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Real-Time Particle Monitoring Using Digital Inline Holography¹ RAFAEL GRAZZINI PLACUCCI, SIYAO SHAO, BUYU GUO², JIARONG HONG, University of Minnesota — The analysis of particle concentration, size and shape distribution is critical in many engineering applications and fundamental research, including spray coating, pollutant monitoring, cellular identification, and sorting, etc. Unlike conventional techniques, such as laser diffraction and phase Doppler analysis, the emerging digital inline holography (DIH) technique could provide imaging-based quantification of particle size and shape using a simple and inexpensive setup without knowledge of particle characteristics. Nevertheless, DIH is computationally expensive. In this presentation, we introduce a novel mobile DIH device for high-precision in situ characterization of particles. Compared to conventional DIH, the proposed system leverages machine-learning, multi-threading programming, and embedded GPU computing to achieve real-time hologram acquisition and processing. Measurements of spray size distribution obtained from a consumer-grade nebulizer demonstrate high measurement fidelity and significant improvement in the speed of particle characterization compared to previous DIH systems. We expect this technique can be widely employed in spray analysis and other particle analysis tasks, such as airborne pollutant monitoring and biotic particle analysis.

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