Geometric Brings Knowledge-Based CAM Software to Solid Edge

CIMdata Commentary

Key takeaways:

- *The CAM software market is seeing strong growth, especially in integrated CAD/CAM solutions with feature-based programming and knowledge-based machining technology*
- *An integrated CAD/CAM solution allows the design and manufacturing models to become one and automates the CNC programming process to eliminate bottlenecks*
- *CAMWorks for Solid Edge uses associative knowledge-based machining to leverage Synchronous Technology from Siemens PLM Software*
- *CAMWorks bridges a technology gap by providing high-end CAM capabilities to the mid-range CAD/CAM market*

Introduction

CIMdata has tracked the CAM software market for over 20 years. While it has had ebbs and flows over the years, there seems to be a renewed interest in CAM technology. The market has seen strong growth since 2009, achieving 10% growth in 2012. The driving forces behind the growth include:

- Growth in Machine Tool Investments—In the recent past, companies have made sizeable investments in machine tools to remain competitive in global markets and significant ROI is expected

- Investor Pressures—Modern investors are increasing the pressure on manufacturers to produce better products with higher quality at lower cost to generate a better ROI

- Customer Expectations—Customer expectations, including product cost, time to market, and quality are rising

- Worldwide Competition—Increasingly intense global and local competition force manufacturers to produce higher quality products in the shortest possible time at minimum cost

- Shorter Product Cycles—A reduced product development cycle is a primary force driving manufacturing

- Evolution from Design—There is a natural movement in the implementation of advanced technology software systems from product design to manufacturing

- Manufacturing Complexity—To gain increased production efficiency, manufacturing tools and processes are becoming more complex

- Shortage of Skilled Workers—In most parts of the world, including North America and Europe, there is a shortage of skilled manufacturing workers

While integrated CAD/CAM tools have been available from high-end CAD/CAM solution providers, their cost has prevented broad deployment. Historically, machinists and operators programmed simpler parts by generating manual NC programs at the machine control. In larger machines shops or shops making complex parts, CAM programming is commonly performed by dedicated programmers and executed by machine operators on the shop floor.

Improving Technology

People, technology, and other driving forces have pushed CAM software developers to implement advanced technology and improve ease of use to meet the business challenges of their customers. As software becomes easier to use and more automated it will become more practical for use by casual programmers and by machine operators on the shop floor as well as being more productive for companies that have dedicated programmers.

The most significant technology improvement of the past decade or so is knowledge-based machining (KBM). KBM allows experienced CAM programmers and machinists to capture their knowledge as best practices within software. When best practices are applied, components are produced with improved consistency and standardization leading to improved quality and profitability. The automated application of best practices enables the experienced staff to work faster and more consistently, and the less skilled staff to generate similar output to experienced staff more quickly.

About Geometric CAMWorks for Solid Edge

Geometric, has been developing software to support manufacturing companies for two decades. They provide software development services to most major CAD/CAM and PLM Solution providers and also develop their own products. CAMWorks has been available for more than 16 years as a plug-in for SolidWorks and as a standalone solution. It is now available as an embedded solution within Solid Edge.

CAMWorks is a full-featured generative machining application that supports common machining practices including turning, two- through five-axis milling, as well as high-speed machining, wire EDM, mill-turn and VoluMill for fast roughing operations. In addition to being a Windows-based application, the plug-in's tight integration with the CAD modeler improves ease of use. For customers who need additional capability, an API is provided so extensions and proprietary capabilities can be developed. Figure 1 shows a CAMWorks simulation of a complex toolpath as well as some of its visualization capabilities.

