Carnegie Mellon University
Electrical & Computer Engineering

Ph.D. Thesis Defense

Computational Imaging with Self-Interference

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Zoom Meeting
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ABSTRACT

Interferometry records the relative phase between incident light and reference wave. Since phase encodes the path information of the scene, it can be applied to tasks including phase imaging, scatter correction, or 3D reconstruction. However, a reference beam is not always available in these applications. The self-interference technique is one variant of interferometry that does not require a reference beam. While it does not measure the phase directly, we can combine computational imaging methods to solve the problem more flexibly.

In this thesis, we go over three tasks: wavefront sensing, imaging fluorescent targets behind tissue, and passive textureless 3D reconstruction. For wavefront sensing, we use the computational imaging method to provide a brighter reference wave for self-interference to improve SNR. For imaging fluorescent targets behind tissue, we use self-interference to provide diversified measurements for the computational imaging method. For passive textureless 3D reconstruction, we use self-interference to turn the wave nature of the light into texture so we can reconstruct 3D scenes computationally.

PUBLIC DEFENSE

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