

Call for papers: IEEE Transactions on Multimedia special issue on “Point Cloud Processing and Understanding”

Overview

With the rapid development of 3D acquisition technologies, 3D sensors are becoming increasingly available and affordable, including various types of 3D lasers scanners (or LiDAR) onboard various platforms, and RGB-D cameras (such as Microsoft[®] Kinect, Intel[®] RealSense, and Apple[®] Truth Depth Camera). As the fourth multimedia (Signal, Image and Video are the 1st to 3rd multimedia), 3D data acquired by these sensors can provide rich geometric, shape and scale information. Complemented with 2D images, 3D data provide an opportunity for a better understanding of the surrounding environment for machines. 3D data can be usually represented with different formats, including depth images, point clouds, meshes, and volumetric grids. As a commonly used representation, point clouds preserve the original geometric information in 3D space with a very simple yet flexible data structure. Therefore, it is the preferred representation for many practically meaningful applications such as virtual/augmented reality, autonomous driving, and robotics.

The development of deep learning on 2D images has boomed due to its superiority in solving computer vision problems. Deep learning for point clouds has also drawn much interests in recent years. However, it is still far from being satisfactory to leverage the potential of both deep learning and geometry domain knowledge for understanding point clouds. Compared with 2D images, unstructured point clouds are more difficult to obtain, process and label, which results in scant effective datasets for supervised learning. Also, raw point clouds are often noisy and incomplete, and lack of colors and textures. They can be extremely large in many scenarios, which pose more challenges to dataset construction and network efficiency. Other challenges in the field of point cloud processing include rendering, low-level processing algorithms (consolidation, geometric computation, registration), and high-level understanding tasks (scene segmentation and classification, object detection and tracking). The scope of this special issue is therefore rather broad in the sense that we would like to include point cloud acquisition and dataset establishment, in combination with point cloud processing and understanding algorithms, for a broad range of applications.

Aim and Scope

Prospective authors are invited to submit original manuscripts on topics including, but not limited to:

- ACQUISITION & VISUALIZATION
 - Dataset establishment for different applications
 - Large-scale point cloud compression
 - Large-scale point cloud rendering
 - Super-resolution for point cloud quality enhancement
 - Point cloud quality assessment
- 3D PROCESSING
 - Multi-resolution 3D representations
 - Point cloud registration
 - Fusion of point clouds with optical images
 - Point cloud sampling, consolidation, and geometric primitive extraction
 - Shape reconstruction from point clouds
 - Shape and appearance modelling
 - 3D shape retrieval and recognition
 - 3D scene reconstruction using multisensory point clouds

- Object detection and tracking
 - Shape analysis and morphology
 - Unsupervised point cloud representation learning
 - Segmentation with limited labelled data/under weak supervision
 - Simultaneous semantic and instance segmentation
- APPLICATIONS
- Cultural heritage
 - Multimedia
 - Object/human/environment modelling
 - Medical applications
 - Reverse engineering, dimensional inspection & metrology
 - Virtual and augmented reality
 - Remote sensing

Prospective authors should submit their manuscripts following the <http://journals.ieeeauthorcenter.ieee.org/submit-your-article-for-peer-review/the-ieee-article-submission-process/>. Authors should submit a PDF version of their complete manuscript to <https://mc.manuscriptcentral.com/tmm-ieee> according to the following schedule:

Submission deadline: 15 October 2022 (Extended)

First Review: 15 November 2022

Revisions due: 31 December 2022

Second Review: 31 January 2023

Final Manuscripts: 15 February 2023

Publication date: Mid-2023

Guest Editors:

Xiao-Ping Zhang: Ryerson University, Toronto, ON Canada (e-mail: xzhang@ee.ryerson.ca)

Mingqiang Wei: Nanjing University of Aeronautics and Astronautics, China (e-mail: mqwei@nuaa.edu.cn)

Jonathan Li: University of Waterloo, Waterloo, Ontario, N2L 3G1, Canada (e-mail: junli@uwaterloo.ca)

Kai Xu: National University of Defense Technology, China (e-mail: kevin.kai.xu@gmail.com)

