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Utilization of strategies to generate and optimize machining sequences in CAD/CAM

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Abstract

At present some CAD/CAM systems allow to create strategies or macros to accelerate the process of creation NC programs. The article deals with the development of experimental strategies in the CAD/CAM system. These strategies allow to remove repetitive tasks and allow to accelerate the process of creation the NC programs for machine tools. Feature analysis contained basic types of features and additional attributes of features. This feature analysis is based on possibilities of CAD/CAM system.
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1. Introduction

The technology of manufacturing is an area, which is constantly growing. At present not only requirements of accuracy and quality of components increase, but also the rate of products manufacturing. It is not only shortening the times in production but also in the creation of NC programs for new component. CAD/CAM systems allow companies to quickly adapt to customer requirements and respond flexibly to changing production of parts. Main advantages of CAD/CAM systems include speed of creation of NC program for parts with complex shapes as well as the simulation of a whole machining process. However, programmer is forced to perform repetitive tasks in the creation of NC programs for new parts, such as a face milling or pocket milling. For that reason, some CAD/CAM

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systems offer ways to eliminate repetitive tasks. One such possibility is for example developing of NC strategies. Main advantage of NC strategies is to automate and streamline the entire process of creation of NC programs. The CAD/CAM system that allows creation of the NC strategies is for example CAD/CAM system Edgecam 2016.

2. Feature-based machining and recognition of geometric features in CAD/CAM systems

Feature-Based Machining (i.e. FBM) allows the programmer to automate creation of NC programs. We can say that FBM evaluates the components features and automatically creates an effective machining process. This task is usually done in seconds, and the machining process is generated during several minutes.

Recognition of geometric features is done after creation of a model in CAD system. Recognition can be made in CAD/CAM systems or in another system used for recognition of features. For feature recognition are necessary two types of data, i.e. geometrical and topological. The recognition of features is done by searching and comparing information stored in the database and the model itself. [1,2]

Recognition includes three major tasks:

- definition of the features - rules stored in database,
- sorting and extracting features from solid model,
- storage for further use.

Methods for extraction of geometric features from CAD model of a part can be divided into two groups:

- Internal,
- External.

Internal method allows reading data directly from a CAD file of the system in which the model was created and saved. External method allows reading data from files that have been exported to neutral formats - ASCII file.

CAD/CAM system Edgecam 2016 uses the first of these methods, i.e. features are recognized directly from the output of CAD file system. Features recognized in Edgecam 2016 can be divided into four basic groups - 2D and 3D features, surfaces and holes.

3. Edgecam 2016 Strategy Manager

Edgecam allows creation of an NC programs for CNC turning and milling machines, CNC machining centers and also for wire cutting machines. Main advantage of Edgecam is a support of modern CAD formats like .prt, .itp, .sldprt, .catpart and another.

Edgecam Strategy Manager is one of the modules of CAD/CAM system Edgecam 2016. It can be used like a library of knowledge and experience of technologist. Strategy is a set of rules that can automatically generate instruction for machining of the specific features. It also carries information on the different types of geometry and parameters that will apply on machining process that is selected inside of strategy [3,4].

Input data for strategies can be divided into three basic groups:

- *Geometric data* - contain information about the features, dimensions or other information as surface quality and tolerance,
- *Technological data* - contain information about cutting data or chosen strategy of roughing,
- *Additional data* – orders for the tool change.

Example of a NC experimental strategy created by Strategy Manager of CAD/CAM system Edgecam 2016 is showed in Fig. 1. The NC strategies are created by using an algorithm and that has form of a flowchart. Each part of the strategy (such as information about geometry and the technological operations) are copied from existing machining processes and they are edited so that they may be used for machining of other similar geometric features.

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