INTEGRATED ACTIVITIES OF CAD & CAM

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ABSTRACT

A Commercial mechanical CAD/CAM packages provide a rather low level of automation of process planning tasks and a weak connection between their CAD and CAM/NC part programming modules. Features have primarily been used as geometry construction 'macros' without fully realizing their potential in supporting downstream applications, such as process planning. This paper demonstrates the use of features in automating certain process planning tasks and integrating CAD and CAM modules in commercial CAD/CAM software. Automated process planning involves two important tasks; machining feature extraction and feature-based process planning. The CAD model of the part and the stock is exported via STEP from the commercial CAD system to an external machining feature recognition system. The recognized features are used in conjunction with knowledge-based methods to prepare a process plan for the part. Set-up Planning, Operation Sequencing and Tool Selection are performed automatically based on criteria such as feature shapes, feature locations, tool access directions and feasibility of workpiece locating and clamping. Features and manufacturing attributes are exported to a commercial CAM system for toolpath generation and verification. A prototype system was implemented in conjunction with a commercial CAD/CAM package, SDRC/IDEAS.

CAD/CAM INTEGRATION

Cad/Cam means an integrated approach to the creation of CAD database, transfer of CAD database to CAM software and creation of programs to handle the workpiece using a robot and machining and inspecting a component using CAM software respectively. CAD/CAM integration thus a highly complex problem which includes integration of 3 different technical and management activities design, manufacturing and computing.
INTRODUCTION

Several activities are involved in the CAD/CAM integration process. The activities include:

1. 3-D Modeling
2. Analysis and optimizations
3. Data base management
4. Process planning
5. Tool design
6. NC programming
7. Inspection.

CONCEPTUAL DESIGN THROUGH 3-D MODELLING:

The designer evolves initially a conceptual design to meet the specification laid out by the marketing and R&D departments. There are several software packages available for conceptual design development. ADAMS, ANALYTIX, CEDAR, DADS, DESIGN VIEW, DYMES, IDEAS, IN-MOTION, LINCAGES, MECHANICAL, MECHANISMS, PRO/ENGINEERING etc are some of the software packages which can be used for this purpose.
2D DRAFTING AND DRAWING OFFICE DOCUMENTATION:

- 2D drafting module is a part of solid modelling software. This module provides the ability to create production drawings, typically using the 3D model as input. This will be important as long as blueprints are used to communicate with manual operations. A good drawing office management system will take care of this. 2D drafting module can produce dimensioned drawings with sections, detailed views etc.

RELATION DATA BASE MANAGEMENT:

- The relational database provides the ability to store relationships between items within designs and between designs. This is used to provide data to other drive other subsystems notably those in MIS.

DESIGN ENGINEERING CHANGE CONTROL:

- Design change are quite often implemented in product development and a management system should be available to carry out design changes without creating confusion.

MANAGEMENT INFORMATION SYSTEM:

- This included as integrated CAD/CAM activity to emphasize how important the relationship is between MIS and integrated CAD/CAM. The engineering and manufacturing oriented systems which are active on workstations or mainframes will act as data sources and recipients to subsystems within the ICC systems.

THE COMMUNICATION NETWORK:

- The ICC subsystems communicate with the MIS system and with each other, and manufacturing systems through the communication network. This includes all techniques for data exchange, including local networks, remote job entry, direct asynchronous and bisynchronous links and hand carried media.
ANALYSE DESIGN PROCESS

ASSESS MANAGEMENT OF PRODUCT DEVELOPMENT

IDENTIFY DESIGN MANUFACTURING INTERACT

QUANTIFY DESIGN DATA

DESCRIBE DESIGNER NEEDS

ESTABLISH REQUIREMENTS

PRELIMINARY DESIGN

PROTOTYPE SOFTWARE DEVELOPMENT

DEVELOPMENT APPROACH

DESIGN LEVELS

RESEARCH

PRELIMINARY DESIGN

DETAIL DESIGN

PRODUCT MANUFACTURING

PRODUCT VERIFICATION

PRODUCT SUPPORT

THE DESIGN PROCESS
PRELIMINARY DESIGN OF AN INTEGRATED CAD SYSTEM:

- Executive software to control user directed processes through interactive with a large number of terminals in simulations use by engineering and management personnel to provide communications between computer hardware within and outside the IPAD distributed computing system.

- Data management software to provide a versatile capability for efficient storing, tracking, protecting and retrieving exceptionally large quantities of data maintained of multiple storage devices.

CAM DATA MANAGEMENT REQUIREMENTS PHASE:

- 1. Data integration across heterogenous computer systems.
- 2. Transaction processing data.
- 4. Distributed processing and data.
- 5. Multiple views of data.
- 6. Levels of security data integrity.
- 8. Local and global data distribution.
- 10. Versioning.
- 11. 3-D electronic product definition data.
- 12. Configuration control.

CONCLUSION

This work has contributed to the expansion of craft practice through:

- The production of a holistic body of craft objects presented, unusually as an installation.
- The issues embodied by the work have been supported and elaborated through text and poetry by Tony Birch, an indigenous writer.
- Some of the work is capable of mass production due to its CAD/CAM realisation.
- The work has been accomplished because it was conducted as research framed craft practice addressing important cultural issues; this is a transferable strategy.
- Personally, this experience has provided an important new point of reference, context and sensibility.

REFERENCE

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