Yang Liu: Microsoft Research Asia, China (e-mail: yangliu@microsoft.com)

Yanwen Guo: Nanjing University, China (e-mail: ywguo@nju.edu.cn)

Biography of Guest Editors:



Xiao-Ping Zhang (Fellow, IEEE) received the B.S. and Ph.D. degrees from Tsinghua University, in 1992 and 1996, respectively, both in Electronic Engineering. He holds an MBA in Finance, Economics and Entrepreneurship with Honors from the University of Chicago Booth School of Business, Chicago, IL. Since Fall 2000, he has been with the Department of Electrical, Computer and Biomedical Engineering, Ryerson University, Toronto, ON, Canada, where he is currently a Professor and the Director of the Communication and Signal Processing Applications Laboratory. He has served as the Program Director of Graduate Studies. He is cross-appointed to the Finance

Department at the Ted Rogers School of Management, Ryerson University. He was a Visiting Scientist with the Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, MA, USA, in 2015 and 2017. He is a frequent consultant for biotech companies and investment firms. His research interests include sensor networks and IoT, machine learning, statistical signal processing, image and multimedia content analysis, and applications in big data, finance, and marketing.

Dr. Zhang is Fellow of the Canadian Academy of Engineering, Fellow of the Engineering Institute of Canada, Fellow of the IEEE, a registered Professional Engineer in Ontario, Canada, and a member of Beta Gamma Sigma Honor Society. He is the general Co-Chair for the IEEE International Conference on Acoustics, Speech, and Signal Processing, 2021. He is the general co-chair for 2017 GlobalSIP Symposium on Signal and Information Processing for Finance and Business, and the general co-chair for 2019 GlobalSIP Symposium on Signal, Information Processing and AI for Finance and Business. He is an elected Member of the ICME steering committee. He is the General Chair for the IEEE International Workshop on Multimedia Signal Processing, 2015. He is the Publicity Chair for the International Conference on Multimedia and Expo 2006, and the Program Chair for International Conference on Intelligent Computing in 2005 and 2010. He served as a Guest Editor for Multimedia Tools and Applications and the International Journal of Semantic Computing. He was a tutorial speaker at the 2011 ACM International Conference on Multimedia, the 2013 IEEE International Symposium on Circuits and Systems, the 2013 IEEE International Conference on Image Processing, the 2014 IEEE International Conference on Acoustics, Speech, and Signal Processing, the 2017 International Joint Conference on Neural Networks and the 2019 IEEE International Symposium on Circuits and Systems. He will serve IEEE JOURNAL OF SELECTED TOPICS IN SIGNAL PROCESSING as the Editor-in-Chief from January 2022. He is Senior Area Editor for the IEEE TRANSACTIONS ON SIGNAL PROCESSING and the IEEE TRANSACTIONS ON IMAGE PROCESSING. He was Associate Editor for the IEEE TRANSACTIONS ON IMAGE PROCESSING, the IEEE TRANSACTIONS ON MULTIMEDIA, the IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, the IEEE TRANSACTIONS ON SIGNAL PROCESSING, and the IEEE SIGNAL PROCESSING LETTERS. He received 2020 Sarwan Sahota Ryerson Distinguished Scholar Award - the Ryerson University highest honor for scholarly, research and creative achievements. He is selected as IEEE Distinguished Lecturer by the IEEE Signal Processing Society for the term 2020 to 2021, and by the IEEE Circuits and Systems Society for the term 2021 to 2022.



Mingqiang Wei (Member, IEEE) received his Ph. D degree (2014) in Computer Science and Engineering from the Chinese University of Hong Kong (CUHK). He is an Associate Professor at the School of Computer Science and Technology, Nanjing University of Aeronautics and Astronautics (NUAA). Before joining NUAA, he served as an assistant professor at Hefei University of Technology, and a postdoctoral fellow at CUHK. He was the recipient of CUHK Young Scholar Thesis Awards in 2014. He is now serving on the Editorial Board of The Visual Computer, Journal of Electronic Imaging, and Journal of Image and Graphics. His research interests focus on point

cloud/mesh processing, 3D vision, deep learning and computer-aided art design, in which areas he has

published over ninety papers in prestigious conferences and journals including IEEE TPAMI, TVCG, TMM, TNNLS, CAD, CGF, and CVPR, ICCV, IJCAI, PG, EG, SPM.



