

VR ICVR 2022
International Conference on Virtual Reality

ICVR 2022 8th International Conference on Virtual Reality
2022年第八届国际虚拟现实大会

2022 July 3-5, 2022 // Nanjing, China

Conference Abstract

2022 8th International Conference on Virtual Reality

VR ICVR 2022
International Conference on Virtual Reality

July 3-5, 2022 | Nanjing, China

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Table of Contents

Welcome Message	3
Useful Information	4
Daily Schedule	7
Keynote Speakers	9
Onsite Presentation A	12
Onsite Presentation B	16
Online Session 1	19
Online Session 2	23
Online Session 3	27
Online Session 4	32
Online Session 5	36
Notes	40

Welcome Message

The 8th International Conference on Virtual Reality in 2022(ICVR 2022) is a forum to discuss new advances and developments in virtual reality by involving researchers, senior technical people, domain experts, and academics together. Authors are solicited to contribute to the conference by submitting original works that illustrate research results, projects, surveying works and industrial experiences that describe significant advances in related fields of virtual reality.

We are very glad to bring you to ICVR 2022, which will be held Nanjing, China. It is sponsored by IEEE, Nanjing University of Information Science and Technology, and Southeast University.

This year ICVR received many submissions from members of universities, research institutes and industries. All papers were subject to peer-review by conference committee members and international experts. The acceptance of the papers is based on their quality and relevance to the conference. We hope that this conference proceedings will serve as a valuable reference for researchers, educators and developers.

This year, we are very grateful to have three keynote speakers, they are:

- Dr. Jiqiang Song, Vice President, Intel Labs, Director of Intel Labs China
- Prof. Nadia Magnenat Thalmann, Nanyang Technological University, Singapore; University of Geneva, Switzerland
- Professor Marc Baaden, UPR9080, Centre national de la recherche scientifique (CNRS), France.

The director of Nobel Laboratories.

On behalf of the conference committee, we would like to express our gratitude to all the authors, the reviewers, and the attendees for their contributions and participation in ICVR 2022. Their dedication and expertise enable us to prepare this high-quality program and make the conference successful. Finally, we would like to wish all the presenters and participants having a productive and enjoyable conference.

Conference Co-chair

Zhigeng Pan

Nanjing University of Information Science and Technology, China

[On behalf of the ICVR 2022 Conference Committee]

Useful Information

Conference Venue

南气宾馆 (NUIST Hotel)

地址: 南京市江北新区宁六路 219 号 (南京信息工程大学北二门)

订房电话: 张杰 18914756232 (微信同号)

详情: <http://www.icvr.org/venue.html>

Temperature

Average Temperature in July in Nanjing

27°C - 34°C

Bank and Foreign Exchange

The Currency is RMB here. You can exchange foreign currency 24hours at the airport, or exchange at the bank, Money exchanger.

Attention Please

- ♣ Due to COVID-19 Pandemic, delegates must show health QR code and wear face mask to attend conference. For health consideration, please wash hands before meals and please use serving chopsticks and serving spoon during meals.
- ♣ Please take care of your belongings in public area. For your personal and property safety, delegates are suggested to wear representative card during conference and not to lend it to those unconcerned to enter event rooms. Conference does not assume any responsibility for loss of personal belongings of participants.
- ♣ Don't stay too late in the city, don't be alone in the remote area. Be aware of the strangers who offer you service, signature of charity, etc., at scenic spots. You can search more Tourist Information and Security tips online.

Emergency

Ambulance: 120 Police: 110

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Remark "ICVR 2022"

Useful Information

Date	Arrangement	ZOOM Link (Password: 070305)
July 3	Online Presentation Test	https://us02web.zoom.us/j/88573869133
July 4	Keynote Speeches & Onsite Sessions A&B	https://us02web.zoom.us/j/88573869133
July 5	Online Sessions 1,3,5	https://us02web.zoom.us/j/88573869133
	Online Sessions 2,4	https://us02web.zoom.us/j/82556219648

Online Conference Information

Note:

Conference rooms will be open 30 mins before scheduled time.
Pls join the zoom 10-15 mins before your session start and be prepared.

ZOOM Download: <https://zoom.us/>



Tips:

- Please unmute audio and start video while your presentation.
- It's suggested to use headset with microphone or earphone with microphone.
- Duration of each Presentation: about 12 Minutes of Presentation and 3 Minutes of Q&A.
- E-certificate will be sent to presenters after conference by email.
- An excellent presentation will be selected from each session and announced on the website after conference. An excellent presentation certificate will be sent after conference by email.

Rename your screen name before entering the room	Example
Authors: Paper ID-Name	V0001-San Zhang
Listener: Listener Number-Name	Listener- San Zhang
Keynote Speaker: Keynote-Name	Keynote- San Zhang
Committee Member: Position-Name	Committee- San Zhang

Useful Information

Devices Provided by the Conference Organizer

- ✧ Laptops (with MS-Office & Adobe Reader)
- ✧ Projectors & Screen

Materials Prepared by the Presenters

- ✧ Oral Presentation:
Onsite Presentation: PowerPoint or PDF files. Please copy your slides to the desktop 20 mins before your session start and test it ahead.
Online Presentation: PowerPoint or PDF files. Please install ZOOM in advance and join our online session on time.

Duration of Each Presentation

- ✧ Keynote Speech: 45 Minutes of Presentation including Q&A.
- ✧ Regular Oral Presentation: 15 Minutes of Presentation including Q&A.
(Duration of each Presentation: about 12 Minutes of Presentation and 3 Minutes of Q&A.)

Dress Code

- ✧ All participants are required to dress formally. Casual wear is unacceptable.
- ✧ National formal dress is acceptable.

Note

- ✧ The regular oral presentation time arrangement is for reference only. In case any absence or some presentations are less than 15 minutes, please join your session before it starts.
- ✧ An excellent presentation will be selected from each session which will be announced and awarded an excellent presentation certificate.

Online Test Timetable and online sign-in (July 3, 2022)

*Please enter the room 10 minutes before the test session start

Online Zoom No.: <https://us02web.zoom.us/j/88573869133> (Password: 070305)

Test Time	Test Paper ID
10:00-10:30	Test time for Committee Members
10:30-11:00	Test time for Session Chairs
11:00-11:30	Test time for Keynote Speakers
14:00-14:30	Online Session 1: V0029, V0084, V0001, V0008, V0048, V0068, V0089, V0106, V1102, V0032 Online Session 2: V0011, V0028, V0051, V6053, V0085, V0086, V2049, V0078, V3110, V3090 Online Session 3: V0018, V0030, V0047, V0072, V0087, V3101, V3109, V4100, V0073, V0010
15:00-15:30	Online Session 4: V0045, V0061, V0026, V0027, V0034, V0042, V0060, V0069, V1037, V1079 Online Session 5: V0005, V0025, V0031, V0091, V5052, V6105, V7080, V0015

Daily Schedule

Day 1, July 3, 2022

10:00-15:30 **Online Test** (Refer to page 6)

Sign in and Collect Conference Materials in the **Lobby**

14:00-17:00 **南气宾馆 (NUIST Hotel)**

地址: 南京市江北新区宁六路219号 (南京信息工程大学北二门)

Day 2, July 4, 2022

Morning Program-Location: **三楼多功能厅 (Multi-function ROOM, 3rd floor)**

Online Zoom No.: <https://us02web.zoom.us/j/88573869133>

Password: 070305

Host

Prof. Zhigeng Pan, Nanjing University of Information Science & Technology, China

09:00-09:05

Opening Remarks

Prof. Aiguo Song, Southeast University, China

09:05-09:10

TPC Message

Prof. Kai Xu, National University of Defense Technology, China

09:10-09:55

Keynote Speaker I

Dr. Jiqiang Song, Vice President, Intel Labs, Director of Intel Labs China

Speech Title: Highly efficient human tracking technology for Beijing 2022 Olympics

09:55-10:20

Group Photo & Coffee Break

10:20-11:25

Keynote Speaker II

Prof. Marc Baaden, Director, UPR9080, Centre national de la recherche scientifique (CNRS), France. The director of Nobel Laboratories.

Speech Title: Deep inside molecules - digital twins at the nanoscale

11:25-12:10

Keynote Speaker III

Prof. Nadia Magnenat Thalmann, Nanyang Technological University, Singapore; University of Geneva, Switzerland

Speech Title: From Automatons to social humanoid Robots: a human Dream

12:10-13:30

Lunch Time

13:30-15:30

Onsite Session A 三楼多功能厅 (Multi-function ROOM, 3rd floor)

V0062, V0023, V0024, V0097, V0107, V1081, V2039, V0066

15:30-15:45

Coffee Break

15:45-17:45

Onsite Session B 三楼多功能厅 (Multi-function ROOM, 3rd floor)

V0019, V0002, V0017, V0020, V0022, V0040, V0050, V0095

From 18:00

Dinner Time

Daily Schedule

Day 3, July 5, 2022 (Online Sessions)		
Password: 070305	Room 1 Zoom ID: 885 7386 9133	Room 2 Zoom ID: 825 5621 9648
09:30- 12:00	Online Session 1 Topic: Virtual and Augmented Reality V0029, V0084, V0001, V0008, V0048, V0068, V0089, V0106, V1102, V0032	Online Session 2 Topic: Computer Vision and Image Processing V0011, V0028, V0051, V6053, V0085, V0086, V2049, V0078, V3110, V3090
12:00- 13:30	<i>Break Time</i>	
13:30- 16:00	Online Session 3 Topic: 3D model and image reconstruction V0018, V0030, V0047, V0072, V0087, V3101, V3109, V4100, V0073, V0010	Online Session 4 Topic: Computer Simulation and Virtual Reality V0045, V0061, V0026, V0027, V0034, V0042, V0060, V0069, V1037, V1079
16:00- 16:15	<i>Break Time</i>	
16:15- 18:15	Online Session 5 Topic: System Simulation and Computation V0005, V0025, V0031, V0091, V5052, V6105, V7080, V0015	None

Keynote Speakers



Dr. Jiqiang Song, Vice President, Intel Labs, Director of Intel Labs China

宋继强, 英特尔研究院副总裁、英特尔中国研究院院长

**Zoom Link: <https://us02web.zoom.us/j/88573869133>
July 4, 2022 Beijing Time, GMT+8**

Dr. Jiqiang Song is the managing director of Intel Labs China (ILC) and has led the ILC team to deliver a series of impactful research results that directly support Intel's growth areas of AI and Graphics, 5G, Autonomous Systems and Robotics. The results include direct technology transfers to Intel business units, as well as patents, reference platforms and industry standards. Jiqiang holds a Ph.D. degree in Computer Science. Prior to Intel, he served as Postdoctoral Fellow of the Chinese University of Hong Kong, Principal Engineer of Hong Kong Applied Science and Technology Research Institute, R&D Director of Beijing Simplnano Electronics Co., Ltd. He is a Senior Member of IEEE and a Distinguished Member of China Computer Federation. He has published 40+ research papers in international journals and conferences and filed 30+ patents. Jiqiang is well respected in China academia and industry community, sitting in the executive committees of China Association of Automation and China Computer Federation. He is the leading technical spokesperson for Intel China, and the advisor of Intel China PE Community.

