NON-PLANAR GRANULAR 3D PRINTING

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PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO 2024/102803	05/16/2024	2022-135

BRIEF DESCRIPTION

The inventors have developed a novel 3D printing technique, named Non-Planar Granular 3D Printing (NGP), which selectively deposits a liquid binder into granular particles, enabling rapid fabrication of complex 3-dimensional objects. For this new method, an industrial robotic arm is equipped with a dispenser attached to a long metal needle, called a liquid deposition end-effector, and a container of granular particles, such as sand, beads, or powders. The needle moves freely as it injects the binding liquid into the granular material.

Like other 3D printing methods, NGP can use a CAD 3D model and conventional slicing software to produce a robotic toolpath following a desired height and width. However, the advantage of the process lies in its ability to 3D print objects non-planarly, by moving the extruder's dispensing tip freely within the granular medium. The selective application of the binding liquid causes the particles to bond together, forming parts of the 3D printed object. Meanwhile, the loose particles remaining in the container temporarily support the weight of the wet particles while they cure. This unique approach enables the creation of complex geometric forms without the need for supporting structures that are typical in traditional 3D printing methods, thereby eliminating material waste typically associated with such processes. After the completion of the process, and the binding material has cured, the hard objects can be easily extracted from the container, leaving behind the remaining loose particles, which can be repeatedly re-used.

SUGGESTED USES

Composites for various products in various fields such as design and engineering in addition to construction materials composites for interior and exterior grade applications.

ADVANTAGES

This method of 3D printing presents several advantages including printing time efficiency, material variation, material reusability and waste reduction.

RELATED MATERIALS

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OTHER INFORMATION

KEYWORDS

Robotic Fabrication, Additive Manufacturing, 3D Printing, Digital Fabrication

CATEGORIZED AS

» **Materials & Chemicals**

» Other

» **Research Tools**

» Other

» **Engineering**

» Robotics and Automation

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