International Forum on Computational Optical Measurement and its Education (COME 2020)

计算光学测量研讨会

27 June 2020, Zhejiang University of Technology

Program 研讨会议程

Session I	
27 June 2020 8:30am-12:30am	**Chair: Wang Haixia**
8:30am-8:45am **Opening Ceremony** Prof. Liang Ronghua, Zhejiang University of Technology, China 梁荣华，浙江工业大学，中国	
8:45am-9:00am **Title : Computational Optical Measurement and its Education** Prof. Qian Kemao, Nanyang Technological University, Singapore 钱克矛，南洋理工大学，新加坡	
9:00am-9:40am **Title : Portable high-resolution 3D imaging for forensic applications** Prof. Zhang Song, Purdue University, American 张松，普渡大学，美国	

9:40am-10:20am

Title : Fringe Processing + Deep learning

Prof. Yu Yingjie, Shanghai University, China

于瀛洁，上海大学，中国

Break

10:30am-11:10am

Title : Digital image correlation: a brief introduction and some new advances

Prof. Pan Bing, Beihang University, China

潘兵，北京航空航天大学，中国

11:10am-11:50am

Title : SIFT aided digital image/volume correlation accelerated by GPU

Prof. Jiang Zhenyu, South China University of Technology, China

蒋震宇，华南理工大学，中国

11:50am-12:30am

Title : Fringe projection profilometry using deep learning

Prof. Feng Shijie, Nanjing University of Science and Technology, China

冯世杰，南京理工大学，中国

Lunch Break

Session II

27 June 2020 14:00pm-16:15pm **Chair: Wang Haixia**

14:00pm-15:00pm

Title : Marriage between Holography and Statistical Optics for Unconventional Computational Imaging: A Tutorial

Prof. Mitsuo Takeda, Utsunomiya University, Japan

武田光夫，宇都宮大学，日本

15:00pm-16:00pm

Title : Design of single-photon sources in 2D semiconductors

Prof. Guo Wanlin, Nanjing University of Aeronautics and Astronautics, China

郭万林，南京航空航天大学，中国

16:00pm -16:15pm

Closing Ceremony: Introduction to COME 2021

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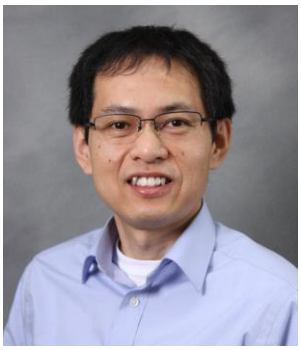
国家自然科学基金

Broadcast Link: https://live.bilibili.com/12950916

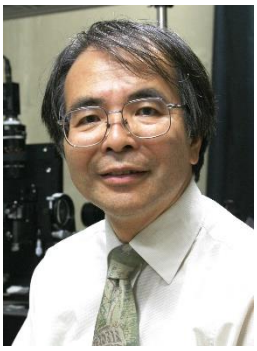
Name	**Zhang Song**	
Organization	**Purdue University**	
Title of Presentation	**Portable high-resolution 3D imaging for forensic applications**	
Abstract	The current practices (e.g., casting, and 2D photo) of documenting crime scenes especially footwear and tire impressions face challenges either in front-end acquisition or in court. This necessitates the development of 3D imaging technology for this particular field of application. Over the past three years, we have developed a fully automated portable 3D imaging system equipped with a user-friendly graphical user interface (GUI) and a simple hardware and software design. Our system can reach 137 dpi (dots per inch) for approximately 14”x10” field of view (FOV), or 400 dpi for 5.12” x 3.84” FOV. The system was extensively evaluated by forensic examiners with minimal training requirements. I will present some interesting results and findings we have thus far.	
Biography	Song Zhang is a Professor of Mechanical Engineering and Assistant Head for Experiential Learning at Purdue University. He received his Ph.D. degree in mechanical engineering from Stony Brook University in 2005. He was a postdoctoral fellow at Harvard University for three years and joined Iowa State University as an assistant professor in 2008 before moved to Purdue in 2015.	

