Locating and identifying hidden objects can prove critical in applications ranging from military reconnaissance to emergency rescue. Although non-line-of-sight (NLOS) reconstruction and imaging have received much attention recently, state-of-the-art methods often use coherent sources (lasers) or require control of the scene. This dissertation focuses on passive NLOS scene reconstruction using the light reflected off a diffusive wall. No control over the light illuminating the scene is assumed, and the method is compatible with the partially coherent fields ubiquitous in both indoor and outdoor environments. In order to counteract the detrimental effects of the wall, rather than measuring the 2-dimensional intensity of the reflected light, we exploit the full 4-dimensional spatial coherence function to reconstruct the scene. As a step towards the NLOS problem, we first consider the line-of-sight (LOS) problem. Numerical simulations using Fresnel propagation operators show that our forward model has good agreement with experimental results. We show that numerically back-propagating the measured coherence function enables a visual estimation of the objects' sizes and locations. To facilitate efficient, systematic and explicit detection of object parameters in the inverse problem, we propose a closed-form approximation of the propagated coherence function. Using this analytic solution we formulate a minimum residue optimization problem which is solved using a gradient descent algorithm. Then, for the NLOS problem, we derive an analytic model based on experimentally-verified scattering models. This model is used to study the information retained in the coherence function after the field interacts with the wall, and this insight is used to classify and estimate simple objects. Finally, we consider imaging in more complicated settings with larger objects. We formulate a multi-criteria convex optimization problem, which fuses the reflected field's intensity and spatial coherence information at different scales, along with an algorithm to efficiently solve the proposed problem.

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Approved for distribution by George Atia, Committee Chair, on May 26, 2020.

The public is welcome to attend.