IRIS: VISION BEYOND OBSTRUCTION

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Project Overview
A single camera is a useful surveillance tool, but video recorded from a single point of view becomes ineffective when objects of interest are blocked by occlusions. The Iris system overcomes this shortcoming by using a 21-camera array to reconstruct, in real-time, objects that would appear occluded to a conventional camera.

The reconstruction is accomplished with a technique called synthetic aperture imaging, which warps video frames from many different perspectives into one coherent image. With this algorithm, the camera array acts as a discrete approximation of a single camera with an extremely large aperture. Optics principles dictate that such a large aperture has a very narrow depth of field, which means that objects that do not lie on the focal plane appear blurred, even invisible.

The system consists of a scaleable 21-camera array and a distributed network of processors which manage the staggering bandwidth and computational requirements of the algorithm. The system penetrates occlusions such as foliage and crowds, and accurately detects occluded faces in real-time and on pre-recorded video. It automatically finds the relative position of every camera, allowing an arbitrary arrangement of cameras in the array. In addition, it presents a professional user interface that controls all cameras and processors and allows the user to seamlessly adjust the focal plane and the position of the virtual camera view.

The system is a flexible tool for military and civilian surveillance applications where preserving a line of sight is important, even when objects are partially obscured.