The generative machining capabilities of CAMWorks take advantage of Geometric's automated feature recognition (AFR) technology to automate toolpath generation. AFR is able to analyze a solid model and recognize manufacturing features. A feature-based manufacturing model is automatically created and associatively linked with the design model. This model is independent of the modeling methodology, so it works on native models or imported models including STEP and IGES. Solid Edge's Synchronous Technology automatically recognizes relationships between elements of geometry enabling complex changes to be made quickly and easily to the product model and then be reflected in the manufacturing model. In addition, the manufacturing model can be modified independent of the design model to capture manufacturing specific requirements. The manufacturing model is important because product features may be different from design features. For example, a radius at the base of a pocket may be included in a swept profile or added as a blend feature. AFR recognizes that the blend needs to be incorporated into the machining strategy.
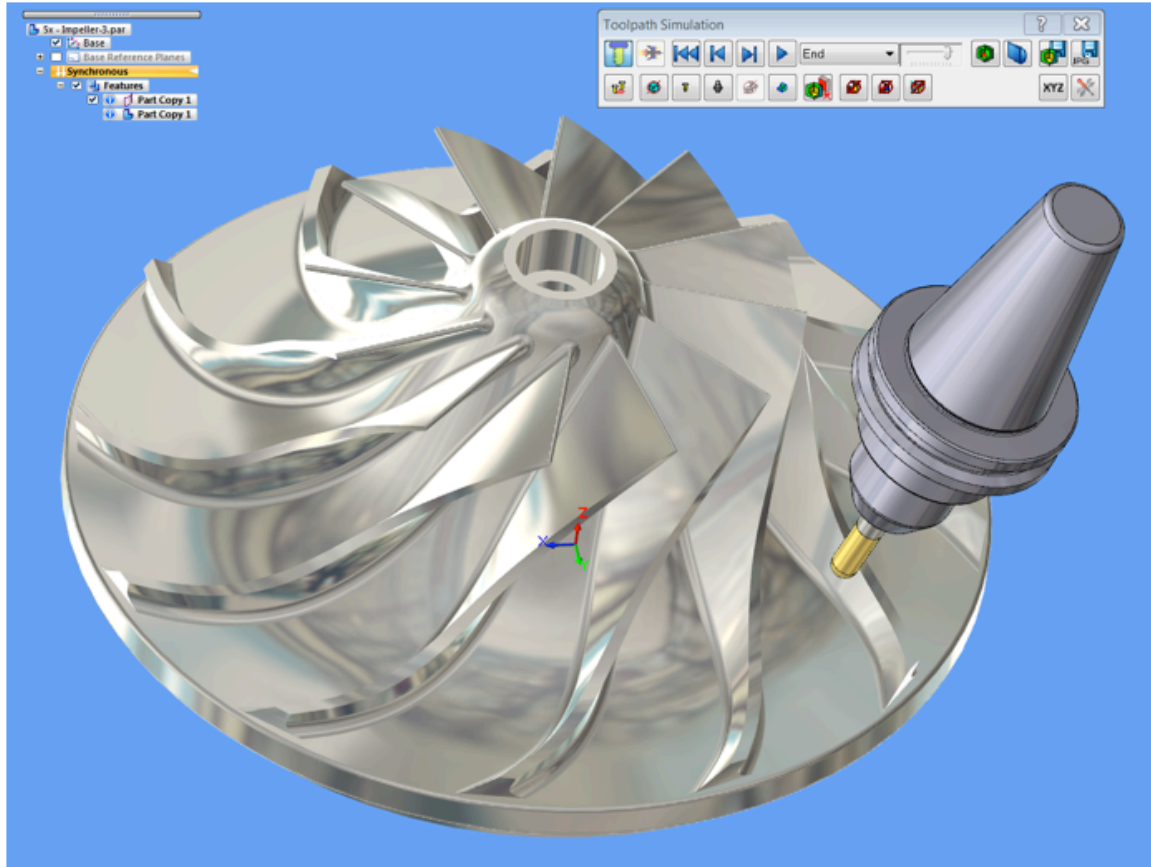
Figure 1—Geometric CAMWorks Toolpath Simulation of a 5-Axis Machining Operation

After developing the manufacturing model, Geometric's generative machining technology chooses the best machining strategy for each feature in the manufacturing model. It applies the captured knowledge stored in CAMWorks' knowledge-base to choose the optimal toolpath type, standard tools, feeds, speeds, step-overs and other parameters. The knowledge-base can be enhanced to incorporate company best practices. Toolpaths are organized into a machining sequence that can be reordered if necessary, and finally machine code is output from the embedded post processor.

Conclusion

Global competition is continuing to increase pressure on manufacturers to improve product quality, time to market, and financial performance. The capture and application of company specific knowledge enables experienced staff to be more productive and less experienced staff to contribute more to company success. CAM software that supports generative machining is a key technology enabling manufacturers to compete.

CIMdata recognizes Geometric as one of the fastest growing CAM software suppliers over the past five years. In reviewing the capabilities of CAMWorks it is easy to see why. The software is easy to use and has advanced capabilities built on a modern technology platform. Feature recognition with knowledge-based generative machining, and the flexibility of Synchronous Technology is a powerful combination that should help address the pressures on manufacturing organizations. The integrations with midrange CAD solutions like Solid Edge (and SolidWorks) provide capabilities that were, at one time, only available with expensive, high-end integrated solutions.

About CIMdata

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