Controlling light focusing inside strongly scattering media

by

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Abstract

Focusing light through and within scattering media is critically important in many applications, such as high-resolution optical imaging, photodynamic therapy, and optical manipulation. However, in scattering media such as biological tissue, light gradually loses the memory of its initial propagation direction, which makes it difficult to create a focus beyond the optical diffusion limit (~1 mm deep). To break this limit, wavefront shaping has been developed with the capability of focusing light through and inside scattering media. Based on the time-reversal principle, this technique first measures the scattered wavefront through holography, and then compensates the wavefront distortion using a spatial light modulator. In this talk, I will present some of the most recently achieved results, including extending the limit of focusing depth by more than an order of magnitude and implementing a new high speed wavefront shaping scheme. These works show the promise of time-reversal based wavefront shaping techniques to revolutionize biomedicine with deep-tissue noninvasive optical imaging, manipulation, and therapy.

Biography:
Dr. Yuecheng Shen received his BSc in applied physics from the University of Science and Technology of China (2010) and his Ph.D. in electrical engineering from Washington University in St. Louis (2015). He then did his postdoc research under the tutelage of Dr. Lihong V. Wang at California Institute of Technology. He is now an associate professor in the school of electronics and information technology at Sun Yat-sen University.

Dr. Shen’s research interests focus on developing wavefront shaping technologies, which overcome optical scattering effects and enable deep tissue noninvasive optical imaging, optogenetics, optical tweezing, and phototherapy. He has published more than 30 articles in peer-reviewed journals (including Physical Review Letters and Optica) and has 10 U.S. patents/provisional patents.

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