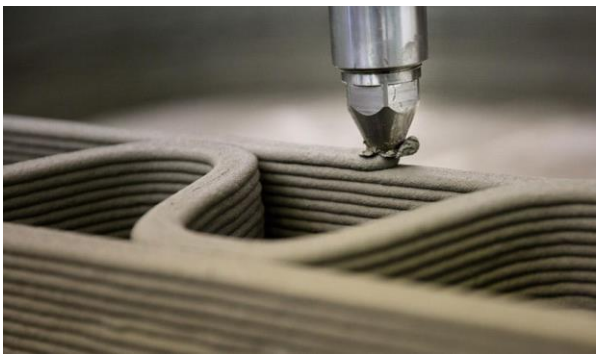
Master's Thesis

Numerical investigation of structural failure during 3D-concrete-printing

Betreuer: M.Sc. Janis Reinold

Background: Possibilities of additive manufacturing of printing complex shapes with apparently no limitation of architectural design have attracted the construction industry in recent years. Extrusion based approaches are in majority among the adopted 3D-printing techniques. In these processes the material is deposited in layers to form structural components freely without any use of formwork. Prediction of deformations and failure during these processes is of high significance to optimise the printing process and to obtain desired shapes and properties of the printed component.



[Image from https://www.3dnatives.com/en/3d-printing-construction-310120184/]

Task:

- Literature review on various 3D-concrete-printing techniques
- Literature review on stability and buckling
- Investigation of typical stability benchmark problems using analytical solutions and numerical models for linear and nonlinear analysis
- Investigation of 3D-concrete-printing benchmark problems with time-evolving material properties using analytical solutions and numerical models for linear and nonlinear analysis
- Stability analysis of more complex components (e.g. cylinder, assembled wall elements) with time-evolving material properties using numerical models for linear and nonlinear analysis

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