Name	**Yu Yingjie**	
Organization	**Shanghai University**	
Title of Presentation	**Fringe Processing + Deep learning**	
Abstract	Digital interference technology, digital holography, speckle interference technology, and fringe projection technology are all classic carrier information methods. The relevant processing technologies have been developed for many years and are becoming more mature. Deep learning as a powerful technique provides new ideas, and has penetrated into the optical measurement field. This paper will discuss the demodulation technique of digital interferogram, such as phase denoising and phase unwrapping methods, including separate processing methods and a two-in-one processing method. Moreover, we propose an end-to-end deep learning algorithm to denoise fringe patterns and do phase unwrapping. The effectiveness of the proposed algorithm is verified using the simulated and real data. Compared with the existing algorithm, the proposed algorithm has a faster calculation speed while maintaining high processing accuracy. The proposed method can also provide solutions for other demodulation problems, such as digital hologram and electronic speckle interferogram.	
Biography	Prof.Yu Yingjie,Obtained her doctor degree in 1998 and master degree in 1996 from Harbin Institute of Technology, China. From 1999, she works at the dept. of precision mechanical engineering, shanghai university. Her research area is optical metrology and interesting focuses on digital interferometry, digital holography and electronic speckle interferometry. Now her projects are about stitching interferometry for the cylindricity error measurement, on-situ testing of flatness of large scale optics on machine tool by dynamic interferometer, sub-surface damage testing by compressive holography and 3D holographic display. She is also the executive director and secretary-general of the precision machinery branch of china instrument and control society(CIS).	

Name	**Pan Bing**	
Organization	**Beihang University**	
Title of Presentation	**Digital image correlation: a brief introduction and some new advances**	
Abstract	This talk first gives the author's personal new insights into the historical developments and classifications of digital image correlation (DIC) techniques. Then, several recent advances made by the author's group in last three years are described, which have enabled more accurate, more convenient and better DIC measurements to be made. First, we review existing single-camera stereo-DIC techniques, and describe a novel and elegant color stereo-DIC method using a single color 3CCD or high-speed CMOS camera. Second, we report a novel mirror-assisted multi-view DIC technique for panoramic/dual surface shape and defamation measurements. Third, we introduce two novel video extensometers with enhanced strain sensitivity, accuracy and precision.	
Biography	Pan Bing is a full professor in School of Aerospace Science & Engineering at Beihang University (BUAA), China. He received his Ph.D degree in Mechanical Engineering from Tsinghua University in 2008. After working with Professor Anand Asundi in Nanyang Technological University (Singapore) as a postdoctor, he joined Institute of Solid Mechanics, BUAA in 2009. Prof. Pan won the National Science Fund for Distinguished Young Scholars in 2019. His current research interests mainly focus on advanced optical techniques and their applications to experimental mechanics, especially the digital image/volume correlation techniques for surface/internal deformation measurement of solid materials and structures, as well as new experimental techniques for characterizing thermo-mechanical behavior of hypersonic materials and structures. He has published more than 120 peer-reviewed articles in international journals. All his publications have been cited nearly 10 000 times according to Google Scholar.	

Name	**Jiang Zhenyu**	
Organization	**South China University of Technology**	
Title of Presentation	**SIFT aided digital image/volume correlation accelerated by GPU**	
Abstract	Digital image correlation (DIC) and digital volume correlation (DVC) are the methods of deformation measurement based on image matching, which can be carried out through the comparison of grayscale or features in the two images. Most of current DIC and DVC methods are developed using cross-correlation criterion or similar criterion for grayscale matching. To enhance the adaptability of DIC/DVC methods to the challenging cases containing large and complex deformation, we developed a superior DIC/DVC method combine the grayscale matching with feature matching. In our method, scale-invariant feature transform (SIFT) is employed to extract image features, which are robust to various deformation and illumination change of images. According to the features, deformation at the points of interest (POIs) can be correctly estimated even though the interrogated regions experience considerable deformation, which may be beyond the capability of traditional DIC/DVC methods. Then the estimated deformation is fed as the initial guess to the iterative Gauss-Newton algorithm to achieve high accuracy results of measurement. Besides the improved robustness, the performance of our methods is further enhanced with parallel computing technique. Superfast computation speed is reached on GPU, without any compromise of accuracy and resolution.	
Biography	Dr. Zhenyu Jiang received his BSc and PhD degrees at the University of Science and Technology of China. He is currently a professor at School of Civil Engineering and Transportation, South China University of Technology, China. His research interests focus on the image-based measurement technologies and their applications in the exploration on the mechanical behaviors of advanced engineering materials and structures. He has authored and co-authored over 70 peer-reviewed scientific articles and two research book chapters.	

