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VISUALIZING MORE QUATERNIONS

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Visualizing Quaternions Author Andrew J Hanson Feb 2006

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Visualizing More Quaternions Andrew J. Hanson, 2024-07-01 Visualizing More Quaternions Volume Two updates on proteomics related material that will be useful for biochemists and biophysicists including material related to electron microscopy and specifically cryo E Visualizing Dr Andrew J Hanson's groundbreaking book updates and extends concepts that have evolved since the first book published in 2005 adding entirely new insights that Dr Hanson's research has recently developed This includes the applications of quaternion methods to proteomics and molecular crystallography problems which are domains with significant current research and application activity In addition to readers interested in quaternions for their own sake scientists involved in computer graphics animation shape modeling and scientific visualization and readers from several other disciplines will benefit from this new volume Foremost among these and the target of the first several chapters are scientists involved in molecular chemistry where techniques based on quaternion eigensystems have become a standard tool for evaluating the quality of shape matching Establishes basic principles for visual display of quaternions and their applications Explores quaternion based approaches to the matching of point cloud pairs including approaches to data from orthographic and perspective projections Develops extensive applications of quaternion frames to protein orientation analysis Analyzes the application of quaternion methods to physics problems ranging from quantum computing to special relativity and gravitational instantons

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offer a powerful way to represent rotations and compared to rotation matrices they use less memory compose faster and are naturally suited for efficient interpolation of rotations Despite this many practitioners have avoided quaternions because of the mathematics used to understand them hoping that some day a more intuitive description will be available The wait is over Andrew Hanson s new book is a fresh perspective on quaternions The first part of the book focuses on visualizing quaternions to provide the intuition necessary to use them and includes many illustrative examples to motivate why they are important a beautiful introduction to those wanting to explore quaternions unencumbered by their mathematical aspects The second part covers the all important advanced applications including quaternion curves surfaces and volumes Finally for those wanting the full story of the mathematics behind quaternions there is a gentle introduction to their four dimensional nature and to Clifford Algebras the all encompassing framework for vectors and quaternions Richly illustrated introduction for the developer scientist engineer or student in computer graphics visualization or entertainment computing Covers both non mathematical and mathematical approaches to quaternions Companion website with an assortment of quaternion utilities and sample code data sets for the book s illustrations and Mathematica notebooks with essential algebraic utilities

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