宋继强博士现任英特尔研究院副总裁、英特尔中国研究院院长。他带领的英特尔中国研究院团队提供了一系列有影响力的研究成果，直接支持和推动英特尔在人工智能与图形学，5G，智能自主系统和机器人技术领域的增长。英特尔中国研究院的研究成果成功转化至英特尔各事业部，在专利、参考平台设计和行业标准方面亦有丰硕成绩。宋继强拥有计算机专业博士学位。在加入英特尔之前，他历任香港中文大学博士后研究员，香港应用科技研究院首席工程师，北京简约纳电子有限公司研发总监。宋继强是 IEEE 的高级会员，中国计算机学会 (CCF) 杰出会员，他在国际期刊和会议上发表了 40 余篇学术论文，并拥有 30 多项专利。宋继强在中国学术界和产业界享有很高的声誉，是中国自动化学会 (CAA) 和中国计算机学会 (CCF) 委员会委员。他是英特尔中国首席技术发言人，也是英特尔中国首席工程师社区的顾问。

Speech Title: Highly efficient human tracking technology for Beijing 2022 Olympics

Abstract: Intel Labs China developed the highly efficient 3D human tracking technologies that have been successfully applied to the opening ceremony shows and athlete training for Beijing 2022 Olympics game. In this talk, we will introduce the real-time tracking technology for hundreds of people in a large scale scene and the camera-only 3D human skeleton tracking technology for athlete training assistance and artistic effect synthesis.

Keynote Speakers



Professor Marc Baaden
Director, UPR9080, Centre national de la recherche scientifique (CNRS), France. The director of Nobel Laboratories.

Zoom Link: <https://us02web.zoom.us/j/88573869133>
July 4, 2022 Beijing Time, GMT+8

Marc Baaden is Directeur de Recherche at CNRS and head of the Laboratoire de Biochimie Théorique (UPR9080). His research interests include the study of membrane proteins using high performance computing, the development of new bioinformatics methods and approaches, which he offers to the scientific community. Research on biological systems focuses on water and ion transport in large-scale simulations of membrane proteins. Interdisciplinary work comprises interactive molecular modeling approaches for biological systems and virtual reality approaches. He develops scientific visualization approaches in the context of experimental and clinical biomedical research, as well as original tools in the context of Big Data and immersive analytics. His research combines simulations of proteins and bioinformatics with high-performance computing, virtual reality, visualization, and dissemination activities.

Marc Baaden 曾在牛津大学分子生物物理学实验室的 Mark SP Sansom 小组从事生物系统研究，当时为欧盟玛丽居里学者，并在 2001 年和 2002 年期间担任博士后研究员。Marc Baaden 发表论文 70 余篇，在 Google Scholar 上被引用 5000 余次，h-index 39。他在 Nature 及其子期刊发表论文 5 篇，他在美国杂志 PNAS 上发表了 4 篇高水平论文。Marc Baaden 专注于基于大规模分子动力学模拟的水和离子传输膜蛋白系统的数值模拟。他研究了分子动力学轨迹数据的高级分析以及此类模拟的可视化和交互式转向。他于 2010 年被法国化学学会授予“青年研究员”奖，是交互式模拟和可视化工具的主要开发者，包括 MDDriver、UnityMol、HyperBalls、FvNano 和 ExaViz/Vitamins。

Speech Title: Deep inside molecules - digital twins at the nanoscale

Abstract: Digital twins of molecular systems at the nanoscale offer rich potential for exploration in virtual reality. Using interactive molecular simulation approaches, they enable a human operator to access the physical properties of molecular objects and to build, manipulate, and explore their assemblies. Integrative modeling and drug design are important application areas. I report on several membrane-embedded systems of ion channels, viral components, and artificial water channels. My lab has been able to improve and create molecular designs based on digital twins. It is expected that such approaches will become more widespread as the onboarding of VR is simplified and the technology becomes more widely accepted.

Keynote Speakers



Prof. Nadia Magnenat Thalmann
Nanyang Technological University, Singapore; University of Geneva, Switzerland

Zoom Link: <https://us02web.zoom.us/j/88573869133>
July 4, 2022 Beijing Time, GMT+8

Professor Nadia Magnenat Thalmann is a computer graphics scientist and a roboticist and is the founder and head of MIRALab at the University of Geneva. She chaired the Institute for Media Innovation at Nanyang Technological University (NTU), Singapore until July 2021. Nadia Magnenat Thalmann received an MS in Psychology, an MS in Biology and a Master in Biochemistry at the University of Geneva. She obtained a PhD in Quantum Physics in 1977 from the same university. She started her career as an Assistant Professor at Laval University in Canada, then became a Professor at University of Montreal until 1988. In 1989, she moved to the University of Geneva where she founded the interdisciplinary laboratory MIRALab. Thalmann has authored and co-authored more than 600 papers in the area of Virtual Humans, social robots, VR, AR, and 3D simulation of human articulations. She has participated in more than 45 European Research projects and has initiated quite a few. She has served the Computer Graphics community by creating the Computer Animation and Social Agents (CASA) Conference as well as the Computer Graphics International Conference (CGI) in Geneva, both of which are internationally well known yearly conferences. She is the editor-in-chief of the journal *The Visual Computer* published by Springer, Germany and co editor-in-chief of the *Computer Animation Journal* published by Wiley, UK. Professor Thalmann has received more than 30 honours and Awards such as "Woman of the Year", for early pioneer contribution in computer graphics in Montreal (1987). More recently, she was awarded a Doctor Honoris Causa in Natural Sciences from Leibniz University Hannover (2009), an Honorary Doctorate of the University of Ottawa (2010), and a Career Achievement Award from the Canadian Human Computer Communications Society in Toronto (2012). The same year, she received the prestigious Humboldt Research Award in Germany and the Eurographics Distinguished Career Award. Nadine, her Social Robot, has received more than 1.2 million video views online, and over 200 publications in international media. Professor Thalmann is a life member of the Swiss Academy of Engineering Sciences.

瑞士工程科学院院士. Nadia 教授现任新加坡南洋理工大学媒体创新研究所 (IMI) 的主任, 同时也是瑞士日内瓦大学跨学科研究小组 MIRALab 的主任和创始人, 曾任日内瓦大学副校长 (2003 年-2006 年)。她是 Springer Verlag 出版社 "The Visual Computer" 的总编辑, 是 wiley 出版社 "Computer Animation and Virtual Worlds" 的主编之一, 同时还是多个其他科学期刊的副主编。

Speech Title: From Automaton to social humanoid Robots: a human Dream

Abstract: In his book on politics, Aristotle was dreaming to have statues and objects that express life and replace slaves. Later on, Leonardo da Vinci created some mechanical automatons that could move and serve people. In the 18th Century, various automatons were produced with fantastic appearance and they were able to sing, write or bow. Last Century gave birth to the first robots guided by software. These robots were able to interact with speech and do actions. And more recently, realistic social humanoid robots can interact and recognize people and analyse emotions.

What are these companion robots? What can they do in reality? What is their future? Why are they useful for society?

Our presentation will show several case studies including demos of Nadine social robot. (https://en.wikipedia.org/wiki/Nadine_Social_Robot)

Onsite Session A

- **Topic: Image Recognition and Analysis**
- **Time: 13:30-15:30, Beijing Time, GMT+8, July 4, 2022**
- **Session Chair: Prof. Mithun Mukherjee, Nanjing University of Information Science & Technology, China**

<p>V0062 13:30-13:45</p>	<p>Trans-Inf-Net: COVID-19 Lung Infection Segmentation based on Transformer Jie Zhang, Kunlan Xiang, Jingyi Wang, Jiahao Liu, Mengfei Kang and Zhigeng Pan Presenter: Jie Zhang, Xi'an University of Technology, China</p> <p>Abstract: For the global health crisis COVID-19, the radiological imaging techniques CT have demonstrated effectiveness in both current diagnosis and evaluation of disease evolution. However, the manual delineation of lung infections is tedious and time-consuming work, and infection annotation by radiologists is a highly subjective task, often influenced by individual bias and clinical experiences. Furthermore, segmenting infected regions from CT slices faces several challenges, including high variation in infection characteristics, and low intensity contrast between infections and normal tissues. To address these challenges, we proposed a transformer learning method (Trans-Inf-Net) to automatically identify infected regions from chest CT slices. In our Trans-Inf-Net, a parallel partial decoder is used to aggregate the high-level features and generate a global map. Then, the implicit reverse attention and explicit edge-attention are utilized to model the boundaries and enhance the representations. Moreover, to alleviate the shortage of labeled data, we present a segmentation framework based on a randomly selected propagation strategy and transformer, which only requires a few labeled images and leverages primarily unlabeled data. We apply attention in conjunction with convolutional networks, while keeping their overall structure in place. a pure transformer applied directly to sequences of image patches can perform very well on image segmentation tasks. Our framework can improve the learning ability and achieve a higher performance. Extensive experiments on COVID-SemiSeg and real CT volumes demonstrate that the proposed Trans-Inf-Net outperforms most cutting-edge segmentation models and advances the state-of-the-art performance.</p>
<p>V0023 13:45-14:00</p>	<p>Human action recognition based on improved FCN framework Yixuan Cai, Hua Yu, Xuanzhe Fan, Yaqing Hou and Qiang Zhang Presenter: Hua Yu, Dalian University of Technology, China</p> <p>Abstract: Human motion recognition is a highly active area of research. In this paper, we propose a Spatial Transformer Fully Convolutional Network (STFCN) for human action recognition, which leverages the advantages of both full convolution network (FCN) and spatial transformation network (STN). Firstly, in the stage of video image feature extraction, the proposed method integrates the STN network into the Convolutional Neural Networks (CNN) and the obtained feature maps are then passed through the FCN network. The upsampled operation of the FCN restores the feature maps to the size of the original input image. Finally, a softmax classifier is used to classify the human action at the pixel level. Extensive experiments are conducted on the standard human action datasets, i.e., HMDB51 and UCF101. The experimental results show that the STFCN achieves better performance than other compared methods.</p>
<p>V0024 14:00-14:15</p>	<p>Selective Kernel and Spatial Grouping Attention Network for Occluded Pedestrian Detection Yaru Wang, Yijing Li, Hua Yu, Qiang Zhang</p>

Onsite Session A

	<p>Presenter: Yaru Wang, Dalian University of Technology, China</p> <p>Abstract: Pedestrian detection has achieved significant progress on computer vision tasks in recent years. Most pedestrian detection methods employ deep convolutional neural networks to extract abstract features. However, convolution is a local operation that relies on down-sampling to obtain high-level semantic features, which cannot extract global image information or selectively focus on the input features. Furthermore, since the majority of the pedestrian's body is invisible under severe occlusion, the performance of existing pedestrian detectors remains further improvement. To this end, we propose a novel network with selective kernel and spatial grouping attention, i.e., SKGNet, for the occluded pedestrian detection task. Specifically, we first introduce a lightweight attention module, selective kernel and spatial grouping attention (SKG), which is embedded in the SKGNet's feature extraction backbone. The SKG module combines the properties of the selective kernel (SK) and spatial grouping enhancement (SGE) mechanisms to extract more critical features and improve the expressive ability of feature maps, ultimately improving the detection performance of the network. Moreover, we propose a mask-guided (MG) module to modulate full-body features, which can highlight the visible part of pedestrians while suppressing the occlusion part, thereby significantly improving occlusion detection performance. Extensive experiments show that SKGNet outperforms the existing advanced methods on the CityPersons dataset without excessive extra parameters and computations.</p>
<p>V0097 14:15-14:30</p>	<p>SFNet: Clothed Human 3D Reconstruction via single Side-to-Front view RGB-D image Xing Li, Yangyu Fan, Di Xu, Wenqing He, Guoyun Lv, Shiya Liu Presenter: Xing Li, Northwestern Polytechnical University, China</p> <p>Abstract: Front-view human information is critical for reconstructing a detailed 3D human body from a single RGB/RGB-D image. However, we sometimes struggle to access the front-view portrait in practice. Thus, in this work, we propose a bidirectional network (SFNet), one branch to transform side-view RGB image to front-view and another to transform side-view depth image to front-view. Since normal maps typically encode more 3D surface detail information than depth maps, we leverage an adversarial learning framework conditioned on normal maps to improve the performance of predicting front-view depth. Our method is end-to-end trainable, resulting in high fidelity front-view RGB-D estimation and 3D reconstruction.</p>
<p>V0107 14:30-14:45</p>	<p>Brain Inspired Keypoint Matching for 3D Scene Reconstruction Anam Zaman, Fan Yangyu, Muhammad Saad Ayub, Lv Guoyun and Liu Shiya Presenter: Anam Zaman, Northwestern Polytechnical University, Xi'an, China</p> <p>Abstract: In this paper, we investigate the keypoint matching problem in a 3D scene reconstruction system. 3D scene reconstruction using a sequential set of images or video is an essential component in various virtual reality(VR) and augmented reality(AR) solutions. Keypoint matching is necessary for achieving a close to reality model of the scene using varying views. Although deep learning-based methods have been readily proposed for image matching using the keypoints and respective descriptors. These methods do not take into account the previous image matches when performing correspondence on the current pair of images. This is crucial in the presence of sequential images or frames from a video. A continual learning-based image matching framework is proposed that replicates the working of a human brain. The method efficiently extracts knowledge, stores the knowledge in its</p>

