3. PROBLEM IDENTIFICATION AND OBJECTIVES

3.1 Objectives of the Project

The objectives of the work are to select optimum process for the manufacture of a given component. On completion of this work real time information to the process planner on the availability of tools and machines are available. Further a better user interface for tool and cutting parameter selection is made available to the user. Tolerance, surface finish, and positional/form tolerances are considered during process selection.

3.2 Present Work

The entire CAPP system is divided into the following modules and the information flow is shown in Fig. 2.1

- Feature Extraction and Grouping
- Database design and development
- Process plan generation
- Overall design for integration and implementation.

3.2.1 Feature Extraction and Grouping

The traditional CAD description of the design of a prismatic part represents its geometry has a data structure involving faces, edges and vertices. However to manufacture a part, the description in terms of higher level semantic features such as slots holes, pockets, etc., are needed. Thus this higher-level feature information should be extracted from the CAD description.

Feature recognition can be viewed as a three-step process: feature extraction, feature classification and feature geometry. In the feature extraction process, features such as holes and pockets are separated from the solid model. Feature classification deals with the subsequent problem of classifying the extracted features into categories such as blind holes, through holes, slots, etc. Solid model data file (readable ASCII file obtained by VERIFY-ENTITY detail utility) from CADDS5 is pruned resulting in three tables - each representing faces, edges and vertices. Each entity - be it a face, an edge, or a vertex - is given a unique number which enables a concise representation of the entire solid model in the database. An attributed adjacency graph (AAG), where each node represents a unique face, and each arc connecting any two nodes represents an edge common to the two faces represented by the connected nodes. Assigning an
attribute to each arc identifies an edge as convex or concave, thus enabling the topology of the solid models too.

Fig. 3.1 Information flow in the CAPP

3.2.2 Database Design and Development

The entire information that is required to carry out the process planning activity effectively is provided by the centralised database. It contains data on cutting tools, raw material, processes, cutting parameters, machine tools, etc. that are pertaining to work environment of DRDL. The part data that is extracted from solid models by the feature recognition module are stored in the respective database, which is further used by Process Generation module.

This large data has to be properly organised for easy and quick access as well as maintaining data integrity that requires the proper design of the entire system minimising data redundancy. Data entry/retrieval can be enhanced by the design of
User Interface Forms and also the required reports can be generated. All this information is maintained in centralised ORACLE RDBMS.

3.2.3 Process Generation

Process Generation module decides on the raw material, what are the operations to be performed to achieve each feature. Depending upon the part geometry, feature geometry, dimensions, dimensional tolerances, references and its tolerances, positional/form tolerances and surface finish. It generates the process plan by selecting suitable resources (processes, cutting tools, machine tools, etc.) to machine the part features. The selection has been made by knowledge base available in the software. Here production rules are used as knowledge base. The selection has been made by two methods. One is without user interaction with Knowledge Based System (KBS) and another one is with user interaction with KBS.