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Filament Deposition Method and System for Rapid Freeform Fabrication

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Background

Inventor Dr. Ampere Tseng

Professor

Department of Mechanical and Aerospace Engineering, Arizona State University

Intellectual Property Status:

U.S. Patents: 6,113,696 6,251,340

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Manufacturing processes utilizing filament deposition techniques have been developed for rapid and flexible prototyping of three-dimensional objects. The leading technique in the industry is the Fused Deposition Modeling (FDM). FDM is a process in which it deposits a thin filament on a base to progressively shape an object. However, due to a fixed-size extrusion head, current systems can only produce a small range of filament sizes, limiting their total flow rate and making them inadequate for manufacturing or complex rapid prototyping.

Invention Description

Researchers at Arizona State University have developed a unique filament deposition system and technique which improves on current market offerings. A controllable mechanical orifice in the extrusion head allows filaments of widely varied widths to be dynamically selected and deposited. This allows for faster object construction, lower operating costs, and greater precision. The system can be used with a wide variety of materials, making it useful for a range of manufacturing and prototyping tasks. With this system, three-dimensional objects of all types can be rapidly and reliably created.

Development

This technology is part of a suite of rapid prototyping technologies developed at Arizona State University. A laboratory-scale filament generator has been constructed, and research results have been published.

Potential Applications

- Rapid Prototyping
- General Freeform Fabrication

Benefits and Advantages

- Widely Variable Filament Size Varying the filament size allows for a wide range of mass flux.
- Faster Structure Generation High flow allows for quicker run-times.
- **Minimized Aliasing** The 'stair-step' error caused by approximating angled surfaces with thin layers can be minimized.
- **Complex Geometry Compatible** Three-dimensional structures of unlimited complexity can be rapidly modeled.