Abstract:
Generative design and fabrication refers to the ability to autonomously generate designs while simultaneously generating all information to directly fabricate them. This technique is driven by the increasing need to rapidly and flexibly fabricate customized parts and individually designed products. For the automation of the design-to-fabrication process chain, intensive and dynamically updated knowledge from the domains of design and fabrication must be provided. To allow for a flexible, autonomous fabrication, the knowledge modeled must dynamically reflect the state of the fabrication system and its capabilities. This paper presents an approach to unify knowledge for generative design and generative fabrication using shape grammars. With shape grammars, the geometry of designs and their mapping to removal volumes corresponding to fabrication processes on CNC machine tools are represented. The process instructions for fabrication are included by augmenting the removal volume shapes with labels. A new shape grammar approach to represent designs and fabrication processes is presented and validated on an example functional part as a proof-of-concept. The approach enables pushing knowledge downstream, from design and process planning directly to the fabrication system itself providing a stepping stone towards...
awareness of machine capabilities in fabrication systems and autonomous process planning for customized parts.

Stichworte: generative design; generative fabrication; shape grammar; CAD/CAM


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Occurences:

· Einrichtungen > Fakultäten > Fakultät für Maschinenwesen > Institut für Mechatronik > Lehrstuhl für Produktentwicklung und Leichtbau (Prof. Zimmermann) > Konferenzbeiträge

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