# Chapter 2

# IGES Standard Protocol for Feature Recognition CAD System

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**Abstract:**

Automatic feature recognition from CAD solid systems highly impacts the level of integration. CAD files contain detailed geometric information of a part, which are not suitable for using in the downstream applications such as process planning. Different CAD or geometric modeling packages store the information related to the design in their own databases. Structures of these databases are different from each other. As a result no common or standard structure has been developed so far, that can be used by all CAD packages. For that reason this chapter proposes an intelligent feature recognition methodology (IFRM) to develop a feature recognition system which has the ability to communicate with various CAD/CAM systems. The proposed methodology is developed for 3D prismatic parts that are created by using solid modeling package by using constructive solid geometry (CSG) technique as a drawing tool. The system takes a neutral file in Initial Graphics Exchange Specification (IGES) format as input and translates the information in the file to manufacturing information. The boundary (B-rep) geometrical information of the part design is then analyzed by a feature

recognition program that is created specifically to extract the features from the geometrical information based on a geometric reasoning approach by using object oriented design software which is included in C++ language. A feature recognition algorithm is used to recognize different features of the part such as step, holes, etc. Finally, a sample application description for a workpiece is presented for demonstration purposes.

**Key words:**

*CAD, CAM, CAPP, CIM, Feature Recognition, IGES*

## 2.1. History & Overview

The origins of solid modeling are traced back to the key technological inventions of the 1950s which was Computer Graphics and NC machining. These spawned the developments of computer based geometric systems to aid in the description of object's geometry, which is the main activity to design and manufacture of mechanical parts. This resulted research into the development of Computer Aided Design and Computer Aided Manufacturing (CAD/CAM). Preliminary systems used electronic drafting and wireframe models to represent the shape of three dimensional objects. Subsequent systems developed in the 1960s used polygonal and surface based models which were utilized for a variety of applications in aerospace, marine and automotive industries[4].

Until the 1970s, these models were used in a broad manner. They were merely a collection of lower dimensional entities (polygons, surfaces, lines, curves and points) put together in an unstructured manner to represent a real object. The developments in CAD/CAM led to the crucial questions about the uniqueness and the validity of these models, issues which until then were unimportant from the point of view of computer graphics and its applications. In the late 1970s, these issues were resolved by the Production Automation Project at the University of Rochester, where the term "solid modeling" was coined[11]. This group developed new mathematical models for representing solids and identified the relevant properties of an informationally complete representation. They also identified the mathematical operations that could be used to manipulate these models. After that several other models have been proposed along with different representation schemes[14].

In the 1980s, several solid modeling systems were developed and used in the commercial CAD/CAM world, including the automobile, aerospace