Onsite Session A

	<p>memory, and reuses it for future matches. The proposed method increases the expressiveness of the descriptors to be used for keypoint matching in the pair of images. Specifically, the methodology using a continual graph attention network to find the correspondence among keypoints in a pair of images. The methodology is thoroughly validated on a challenging benchmark dataset namely HPatches. The methodology is evaluated along with present state-of-the-art handcrafted and learning-based image matching methods under varying confidence thresholds. The experimental results reveal that the proposed methodology outperforms all the underlying methods while achieving significant improvement.</p>
<p>V1081 14:45-15:00</p>	<p>A novel surface skeleton based segmentation method for voxel shapes Cong Feng Presenter: Cong Feng, Xiangtan Institute of Technology, China</p> <p>Abstract: In this paper, a new method is proposed for voxel shape segmentation which uses 3D surface skeleton to segmenting a shape into part-like structure. Firstly, a cut is defined for segmenting a shape, and this cut is partly smooth, tight, and its orientation is defined by the local symmetric axis of a shape. Next, with analysis of the cut space, potential segmenting cuts are detected. Finally, we use a variety of 3D shapes to test the usability of our methods. From our experiments, our method has topology and geometry based invariant.</p>
<p>V2039 15:00-15:15</p>	<p>Throat Modeling Based On Mass-Spring Method And Unity 3D For Surgery Training Liang Li, Yanfeng Pu, Ting Wang, Zhenxing Sun, Dekun Zheng and Yichen Zhong Presenter: Liang Li, Nanjing tech university, China</p> <p>Abstract: With continuous development and progress of computer graphics, virtual reality and other technologies, it has gradually begun to use computers to make virtual objects with highly reductive properties to simulate the motion and posture of real objects. The simulation technology of rigid objects is becoming more and more mature. However, the flexible objects' modeling and simulation is still an active topic. Using virtual flexible object for preoperative training is an important application of flexible object modeling technology in the field of medical area. Before the surgery, doctors can use virtual flexible objects for teaching or training, which is great significant to improve the success rate of surgery and reduce errors. At present, the demand of soft object models realized by physical modeling method is increasing. In this paper, we construct a virtual spring using Hooke's law, updating the velocity and position of the masses using Euler's integral method. We also construct a spring mass model for a throat by generating the masses according to the model volume. The mass position information may be acquired from dynamic texture mapping so as to realize the deformation simulation of a flexible object.</p>
<p>V0066 15:15-15:30</p>	<p>A Transfer Learning Image Classification Method Using Self-Supervised Information Jie Zhang, Jingyi Wang, Yingdan Zhang, Kunlan Xiang, Mengfei Kang, Zhigeng Pan Presenter: Jingyi Wang, Xian university of technology, China</p> <p>Abstract: Research on intelligent diagnosis and treatment is a major frontier issue in the current era of medical big data. For the global health crisis COVID-19, the radiological imaging techniques CT can provide useful and important information thus widely preferred due to its merit and three-dimensional view of the lung. However, to classify the CT-slices to assist in diagnosis, due to the annotation by radiologists is a highly subjective task, tedious and time-consuming work often influenced by individual bias and clinical experiences. Moreover, the current image classification methods cannot</p>

Onsite Session A

	<p>work well on the massive real-time totally unlabeled CT scans. To address these challenges, we proposed a transfer learning method using self-supervised information to classify the unlabeled CT images, using an auxiliary task of segmentation to improve classification efficiency. We classified the totally unlabeled CT scans from Huoshenshan Hospital into ordinary, severe and critical cases, and the accuracy rate reached 86%. The experimental results show that the use of small-sample semi-supervised transfer learning algorithm can be used in insufficient CT images. Our framework can improve the learning ability and achieve a higher performance. Extensive experiments on real CT volumes demonstrate that the proposed method outperforms most current models and advances the state-of-the-art performance.</p>
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Onsite Session B

- **Topic: Computer Graphics and Virtual Technology**
- **Time: 15:45-17:45, Beijing Time, GMT+8, July 4, 2022**
- **Session Chair: Assoc. Prof. Guosheng Hu, China Academy of Art, China**

<p>V0019 15:45-16:00</p>	<p>Remote Care and Collaboration for Empty Nest Family: Smart Home, Digital Twin and Mixed Reality Guosheng Hu, Yu'Ao Wang, Mengyuan Mao and Yi Zhao Presenter: Yu'Ao Wang, Mengyuan Mao and Yi Zhao</p> <p>Abstract: With the acceleration of aging and the rapid upgrading of smart home devices, the solitary elderly of empty nest inevitably face the whirlpool of smart equipment. Lack of escort and assistance from their younger generations and third-party service, the senior's sense of loneliness and loss of control over smart home has become increasingly prominent. The authors of this article established a remote collaboration system for smart home (RCSSH) based on digital twin (DT) and mixed reality (MR), which achieves the cooperation between remote users (family juniors) and home users (the seniors) to complete auxiliary tasks such as remote company, management of smart devices, etc. In addition to sharing immersive perspectives and collaborative elements, the system also collects home environment data via hardware of internet of things (IoT) and displays them in the DT space to enrich the collaboration experience. Using augmented reality (AR) and remote interaction beyond physical space, the system can reduce the learning burden of smart homes for the in-home seniors through the bilateral remote collaboration, and expand the means that remote family members accompany their seniors, that make up for the loss of self-value for the elderly.</p>
<p>V0002 16:00-16:15</p>	<p>The Flipping-free Tabletop Integral Imaging with Large Viewing Angle based on Space-multiplexed Voxel Screen and Compound Lens-array Peiren Wang, Xue Han, Zilong Li, Dongfang Shang, Wenjia Zhang and Quanbo Xin Presenter: Peiren Wang, Tianjin Research Institute for Water Transport Engineering, M.O.T., China</p> <p>Abstract: Tabletop integral imaging display with a more realistic and immersive experience has always been a hot spot in three dimensional imaging technology, which is widely used in biomedical imaging and visualization to enhance medical analysis and diagnosis. However, the traditional structural characteristics of integral imaging display inevitable introduces flipping effect beyond the viewing angle. To avoid the flipping effect in optical reconstruction, the space-multiplexed voxel screen consisted of projectors array and holographic functional screen is presented to constrain light beams passing through corresponding lens. To further improve the imaging quality in the large viewing angle, the compound lens with two pieces of aspheric lens in each lens unit is optimized to suppress the aberrations, and cooperates with holographic functional screen to recompose the light distribution. The imaging distortion is decreased to less than 9% from more than 30%. In the experiment, the reconstructed full-parallax three dimensional image with the clear displayed depth of 20cm can be perceived with the correct geometric occlusion and smooth parallax in the viewing angle of $96^{\circ} \times 96^{\circ}$.</p>
<p>V0017 16:15-16:30</p>	<p>Redirected Walking for Virtual Environments: Investigation and Evaluation Yuze Gao, Lin Li, Jieke Wang, Liping Zheng Presenter: Lin Li, Hefei University of Technology, China</p>

Onsite Session B

	<p>Abstract: Redirected walking (RDW) is a significant technique to tackle the problem of limited physical space in the process of creating and experiencing an immersive virtual environment (VE). The classification and description of the RDW methods in the existing literature are biased toward the core concept, and the available evaluation system does not comprehensively consider the subjective and objective indicators. It is arduous to effectively guide the selection of solutions for practical development. This work classifies and compares the mainstream RDW technologies in virtual reality based on whether there exists a walking boundary in a VE. Four metrics from both objective and subjective aspects were selected including mean walking speed, mean reset distance, motion fidelity, and motion sickness index. An evaluation system was established based on a fuzzy comprehensive evaluation, and five groups of live user experiments were conducted to evaluate the representative RDW schemes. Sub-results analyzed the advantages and drawbacks of the RDW methods at both objective and subjective levels. Comprehensive results allowed for more intuitive outcomes that are hardly attainable with a single factor.</p>
<p>V0020 16:30-16:45</p>	<p>UOUU: User-object and User-user Distance-combined Method for Augmented Reality Collaborative Task Xiangdong Li, Pengfei Wang, Hanfei Xia, Zhongnan Huang, Yuting Niu Presenter: Pengfei Wang, Zhejiang University, China</p> <p>Abstract: Augmented reality superimposes digital information on objects in the physical world and stimulates multiuser collaboration by enabling a shared augmented space. Despite extensive studies that separately explored user-object and user-user distances, few are concerned about how combining these distances affects multiuser collaboration in augmented reality. To fill the gap, we present the UOUU, the user-object and user-user distance-combined collaboration method. The method integrates two types of distances to assign tasks dynamically. Furthermore, we conducted empirical studies with 16 publicly recruited participants to evaluate the method's influence on overall task performance and collaboration. The results showed a significant increase in collaboration occurrences and task performance, indicating that the simultaneous comparison of UOD and UUD in UOUU helped users collaborate efficiently. Besides, we also found that UOUU reduced user's perceived workload and facilitated the development of user's relations with their collaborators in terms of increased social presence on collaborators and reduced psychological distance between users and collaborators.</p>
<p>V0022 16:45-17:00</p>	<p>Motion Simulation of Electric Tracked Vehicle Based on Virtual Reality Fusion Hongwang Du, Qinwen Jiang, Yuhang Ruan, Wei Xiong Presenter: Qinwen Jiang, Dalian Maritime University, China</p> <p>Abstract: The development of electric tracked vehicle is gradually mature, but the research on its virtual simulation and verification has the problem of single function and poor authenticity. To solve these problems, this paper proposes a virtual simulation platform for electric tracked vehicle based on virtual reality fusion. The platform uses three-dimensional digital prototype technology to complete the modeling including the motion scene, the whole vehicle and the transmission mechanism respectively, and uses the standard CAD interface to complete the data transformation. CAN bus communication is used to obtain the real movement state of external vehicles in real time by developing data transmission interface. Real-time control of vehicle model and virtual assembly display based on Unity 3D. Virtual simulation results show that the platform can complete the assembly and kinematic</p>

