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Lagrangian/Eulerian Description and Transformation; 2.2 Curvilinear Coordinates; 2.2.1 Polar Coordinate; 2.2.2 Streamline (Flux Line) Coordinates; 2.2.3 Potential-Stream Function Coordinates; 2.3 Field Kinematics and Visual Attributes; 2.3.1 Field Line Trajectory; 2.3.2 Field Line Integral Curves
2.3.3 Field Lines, Material Lines and Path Lines2.3.4 Streamlines (Flux Lines); 3 Field Model, Representation and Visualization; 3.1 Field Models and Concepts; 3.2 Scalar Fields and Representation; 3.3 Vector Fields and Representation; 3.4 Vector Icons and Classifications; 3.4.1 Classification Based on Domain Configurations; 3.4.2 Classification Based on Information Levels; 3.4.3 Classification Based on Topological Skeleton; 3.5 Scalar Potential; 3.6 Vector Potential; 3.7 Vector Field Specification; 3.7.1 Helmholtz's Theorem; 3.8 Tensor Contraction and Transport Process Visualization
3.8.1 Mechanical Energy Function and Heatfunction3.8.2 Strain Energy Trajectory and Strain Function; 3.9 Multiple Fields; 4 Complex Analysis and Complex Potentials; 4.1 Complex Variables/Functions and Applications; 4.2 Complex Analysis and Cauchy-Riemann Equation; 4.3 Differentiation of Complex Function; 4.4 Integration of Complex Functions; 4.5 Visualization of Complex Potentials; 4.5.1 Trajectory Method; 4.5.2 Method of Curvilinear Squares; 4.5.3 Transfer Characteristics and Field Property Evaluation; 4.6 Example 4.1a Visualization of Heat and Fluid Transport in a Corner
5 Field Mapping and Applications 5.1 Introduction; 5.2 Mapping of Euclidean Geometry; 5.2.1 Congruent Mapping; 5.2.2 Similitude Mapping; 5.2.3 Affine Mapping; 5.3 Inversion Mapping; 5.3.1 Circle Inversion; 5.4 Mapping with Complex Functions; 5.5 Conformal Mapping and Applications; 5.6 Hodograph Method and Mapping; 5.6.1 Conjugate Hodograph; 5.6.2 Hodograph; 5.7 Hodograph Representations and Applications; 5.7.1 Straight Boundaries; 5.7.2 Free Surface; 5.7.3 Special Field Patterns; 5.7.4 Projectile Trajectory in Constant Force Fields; 5.7.5 Motion Trajectory in Central Force Fields 5.7.6 Trajectory of Charged Particles in Uniform Magnetic Fields5.8 Example 4.1b Mapping of Field Patterns and Image Warping; 6 Tensor Representation, Contraction and Visualization; 6.1 Introduction; 6.2 Development of Tensor Visualization Techniques; 6.2.1 Mohr's Circle; 6.2.2 Tensor Field Line Trajectories (Lines of Principal Stress); 6.2.3 Isochromatics; 6.2.4 Isoclines; 6.2.5 Stress Trajectories; 6.2.6 Slip Lines; 6.2.7 Isopachs; 6.3 Tensor Description and Representation; 6.3.1 Tensor Icons and Classification; 6.4 Tensor Decomposition and Tensor Rank Reduction
6.4.1 Strain Tensor and Stress Tensor

Sommario/riassunto

Driven by advances in computer technology, engineering analysis has developed rapidly and extensively in recent times; Visualization of Fields and Applications in Engineering presents the basic techniques for tensor field visualization and mapping of engineering data. Focusing on the fundamental aspects of post processing databases and applications outputs, the author explores existing theories and their integration in tensor field visualization and analysis. The subject covers fundamental theories through to integrated, multi-disciplinary technologies with practical applications in eng