Computer Integrated Manufacturing

And the Lord came down to see the city and the tower which the children of men builded. And the Lord said, 'Behold, the people is one, and they have all one language; and this they begin to do; now nothing will be restrained from them, which they have imagined to do. Go to, let us go down, and there confound their language that they may not understand one another's speech,' So the Lord scattered them abroad from thence upon the face of the earth; and they left off to build the city.

Genesis 11:5–8

In the course of an attempt to automate design and manufacturing by means of computers, talented workers emerged from many of the traditional branches of engineering, such as electrical, mechanical and industrial engineering, as well as from the applied sciences, such as solids mechanics, materials science and computer science. They had hardware for stones, software had they for mortar. Their trades, however, required special languages so that they could communicate with their own peers, concisely and unambiguously. Unlike the construction of the great cathedrals during the Renaissance era, there was not just one architect for each project. There were thousands, who themselves were also masons, or perhaps stone cutters. This was an era of independent spirits with a common goal. It was the era of new Tower of Babel.

It is not the unification of the languages but the reconstruction of the blueprint that this special issue on computer integrated manufacturing (CIM) is aimed at. If only the cornerstones can be identified, the columns re-located, then perhaps we can hope to build a multi-disciplined spire that reaches even greater heights. It was in this spirit that I assembled the present six papers. As in a treasure trove, some other gems were mistaken for common stones, for which I only have my ignorance to blame.

Geometry, the foundation of CIM, comes first in this special issue with two papers. The first paper, "Apex: two architectures for generating Parametric Curves and Surfaces," by De Rose et al., presents VLSI implementations for parametric surface generation. The second paper, "On the geometry of Dupin cyclides," by Chandru et al., consider a class of geometry called cyclides by the 19th century French mathematician Dupin from the viewpoint of a computer scientist.

Finite element analysis permits functional evaluation of geometric forms in a unified way. The third paper, "Feature-based object decomposition for finite element meshing," by Razdan et al., links geometry to analysis through feature extraction. The fourth paper, "Geometry-defining processors for engineering design and analysis," by Anagnostou et al., introduces a finite element engine in the form of geometric building blocks.

Functionality and manufacturability go hand in hand. The fifth paper, "An analysis of assembly," by Natarajan, examines the issue of how far composite objects can be assembled. A sixth paper, "Approximate methods for simulation and verification of numerically controlled machining programs" by Jerard et al., suggests methods for evaluating the tolerances of machined surfaces. For space reasons, this paper will appear in the next issue.

Superior insights are the hallmark of these authors, who have devoted an enormous concentration of energy in recent months to the preparation of this special issue. I am indebted to them for all their hard work. Special gratitude is extended to Dr. T.L. Kunii, the Editor-in-Chief, for giving us the opportunity to air these topics. Finally, without the watchful eyes and diligent mind of Ms. Pam Linderman, this special issue would not have been possible.

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