STEP-NC COMPLIANT APPROACH FOR WORKPIECE SETUP PLANNING PROBLEM ON TRANSFER LINE

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Keywords:

Production system configuration, Transfer line, Setup planning, STEP-NC.

Abstract

Given the current market dynamics, production system design and configuration play a fundamental role in companies success. These activities are highly critical as many economical and technological issues must be considered. System configuration is a broad problem that involves different topics concerning workpiece, fixture and machine. In this paper, an approach for the resolution of the Setup Planning problem on transfer line based on a STEP-NC compliant data structure is presented. The aim of the approach is to shorten the time needed for the process planning activity, automating some time-consuming activities without losing solution accuracy. Indeed, setup planning is normally manually performed and requires long time and specific knowledge. In the proposed approach a CAM software tool is used for setting geometric and technological data about the product considering alternative workingsteps for the manufacturing of the part. Using this structure an approach for the resolution of setup planning problem based on inverse kinematic and mathematical programming is proposed. The developed kinematic approach defines all the feasible part orientations which can be possible setups and performs a workingstep accessibility analysis. The model aims at the calculation of the minimum number of setups for the machining of the part and provides the orientation of the workpiece linked to each selected setup. The solution is searched among all the feasible configurations, it is optimal and needs a very short calculation time. The model takes into account both precedence constraints among workingsteps and constraints related with tolerance analysis, which impose the machining of two or more workingsteps in the same setup. The data structure contains also information for a following study of transfer line balancing with equipment selection problem and its granularity is a prerequisite for innovative part program generation methods. The approach has been tested on real cases.

REFERENCES

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