

Geometric Algebra for Elastica: Frames, Lagrangians, and Conserved Quantities

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The elastica theory is intimately related to the classical field of elliptic functions and integrals. This presentation develops a coordinate-free formulation of elastic curves in three dimensions using the language of Geometric Algebra, positioning elasticity within a coordinate-free, dimensionally covariant framework of mathematical physics. A constrained Lagrangian formulation of elastica is introduced, from which the fundamental Noetherian conserved quantities are systematically derived. The elastica's equation admits a particularly compact form using the Bishop moving frame. Plots of different species of elasticas will be presented.