Onsite Session B

	verification of vehicles, which can guide the optimization design verification of digital prototype.
V0040 17:00-17:15	<p>A New Dynamic Stable Treemapping Method Cong Feng, Minglun Gong, Oiver Deussen Presenter: Cong Feng, Xiangtan Intitute of Technology</p> <p>Abstract: Dynamic stability is a desired property for treemapping methods. Since in real world, the dataset is usually in a continuous way to be proceed, and the treemap we visualized will be in a dynamic flow. In this paper, We present a dynamic stable treeping method. This method has two steps, the first step is to lay out each rectangle into the treemap in a nearuniform way, and the second step is to resize each rectanle into its real size. This method is a novel method which focuses on the dynamic stable issue of treemapping methods. We use three different real world datasets to test our method, and compare our method with 14 existing methods.</p>
V0050 17:15-17:30	<p>Construction of psychological training System for military pilots based on virtual reality technology Hao Wen; Zhiyong Zhang; Congcong Lv; Yongbin Wang; Yongchang Hu Presenter: Hao Wen, National University of Defense Technology, China</p> <p>Abstract: As the new Military revolution improves the quality and energy of military training, the mature virtual reality technology is applied to the psychological training of military pilots, and the psychological training system is constructed to improve the effect of psychological training. Through literature method, observation method, analysis method, system method and other methods, reasonable selection of virtual reality technology more mature and practical hardware and software, the use of virtual reality technology to achieve psychological training scene construction, interactive system technical scheme, data collection and analysis, training effect evaluation were analyzed. By constructing psychological training system, the author provides theoretical basis and technical support for the practical organization and implementation of psychological training in the next step, so as to further improve the psychological quality of military pilots, combat effectiveness of aviation forces, and the ability to win the future information war.</p>
V0095 17:30-17:45	<p>A New Parameter Model For Consumer-Level Virtual Reality Equipment Evaluation Jiawei Ruan, Shuo Xiong, Ziyang Li, Presenter: Jiawei Ruan, HUST</p> <p>Abstract: This paper explores the parameter model of Virtual Reality (short as VR) equipment evaluation, it focuses on the comfortable feeling of VR users. Because the keyword comfortable feeling has strong personal subjective imagination, therefore in this research, we draw on existing methods such as comfortable feeling evaluation model of vehicle or other riding equipment, also the existing and traditional VR evaluation method was referred. According to the current experience and past achievement, a new evaluation model by parameter was establish. In the model, three macro directions (Image, Sound, Tactile) and six influence parameters (Sound delay, Horizon, Picture delay, Weight, Pressure, Sound source deviation) were included. Based on these parameters and thus the calculation of algorithm's area, we can get a relatively objective and reasonable evaluation of the performance of VR devices.</p>

Online Session 1

- **Topic: Virtual and Augmented Reality**
- **Time: 09:30-12:00, Beijing Time, GMT+8, July 5, 2022**
- **Zoom Link: <https://us02web.zoom.us/j/88573869133> (Password: 070305)**
- **Session Chair: Prof. Yue Liu, Beijing Institute Of technology, China**
- **Co-Chair Prof. Desheng Lyu, Harbin Institute of Technology, China**

<p>V0029 09:30-09:45</p>	<p>How Virtual Walking Task Difficulty Design Influences on Task Performance and User Experience Yufei Zheng, Mengjie Huang, Liu Wang, Jingyi Zhao, Chuanxin Zhai and Rui Yang Presenter: Mengjie Huang, Xi'an Jiaotong-Liverpool University, China</p> <p>Abstract: In recent years, virtual reality (VR) has emerged as a novel paradigm for immersive applications for rehabilitation purposes. When designing a virtual rehabilitation application, difficulty customization and motivation improvement are two major concerns and are essential for ensuring a desirable rehabilitation outcome. It is significant to explore the impact of task difficulty on user experiences in virtual rehabilitation. This paper proposes a VR rehabilitation system for walking tasks with difficulty customization based on performance judgment (loose, standard, strict, and adaptive modes). In addition, this paper investigates the influence of walking task difficulties on users' task performance and user experience with sense of agency and emotion as two indexes, through an experimental study of users' subjective feelings and objective measured data. The results show that the task difficulties designed in this study have a noticeable influence on task performance and user experience. The proposed system and experimental study can provide a strong empirical basis for building a more effective and user-centered VR rehabilitation training system.</p>
<p>V0084 09:45-10:00</p>	<p>The Improved Adaptive Algorithm of Deep Learning with Barzilai-Borwein Step Size Zhi-Jun Wang, He-Bei Gao, Bin-Shuang Zhang, Zhou-Xiang Xu, Xiao-Qin Zhang, Hong Li Presenter: Zhi-Jun Wang, Wenzhou University, China</p> <p>Abstract: To solve the problem that it is difficult to determine the learning rate when training a neural network model, this paper proposes an improved adaptive algorithm based on the Barzilai-Borwein(BB) step size. In this paper, the new algorithm accelerates the model's training through the second-order momentum and adapts the learning rate according to the BB step size. We also set an adequate range for the learning rate to ensure the stability of adaptive adjustment and reduce the error of step size. Compared with different algorithms in a series of popular models, the new algorithm significantly avoids the tediousness of manually adjusting the learning rate and helps to improve the convergence speed. The results show that the new algorithm is feasible and effective.</p>
<p>V0001 10:00-10:15</p>	<p>FIND : Mall Navigation Using Augmented Reality Theresia Herlina Rochadiani, Wahyu Tisno Atmojo, Mohammad Barj, Erika Kristina, Renaldi, Andres Setiawan Presenter: Theresia Herlina Rochadiani, Pradita University, Indonesia</p> <p>Abstract: The pandemic has hit all countries in the world, including Indonesia. It affected many sectors, such as malls, which have become deserted. Meanwhile, the visitors often experience the problem of finding a location inside the mall because the mall building is wide and complex. For solving these problems, a mall navigation application needed. This study presents the augmented reality-based mall navigation</p>

Online Session 1

	<p>using AR Core that not only guide visitors to the exhibition location but also offer them having experience to enjoy the virtual objects in the mall. This AR application is built as an innovation to attract the visitor to come and shop to this mall while they are enjoying using this AR application. To analyze if this application may leverage the number of visitors, this application stores the number of visitors into database.</p>
<p>V0008 10:15-10:30</p>	<p>Therapeutic Benefits of Xbox Kinect Training on Upper limb Motor Function in Chronic Stroke Patients Ain Qurat Ul, Sara Khan, Summaiya Ishtiaq, Alrawda Alsaied, Tian Liu and Jue Wang, Presenter: Qurat ul Ain, Xian Jiaotong University, China</p> <p>Abstract: Objective: The use Xbox Kinect in stroke rehabilitation is recently increased due to its therapeutic effects. The current study aims to investigate the effect of Xbox based Kinect training for rehabilitation of upper limb function in stroke patients. Methods: A single blinded randomized control experiment was carried out on chronic stroke patients referred from the outpatient rehabilitation department of the Railway General Hospital in Rawalpindi. A total of 56 patients were included in the trial, with 50 completing the intervention (25 in the Xbox Kinect Training Group and 25 in the Exercise Training Group). The outcome measures were measured using the Modified Ashworth Scale (MAS) and the Wolf Motor Function Test (WMFT) before and after the 6-week intervention. The study was approved by Riphah International University's ethical committee, and all participants signed a written informed consent form before taking part. Results: Mean age of participants in Xbox training group was 57.48 ± 10.60 and in exercise training group mean age was 57.68 ± 10.43. MAS had no significant difference across the two group ($p=0.338$) however, it was significantly improved in both groups (XKTG $p < 0.001$, ETG $p = 0.009$). Significant improvement across group was observed in WMFT ($p < 0.001$) both within subject and across subjects favoring Xbox Kinect training group. Conclusion: When used as adjunct virtual reality training through Xbox Kinect is advantageous in accelerating motor recovery of upper extremity and therefore improves activities of daily living. We recommend virtual reality based training to be a part of routinely rehabilitation techniques for better outcomes in chronic stroke patients.</p>
<p>V0048 10:30-10:45</p>	<p>Evaluating the impact of immersive virtual reality learning environments with a cognitive load on students in various interaction modes Yuze Shen, Zhigeng Pan Presenter: Yuze Shen, Hangzhou Normal University, China</p> <p>Abstract: The purpose of this study is to discuss how the complex interaction methods in the virtual reality teaching environment affect students' understanding of operational training. A specific medical experiment learning process is designed as a system that integrates three interaction methods. 48 students were tested mainly from the perspective of system usability and system operability, and students' opinions and feedback on the system were also collected by means of unstructured questions and answers. The test results show that additional perceptual channels will increase the cognitive load of learners. The virtual reality system integrating haptics does improve students' learning interest on the one hand, but also increases students' learning and cognitive load on the other hand.</p>
<p>V0068 10:45-11:00</p>	<p>Roadmap to Create an Augmented Reality Application Cynthia Yacel Fuertes Panizo Presenter: Cynthia Yacel Fuertes Panizo, Universidad Nacional de Ingeniería, Peru</p>

Online Session 1

	<p>Abstract: Augmented Reality (AR) combines real and virtual objects and makes them coexist in the same space, which highlights reality. This characteristic makes the creation of Augmented Reality applications attractive in several industries, such as medicine, education, entertainment, and so on. With this heyday of Augmented Reality, it is imperative to know what is required to create Augmented Reality applications. This paper explains what Augmented Reality is, defines the tools necessary to create an Augmented Reality application, and presents a software selection methodology. This paper stated that four tools are required to create an Augmented Reality application. First, the Integration tool manages the integration of all the tools. Second, the Virtual Object tool handles the creation of virtual objects. Third, the Coding tool allows to write code, locate its errors, and compile the code. Finally, the fourth tool is the Development tool, which provides functions that other tools do not offer, such as marker recognition. Although four tools are required to create an Augmented Reality application, this does not mean that four software should be used, it may be more or less. The amount of software to use in creating an application is a unique number for each project.</p>
<p>V0089 11:00-11:15</p>	<p>Research and implement a virtual reality system for Parkinson's disease rehabilitation training Ming-Nan Li, He-Bei Gao, Hao-Wen Shi, Zhi-Geng Pan, Peng-Jun Wang and Hong Li, Presenter: Ming-Nan Li, Wenzhou University, China</p> <p>Abstract: Rehabilitation training systems using virtual reality (VR) techniques offer a cost-effective alternative to conventional training methods. This paper investigated the implementation of VR in motor function rehabilitation training. We describe our experience in researching and developing VR-based rehabilitation training systems for the patient with early state of Parkinson's Disease (PD). By analyzing the correlation of Virtual Reality feature and the dysfunction of Parkinson's disease a rehabilitation training system framework is proposed in this work. In this paper, we propose a rehabilitation training system framework by analyzing the correlation between virtual reality features and Parkinson's disease dysfunction.</p>
<p>V0106 11:15-11:30</p>	<p>Virtual Simulation Experiment Development for Comprehensive patrol Inspection and Engineering Design of High Speed Railway Traction Power Supply System Biao Yue, Yangping Wang, Jianwu Dang, Wenrun Wang Presenter: Biao Yue, Lanzhou Jiaotong University, China</p> <p>Abstract: Railway traction power supply system is the power source to maintain the high-speed operation of trains. Aiming at the problems faced by students majoring in traction power supply in field practice, such as high risk, high cost and difficult to carry out comprehensive experiments, this paper deeply integrates engineering data with virtual simulation technology, accurately models and simulates the primary equipment such as transformer, disconnecter and circuit breaker and the secondary equipment such as metering panel and power panel in the railway traction power supply system, and truly reproduces the operation scene of rail transit traction power supply. On this basis, the experimental content is designed into three levels: comprehensive patrol inspection of equipment, electrical design and engineering case design, so as to improve students' innovation ability and ability to solve complex engineering problems.</p>
<p>V1102 11:30-11:45</p>	<p>Virtual Reality in Financial Trading and Investing: A Review of Literature and Applications Marco I. Bonelli, PhD, Nicolas Hamelin, PhD Presenter: Marco I. Bonelli, Alliance University, Bangalore- India</p>

