



# Architectural Geometry

*By Helmut Pottmann, Andreas Asperl, Michael Hofer, Axel Kilian*

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Geometry lies at the core of the architectural design process. It is omnipresent, from the initial form-finding stages to the actual construction. Modern constructive geometry provides a variety of tools for the efficient design, analysis, and manufacture of complex shapes. This results in new challenges for architecture. However, the architectural application also poses new problems to geometry. Architectural geometry is therefore an entire research area, currently emerging at the border between applied geometry and architecture. This book has been written as a textbook for students of architecture or industrial design. It comprises material at all levels, from the basics of geometric modeling to the cutting edge of research. During the architectural journey through geometry, topics typically reserved for a mathematically well-trained audience are addressed in an easily understandable way. These include central concepts on freeform curves and surfaces, differential geometry, kinematic geometry, mesh processing, digital reconstruction, and optimization of shapes. This book is also intended as a geometry consultant for architects, construction engineers, and industrial designers and as a source of inspiration for scientists interested in applications of geometry processing in architecture and art.

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### **Editorial Review**

#### About the Author

Helmut Pottmann is a professor of geometry at Vienna University of Technology, where he directs the research group Geometric Modeling and Industrial Geometry at the Institute of Discrete Mathematics and Geometry. He has held faculty positions at the University of Hamburg, University of Kaiserslautern, Purdue University, University of California at Davis, and Tsinghua University in Beijing. His most recent research focuses on the development of geometric methods and algorithmic tools for the design and manufacture of complex freeform structures in architecture. Michael Hofer is a post-doctoral researcher at Vienna University of Technology. He received his doctoral degree in Applied Geometry in 2005 and was employed at the University of California at Davis and the University of Minnesota. Since 200 he has regularly taught geometry to undergraduate and graduate students of architecture. His research focuses on the solution of geometric problems in applications such as computer-aided design, computer graphics, and image processing. Andreas Asperl studied Mathematics and Descriptive Geometry at Vienna University of Technology, where he has held a faculty position since 1983. He is also a teacher of geometry and CAD for a gymnasium in Vienna, author of several textbooks for use in Austrian schools at different levels, and a main promoter of the use of three-dimensional CAD systems in geometry education. Axel Kilian studied Architecture and specialized in Design and Computation for a Masters of Science, a Ph.D., and a post-doctorate at the Massachusetts Institute of Technology. He has been teaching workshops in computational design and design studios and has lectured on the topic of generative design widely at schools and in the context of the Smart Geometry group events.

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