5. MAJOR BUILDING BLOCKS OF A CAPP SYSTEM

5.1 Introduction

As mentioned earlier process planning is a heuristic and knowledge based activity and is one of the incomplete elements in the integration of CAD and CAM. The increase in use of CAD packages, due to its benefits, has further necessitated for the development of Computer Aided Process Planning package.

5.2 Building Blocks of the CAPP System

- Feature Extraction: To extract the details of the features of the component in order to identify the processes to generate these features.

- Process Generation: This is a knowledge based activity which requires accessing various databases like work center, cutting tool, cutting parameters etc., The sequencing of features is done both automatically and interactively.

- Design and Development of Database: This database is primarily meant for tool, work-center and manufacturing technology details. In addition to this part and feature information is also stored in the database for later use. An interactive user interface is created for easy entry, retrieval and query of the information into the database.

- Integration: The computer-aided process planning system developed should perform the following logical functions such as feature extraction from CADDS5 solid models; manufacturability analysis; database management for B-rep solid model data, manufacturing resources like tool, machine tools, fixtures, gauging, etc.; parts classification and coding; archival of process plans. The required seamless integration should exist among the functions mentioned above should be obtained from the capabilities of a relational database management system which provides all the information required for executing the above functions which are part of computer-aided process planning.

This CAPP system that has been developed is based on the principles of generative process planning. It makes use of the Boundary representation of
solid objects obtained using CADDS5 package. It also makes use of a RDBMS package into which is recorded all data pertaining to tools, machines and processes. The RDBMS system made use of is ORACLE.

The overview of the system is shown in Fig. 5.1.

![Diagram of process plan system]

**Fig. 5.1 Structure of a process plan system**

### 5.3 Salient points of the CAPP system

Most of the work being carried out today in the field of computer aided process planning tend to be highly domain specific either due to the methodology they adopt or because of the specifications of the end customer.

However the general features of any CAPP system should have the following characteristics:

- Provide process plans which can be directly utilized in the shopfloor without any ambiguity
➤ Provide an effective knowledge acquisition mechanism
➤ Incorporate modularity so that future refinement of knowledge can be easily incorporated without many changes.
➤ Provide a means for user interaction to supplement the capabilities of the system.
➤ Provide a user interaction that is easily understood for effective utilization of the package and produce easy-to-understand outputs and reports.
➤ Should be easily upgradable and portable.

The feature classification method proposed by the Nalluri S.R.P. Rao [48] has been followed for classifying the features and their classes. As the proposed CAPP is feature based it has been decided to have feature precedence as suggested by V. Arora et al. [4]. Feature sequencing is based on the precedence relationship proposed by John M. Usher et al. [29]. The CAPP systems developed by K.K. Hon et al. [20], and V.K. Kustagi et al. [36], gave an idea about the processes and features, how to relate them. Locating the process knowledge for a feature within the feature class itself, as proposed by John M. Usher et al. [29] has been followed.

![Data flow in a process plan system](image-url)

Fig. 5.2 Data flow in a process plan system
The data format followed by the C.L. Philip Chen et al [56] gave an idea about how data should be represented in a CAPP system. This has been further refined to support entire range of features. Most of the sequencing methods followed by the authors are based on single machine environment. The operation sequencing based on the minimum number of cutting tool changes and part loading /unloading has been followed. The method followed by Mukasa E. Ssemakual [47] for sequencing of operations is taken as guidance. The data flows between the various modules are shown in Fig.5.2.