Advances in Optical Coded-aperture Imaging: Ultrafast Visualization and Ultra-precise Modulation of Laser Beam/Pulses

Jinyang Yang, Ph.D.

Laboratory of Applied Computational Imaging (LACI)
Centre Énergie Matériaux Télécommunications
Institut National de la Recherche Scientifique (INRS)

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LECTURE ABSTRACT

Coded apertures have been exploited in various imaging modalities to enhance their performance. The unique paradigm of data acquisition and imaging reconstruction in coded-aperture imaging has extended the operating spectral range and enabled myriad applications, especially where conventional imaging systems are inapplicable. This presentation briefly reviews the coded-aperture imaging technique and concentrates on our recent efforts to build next-generation optical coded-aperture imaging systems. I will first present the development of compressed ultrafast photography [*Nature* **561**, 74 (2014), *Science Adv.* **3**, e1601814 (2017), and *Light-Sci. Appl.* **7**, 42 (2018)], the world's fastest receive-only camera that enables ultrafast imaging of spatiotemporal profiles of single laser pulses in real time at up to 10 trillion frames per second. The second part of this presentation will briefly touch on bandwidth-limited programmable imaging that enables ultra-high precision laser beam/pulse shaping [*Opt. Eng.* **51**, 108201 (2012) and *Opt. Express* **21**, 32013 (2013)] for applications in atomic physics, free electron lasers, and three- dimensional profilometry.

SPEAKER BIOSKETCH

Dr. Jinyang Liang is currently an Assistant Professor at the Institut National de la Recherche Scientifique (INRS) - Université du Québec. His research interests cover a broad range of areas, including ultrafast imaging, photoacoustic microscopy, wavefront engineering, and high-precision laser beam shaping. His research primarily focuses on implementing optical modulation techniques to develop new optical instruments for applications in biology and physics. He has published over 50 journal papers and conference proceedings, including *Nature* (cover story), *Science Advances*, and *Light: Science & Technology*. He holds two U.S. patents on ultrafast optical imaging technology. He received his B.E. degree in Optoelectronic Engineering from Beijing Institute of Technology in 2007, and his M.S. and Ph.D. degrees in Electrical Engineering from the University of Texas at Austin, in 2009 and 2012. From 2012 to 2017, he was a postdoctoral trainee at Washington University in St. Louis and California Institute of Technology.