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From Computer Geometry to Manufacturing Algorithms

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Abstract

Abstractly, machining a shape is rather a simple task, that is, one is merely asked to subtractively metamorphose a superset of stock material into the ultimate shape of a given geometric model. In practice, however, there are a multitude of technical considerations that make automating this process rather a formidable and generally unsolved problem.This presentation will discuss some of the practical and technical considerations of machining a desired shape from a block of stock material. When a realistic cost function is introduced where literally Ştime is money,Ť formulating a winning strategy for efficiently eliminating material while optimizing cutter path times as well as automatic tool changes becomes a complex matter involving much mathematical richness. Just as computer architecture affects computing complexity analysis, so machine tool architecture can significantly alter the cost functions and corresponding strategies of various manufacturing algorithms. Finally, the quality of the desired finish, the closeness of the approximation, as it were, has a major influence on what strategies emerge as superior. Further, new technologies are changing the fundamental cost functions so that new strategies are called for. Many examples and some video will be presented to illustrate the issues, especially in cases that may not be intuitive to the uninitiated. No prior manufacturing experience will be assumed for this talk.