Chapter 11

Intelligent Process Planning: Intelligent CAPP

INTRODUCTION

Computer Aided Process Planning is very hot topic in the manufacturing. It uses the geometric information (such as shape, size, etc.) and information technology (such as materials, heat treatment, bulk, etc.) which are input into the computer to output parts of the route of the process and the procedures automatically. Process planning is very important in the manufacturing process. With the continuous development of the manufacturing sector, the traditional manual methods of Process Planning flaws more and more serious. Computer-aided technology can increase their technical capacity effectively. CAPP is an effective means to improve the design. The research of CAPP has got a very huge development, from the search logic structure, Variant, Generative, and Hybrid to Expert System. In the future, the development of the CAPP will focus on the extending of the application scope, depth and level. In this chapter, a general introduction is presented firstly. Then the application of genetic algorithm (GA) to CAPP is introduced. Thirdly implement of ANN in CAPP System is presented. In the fourth part, use of Case-Based Reasoning in CAPP is discussed. Fourthly, CAPP based on Multi-Agent (MAS) system is illustrated.

The Origin of CAPP

Process planning translates design information into the process steps and instructions to efficiently and effectively manufacture products. Process planning is very important in the manufacturing process. It is the interface of product design and manufactur-
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In this process, vast amounts of information must be analyzed.

Process planning is affected by a lot of factors such as the production environment, product type, manufacturer resources, production volume, process methods, the level of the experience, and even restricted by the production organization and management. These factors above in any changes would lead to the change of the programmer design, so that the process is full of “personality.”

The process planning outputs a large amount of information, which guide man to the procurement of enterprise material, the production planning and scheduling, the organization of production, the balance of resources, the cost accounting and so on. It encompasses the activities and functions to prepare a detailed set of plans and instructions to produce a part (Chang T. C., Richard A. & Wysk, Wang H. P., 1998). The planning begins with engineering drawings, specifications, parts or material lists and a forecast of demand. The results of Process planning are the following:

Routing Design

Routings specify operation sequences, the operations on the station or work centers, the tools and fixtures. And the gotten routing becomes a major input to the manufacturing system, with which to define operations for production activity control purposes and to define required resources for capacity requirements planning purposes.

Process Planning

Process planning typically provides a detailed, step-by-step work instructions, including the individual operations, machining parameters, set-up instructions, and quality assurance checkpoints.

With the continuous development of the manufacturing sector, the traditional manual methods of Process Planning flaws more and more outstanding. There are as follows:

1. There is a lot of duplicate work. The data is double counting and unable to use the CAD information directly, so it is a heavy workload, and low efficiency, long cycle, error-prone.
2. The quality of process planning depends entirely on the technological level and work experience of the staff; it is difficult to guarantee the accuracy of data.
3. The methods of technology vary from person to person, it is difficult to achieve the succession process design, regulatory, standardization and optimization, and cannot reduce production costs effectively.
4. It is impossible to use the computer to achieve unified management of process documents. The information of the process planning cannot be shared with the other departments. The technology and the knowledge cannot be made full use; neither do the manufacturing resources and the technology resources.
5. The technician must have rich experience in production, and be familiar with various internal processing methods and the use of appropriate equipment. Also it means that as a good technician he must be familiar with the production and processing enterprises of various regulations.

The increasingly fierce competition and the increasingly volatile market require enterprises continuously introduce new products, to make rapid response to their customer. At the same time, it requires more technology and shorter delivery time. All of this is severe challenges to the technical capacity of enterprises, technological capacity of our company.

Computer-aided technology can increase their technical capacity effectively; CAPP is an effective means to improve the design. The implementation of CAPP system, promote enterprise information technology departments is an important subject to enterprise.