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Applications of a "Two Point Boundary Variation"

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ABSTRACT. In 2004 Alex Solynin and I developed a Two Point Boundary Variation Formula for the change in the reduced module of a domain in the complex plane with minimal assumptions on the boundary. In this talk we will discuss this variation and how we have been able to combine it with polarization, symmetrization, and quadratic differential methods to solve a variety of extremal problems over the last dozen years. These include determining sharpened isometric inequalities for the logarithmic capacity of both convex and non-convex domains involving their diameter and area, determining an isometric inequality for hyperbolic polygons using our lemma verifying the convexity of a complicated combination of gamma functions, solving the minimum area problem for non-vanishing functions in the plane, and solving iceberg-type problems involving estimating hidden parts of a variety of domains from their visible parts. This is joint work with Alexander Solynin.