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Novel closed-loop control strategy for inkjet-based additive manufacturing system

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ABSTRACT

As one method of additive manufacturing, inkjet printing technique which devoted to fabricate 3D components has been under investigation for decades. Optimizations have been raised up to improve the geometry accuracy, mechanical property, and so on using various approaches. In this paper, a novel inkjet 3D printer has been developed. This equipment consists of piezoelectric print head, servo falling powder pavement device, and a digital industrial camera. Impacts on the depositing quality by inkjet head's behavior and powder pavement device has been studied individually. But during the printing process, the two steps are conducted alternatively. A model has been built based on the integration of the two steps. And based on the model, investigation and simulation have been conducted to unravel the impacts on the depositing quality of single and multiple layers. To improve the quality of printing process, a double loop control strategy of the inkjet head is proposed. Experiments and simulation are conducted, and result shows that the new control strategy leads to a higher geometry quality, which is consistent with the simulation result.