Workshop: Additive Fertigung/3D Druck – Technologie, Auswirkungen und Chancen

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Book of Abstracts

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Universal API for 3D Printers

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With this research we propose the implementation of a overlay restful API for 3D printers to expose these machines to the internet for utilization within cloud services. This is to abstract the underlying communication structure and means for accessing and controlling a 3D printer resource which is performed in one of three ways. The first method of accessing and controlling a 3D printer is via a proprietary protocol or a printer driver in Microsoft Windows. The second method is the control via a USB-serial connection between a controlling computer and the printer resource. This protocol can either be proprietary or based on open standards like GCODE (ISO 6983-1:2009). The third method of control is based on physical storage devices attached to the printer with machining instructions stored on them. This research excludes the communication and control means involving proprietary protocols or drivers due complexity restrictions within the implementation. The approach is designed with extensibility in mind so that future access to proprietary protocols can be added to the control API. Printer resources with only the third control method available are also excluded from this research as they are currently lacking the capability to be remotely controlled. This work describes the design and implementation of an abstraction API layer between varying soft- and hardware components with an extensible architecture for future hard- and software components for within the domain of Additive Manufacturing (AM). This approach enables the use of AM machinery within cloud or business process oriented architectures as the AM machinery and the associated software is exposed and usable as services.

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The custom-made body – Legal aspects of bioprinted tissue and organs

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Progress in bioprinting, combining the science to grow human tissue and organs in the laboratory and 3D printing technology, elicits legal analysis as to how patient confidentiality and a patient's life and health are protected under the law. We argue that the Federal Data Protection Act protects patient confidentiality. Likewise, the Medicinal Products Act provides ample protection to the recipient of printed tissue and organs. This paper focuses on the legal situation in Germany.

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Supporting the Set-up Processes by Cyber Elements based on the Example of Tube Bending

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The increasing demand for individual and customized products constrains industrial companies to produce lower quantities which caused higher set-up times of the machines and therefore higher costs per piece compared to their traditional mass production. Especially within small and medium enterprises, the set-up processes often take place manually. However, the result is a

critical factor for production success itself. During the set-up process, the worker is confronted with information overload caused by the complex production system such as those like a tube bending process. Within this paper we outline a project called 'Cyber-Rüsten 4.0' that aims to provide a cyber element which is able to display needed information and adapted feedback for the set-up process. For this purpose, there are several steps of a practice-based research necessary. These steps were framed by the Design Case Study.

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Infrastructuring, globale Innovation & digitale Fabrikation

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Wir versuchen, einen Einblick in digitale Fabrikation aus Sicht von Infrastructuring als holistische Forschungs- und Praxislinse aus der Computerunterstützten Gruppenarbeit zu geben. Unser Positionspapier dient als Diskussionsbeitrag für den Workshop „Additive Fertigung/3D Druck – Technologie, Auswirkungen und Chancen" auf der Informatik 2016.

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Bridging Gaps in Cloud Manufacturing with 3D Printing

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In order to keep up with the flexibility and cost-efficiency requirements, the manufacturing industry has begun a transformation process towards a service-oriented production approach. This approach is in line with the cloud manufacturing paradigm that applies established concepts from cloud computing to the manufacturing domain. Although the cloud manufacturing paradigm provides promising concepts for a flexible manufacturing industry, it still exposes several challenges. One of the most important challenges is the recovery from production failures and delays. Due to the physical configuration and transportation overhead in the manufacturing domain, it is often not possible to quickly replace one production facility with another one. To bridge the gap of these production delays, we propose the integration of additive manufacturing technologies tightly into cloud manufacturing processes to ensure the continuity of the production processes.