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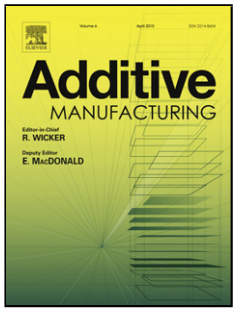

Title: Feature based three axes computer aided manufacturing software for wire arc additive manufacturing dedicated to thin walled components

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ACCEPTED MANUSCRIPT

Title

Feature based three axes computer aided manufacturing software for wire arc additive manufacturing dedicated to thin walled components

Authors

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Abstract

WAAM (Wire-Arc-Additive-Manufacturing) is a metal additive manufacturing process using arc welding to create large components with high deposition rate. The workpiece quality and the process productivity are strongly dependent both on the process parameters (wire feed speed, voltage and current) and on the selected deposition path. Currently, the CAM (Computer-Aided-Manufacturing) software dedicated to WAAM rely on a multi-pass strategy to create the component layers, i.e. each layer is built overlapping multiple welding passes. However, since WAAM can create wide layers, a single pass strategy can improve the process efficiency when dealing with thin walled components. This paper proposes CAM software dedicated to WAAM, using a single pass strategy. The proposed solution uses a midsurface representation of the workpiece as input, to generate the deposition toolpath. A feature recognition module is proposed, to identify the critical features of the part, such as free end walls, t-crossings, direct-crossings and isolated tubulars. A specific strategy is developed and proposed for each one of the selected features, with the aim of minimizing the geometrical errors and to ensure the required machining allowances for the subsequent finishing operations. The effectiveness of the proposed strategy is verified manufacturing a test case.

Abbreviation list:

- AM: Additive Manufacturing.
- CAD: Computer Aided Design.
- CAM: Computer Aided Manufacturing.
- EWW: Effective Wall Width
- FDM: Fused Deposition Modelling
- GMAW: Gas Metal Arc Welding
- GTAW: Gas Tungsten Arc Welding
- LH: Layer Height
- NC: Numerical Control
- TWW: Total Wall Width
- WAAM: Wire Arc Additive Manufacturing

Keywords

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