Computer Aided Process Planning for Economic Part Design

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Worldwide competition in industry makes it necessary to consider the cost reduction for the product more than ever. Integration of design and manufacturing has been a main issue for this purpose. Computer Aided Process Planning has been recognized as playing a critical role for this system integration.

Despite of a considerable amount of researches has been done to automize the process planning system during the last two decades, most of these systems are essentially concerned with the automatic generation of process plan once a design has been completed. However, for the significant cost saving of the product, process planning must support the design activity by interactively incorporating the manufacturability and cost in the design process.

Here, a process planning system, Real Time Computer Aided Process Planning (RTCAPP), is developed which can provide the information about the manufacturing implication of each added design feature to the designer, as well as generate the process plan for the intermediate product design.

An expert system using hierarchical planning scheme and a multi-bank rule base is applied to organize RTCAPP system. This expert system application has an advantage to extract the near optimal answer and to be able to update the knowledge base more easily. In the macro level of hierarchical planning, the precedence relationship among the design features is organized to reduce the search space for planning. A control strategy is developed to be able to infer a feasible set of processes and other parameters for each design feature from the knowledge rules. Detailed machining data is calculated by formulating all types of processes in the micro level of planning. The micro level of planning is supported by an Dynamic Programming for the locally optimal machine sequence. In the process of planning, an effective mechanism is developed for the generation of an upgraded process plan in real time whenever a new design feature is added.

Finally, an extension of RTCAPP is desirable to integrate with an efficient Feature Based Design system, where the geometric and topological information may be translated automatically without human intervention.