Configuring a new machine tool

Abstract

The subject of this dissertation is a new machine tool in its concept and configuration, configuring methods, programming methods and testing and verification procedures. The definitions and classification of machine tools, configuring and a new machine tool are given. Interpretations of a number of new machine tools, as well as available and emerging resources are shown in this dissertation as well.

For new machine tools configuring following approaches are used:
- ➢ Modular approach with its equivalents for formalization of machine tools configuring process description
- ➢ A principle of family and similarity for configuring a family of machine tools
- ➢ Application of CAD/CAM/CAE techniques for configuring and application of web interface together with these environments, as well as application of standard and realization of special CAD configurators
- ➢ Functional modeling of a machine tool as a system using IDEF0 (Integration Definition for Function Modeling) methodology which is exploited for setting and interpretation of own methodology for configuring a new machine tool.

This dissertation gives examples of merging existing knowledge about machine tools needed for configurator setting, and a configuration process itself is formally described using IDEF0 methodology. For established configuring methodology verification is carried out by development of a desk-top three axis parallel kinematics machine tool using given methodology - machine is made, shown and verified as a new machine tool. This machine is realized as the first prototype as well as a virtual machine tool. Its upgrade for five axis hybrid variant is considered, as well, by adding two axes head which is realized at the level of virtual machine tool. Basic results of this dissertation are:

- ➢ A methodology for configuring a new machine tool
- ➢ Virtual desk-top machine tools – one with three axes and another hybrid with five axes
- ➢ A methodology for developmental testing of parallel kinematics machine tools
- ➢ Development of educational desktop three axes parallel kinematics machine tool

Given results are presented within Demonstration center for parallel kinematics machine tools which gives the possibility for open exchange of experiences with other research centers and acquisition of new knowledge needed for further development of machine tools, education and knowledge innovation. Desk-top three axes machine tool is potential commercial new low-budget product dedicated for training and education in high education, high schools and factories.

Key words: machine tool, configuring, configurators, a new machine tool, modularity, virtual machine tool prototype, parallel kinematics machine tools, reconfigurable machine tools, machine tools control and programming, machine tools testing and verification.

Scientific discipline: Mechanical Engineering

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