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ORIGINAL PAPER

5-axis virtual machine tool centre building in PLM environment

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Abstract
Programs for 5 axis machining is not complex task but also tedious to understand and implement for new CNC programmers. Hence for making the concept of 5-axis easy for understanding at zero damage of the machine tool it is necessary for developing virtual platform which will give real time feel of the actual CNC machine. The concept of 5 axis simultaneous machining is not as the same as that of the 3 axis programming as there is two more axis operating simultaneously. This constraint makes 5 axis program is bit complex for the new programmers it is needed to be done in virtual environment. This paper explains a systematic procedure of developing a virtual 5 axis machine tool in PLM platform (Product lifecycle Management). This virtual platform is not only used for training purpose but also for identifying collision detection between the machine components and work piece. Standard procedure is applied to 5-axis table-table configuration builded in SIEMENS NX 12 software. This process implies 3 major steps. The first step is simplifying the hierarchy based kinematic chain. The second step implies assignment of specific movements of the machine components. The last step is the assignment of the virtual controller and its respective post processor. On completion of the above procedure validation is done by same by generating by the 5 axis program on gear bracket component.

Keywords Common simulation engine · Collision detection · Gear bracket · 5 axis machine tool · Machine simulations · Product lifecycle management · Kinematic chain · Virtual machine tool

1 Introduction

The PLM platform in the today's era is an integration of the various verticals of manufacturing segments such as CAD, CAM, and CAE [1] and many more under one umbrella. This wide spread umbrella helps in acquiring a holistic environment of the product. The platform set gives an advantage from the birth of product to the retirement of the product. The main distinctive advantage of the PLM is that it chops the actual operational cost which is considered at the time of the development of the product. The PLM platform helps in acquiring a realistic concurrent engineering environment. The integrated module of the PLM software starts with the most *optimal geometrical topology* done by tools *synchronous modelling and behaviour modelling*. Further fine tuning to the smallest effective discretization done in the finite element analysis software. The fine tuned geometry

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