A Flexible Fixture and Reconfiguration Process for the Cognitive Machine Shop

To enable the autonomous fabrication of individual and customized parts, the flexibility provided by the planning system and the control system must be supported on the hardware level. To enable this degree of flexibility on the hardware level in the area of machining, an approach to the reconfiguration of fixtures for machine tools has been developed. By using a vice with jaws that can be exchanged with sufficient precision by a handling robot, the fixture can be changed to allow the fabrication of different parts. By having the machine tool machine the jaws directly, the fixture can be adapted to allow the fabrication of new, previously not produced parts. For the machining planning of the jaws the very same system as for machining planning of parts can be used. A prototype design of the flexible fixture device will be shown along with a process outline of the reconfiguration process on the system level. The approach and principle presented will enable a manufacturing system to fabricate a wide variety and even new parts without human interaction through the strong flexibility support on the hardware level and is therefore a stepping-stone towards the Cognitive Machine Shop.
Cognitive Machine Shop; Fixture Design; Autonomous System; Reconfigurable Machine Tools

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