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Universität der Bundeswehr München
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Bachelorarbeit

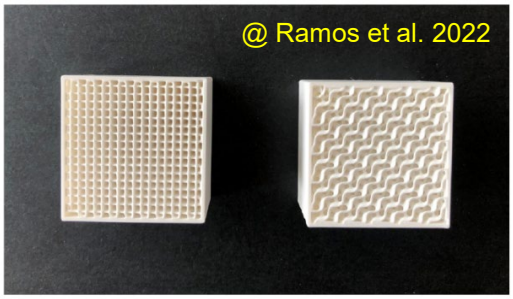
Numerical Simulation of 3D Printing Processes

3D printing (or additive manufacturing) is a manufacturing process of producing three dimensional physical objects or structures by depositing (e.g. thermoplastic) materials, typically in layer-wised manner, under precise control from a computer unit. During the printing process, the deposited material experiences material solidification and deformation through a series of complex thermodynamical processes, including material melting and material bonding. For obtaining a desired quality and properties of the printed objects, it is crucial to choose a suitable set of manufacturing parameters such as temperature, depositing rate and printing layout etc. This, however, often requires our knowledge of underlying mechanisms during the formation of material layers, so that we can control the printing process more effectively.

In our approach, instead of using physical experiments, we employ numerical simulation tools in order to conduct various virtual experiments of the 3D printing processes. This approach enables to gain insight into the printing processes that the physical experiments are sometimes impossible, or too expensive to provide. In this thesis, we will consider a 3D printing technology called Fused Filament Fabrication (FFF), in which printing layers are constructed from a continuous filament of a thermoplastic material. We will focus on working with the virtual system to study the role of various manufacturing parameters in the printing process.

Tasks:

- Get an overview on Fused Filament Fabrication
- Get used to using our simulation tools
- Construction of virtual experimental systems
- Perform simulations and analyzing the results
- Documentation



Examples of FFF printed specimens

Requirements :

- Knowledge of MATLAB is a plus
- High motivation and willing to learn new skills

Starttermin: flexible

Stand: 18.07.2022