Monocular metasurface camera for single-shot multi-dimensional imaging

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Conventional camera systems can only detect light intensity while losing important information about the target scene, including depth, polarization, and spectrum. In order to further obtain the multi-dimensional light-field information of the target object, it is often required to use bulky and expensive instruments. Metasurface is composed of an array of optical antennas that can manipulate the Here, I will present our group's recent effort to replace conventional camera lenses with metalenses. By leveraging the unique capability of metasurface to tailor the vectorial field of light, in combination with an advanced image retrieval algorithm, we aim to build compact camera systems that can capture multi-dimensional light field information of a target scene in a single shot under ambient illumination conditions. Specifically, I will show how we build a monocular camera that can capture a 4D image, including 2D all-in-focus intensity, depth, and polarization of a target scene in a single shot. I will also discuss how to use a metasurface-equipped camera for ellipsometry measurement in a single shot.

Short Bio:

Yuanmu Yang is currently a tenured associate professor at the Department of Precision Instrument of Tsinghua University. His research focuses on the area of meta-optics. He has published more than 50 journal articles, including 2 in Nature Photonics and 1 in Nature Physics, received over 6000 citations according to Google Scholar, and was selected as a "Highly-cited Researcher in China" by Elsevier in 2022 and 2023. He has been granted over 10 China and US patents, many of which have been commercialized. His recognitions include the Jin-Guofan Young Scientist Award given by the China Instrument and Control Society as well as the Forbes China "30 under 30" in 2018.