

# Reaction Report VII: WISH: Wavefront Imaging Sensor with High Resolution

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**Identify one idea in the paper that you feel is a major contribution or a major limitation, explain it, and discuss why it is important**

I think the main contribution of this research is to remove the fundamental trade-off between spatial resolution and phase estimation of traditional wavefront sensors such as Shack-Hartmann. WISH replaces the microlens array in SHWFS with a spatial light modulator (SLM) that works in cooperation with a phase-retrieval algorithm to measure high-resolution optical fields with good phase estimations. The authors also demonstrated this pipeline's scalability with various applications from long distance, scattering media to lensless microscopy. These showed its robustness to noise, high resolution, and the ability to work in dynamic scenes. The process to estimate an unknown field starts with multiple measurements, which are then formed into an optimization problem and solved by alternating projections between the SLM and the sensor plane. An important fact to note is that their approach is not limited by the prior information of the object, which allows the model to work with complex fields and reduces the number of required measurements. It is also worth mentioning that WISH provides full sensor resolution since the pixel size of most SLMs is larger than the image sensor.

**Describe one idea of yours that builds on the paper and expand on that idea as much as possible**

I am impressed by the experiment on imaging through scattering media, where they inverted the transfer function of the scattering media by measuring phase distortion and then used that to recover hidden objects. The authors also mentioned that this work can be extended to reflective mode for applications such as non-line-of-sight imaging. Perhaps conducting experiments with reflective WISH in an out-of-field-of-view setting and objects hidden by diffusers could be a stress test for the algorithm. And if it does not work well, perhaps a transient camera and algorithm such as Fermat Flow could be a good supplement for this approach.