

Geometry and control of polygonal linkages

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We consider various numerical invariants of the shape spaces of polygonal and arachnoid linkages. For planar linkages, we present some applications of the Riemannian curvature of shape space to the kinematic singularities and stability of motion. For spatial linkages, we discuss similar issues regarding the symplectic volume of shape space.

We will also describe the critical points of several geometrically interesting Morse functions on the shape spaces of such linkages with a view toward applications to the control theory. As a typical application we will present in some detail a scenario for controlling the shape of polygonal linkage by means of the Coulomb potential of point charges placed at its vertices.