Name	**Feng Shijie**	
Organization	**Nanjing University of Science and Technology**	
Title of Presentation	**Fringe projection profilometry using deep learning**	
Abstract	Deep learning techniques are receiving increasing attention in the fields of optical imaging. The use of convolutional neural networks can substantially enhance the accuracy of phase demodulation from a single fringe pattern. Moreover, the powerful learning ability of deep neural network (DNN) also enables the phase unwrapping, super-fast 3D shape measurement of transient events, multi-view fringe projection and so on. From comparative results, the methods based on DNN shows improved performance over traditional state-of-the-art methods in terms of the phase accuracy and efficiency. We believe the deep learning technique is a powerful technique to handle fringe images and will find wide applications in 3D measurements with fringe projection.	
Biography	Shijie Feng received his PhD in optical engineering at Nanjing University of Science and Technology (NJUST) in 2017. He was a research assistant at Centre for Optical and Laser Engineering, Nanyang Technological University from 2015 to 2016. He was a postdoctoral researcher at NJUST from 2017 to 2019. Currently, He is an associate professor at the Department of Electronic and Optical Engineering of NJUST. He has published more than 40 journal papers. His research interests include fringe projection, phase measurement, high-speed 3D imaging, machine learning, and computer vision.	

Name	**Mitsuo Takeda**	
Organization	**Utsunomiya University**	
Title of Presentation	**Marriage between Holography and Statistical Optics for Unconventional Computational Imaging: A Tutorial**	
Abstract	Traditionally, holography and statistical optics have been regarded as mutually separated fields of optics. For long time, this has restricted synergy of knowledge in holography and coherence theory. This talk will introduce some of our recent efforts to bridge the gap between holography and statistical optics. Focus will be on unconventional computational imaging techniques, coherence holography and holographic correloscopy, which were born from the happy marriage between holography and statistical optics. With these unconventional imaging techniques as an example, I will illustrate how the reasoning of analogy plays a powerful role in the unification and integration of different fields of optics.	
Biography	Mitsuo Takeda is Research Professor of Center for Optical Research and Education (CORE) at Utsunomiya University, and Professor Emeritus of the University of Electro-Communications (UEC), Tokyo Japan. He received the BE degree in EE from UEC in 1969, and the ME and Ph.D. degrees in Applied Physics from the University of Tokyo, respectively, in 1971 and 1974. After working for Canon Inc., he joined the faculty of UEC in 1977. During 1985 he was a visiting scholar of Prof. J. W. Goodman's Group at Stanford University, and an Alexander von Humboldt Guest Professor of Institut für Technische Optik, Universität Stuttgart, Germany, for the years 2013-2014. His honors include: Dennis Gabor Award (SPIE, 2010), Humboldt Research Award (Germany, 2013), Optics and Quantum Electronics Achievement Award (JSAP, 2012), Chandra S. Vikram Award (SPIE, 2017), Emmett N. Leith Medal (OSA, 2020), SPIE Fellow (1999), OSA Fellow (2007), JSAP Fellow (2007).	

Name	**Guo Wanlin**	
Organization	**Nanjing University of Aeronautics and Astronautics**	
Title of Presentation	**Design of single-photon sources in 2D semiconductors**	
Abstract	Single-photon sources hold great promise in quantum communication and quantum computing. Recently, single-photon emissions were experimentally observed in different 2D semiconductors while the exact origins of these quantum sources remain to be uncovered. Here, using first-principles calculations we identify the dislocations in 2D transition metal dichalcogenides as single-photon sources. The quantum emissions can range in the infrared (0.40~1.60 eV) with varying structures, charge states and chemical compositions of dislocations, complementary to those limited in the visible range provided by previously reported sources. The dislocations are topologically and thermodynamically stable and can be experimentally synthesized, suggesting a feasible way to utilizing 2D materials in quantum information technologies. Strain-gradient can also be applied to manipulate exciton dynamics in electro-optical semiconductors efficiently.	
Biography	Dr. Wanlin GUO, Academician of Chinese Academy of Sciences, Chair Professor in mechanics and nanoscience, founder and director of the Key Laboratory of Intelligent Nano Materials and Devices of Ministry of Education and the Institute of Nanoscience of Nanjing University of Aeronautics and Astronautics. His current research focuses on intelligent nano materials and devices, novel conception and technology for efficient energy conversion, molecular physical mechanics for neuronal signaling and molecular biomimics, as well as strength and safety of aircraft and engine. He has published more than 400 peer-reviewed journal papers on Nature series, Phys. Rev. Lett., J. Am. Chem. Soc., Adv. Mater., J. Mech. Phys. Solids, Nano Lett., etc. He received the National Science Foundation of China for Distinguished Young Scholars in 1996 and the position of Cheung Kong Scholars in 1999. He obtained the National Nature Science Prize of China in 2012 for his contribution to physics mechanics, and the ICCES Eric Reissner Award in 2019 for his sustained contributions to the integrity and durability of aerospace structures, and to nano-mechanics.	