AN ALGORITHM SOLUTION FOR THE COMPUTATION OF NONPLANAR CONTINUOUS INTERWEAVING 3D PRINTING TOOLPATH FOR POLYMERS AND POLYMER COMPOSITE MATERIAL

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HIGHLIGHTS

- An implemented algorithmic solution for the generation of continuous interweaving algorithms toolpath for additive manufacturing of medium to large parts using stable polymer matrices

OPPORTUNITY

The University of Alberta researchers have developed an algorithm for a 3D printing toolpath. The project is intended to develop a solution capable of manufacturing carbon fiber parts using additive manufacturing while conserving the structural and mechanical properties of commonly manufactured parts. This project implements a non-planar continuous interweaving toolpath for medium to large-volume parts with similar properties to those observed with common composite matrix part production. The map encodes the vertical motion of the nozzle according to the average height of material deposited in its close neighborhood to avoid any collision between the nozzle and the previously deposited matrix.

The algorithm has been implemented to 3D print large-volume components using continuous carbon fiber materials. This algorithm provides mentioned competitive advantages while preserving the properties of the materials known for their stiffness, low weight-to-strength ratio, high-temperature tolerance, low thermal expansion, and high chemical resistance.

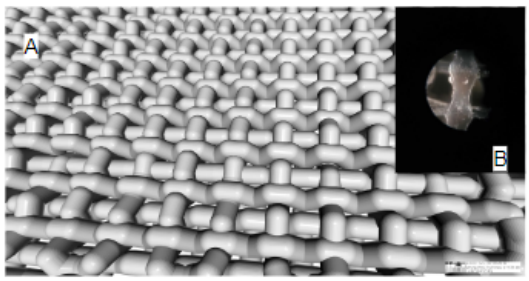

Figure 1. A) Virtual representation of the weave at a specific layer. Each layer includes four woven paths linked together in a continuous manner. B)Macroscopic observation of the interwoven paths inside a FDM 3D printed part.

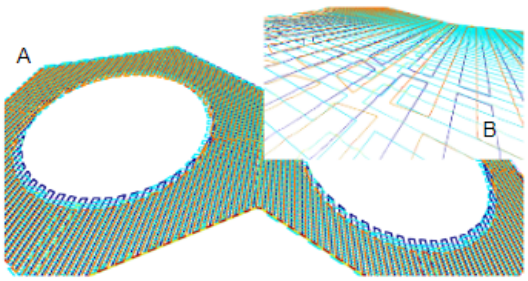

Figure 2. A) Virtual representation of the continuous path at a specific layer. Each layer is divided into convex areas for continuous infill and linked together using the boundary layers. B) Close up view of the woven pattern. A vertical motion is applied every time the deposition tool goes above a previously deposited bead.

COMPETITIVE ADVANTAGE

- Decreased manufacturing complexity, time, and cost

STATUS

- Patent Pending

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MORE INFORMATION

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