: Goddard's Room

Chair: Ambika Bansal (Centre for Vision Research, York University, Canada)

15:30 ***Gamified Digital Intervention to Ameliorate the Aptitude of Exposure Therapy for OCD...141***

Farjana Eishita, Rifat Ara Tasnim, Rick Pongratz and David V Beard (Idaho State University, USA)

Obsessive Compulsive Disorder (OCD) is identified as one of the mental health disorders deteriorated during the Covid-19 pandemic [14]. In spite of the existence of effective psychotherapeutic strategies, a significant percentage of individuals do not get access to mental healthcare facilities due to the increment of number of patients. In this paper, we have proposed the initial prototype of a gamified digital interface MOMG to aid the health care providers in building a custom Exposure Therapy to treat the OCD accessible remotely by both patients and the healthcare providers via handheld devices.

15:50 ***Combining Quest-Based Learning Gamification with Agile Project Management in Higher Education...145***

Jens-Martin Loebel (Magdeburg-Stendal University of Applied Sciences, Germany)

This paper presents a novel educational approach that combines quest-based learning gamification with an agile project management practice (Scrum) for teaching higher education courses in diverse disciplines. Integrating game elements into non-gaming contexts through gamification is known to enhance user engagement and learning outcomes, while agile project management, which focuses on iterative development and adaptive planning, improves collaboration and responsiveness. We present two case studies that were conducted at two German universities. In the first study, the methodology was developed to train media science students in computer programming. In the second study, the approach was adapted to business administration students. Both courses resulted in substantial student engagement, knowledge acquisition, and student satisfaction. High course completion rates and bonus quest participation underscored the approach's success. Challenges like time-consuming individualized feedback provision and exam congruence were identified. The adaptability of this approach across disciplines was evident, suggesting its potential for fostering teamwork. Further refinement, guided by best practices, holds promise for scalable implementation and inclusive education in the digital era. This approach bridges the gap between theoretical knowledge and practical application, optimizing learning outcomes for students across diverse backgrounds.

Presenter bio: Jens-Martin Loebel is a Professor of Business Information Systems at Magdeburg-Stendal University of Applied Sciences. He holds a double degree in Computer Science and Psychology and a doctoral degree from Humboldt-University of Berlin. His research spans Human-Computer Interaction, Long-Term Preservation of Digital Cultural Heritage, Digital Media, and Computer Game Sciences. In his previous role as the Managing Director of bitGilde IT Solutions UG, he dedicated almost a decade to developing tailored software solutions and infrastructure for research, education, and cultural applications.

16:10 ***Utilizing Machine Learning to Predict Flow State from Gameplay Interaction Data...149***

Hsuan-Min Wang (National Yang Ming Chiao Tung University & Asia University, Taiwan); Kuan-Chun Hong and Chuen-Tsai Sun (National Yang Ming Chiao Tung University, Taiwan)

Flow, a profound psychological state associated with optimal experiences, serves as a pivotal gauge of engagement across various contexts. Traditionally evaluated through methods like surveys, interviews, and sampling surveys for qualitative analysis, these approaches aimed to decipher participants' experiences and

perceptions. However, these methods are time-intensive and prone to memory and expressive limitations. In response, contemporary research increasingly leans towards physiological indicators for assessing flow. Utilizing physiological signals to detect flow reduces narrative inaccuracies and minimizes sensitivity to participants' subjective awareness, albeit demanding significant time, human resources, and specialized equipment.

To surmount these challenges, this study introduces an innovative methodology for efficiently predicting flow states. utilizing gameplay and interaction data as inputs for machine learning models. By employing a real-time strategy game as the experimental environment, participants' gameplay recordings and interaction records are collected and paired with the Flow Short Scale questionnaire to establish a predictive model for flow state. The results demonstrate the success of this approach, achieving a significant prediction accuracy (MAE = 0.0623) and highlighting a strong correlation between objective gameplay records and subjective flow experiences. This streamlined methodology offers a promising avenue for quantifying and predicting flow state, contributing to a deeper understanding of engagement dynamics in digital environments.

Presenter bio: Hsuan-Min Wang received the B.S. degrees in computer science from the Chung Hua University, Hsinchu, Taiwan, in 2007 and the M.S. degree of Information Technology from Queensland University of Technology, Brisbane, Australia, in 2011. He is currently working toward the Ph.D. degree in computer science at the National Yang Ming Chiao Tung University. His main research interests are game AI, player modeling, game design and learning in games.

Student Hackathon Competition Presentations

Room: First Citizen's

Tuesday, November 21 16:30 - 17:30 (America/Barbados)

Industry Panel Discussion Unity Technologies

Moderated Session: Thomas Winkley, Joy Horvath & Kirk Musngi, Unity Technologies
Moderated Session: Thomas Winkley, Joy Horvath & Kirk Musngi

Room: First Citizen's

Chair: Abraham Campbell (University College Dublin, Ireland)

Tuesday, November 21 18:00 - 20:30 (America/Barbados)

Social Activity

Room: Foyer

Wednesday, November 22

Wednesday, November 22 8:30 - 9:00 (America/Barbados)

Registration (8:30-1:00)

Room: Foyer

Wednesday, November 22 9:00 - 11:30 (America/Barbados)

Tutorial I – Goddard's Room

Room: Goddard's Room

Workshop I

Room: First Citizen's

Wednesday, November 22 11:30 - 12:00 (America/Barbados)

Morning Break

Room: Lunch Room

Wednesday, November 22 12:00 - 13:30 (America/Barbados)

Tutorial I

Room: Goddard's Room

Workshop I

Room: First Citizen's

Wednesday, November 22 13:30 - 14:00 (America/Barbados)

Break Attendees are asked to arrage their own meals for this break

Room: Lunch Room

Wednesday, November 22 14:00 - 17:30 (America/Barbados)

Tutorial II

Room: Goddard's Room

Workshop II

Room: First Citizen's