Online Session 1

	<p>Abstract: The proliferation of virtual reality (VR) technology is finding new applications in various domains, such as financial trading and investing, where individuals buy and sell financial assets with the intention of increasing their capital gains. The purpose of this review is to summarize the literature and practices regarding the adoption of VR in financial trading and investing. Online searches were conducted to identify studies on the subject; in parallel, an examination of the VR applications for trading and investing was performed. We found convergence when observing that conventional stock trading and investing usually use 2D applications on desktop PC devices. This generates numerous setbacks, predominantly because of poor data visualization due to the limited 2D representation, interaction via mouse and keyboard, poor data presentation capabilities, and restricted support for collaboration among traders and investors. To overcome those setbacks, both academics and practitioners advocate the adoption of an immersive virtual environment for stock trading and investing, in which significant advantages in terms of multidimensional data visualization, data presentation, and user collaboration can be achieved.</p>
<p>V0032 11:45-12:00</p>	<p>An Enhanced Upper Limb Rehabilitation Table Design based on Virtual Reality Fengyi Dong, Mengjie Huang, Jingjing Zhang, Chenxin Wu, Zeyu Jiao and Rui Yang Presenter: Mengjie Huang, Xi'an Jiaotong-Liverpool University, China</p> <p>Abstract: The rehabilitation treatment combined with virtual reality (VR) has recently received widespread attention for recovering the upper limb's motor functions. The immersive environment and rich feedback in VR can help maintain users' motivation and provide a desirable user experience. This paper proposes a novel design of an enhanced upper limb rehabilitation table system. The system is an integration of the rehabilitation table and VR technology, with a game designed and implemented. This paper also evaluates the user experience of the developed rehabilitation system based on VR with different inclination angles of physical and virtual operating planes. The experiment results show no significant differences in the users' sense of presence and embodiment. This study brings new insights into the rehabilitation system design by enhancing existing rehabilitation devices with VR technology. In addition, it contributes to this growing area by exploring the user experience evaluation for the enhanced rehabilitation systems based on VR.</p>

Online Session 2

- **Topic: Computer Vision and Image Processing**
- **Time: 09:30-12:00, Beijing Time, GMT+8, July 5, 2022**
- **Zoom Link: <https://us02web.zoom.us/j/82556219648> (Password: 070305)**
- **Session Chair: Prof. Junjie Cao, Dalian University of Technology, China**

<p>V0011 09:30-09:45</p>	<p>Vehicle recognition combining ResNeXt network and random erasing Qi Dong, Changhui Hu Presenter: Qi Dong, Xidian University, China</p> <p>Abstract: Random erasing is a commonly used data augmentation method. Vehicle recognition now uses deep neural networks as training models. Deep neural networks are getting deeper and deeper, with more and more parameters, and more and more complex models. Random erasing approach is used to preprocess the vehicle identification data set. Then, the expanded data set is used as the training data set of the model recognition model ResNeXt network. Experiments verify that random erasing and preprocessing of the data set can reduce the loss of the model recognition network model and improve the robustness of the model.</p>
<p>V0028 09:45-10:00</p>	<p>Distillation-guided Planar Recovery Fei Ren, Qinglin Chang, Xinglin Liu, Jingheng Xu, Wenqi Li, Yan Cui Presenter: Fei Ren, WuYi University, China</p> <p>Abstract: The 3D plane recovery and reconstruction method of a single image aims to identify the plane region of the instance and estimate the plane parameters, which is widely used in technologies such as virtual reality. Aiming at the problems that the existing methods have a large amount of parameters and ignore the real-time application of the scene, a lightweight student network based on distillation technology is proposed, which realizes real-time and accurate plane distinction and parameter estimation for indoor scenes. The experimental results in the Scannet and NYUD2 datasets show that the detection accuracy of this method is high, and the real-time detection rate reaches 35.7 Fps.</p>
<p>V0051 10:00-10:15</p>	<p>Multi-objective optimization of multi-video synopsis based on NSGA-III Xiaoxiao Chen, Yujia Xie and Xing Wang Presenter: Xiaoxiao Chen, Nanjing University of Finance & Economics, China</p> <p>Abstract: Multi-video synopsis can display all information of surveillance video and show all sports solution of moving objects in the sight of multi-cameras. However, most of the existing multi-video synopsis can't achieve these functions. This is because these approaches do not comprehensively consider these factors: video target display timing, maximum target display number, target display consistency, maximum moving target display density, and compression ratio. To address the comprehensive optimization problem of multiple elements for multi-video synopsis, a multi-objective optimization algorithm for multi-video synopsis is proposed. The proposed approach differs significantly from the existing methods and has several appealing properties. First, we propose five objective functions, which are consistent in time sequence, coherent in cross-camera pedestrian display, largest in number of moving objects displayed, smallest in density of moving objects, and smallest in compression ratio, then, establish a multi-objective optimization model based on the five objective functions. Second, we build a model for multi-video synopsis. Third, we use the non-dominated sorting genetic algorithm NSGA-III to optimize the multi-object model of the multi-video synopsis. Through such a solution, the poor performance of multi-video synopsis can be avoided by comprehensively</p>

Online Session 2

	<p>considering the main influencing factors of multi-video synopsis. Besides, we present extensive experiments that demonstrate the effectiveness and efficiency of the proposed approach.</p>
<p>V6053 10:15-10:30</p>	<p>Occluded Facial Recognition For Surveillance Using Deep Learning Hameed Moqbel, Murali Parameswaran Presenter: Hameed Moqbel, Presidency University, Bangalore, India</p> <p>Abstract: Nowadays, due to the advancement in technology, facial recognition is becoming one of the methods to identify a person. One of the challenges arises due to occlusion or partial covering of face, especially with a facial mask or a scarf. In this work, we use deep neural networks to solve the problem of recognizing such an occluded face. For this work, we have used three publicly available facial datasets, namely Labelled Face Wild dataset, COMASK20 and Specs on Faces (with images having low illumination), cumulatively consisting more than 5000 facial images. We evaluated four existing facial detection classifiers namely OpenCV, Single Shot Detection(SSD), Multi-task Cascaded Convolutional Neural Network(MTCNN) and RetinaFace. We found MTCNN to be most relevant for our work. We proposed a new Convolutional Neural Networks (CNN) as part of this work. We got accuracy of 99.38% for LFW, 99.62% for COMASK20 and 98.33% for SOF dataset.</p>
<p>V0085 10:30-10:45</p>	<p>Multi-interference Lane Detection Based on IPM and Edge Image Filtering Huayue Wu Presenter: Huayue Wu, Xi'an Polytechnic University, China</p> <p>Abstract: In visual based environment perception for autopilots, shadows, stains, water and reflected light could interfere with lane recognition and navigation. In this paper, an improved lane recognition algorithm based on inverse perspective mapping(IPM) and edge image filtering was proposed to solve this issue. An aerial image of the original road scene could be obtained though IPM, which could significantly enhance the visual characteristics of the lane and reduce interference. An iterative clustering segmentation method was proposed to analyze the grayscale values of IPM gray image, and the gray points closest to the color and morphological features of the lane were retained as the lane edge in IPM image. Subsequently, a method that could search and determine the statistic of continuous edge regions was developed to segment the edge image. Filtering the interference factors was achieved by analyzing the edge points and retaining the longest regions. In comparison with other commonly used lane recognition algorithms, the result indicates that our method can more effectively filter all kinds of interference factors on the road and enhance the ability to detect fuzzy, real, virtual, and curved lanes under an environment with interference. This significantly improves the ability to keep to a lane under an autopilot environment. Because of this, lane recognition speed is greatly improved, which can meet the requirement of real-time autopilot.</p>
<p>V0086 10:45-11:00</p>	<p>An Efficient Anchor-based Face Alignment Network With Transformer Quanyu Wang, Yue Sun, Kaixiang Zhang, Uzair Saeed, Guanzhi Shen, Wenming Wang Presenter: Yue Sun, Beijing Institute of Technology, China</p> <p>Abstract: Despite significant advances have been made in facial alignment recently, face alignment remains a challenging problem due to the existence of issues like occlusion and large pose. Besides, small attention has been paid to the algorithm's performance, efficient face landmark localization algorithm with high robustness still has room to enhance. In this work, we propose an efficient face alignment network that combines the Transformer with an anchor-based prediction method.</p>

Online Session 2

	<p>First, we extract features of the input image by CNNs, then capture longrange relationships efficiently using Transformer encoders, at last, we use anchor points to predict landmark coordinates. We test our algorithm through experiments on WFLW, the popular face alignment benchmark. The experiments show that our algorithm can reach high accuracy with satisfactory robustness while also enjoying the high speed.</p>
<p>V2049 11:00-11:15</p>	<p>Two-stream spatial-temporal fusion graph convolutional network for dynamic gesture recognition Ji-kai Zhang, Qi Li, Xiao-qi LYU, Yong Liang Presenter: Qi Li, Inner Mongolia University of Science & Technology, China</p> <p>Abstract: As a compelling field of computer vision, dynamic gesture recognition lays the foundation for interactive interactions of virtual reality (VR) and augmented reality (AR). Compared with other body joints, hand joints feature a smaller range of movement, faster movement speed, and more movement details. It is necessary to further explore the local spatial-temporal information and global dependencies in the process of action execution. On that basis, we propose a two-stream spatial-temporal fusion graph convolutional network, 2s-STFGCN, for dynamic gesture recognition. In order to enrich detailed joint features, the second-order bone information is introduced to the model. The local spatial-temporal information is fused in the one graph to capture the complex spatial-temporal relationship. At the same time, the gated dilated convolution is employed to ensure the correlation of long sequence to be better noticed. Additionally, by simulating actions in the VR interactive applications, we collect and make the dynamic gesture skeleton data set, VR-DHG, based on different grain sizes. Experimental results suggest that the model proposed by us can achieve better recognition effects of the public data set, DHG-14/28. Compared with the DeepGRU algorithm, the recognition rate of our algorithm, when being used to recognize 14 kinds and 28 kinds of gestures, can be improved by 1.21% and 2.64%, respectively. Our algorithm also outperforms in fine-grained gesture recognition. All this provides solid evidence for the effectiveness of our algorithm.</p>
<p>V0078 11:15-11:30</p>	<p>RA-Swin: A RefineNet Based Adaptive Model using Swin Transformer for Monocular Depth Estimation Mengnan Chen, Jiatao Liu, Yaping Zhang, Qiaosheng Feng Presenter: Mengnan Chen, Yunnan Normal University, Kunming</p> <p>Abstract: Transformer-based deep learning networks have achieved extraordinary success in the field of natural language processing(NLP) in recent years. However, Transformer faces practical challenges due to the differences in the fields of NLP and visual dense prediction. This paper employs a layered Transformer as a feature extraction encoder for monocular depth estimation to overcome these differences. The encoder takes the original image size as input and performs self-attention computation on non-overlapping local regions of the feature map by shifting the window. It enables the cross-window information to interact. Different variants of the encoder are followed by an adaptable decoder based on the spatial resampling module and Refine Net. The adaptable decoder can better fuse the multi-scale output features of the encoder while keeping the number of parameters low, combined with skip connections. Experiments show that the encoder-decoder structure in this paper, fine-tuned on the NYU Depth v2 dataset, can also yield substantial improvements for monocular depth estimation. The experimental results show that compared with the current advanced Transformer model DPT-Hybrid, the root mean</p>