Jonathan Li (Senior Member, IEEE) received the Ph.D. degree in geomatics engineering from the University of Cape Town, Cape Town, South Africa, in 2000. He is currently a Professor and the Head of the Mobile Sensing and Geodata Science Group, Department of Geography and Environmental Management, cross-appointed with the Department of Systems Design Engineering, University of Waterloo, Canada. He is also a Founding Member of the Waterloo Artificial Intelligence Institute. His research interests include AI-based information extraction from mobile LiDAR point clouds and Earth observation images. He has coauthored more than 400 publications, over 200 of which were published in refereed journals, including the IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, the IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, the IEEE JOURNAL OF SELECTED TOPICS IN APPLIED EARTH OBSERVATIONS AND REMOTE SENSING, the IEEE GEOSCIENCE AND REMOTE SENSING LETTERS, ISPRS-JPRS, and RSE. He is the Chair of the ISPRS WG I/2 on LiDAR, Air- and Space-borne Optical Sensing from 2016 to 2020 and the ICA Commission on Sensor-driven Mapping from 2015 to 2023. He is an Associate Editor of the IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, the IEEE JOURNAL OF SELECTED TOPICS IN APPLIED EARTH OBSERVATIONS AND REMOTE SENSING, and Canadian Journal of Remote Sensing. He was a recipient of the Outstanding Achievement in Mobile Mapping Technology Award in 2019, for his pioneering contributions in developing and promoting mobile mapping technology, and the ISPRS Samuel Gamble Award in 2020, for his significant contributions to the development, organization or professional activities of the photogrammetry, remote sensing, and spatial information sciences at the national or international level.



Kai Xu (Member, IEEE) received the Ph.D. degree from the National University of Defense Technology in 2011. He is currently a Professor with the National University of Defense Technology. He conducted visiting research at Simon Fraser University from 2008 to 2010 and Princeton University from 2017 to 2018. His research interests include computer graphics, 3D vision, and its robotic applications. He serves on the Editorial Board of ACM Transactions on Graphics, Computer Graphics Forum, Computers & Graphics, and The Visual Computer.



Yang Liu received the bachelor's and master's degrees from the University of Science and Technology of China, and the PhD degree from the University of Hong Kong. He is currently a principal researcher with Microsoft Research Asia. His recent research interests include geometric computation and learning-based geometry processing and generation. He was the program co-chair of Geometric Modeling and Processing 2019, and program committee of Siggraph Asia 2014/2019/2020, SGP 2014/2015/2016/2018/2019/2020, Pacific Graphics 2013/2014/2015/2016/2017/2018, Geometric Modeling and Processing 2014/2015/2016/2017/2018/2020/2021, Advances in Architectural Geometry 2014/2016/2018, CAD/Graphics 2013/2015/2017/2021, GDC 2017, ChinaGraph 2018/2020, ChinaVR 2020, CVM 2019/2020/2021, CAD&CG&GDC 2018, GDC 2020, 3DRW 2018/2019. He served as the guest editor for the journal of Computer-aided Geometric Design. He is an associate editor of the IEEE Transactions on Visualization and Computer Graphics.



Yanwen Guo received the PhD degree in applied mathematics from the State Key Lab of CAD&CG, Zhejiang University, China, in 2006. He is currently a professor with the National Key Lab for Novel Software Technology, Department of Computer Science and Technology, Nanjing University, Jiangsu, China. He worked as a visiting professor with the Department of Computer Science and Engineering, The Chinese University of Hong Kong, in 2006 and 2009, respectively, and the Department of Computer Science, The University of Hong Kong, in 2008, 2012, and 2013, respectively. He was a visiting scholar in the Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, from 2013 to 2015. His research interests include 3D computer vision and Computer Graphics, especially intelligent 3D modeling, in which areas he has published over one hundred papers in prestigious conferences and journals including ACM Siggraph, IEEE TPAMI, TVCG, TMM, and CVPR, ECCV. He serves as a PC of CVPR, ICCV and ECCV.