

Title: Drop-On-Demand Inkjet Drop Control with One-step Look Ahead Estimation of Model Parameters

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Abstract: Applications of drop-on-demand (DoD) inkjet printing in dosage-matter manufacturing and scalable patterning are attributed to its capacity for producing consistent dosages with high placement accuracy. In practice, with the same drop jetting profile, drop volume and drop jetting velocity are affected by variations in ink properties and environmental conditions. Open-loop calibrations are time-consuming and contribute to frequent line stoppage or unacceptable product variations. In this work, a two-input two-output stochastic drop volume and jetting velocity model is derived based on ink jetting calibration data. A control algorithm using drop-image-based one-step look ahead estimation of process model parameters is developed to regulate drop volume and jetting velocity. Boundedness and convergence of the parameter estimation error and stability of the closed-loop system are provided. Experimental results demonstrate a significant reduction to within 1% relative error in the drop volume and jetting velocity using the proposed control algorithm.