



# Wavelet Subdivision Methods: GEMS for Rendering Curves and Surfaces

*Charles Chui, Johan de Villiers*

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Prevalent in animation movies and interactive games, subdivision methods allow users to design and implement simple but efficient schemes for rendering curves and surfaces. Adding to the current subdivision toolbox, **Wavelet Subdivision Methods: GEMS for Rendering Curves and Surfaces** introduces geometry editing and manipulation schemes (GEMS) and covers both subdivision and wavelet analysis for generating and editing parametric curves and surfaces of desirable geometric shapes. The authors develop a complete constructive theory and effective algorithms to derive synthesis wavelets with minimum support and any desirable order of vanishing moments, along with decomposition filters.

Through numerous examples, the book shows how to represent curves and construct convergent subdivision schemes. It comprehensively details subdivision schemes for parametric curve rendering, offering complete algorithms for implementation and theoretical development as well as detailed examples of the most commonly used schemes for rendering both open and closed curves. It also develops an existence and regularity theory for the interpolatory scaling function and extends cardinal B-splines to box splines for surface subdivision.

Keeping mathematical derivations at an elementary level without sacrificing mathematical rigor, this book shows how to apply bottom-up wavelet algorithms to curve and surface editing. It offers an accessible approach to subdivision methods that integrates the techniques and algorithms of bottom-up wavelets.

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