Automatic characterization of particle fields using digital holography JIAN GAO, JUN CHEN, Purdue University, DANIEL GUILDENBECHER, PHILLIP REU, Sandia National Laboratories — An automatic algorithm is developed to characterize sizes and 3D positions of particle fields using digital holography. The reconstructed intensity image is used in conjunction with the edge sharpness of the particle image to automatically determine the level for thresholding of the intensity image. The morphology and transverse position of an individual particle are extracted from the binary image while its axial position is decided by maximizing the edge sharpness of the particle along the axial direction. A comparison using synthetic holograms with published particle detection approaches demonstrates the superiority of the proposed method. We further apply the method to segment a reconstructed image of a particle field. In particular, measurement errors introduced by transversely overlapped particles in dense particle fields are eliminated using a particle refinement algorithm based on 3D segmentation. The results demonstrate significant improvements in both the size and position measurements. The new method is applied to processing of experimental holograms of a particle field to further demonstrate its effectiveness.

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