Online Session 2

	square error (RMS) of the Swin-B and Swin-L based models are reduced by 1.12% and 2.97%, achieving better depth estimation results.
V3110 11:30-11:45	<p>Graph Based Texture Pattern Classification Iyyakutti Iyappan Ganapathi, Sajid Javed, Robert Bob Fisher, Naoufel Werghi Presenter: Iyyakutti Iyappan Ganapathi, Khalifa University, UAE</p> <p>Abstract: Textures in 3D meshes represent intrinsic surface properties and are essential for various applications, including retrieval, segmentation, and classification. However, it is distinct from other types of 3D object analysis. The primary objective is to capture the surface variations induced by multiple textures. While numerous classical approaches are published in the literature, only a few work directly on 3D meshes. Given the versatility of graph representations, we propose a graph learningbased approach for classifying the texture of each facet in a 3D mesh. First, a three-dimensional mesh is transformed into a graph structure in which every node is a facet of a given mesh. Further, each facet is described by a feature vector computed utilizing the neighboring facets within a radius and their geometric properties. The graph structure is then fed into a graph neural network, classifying each node as a texture or non-textured class. The proposed technique has been validated using texture patterns from SHREC'18 and demonstrated positive performance.</p>
V3090 11:45-12:00	<p>Disentangled Face Identity Representationsfor Joint 3D Face Recognition and Neutralisation Anis Kacem, Kseniya Cherenkova and Djamila Aouada Presenter: Anis Kacem, University of Luxembourg, Luxembourg</p> <p>Abstract: In this paper, we propose a new deep learning based approach for disentangling face identity representations from expressive 3D faces. Given a 3D face, our approach not only extracts a disentangled identity representation, but also generates a realistic 3D face with a neutral expression while predicting its identity. The proposed network consists of three components; (1) a Graph Convolutional Autoencoder (GCA) to encode the 3D faces into latent representations, (2) a Generative Adversarial Network (GAN) that translates the latent representations of expressive faces into those of neutral faces, (3) and an identity recognition sub-network taking advantage of the neutralized latent representations for 3D face recognition. The whole network is trained in an end-to-end manner. Experiments are conducted on three publicly available datasets showing the effectiveness of the proposed approach.</p>

Online Session 3

- **Topic: 3D model and image reconstruction**
- **Time: 13:30-16:00, Beijing Time, GMT+8, July 5, 2022**
- **Zoom Link: <https://us02web.zoom.us/j/88573869133> (Password: 070305)**
- **Session Chair: Prof. Junjian Huang, Southwest University, China**

<p>V0018 13:30-13:45</p>	<p>Filling the occluded area of point cloud with RGB-D sensor Zhizhang Li, Junjian Huang, Zili Cao, Luting Zhang and Hailong Yan Presenter: Junjian Huang, Southwest University, China</p> <p>Abstract: Due to the occlusion of foreground objects in the camera's perspective, some background areas have lack of depth and color data, which are reflected as blank areas on the point cloud model. Therefore, we propose a method to repair this part. In this paper, the REALSENSE D435 RGB-D (RGBDepth) sensor is used to capture indoor environment, and the captured color and depth images that have been calibrated and denoised are generated corresponding point cloud models. Then perform OTSU threshold segmentation on the original depth image to segment the background part of the depth image that is occluded. The next step is to use traditional image inpainting criminisi algorithm to inpaint the depth and color image with the foreground removed. Therefore, the occluded part of the background of the point cloud model has been repaired. Finally, the original point cloud and the repaired point cloud are fused, and the result of the fusion is a relatively complete point cloud model.</p>
<p>V0030 13:45-14:00</p>	<p>6D Pose Estimation based on Edge-enhanced Point Pair Features for Surgical Navigation Chenyi Liu, Fei Chen, Lu Deng, Renjiao Yi, Lintao Zheng, Chenyang zhu Presenter: Chenyi Liu, National University of Defense Technology, China</p> <p>Abstract: This paper proposes an efficient 6D pose estimation method for the automatic spinal surgical navigation system. Visual-based pose estimation is challenging in realistic surgical scenes due to the human spine's geometric complexity and symmetric ambiguity. Instead of considering the whole scene for pose estimation, we introduce a targeted down-sampling strategy that focuses more on edge area for efficient feature extraction of complex geometry. A pose hypothesis validation approach is then presented to resolve the symmetric ambiguity. Note that our method can also work on incomplete scenes since our sampling and validation do not require a whole model. We perform evaluations on two challenging datasets, which demonstrate the superiority of our method on pose estimation of geometrically complex, occluded, symmetrical objects. We also implemented a prototype of a surgical navigation system based on the proposed method, which may provide a viable option for improving the spinal clinical surgery system.</p>
<p>V0047 14:00-14:15</p>	<p>GesMoSketch: A System for 3D Sketching in AR with One Mobile Device Yang Zhou, Lin Zong, Xinchu Xu, Weijian Lai, YongLin Chen, Guihuan Feng, Jie Liu Presenter: Yang Zhou, Nanjing University, China</p> <p>Abstract: We present a novel approach for 3D sketching in Augmented Reality (AR). Unlike most existing methods that rely on positioning devices or algorithms, our approach only needs a mobile device to realize 3D sketching in AR scenes. The drawing process is transformed into the process of building blocks, which is intuitive and fun. The user draws directly on the device screen, but the drawing content can be placed anywhere in real space with the help of the planar surface proxy. The advantages of this method are not only low dependence on hardware but also a</p>

Online Session 3

	<p>more natural drawing process and less fatigue. Gesture-based proxy plane manipulations are also very intuitive. The feedback results of 12 participants indicate that they can quickly complete 3D modeling in AR scenes with our prototype system GesMoSketch.</p>
<p>V0072 14:15-14:30</p>	<p>An Improved 3D Human Pose Estimation Model Based On Temporal Convolution With Gaussian Error Linear Units Jian Kang, Rui Liu, Yijing Li, Qian Liu, Pengfei Wang, Qiang Zhang, Dongsheng Zhou Presenter: Dongsheng Zhou, National and Local Joint Engineering Laboratory of Computer Aided Design, School of Software Engineering, Dalian University, China</p> <p>Abstract: With the advancement of image sensing technology, estimating 3D human poses from monocular video has become a hot research topic in computer vision. 3D human pose estimation is an essential prerequisite for subsequent action analysis and understanding. It has a wide range of applications, such as intelligent transportation, human-computer interaction, and medical rehabilitation. Currently, some methods for 3D human pose estimation in monocular video employ temporal convolutional network to extract inter-frame feature relationships, but the majority of them suffer from insufficient inter-frame feature relationship extractions. In this paper, we decompose the 3D joint location regression into bone direction and bone length, we propose a temporal convolutional network incorporating Gaussian error linear units (TCG) to solve bone direction. It enables more inter-frame features to be captured, allowing the feature relationships between data to be fully utilized. And we use kinematic structural information to solve bone length which enhance the use of intra-frame joint features. The proposed method has extensively experimented on the public benchmark dataset Human3.6M. The quantitative and qualitative evaluation results show that the proposed method can achieve more accurate 3D human pose estimations.</p>
<p>V0087 14:30-14:45</p>	<p>Ship Maneuvering and Collision Avoidance Simulation System in Typical Scene Based on Rules for Preventing Collision Mincang LIANG, Shengzheng WANG, Yong YIN Presenter: Mincang LIANG, Shanghai Maritime University/Zhejiang Ocean University, China</p> <p>Abstract: In view of the limitations of the existing crew virtual training system and the problems of vacant and difficult-to-understand teaching and learning of ship handling and collision avoidance courses, through sorting out the Rules for Preventing Collision at Inland Waters systematically, and extracts seven typical scenes including: berthing, unberthing, overtaking, head-on, encounter with ships limited to draught, avoidance of engineering ships underway, collision avoidance of the confluence of main rivers and tributaries. Use adaptive UI interface, three-dimensional models of ships and port buildings, and sea water to complete the construction of the scene frame, then design the reasonable assessment point realizes logical control, and integrates text and voice function. Finally, completes the development of a three-dimensional interactive simulation system that can be released across platforms. Through repeated and violent operations, the feasibility and stability of the system's operation are verified. In the context of the intelligent shipping revolution, the system is the application of virtual reality technology under the B/S architecture in the field of navigation. It can complement the advantages of large-scale ship handling simulators, and promote practitioners' internalization and absorption of collision avoidance rules and the improvement of their maneuvering and collision avoidance skills, the system has certain practical value.</p>

Online Session 3

<p>V3101 14:45-15:00</p>	<p>Face-GCN: A Graph Convolutional Network for 3D Dynamic Face Recognition Konstantinos Papadopoulos, Anis Kacem, Abd El Rahman Shabayek and Djamila Aouada Presenter: Anis Kacem, SnT, University of Luxembourg</p> <p>Abstract: Face recognition has significantly advanced over the past years. However, most of the proposed approaches rely on static RGB frames and on neutral facial expressions. This has two disadvantages. First, important facial shape cues are ignored. Second, facial deformations due to expressions can have an impact in the performance of such a method. In this paper, we propose a novel framework for dynamic 3D face recognition based on facial keypoints. Each dynamic sequence of facial expressions is represented as a spatio-temporal graph, which is constructed using 3D facial landmarks. Each graph node contains local shape and texture features that are extracted from its neighborhood. For the classification of face videos, a Spatio-temporal Graph Convolutional Network (ST-GCN) is used. Finally, we evaluate our approach on a challenging dynamical 3D facial expression dataset.</p>
<p>V3109 15:00-15:15</p>	<p>A 3DMM-based Framework for Deformation Measurement in Face Rehabilitation Claudio Ferrari, Stefano Berretti, Pietro Pala, Alberto Del Bimbo Presenter: Stefano Berretti, University of Florence, Italy</p> <p>Abstract: Reconstructing a 3D model of the face from a single 2D image is a long studied problem, but it remains challenging especially when capturing local and asymmetric deformations of the face is important. Computing a measure of such local deformations can find application in monitoring rehabilitation exercises in patients that are recovering from a stroke or in patient with Parkinson's and Alzheimer's disease. In this study, we present a complete framework for accurately deforming a 3D Morphable Shape Model (3DMM) of the face to a target RGB image. The used 3DMM is based on localized components of deformation, while the 3D to 2D fitting transformation is guided by the correspondence between landmarks detected in the target image and landmarks manually annotated on the average 3DMM. The fitting has also the peculiarity of being performed in two steps, disentangling face deformations that are due to the identity of the target subject from those induced by facial actions. In the experimental validation of the method, we used the MICC-3D dataset that includes 11 subjects each acquired in one neutral pose plus 18 facial actions that deform the face in localized and asymmetric ways. For each acquisition, we fit the 3DMM to an RGB frame with an apex facial action and to the neutral frame, and computed the extent of the deformation. Results indicated that the proposed approach can accurately capture the face deformation even for localized and asymmetric ones. Interestingly, these results were obtained just using RGB targets without the need for 3D scans captured with costly devices. This opens the way to the use of the proposed tool for remote medical monitoring of rehabilitation.</p>
<p>V4100 15:15-15:30</p>	<p>TGNet: Aggregating Geometric Features for 3D Point Cloud Processing Yinghao Li, Renbo Xia, Jibin Zhao, Yueling Chen and Hangbo Zou Presenter: Yinghao Li, Shenyang Institute of Automation, Chinese Academy of Sciences, China</p> <p>Abstract: Point cloud analysis is a challenging task due to geometric information hidden in disordered, unstructured points. In this paper, we propose a new framework named Tree Graph Network (TGNet) for sampling, grouping, and aggregating geometric features of point clouds. Specifically, we build a graph called</p>

