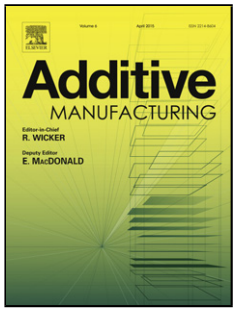

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SYNCHRONIZED MATERIAL DEPOSITION RATE CONTROL WITH PATH VELOCITY ON FUSED DEPOSITION MACHINES

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Abstract

Additive manufacturing (AM) technologies are used in three dimensional (3D) printing of parts using thermo-plastic extruders, or laser and electron beam based metal deposition methods. This paper presents an integrated methodology for planning of tangential path velocity, material deposition rate and temperature control of the extruded material which is deposited along curved paths. The tangential velocity along the path is smoothed and optimized while respecting the heater's and extruder's capacities, as well as the feed drives' jerk, acceleration and velocity limits. The extrusion rate is controlled proportional to the tangential path velocity while keeping the temperature of the deposited thermo-plastic material at the desired temperature by adaptively controlling current supply to the heater. The experimentally proven algorithm leads to more uniform material deposition at sharp curvatures and resulting improved dimensional accuracy of printed parts. The proposed methodology can be extended to laser and electron beam based metal printing applications.

Keywords: Additive Manufacturing (AM), Fused Deposition Modeling (FDM), Synchronized Material Deposition Rate, Temperature Control