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"Double Your Corners, Double Your Fun: The Doorway Camera"

Abstract

In a built environment, wanting to see without direct line of sight is often due to being outside a doorway. The two vertical edges of the doorway provide occlusions that can be exploited for non-line-of-sight imaging by forming corner cameras. While each corner camera can separately yield a robust 1D reconstruction, joint processing suggests novelties in both forward modeling and inversion. The resulting doorway camera provides accurate and robust 2D reconstructions of the hidden scene. This work provides a novel inversion algorithm to jointly estimate two views of change in the hidden scene, using the temporal difference between photographs acquired on the visible side of the doorway. Successful reconstruction is demonstrated in a variety of real and rendered scenarios, including different hidden scenes and lighting conditions. A Cramer-Rao bound analysis is used to demonstrate the 2D resolving power of the doorway camera over other passive acquisition strategies and to motivate the novel biangular reconstruction grid.

Available: https://ieeexplore.ieee.org/document/9887738