Online Session 3

	<p>Tree Graph with several curves extending in different directions through explicit rules, and then aggregate the graph using the cross-attention mechanism block. In this way, we incorporate more geometric information into local features. We demonstrate the excellent performance of our model on standard benchmarks for several basic point cloud processing tasks such as classification, segmentation, and normal estimation. We also provide ablation studies and visualizations that aid in understanding our network.</p>
<p>V0073 15:30-15:45</p>	<p>Human-UAV Collaborative Task Scheduling for 360 Video Generating in Intelligent Transportation Zhiwei Yuan, Hong Tang, Pengfei Wang, Zhaohong Yan, Dongsheng Zhou, Qiang Zhang, Xiaopeng Wei Presenter: Zhiwei Yuan, Dalian University of Technology, China</p> <p>Abstract: With the rapid development of virtual reality technology, 360° video has been widely adopted in intelligent transportation, e.g., traffic monitoring, virtual driving, etc. Therefore, it is necessary to recruit workers and unmanned aerial vehicles (UAVs) to complete the task of video recording. However, we can not guarantee the quality of video recording by only employing workers or UAVs alone. Due to the real-time nature of traffic, task scheduling for 360 video generating is a major challenge in intelligent transportation. In this paper, we propose a human-UAV collaborative 360° video recording task scheduling framework from the perspective of crowdsensing. We build a POI model according to the characteristics of urban intelligent transportation to determine the locations of the video recording tasks and the number of camera stands. We introduce the relay UAV as the video streaming data transmission node to ensure the quality of video transmission and design the route planning algorithm of the relay UAV to guide the route planning of the camera UAV to ensure recording task synchronization. Meanwhile, workers are introduced into the route planning algorithm of camera UAVs to compete for tasks. The simulation experiments of the urban environment show that our proposed framework outperforms worker-mode and UAV-mode under the same environmental settings.</p>
<p>V0010 15:45-16:00</p>	<p>ER-Net: Efficient Recalibration Network for Multi-View Multi-Person 3D Pose Estimation Mi Zhou, Rui Liu, Pengfei Yi, Dongsheng Zhou, Qiang Zhang, Xiaopeng Wei Presenter: Rui Liu, Dalian University, Dalian, China</p> <p>Abstract: Multi-view multi-person 3D human pose estimation is a hot topic in the field of human pose estimation due to its wide range of application scenarios. With the introduction of end-to-end direct regression methods, the field has reached a new stage of development. However, the regression results are still not accurate enough even for the optimal method for the joints that are more heavily influenced by external factors. In this paper, we propose an effective feature recalibration module based on the channel attention mechanism and an optimal calibration strategy, which is applied to a multi-view multi-person 3D human pose estimation task backbone network to achieve improved detection accuracy for joints that are more severely affected by external factors. Specifically, we achieve optimal weight adjustment of joint feature information through a recalibration module based on a channel attention mechanism and an optimal calibration strategy, which enables the model to learn the dependencies between joints and the dependencies between people and their corresponding joints. We call this method the Efficient Recalibration Network (ERNet). Finally, experiments were conducted on two</p>

Online Session 3

	benchmark datasets for this task, Campus, and Shelf, PCP reached 97.3 percent and 98.3 percent, respectively.
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Online Session 4

- **Topic: Computer Simulation and Virtual Reality**
- **Time: 13:30-16:00, Beijing Time, GMT+8, July 5, 2022**
- **Zoom Link: <https://us02web.zoom.us/j/82556219648> (Password: 070305)**
- **Session Chair: Assoc. Prof. Samia Loucif, Zayed University, United Arab Emirates**

<p>V0045 13:30-13:45</p>	<p>Expanding Intersubjectivity: a Metaverse VR Practice Jiahao Li,Ke Fang,Ye Yan,Yuan Zeng Presenter: Jiahao Li, Tsinghua University, China</p> <p>Abstract: The common subjects with intersubjectivity face the objective environment together. With the proposal of the metaverse, the subject-environment boundary in the virtual world is broken. Virtual avatars make the human subject no longer limited to the human itself. Therefore, the interaction relationship between subjects has been redefined. This paper studies the expansion of intersubjectivity in the virtual world under the concept of the metaverse and designs a virtual reality (VR) framework based on cloud server technology to test and verify the study. The conclusions show that when the human-environment boundary is redefined by virtual avatars, experimenters have a completely different interaction experience.</p>
<p>V0061 13:45-14:00</p>	<p>An Empirical Study on Intuitive Gesture Manipulation in Virtual Reality Lee Jen-Tun, R.P.C. Janaka Rajapakse, Kazunori Miyata Presenter: Jen-Tun Lee, Japan Advanced Institute of Science and Technology, Japan</p> <p>Abstract: Gesture manipulation is a new input mode for the modern virtual reality (VR) user experience. Current gesture manipulation can be performed with three types of devices: Hand-held, Bare-hand and Hand-worn devices. Each device has its own advantages and disadvantages. However, many studies have not discussed the difference between these three types of gesture manipulation. To address this gap, we conducted research on how to find their learnability, effectiveness, and extensibility. We introduce a VR cup stacking game to mimic the state-of-presence experiment to compare the completion time of each device. Moreover, a series of user studies were conducted to collect feedback from participants. The results show that despite the Hand-held device being familiar to general users, but most of them were expected that the Hand-worn and Bare-Hand device can be well developed and wildly adopted into other applications to provide more intuitive and immersive experience.</p>
<p>V0026 14:00-14:15</p>	<p>The application status and thinking of VR in architecture. zhang cheng wang jiale yu ao kun Presenter: Zhang Cheng, Beijing University of Civil Engineering and Architecture, China</p> <p>Abstract: The development of information technology has helped the application of VR technology in the field of construction to become popular, and assisted construction practitioners to achieve a lot of achievements in scientific research, design, teaching, etc. A timely understanding of the application status of VR technology in the field of construction is of great help for the cooperation and development of VR technology and architectural disciplines. In this paper, by combing the application of VR technology in scientific research, design and education in the field of architecture in recent years, combined with the achievements of Beijing University of Civil Engineering and Architecture - the spatial perception experiment based on panorama roaming, the VR full-cycle participation and the topic of urban design detail teaching with the theme of "Red Core Area, Re-</p>

Online Session 4

	walking the May Fourth Road" pointed out the application requirements of architecture majors for VR technology, summarized the current limitations of VR technology in the field of architecture, and the discipline's impact on VR expectations for technological development.
V0027 14:15-14:30	<p>A Virtual Reality Interactive System Design for Anti-Drunk Driving Kai-Lun Liao, Mengjie Huang and Rui Yang Presenter: Mengjie Huang, Xi'an Jiaotong-Liverpool University, China</p> <p>Abstract: In order to let people experience drunk driving and learn its dangerousness, thus reducing the drunk driving rate, an interactive system based on virtual reality is proposed to simulate drunk driving in this paper. The system was designed as an arcade game, with prototypes and a walk-through study conducted in the design process. The developed interactive system was evaluated by the usability test with participants. The results show that virtual reality is a successful interactive method and it brings an immersive and impressive experience of drunk driving to users. The system can be further improved according to the evaluation. It will be placed in public areas to involve more people to experience the simulation for the anti-drunk driving purpose.</p>
V0034 14:30-14:45	<p>Simulating the Dilution of Sulfuric Acid on Mixed Reality Platform Zhipeng Pan, Jinda Miao, Ning Cai, Tianren Luo, Mingmin Zhang, Zhigeng Pan Presenter: Zhipeng Pan, Hangzhou Normal University Hangzhou, China</p> <p>Abstract: Augmented reality technology has been widely used in experimental education. Augmented reality provides virtual-real integration, real-time interaction and three-dimensional immersion, which provides a new development direction for simulating the teaching environment and promoting learning interaction. We have developed an MR experiment of diluting concentrated sulfuric acid, which helps students learn experimental manipulations and scientific concepts before conducting real chemical experiments. Virtual experiments can avoid the risks of real chemical experiments and reduce the waste of chemical materials. At the same time, we correctly render the occlusion relationship between the hand, the beaker and the virtual liquid, providing a realistic experimental effect. The tracking of multiple cameras allows students to interact more naturally. We compared the availability and students' attitudes of three virtual experiments about diluting concentrated sulfuric acid. The results show that the usability of the MR experimental system reaches the level of user satisfaction. The realistic visual effects and natural interaction method of the MR experiment have been recognized by the students.</p>
V0042 14:45-15:00	<p>May I Remain Seated: A Pilot Study on the Impact of Reducing Room-scale Trainings to Seated Conditions for Long Procedural Virtual Reality Trainings Yusra Tehreem, Sofia Garcia Fracaro, Timothy Gallagher, Ryo Toyoda, Kristel Bernaerts, Jarka Glassey, Fernando Russo Abegão, Sven Wachsmuth, Michael Wilk, Thies Pfeiffer Presenter: Yusra Tehreem, University of Applied Sciences Emden/Leer & Bielefeld University, Germany</p> <p>Abstract: Although modern consumer level head-mounted-displays of today provide high-quality room scale tracking, and thus support a high level of immersion and presence, there are application contexts in which constraining oneself to seated set-ups is necessary. Classroom sized training groups are one highly relevant example. However, what is lost when constraining cybernauts to a stationary seated physical</p>

Online Session 4

	<p>space? What is the impact on immersion, presence, cybersickness and what implications does this have on training success? Can a careful design for seated virtual reality (VR) amend some of these aspects? In this line of research, the study provides data on a comparison between standing and seated long (50-60 min) procedural VR training sessions of chemical operators in a realistic and lengthy chemical procedure (combination of digital and physical actions) inside a large 3-floor virtual chemical plant. Besides, a VR training framework based on Maslow's hierarchy of needs (MHN) is also proposed to systematically analyze the needs in VR environments. In the first of a series of studies, the physiological and safety needs of MHN are evaluated among seated and standing groups in the form of cybersickness, usability and user experience. The results (n=32, real personnel of a chemical plant) show no statistically significant differences among seated and standing groups. There were low levels of cybersickness along with good scores of usability and user experience for both conditions. From these results, it can be implied that the seated condition does not impose significant problems that might hinder its application in classroom training. A follow-up study with a larger sample will provide a more detailed analysis on differences in experienced presence and learning success.</p>
<p>V0060 15:00-15:15</p>	<p>VRLab4BES- A virtual reality implementation approach of building service simulation for educational purposes Linh Tuan Mai, Heiko Werdin Presenter: Linh Tuan Mai, University of Applied Sciences Dresden (HTW-Dresden), Germany</p> <p>Abstract: EXtended Reality (XR) technologies have been used in a variety of research disciplines and are now commercially available (hardware and software). The potential for XR technology to improve education quality by allowing students to learn in a more immersive environment is also very promising. The increasing complexity of building services places higher demands on education programs for professionals in the Architecture, Engineering, and Construction (AEC) sector. This paper describes a method for implementing building service simulation in a virtual reality (VR) environment for educational purposes (VRLab4BES). The prototype VR-Lab focuses on the modelling of a heating system while taking into account a variety of factors that are required for educational software. The tool has been validated through its use in a study program at the University of Applied Sciences Dresden's Faculty of Mechanical Engineering. Overall, the approach improves the learnability of complex learning contents and the motivation of learners. More research is being planned to improve the approach's applicability as an education tool for the AEC sector.</p>
<p>V0069 15:15-15:30</p>	<p>Interactive Brain-Computer System for Assessing Binocular Rivalry and Amblyopia Based on VR Qinglan Shan, Kaiying Mao, Cheng Yu, Yui Lo, Lanying Li, Qinggan Zeng*, Xiaomei Nie, Xiao-Ping Zhang, Yuhan Dong Presenter: Qinglan Shan, Tsinghua University, China</p> <p>Abstract: Binocular rivalry (BR) is the competition of two eyes when shown with different patterns, which is regarded as a neurological symptom. Since the interocular suppression of BR is related to amblyopia and affects the development of visual function, it is essential to assess both BR and amblyopia. Conventional methods assessing the severity of neurological symptoms rely on chromatic aberration glasses or stereoscope to display BR patterns and stereoscopic objects. However, glasses and stereoscopes are hard to perform respectively and</p>

