Bachelor's Thesis, Term Project

Design and Implementation of a New Type of Infill-Pattern for 3D-Printed Structures

One of the main advantages of additive manufacturing techniques is the possibility to apply material to a structure only where it is needed. When printing voluminous objects, one of the crucial manufacturing parameters is the type and density of the infill pattern. Printing time, material consumption and residual stresses are reduced by using infills instead of printing large solid volumes. The disadvantage is the loss of mechanical properties such as stiffness and strength. So, the infill pattern has several functions: it supports the upper layers, carries loads, and transfers them within the part. All conventional slicing programs include a catalog of infill patterns that can be used. Some examples are gyroid, triangles or cubic.

The objective of this thesis is to implement a new type of infill structure not yet available in traditional slicing software and evaluate its performance regarding to its mechanical properties and manufacturing. Since the pattern is not yet implemented, the student will develop a script to generate the necessary G-Code. The pattern will then be produced using fused filament fabrication in PLA resin and tested under compression. It will be then compared to the most commonly used infills.

Research focus of the thesis

– 3D-Printing (fused filament fabrication)
– G-Code generation (Slicing)
– Mechanical Characterization

Requirements

– Basic knowledge of fused filament fabrication
– Scripting skills (Python, Matlab, o.a.)
– High motivation and ability to work independently
– Good knowledge of English or German (B1 or higher)

Starting date: Now

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