The Robert W. Courter Seminar Series

3:00-4:00pm, Friday, January 29th, 2021

ZOOM: https://lsu.zoom.us/meeting/register/tJApd-mhqzssHNAtbx8xlujIXfCf28JLgcJB

Reconstruction of Trimmed NURBS Surfaces for Gap-Free Intersections

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The modern engineering technologies of Computer-Aided Design (CAD), Computer-Aided Engineering (CAE) and Computer-Aided Manufacturing (CAM) are ubiquitous in engineering practice. They are focused on creating, analyzing, and fabricating engineering artifacts represented as geometric models. Historically, these technologies developed independently, with different geometric representations that are customized to the needs of the technology. As a result, combined use of these technologies has led to differences in data structures, file formats, and user knowledge and practice, requiring translation of representations between systems to support interoperability. Complicating this situation is the approximate nature of modeling operations in CAD systems, which can result in gaps at the boundary curves between mating trimmed

surfaces of a model. The research presented here is aimed at removing the gaps between trimmed surfaces, resulting in a "watertight" model that is suitable for use directly by downstream applications. A three-step algorithm is presented that includes (1) analysis of the parametric space of the trimming curves, (2) reparameterization to create a global parameter space, and (3) reconstruction of the intersecting surfaces to ensure continuity at the trimming curve. Examples of applications of the algorithm are presented, and experiences with commercialization of the research are discussed.
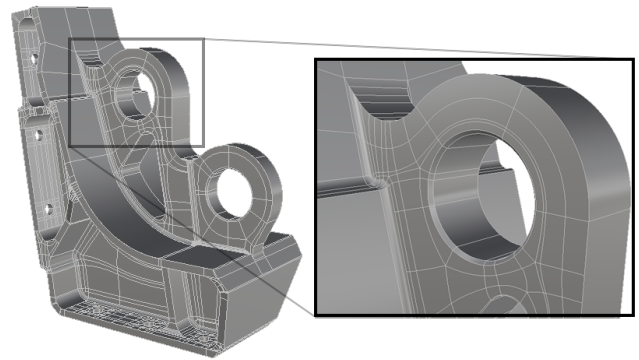
* Dr. Richard H. Crawford is a Professor of Mechanical Engineering at The University of Texas at Austin and is the Earl N. & Margaret Brasfield Endowed Faculty Fellow. He received his BSME from Louisiana State University in 1982, and his MSME in 1985 and Ph.D. in 1989, both from Purdue University. He teaches mechanical engineering design and geometric modeling for design. He received the 2010 Ralph Coates Roe Award from the American Society for Engineering Education as an exemplary Mechanical Engineering educator. He also received a University of Texas System Regents' Outstanding Teaching Award in 2011 in recognition of his contributions to engineering education. Dr. Crawford's research is focused in four areas: (1) computer representations to support conceptual design, design for manufacture and assembly, and design retrieval; (2) design methods to enhance creativity; (3) additive manufacturing, novel processes and applications; and (4) performance of polymer seals. Throughout his career, Dr. Crawford has been involved in K-12 engineering education. He is a founder of the DTEACh program for training K-8 teachers, and co-developed the year-long high school engineering curriculum, Engineer Your World, which is used in over 250 schools throughout the country.