Online Session 4

	<p>dynamically with 2D displays. In this paper, we adopt virtual reality (VR) as a proper display and interaction media for separated screens and dynamic stereoscopic vision to develop a BR assessing system. To promote the usability of measurement of interocular suppression, we further apply steady-state visual-evoked potential (SSVEP) stimulus in VR head-mounted display (HMD) and integrated the stimuli into virtual environments due to the high information transfer rate and accessibility among braincomputer interface (BCI) of SSVEP. Sixteen (16) subjects took part in the experiment, through which the proposed system is effective for BR measurement and amblyopia rehabilitation and outperformed the conventional methods. The proposed method enjoys the benefit of personalized measurement for BR severity and the degree of amblyopia subjectively.</p>
<p>V1037 15:30-15:45</p>	<p>Entrepreneurship, Innovation and Virtual Reality Awareness in Organizations Esra SIPAHI DONGUL and Erkin ARTANTAS Presenter: Esra SIPAHI DONGUL, Aksaray University, Turkey</p> <p>Abstract: Concepts such as entrepreneurship, innovation and virtual reality have recently become the agenda items of many organizations. At the heart of this agenda are changing macroeconomic conditions, the need for divergence and sustainable growth from competitors in deepening competitive conditions; rising costs, the proliferation of technology, and the transformation in customer consumption habits. All these changes push organizations to make radical changes to their strategies and business models. In this article, to increase conceptual awareness, general definitions of entrepreneurship, innovation and virtual reality are discussed in the organizations that stand out primarily in line with the need for innovation, and methods and successful applications are examined. A general assessment of how these concepts are handled on social media is carried out. This article is intended to guide organizations in line with future research.</p>
<p>V1079 15:45-16:00</p>	<p>Virtual Reality-Based Simulator of Needle Interventions for Liver Biopsy Aine Kanzira, Xiaojun Chen Presenter: Aine Kanzira, Shanghai Jiao Tong University, China</p> <p>Abstract: Due to the high precision required for needle-based simulations, targeting the needle and the movement of the tissue (due to breathing) are some of the factors that can lead to poor planning or training. In this work, we developed a simulator based on the Simulation Open Framework Architecture (SOFA) to practice needle interventions on moving tissue. 3D models of ribs and livers derived from computerized tomography (CT) scans during inhalation and exhalation simulated the liver and rib displacements due to respiratory motion. We applied a corotational finite element method and a set of constraints for the needle and tissue interaction and evaluated the puncture and cutting forces obtained during the stages of insertion. The simulation can simulate the appropriate respiratory motion in an interactive virtual environment.</p>

Online Session 5

- **Topic: System Simulation and Computation**
- **Time: 16:15-18:15, Beijing Time, GMT+8, July 5, 2022**
- **Zoom Link: <https://us02web.zoom.us/j/88573869133> (Password: 070305)**
- **Session Chair: Prof. Yinwei Zhan, Guangdong University of Technology, China**

<p>V0005 16:15-16:30</p>	<p>Numerical Simulation of the Different Ship Wave Patterns Miaoyu Cai,Xiaofeng Sun Presenter: Miaoyu Cai, Dalian Maritime University, China</p> <p>Abstract: Numerical simulation of ship waves is of great importance to improve the environmental reality of marine simulators. By deploying different Kelvin sources or Rankine sources, this paper proposes a method to generate more realistic ship wave patterns numerically. Based on the theory of potential flow, the boundary integral equations are firstly obtained, and then are numerically discretized to a set of nonlinear equations. After that, the Jacobian-free Newton-Krylov method is adopted to solve these nonlinear equations. Thus, the ship wave pattern can be determined. Finally, the details of wave patterns are discussed and the mechanism of ship wave transformation is analyzed. Simulation results show that this method can simulate polymorphic ship waves delicately, which are more consistent with real wave patterns of different ships.</p>
<p>V0025 16:30-16:45</p>	<p>Monocular Depth Estimation with Sharp Boundary Xin Yang,Qingling Chang,Xinlin Liu,Yan Cui Presenter: Xin Yang, Wuyi University, China</p> <p>Abstract: Monocular depth estimation is the base task in computer vision. Its accuracy has a tremendous improvement in the decade with the development of deep learning. But the boundary blur of the depth map is still a serious problem. Researchers find the boundary blur is mainly caused by two factors. First, the low-level features, containing boundary and structure information, maybe lost in deeper networks during the convolution process. Second, the model ignores the errors introduced by the boundary area due to the few portions of the boundary area in the whole area, during the backpropagation. Focus on the factors mentioned above, two countermeasures are proposed to mitigate the boundary blur problem. Firstly, we design a scene Understanding module and scale transform module to build a lightweight fuse feature pyramid, which can deal with the low-level feature loss effectively. Secondly, we propose a boundary-aware depth loss function to pay attention to the effects of the boundary's depth value. The extensive experiments show that our method can predict the depth maps with clearer boundaries, and the performance of the depth accuracy based on NYU-depth v2 and SUN RGB-D is competitive.</p>
<p>V0031 16:45-17:00</p>	<p>Vibrotactile Feedback System Based on Multiple Properties Modulation Pengwen Xiong, Jin Bu, Junjie Liao Presenter: Pengwen Xiong, Nanchang University, China</p> <p>Abstract: In recent years, cross-modal retrieval and tactile rendering techniques have become a research hotspot in the virtual reality field due to their ability to provide more realistic sensations to humans. This paper presents a vibrotactile feedback system based on multiple feature modulation, which converts from texture images to tactile stimulation. We focus on tactile texture perception and propose a method to unite modulate the amplitude of raw tactile vibrations based on the physical properties of hardness and roughness to make differential modulation for</p>

Online Session 5

	<p>different kinds of textures, and then we get driving signals that work well for the vibrotactile feedback device eventually. We designed an image-based cross-modal retrieval framework and a vibrotactile feedback device, which together with the data modulation part constitute the system that enables the modulated drive signals to output realistic tactile feedback consistent with human perception in the case of input texture images. The results of the psychophysical experiment shown that the experimenter's recognition of texture increased from 87.5% to 93.3% comparing the virtual texture stimuli given by the vibrotactile feedback system before and after modulation.</p>
<p>V0091 17:00-17:15</p>	<p>Haptic based simulation for patient-specific zygomatic implant placement surgery Jianfeng Luo, Afaque Rafique Memon, Xiaojun Chen Presenter: Jianfeng Luo, Shanghai Jiao Tong University, China</p> <p>Abstract: There are inevitable risks during zygomatic implant placement surgery, particularly due to the complex anatomical structure of the zygomatic maxillary and the limited operating space. In this study, we present a haptic based simulation system for trainees to rehearse the process of zygomatic implant placement surgery, providing them with a multi-dimensional perception of vision, touch, and hearing, so that they can effectively master relevant surgical skills. We realize a complete simulation of the zygomatic implantation process, including preoperative planning, model loading, real-time rendering, and two-stage implantation simulation. The implantation simulation is divided into two stages: free motion and implant placement. We use a surface contact model for haptic rendering during the free motion stage and a voxel model to achieve efficient removal of elements during the implant placement stage. The system also provides trainees with a user-friendly interface for importing personalized model data, customizing the implantation steps and selecting the appropriate surgical tool, which maximizes the reproduction of real surgical scenarios.</p>
<p>V5052 17:15-17:30</p>	<p>The Safety Status and Foreign Object Detection Model of Tobacco Cabinets Based on Deep Learning with IoT-Cloud Chengyuan Wang, Junli Zhao, Zengchen Yu, Shuxuan Xie, Xiaofei Ji, Zhibo Wan Presenter: Chengyuan Wang, Qingdao University, China</p> <p>Abstract: Virtual reality and Internet of Things (IoT) are widely used in various fields ranging from smart healthcare to smart factories. Among these systems, it is indispensable to obtain security, productivity, and other aspects of verification through the input data. We propose to detect the production status of tobacco cabinets in real-time and the safety detection of foreign objects in cigarette cabinets based on deep learning with the Internet of Things environment, and build foreign object detection and production state detection data sets and monitoring models. In the actual detection, the detection accuracy for different foreign objects reaches 97.75%; the accuracy for the feeding in materials status of the tobacco cabinet reaches 96.36%; the accuracy for the detection of the status of the tobacco cabinet conveyor belt is 91.76%; the overall detection time was less than 1 second. The proposed method has important practical significance for the safety, well-being, and efficient production of cigarette factories.</p>
<p>V6105 17:30-17:45</p>	<p>An Automatic Digital Instrument Quality Inspection System Based on Machine Vision Kaiyuan Kang, Jifeng Huang Presenter: Kaiyuan Kang, Shanghai Starriver Bilingual School, China</p>

Online Session 5

	<p>Abstract: With subjective influences, misdetection and missing detection are inevitable problems for traditional manual quality inspection of a digital instrument. This study designs an automatic quality inspection system based on machine vision, which can be widely applied in five-component digital instruments with an arbitrary layout on a 6 (2*3)-instrument test platform. The system uses Hikvision industrial camera to collect images and Python to program. The system consists of the instrument display standard formulation part and detection part. The detection part is divided into five steps: image acquisition and segmentation, instrument model identification, keyframe extraction, image preprocessing, digital display panel recognition and detection. The paper uses the 7-point identification method to identify the state of the nixie tubes and uses the mean square deviation method to identify the states of the indicator lights. It has been proved that the system inspection can control the missing detection rate at 1.59‰ ~ 3.70‰, which shows that the system can detect the quality of digital display instruments with an arbitrary layout automatically and accurately.</p>
<p>V7080 17:45-18:00</p>	<p>APPRAISING THE POTENTIAL OF PRE AND PILOT TESTING DURING SURVEY BASED RESEARCH Dinesh Seth, Meenu Gupta, Bikram Jit Singh Presenter: Dinesh Seth, MMIM, Mullana, Ambala, India.</p> <p>Abstract: This paper envisages the capabilities of Pre-Testing and Pilot-Testing of Questionnaires designed to conduct survey based studies. Related literature is surveyed to access the status and significance of questionnaire-testing, before carrying out regular survey based researches. It also highlights the scarcity of appropriate procedure to carry out effective testing and tends to fill this gap by performing step-wise Pre and Pilot Testing of a Questionnaire, designed to access the impact of artificial intelligence in Indian banking sector. It is a naval study skimming the vitality of both the testings, after accomplishing the proposed methodology and without ignoring the existing constraints of Indian private banking environments. Findings of this study have tremendous application in any kind of survey based study related to scientific, social and economic scenarios. From last couple of decades, Questionnaires have erupted as well structured and systematic way to gather exact voice of masses and its efficiency can be enhanced by designing and redesigning it through relevant pre and pilot testing.</p>
<p>V0015 18:00-18:15</p>	<p>A Practical Method for Assessing Collision Avoidance Strategies Based on Marine Simulator Xi Zhao, Xiaofeng Sun, Lixin Wen, Jingkui Wang, Hongguang Lyu, Zhongxian Zhu, Yong Yin Presenter: Xi Zhao, Dalian Maritime University, China</p> <p>Abstract: To ensure collision avoidance strategy can be used onboard, it's vital to make a thorough assessment on it. In this paper, an assessment method is proposed to evaluate the compliance of collision avoidance strategies in case of two ships in sight of one another at open sea. Based on the International Regulations for Collision Avoidance at Sea, the quantification formulates of metrics, such as safety indexes and different rule clauses, etc., are firstly obtained. After that, the compliance of ship avoidance strategies in different avoidance stages are determined by ship's behaviors on typical encounter situations according to the quantification formulates. Finally, simulation tests of proposed method are carried out with a full mission marine simulator. The score of the assessed collision avoidance strategies in a typical encounter situation is calculated. Test results show that the assessment results of</p>

Online Session 5

	the present method are consistent with the practical performance of the ship's collision avoidance strategy on typical encounter situations, which verifies the effectiveness of the proposed method.
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