Chapter VII
Integrated Feature Technology

ABSTRACT

Integrated feature technology promotes a closer connection between design and manufacturing through features. When machining features are determined, they may or may not be readily useable for a process planning system. In a feature-based design system, features in a design model are of design type of features. Further conversion is also needed to arrive at machining features. This chapter starts with a discussion on the issues of interfacing and integration. This is followed by some of the methodologies that can bring feature technologies one step closer to manufacturing processes.

Representing a machining feature in terms of its machining volume that can directly corresponds to a specific type of machining operation (e.g. finishing, semi-finishing, and roughing operations) is one of the methods introduced in this chapter. In order to achieve this, a number of machining operations is to be decided. For this, tolerances, surface, finish, and other design information are to be considered. The fuzzy nature of these data and the concerning knowledge means that an appropriate treatment of such information is also needed. A direct way of linking a feature-based design model with machining operations is to map the design features to machining features and perhaps further to the cutting tools that may be used to produce the features.

INTEGRATION VERSUS INTERFACING

There exist some confusions between integrated and interfaced feature technologies. Careful examination shows that many systems are mainly trying to interface various
separated activities at the design, manufacturing, and planning phases. One difference between interfacing and integration is that interfacing can be achieved at the result-level, while integration must be addressed at the task-level. In other words, it would be too late to integrate a task when its sub-results have already been decided separately. To achieve truly integrated design and manufacturing, integration between them should be addressed at a much earlier stage than currently done.

Figure 7.1 shows a CAPP system adopting an interfaced approach (Xu, 2001). Features that have been recognised are first organised into a directed graph, generally known as feature access graph, which represents the precedence of the machining of features based on their accesses. This activity may be called routing sequence planning, or macro planning. At the routing sequence level only general machining processes, such as hole-making, pocket-milling and slotting, are decided. Detailed shop-floor operations, such as whether a hole should be centre-drilled, pre-drilled, drilled and reamed or just centre-drilled and drilled are yet to be determined. In order to generate a shop-floor operation plan, an operation planning module, also called a micro planning module, is needed later. The operation planning module decomposes the general machining processes into sequences of actual

*Figure 7.1. CAPP between CAD to Shop-Floor*
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