AN AUTOMATIC EVALUATION OF SET-UP PLANNING, CLAMPING AND SUPPORTING FEATURES OF 2.5D PRISMATIC PARTS

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Set-up planning is one of the main bottleneck in process planning of prismatic parts. Most of the works on this subject used a single constraint like ‘approach directions’ or ‘tolerances’ for grouping features into set-ups, while some of them used heuristics. Those systems have generally limited their domain to a three-axis vertical machining centre.

In our research, a hybrid set-up generator in which both approach directions and geometrical requirements between features of the component are considered as constraints is developed. These constraints can also be used separately. The main criterion considered is the minimisation of number of set-ups. Set-up planning for Horizontal Machining Centre is also possible.

The effect of each constraint on the set-up planning (e.g. number of set-ups) is investigated by changing the values of tolerances or the type of tolerances, the size of component and approach directions (adding or subtracting new feature), etc. It is found that the geometrical tolerances are the predominant constraint over the others, and it tends to increase the number of set-ups. The reverse problem of set-up planning that is grouping the features for a given number set-ups is also addressed. When the generation of set-ups based on the selected constraint(s) is completed, the optimal sequence of set-ups can be determined based on ‘minimum total set-up time’ criterion by using a genetic algorithm.

The set-up planning system described here is implemented in C and integrated with a process planning system. The approach is illustrated through an example in the manuscript.