

From a spatial four-bar to Henrici's flexible hyperboloid

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Abstract: The rods of Henrici's flexible hyperboloid are generators out from both reguli of a one-sheeted hyperboloid. Each crossing point between two rods is materialized by a spherical joint. Then the basic hyperboloid can vary within a confocal family between two flat poses tangent to the focal conics. There is also a parabolic version of this flexible structure with similar properties.

If at any non-planar quadrangle with spherical joints at the vertices two other points are attached to opposite sides and their distance is kept constant, then the quadrangle admits a one-parameter motion which is the restriction of the self-motion of a Henrici hyperboloid. In other words, simultaneously for infinitely many pairs of points placed on respectively opposite sides of the quadrangle the distances remain constant. We discuss the question whether the spherical joints at the vertices of a given quadrangle can be replaced by revolute joints. The proofs are based on purely geometric reasoning and on the selfadjoint affine transformation between confocal quadrics of the same type.