Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Resolving gas-liquid interface geometry using light field imaging ALEXANDER JAFEK, Brigham Young University, JESSE BELDEN, Naval Undersea Warfare Center, TADD TRUSCOTT, Brigham Young University — We present a novel approach for reconstructing the geometry of a three-dimensional specular gas-liquid interface from an image captured by a light-field camera. Whereas the scanning of a diffuse surface can be accomplished with a simple projector-camera system, the local reconstruction of a specular surface is non-unique and requires a more constrained sampling method. In our set-up, a known array of laser points is reflected by the unknown specular surface onto the image plane of a light-field camera. For each illuminated pixel, possible surfaces are generated that are defined by a depth location and local surface normal vector. We show that when the aperture is sufficiently small we can find the exact location and orientation of the local surface. Further, we present an algorithm that allows us to reconstruct a reflective surface from images that are taken with wider apertures. The algorithm searches the possible surfaces for points and normal vectors that are most consistent with each other based on input parameters. We present our simulated results with experimental validation.

Jesse Belden
Naval Undersea Warfare Center

Date submitted: 01 Aug 2014 Electronic form version 1.4