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Solid modelling for manufacturing: from Voelcker s boundary evaluation to discrete paradigms

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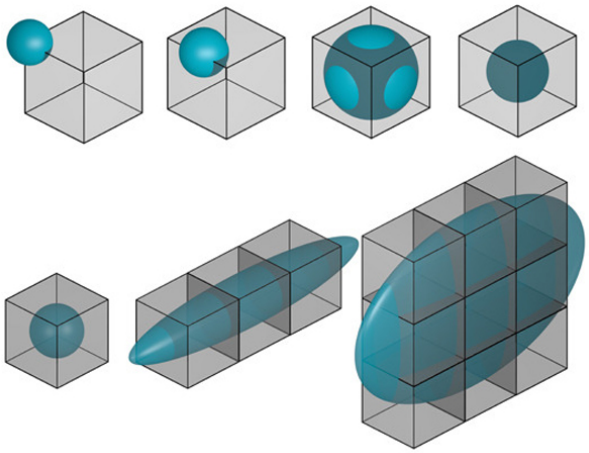

Herb Voelcker and his research team laid the foundations of Solid Modelling, on which Computer-Aided Design is based. He founded the ambitious Production Automation Project, that included Constructive Solid Geometry (CSG) as the basic 3D geometric representation. CSG trees were compact and robust, saving a memory space that was scarce in those times. But the main computational problem was Boundary Evaluation: the process of converting CSG trees to Boundary Representations (BReps) with explicit faces, edges and vertices for manufacturing and visualization purposes. This paper presents some glimpses of the history and evolution of some ideas that started with Herb Voelcker. We briefly describe the path from -localization and boundary evaluation- to -localization and printing-, with many intermediate steps driven by hardware, software and new mathematical tools: voxel and volume representations, triangle meshes, and many others, observing also that in some applications, voxel models no longer require Boundary Evaluation. In this last case, we consider the current research challenges and discuss several avenues for further research.

http://dx.doi.org/10.1016/j.cad.2022.103370