Chapter 7

CONCLUSIONS

This thesis focuses on the very important aspect of Computer Integrated Manufacturing viz integration of Computer Aided Design and Computer Aided Manufacturing. The integrated system is developed for the axisymmetric rotary parts of medium complexities. The proposed methodology is developed in four phases. The first phase deals with development of CAD model data in the dxf file format. The second phase deals with the extraction of the geometrical data of the component, from its corresponding data file. The third phase, feature recognition system, is used to convert the design data into manufacturing data. The final phase involves the generation of CNC part program.

The first phase is about the CAD model data. As the machined surfaces of a rotational part are symmetrical about their axis, they can be designed easily by revolving a line similar to the profile of the upper half of the part about the axis. Thus a 2-D profile of upper half of the part will be sufficient to represent the 3-D part completely. Hence, only the upper half of the 2-D profile of the component is used to develop the CAD model data in the dxf file format.
In the second phase of feature extraction, various algorithms were developed to extract the design feature data. Unlike the other methodologies available in the literature, this work proposes a novel algorithm to extract the details even when the profile is generated with a combination of commands.

In the third phase of feature recognition a predefined library of features is generated with more emphasis on the groove elements. The system is capable of accommodating more user defined features which could help in catering the growing industrial needs. A rule based system is used to sequence the processes.

The fourth phase of the research work is to correlate the manufacturing features with the CNC codes. Algorithms are developed to translate the design data to the corresponding codes.

A software program in C is developed for the integration of the above mentioned phases. The output of the program is given in the form of text files for each of the phase and for the part program. Through a number of casestudies, this research work has successfully demonstrated the integration of feature recognition and CNC code generation for axi-symmetric rotary parts.
7.1 CONTRIBUTIONS OF THE RESEARCH

The main contributions of this research are:

1. This research work addresses a real time problem of integrating CAD and CAM for the axi-symmetric turned components.

2. It proposes a novel feature recognition algorithm for feature extraction of rotary parts. In contrast with other feature recognition techniques, which made use of either line or polyline commands (Yakup Yildiz [2006], Aslan et.al. [1999] and Nafis Ahmed [2001]), the proposed algorithm is capable of extraction of the features drawn with commands viz., Line, Arc and Polyline independently or with a combination of them.

3. In this work pre-defined pattern primitives were developed based on the adjacency relation among the surfaces of the features.

4. It proposes algorithms for the extraction of different groove/recess features along with their coordinate values for subsequent mapping of those features in to manufacturing features.

5. In this work a Library of predefined manufacturing features, with corresponding CNC codes is developed.

6. It facilitates the addition and alteration of the elements of predefined library of manufacturing features, thus providing a very big scope for the user to customize the system to the needs of the industry.
7. Finally, a part program of the part is generated to suit the FANUC Controller environment.

It is our firm belief that, this work is expected to integrate CAD and CAM by the development of procedures and algorithms for feature recognition, mapping of manufacturing features and generation of part program for turned components in CIM environment. The developed system was thoroughly tested on different types of cylindrical components.

7.2 FUTURE SCOPE OF WORK:

1. This thesis develops an integration system for the turned components of medium complexities. Extending this work for non-circular arcs or curves may be taken as a direction for future work.

2. In this research work, system defined process parameters are selected based on the standard values available in the handbooks. However, suitable optimization technique may be adopted for the selection of optimum process parameters.

3. In this research work various algorithms were proposed for the plain turning, step turning, taper turning, profile turning and groove features for the axi-symmetric turned components. A logical extension to this work is to pursue future research in handling other features like threading and knurling.
REFERENCES


52. Woo, T.C., “Interfacing solid modeling to CAD and CAM: data structures and algorithms for decomposing a solid”, IEEE computer, 1984, PP 44-49.

