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Signed Area Function On Moduli Spaces Of Quadrilateral Linkages

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ABSTRACT

We present several results about the critical points of the signed area function on moduli spaces of planar polygonal linkages. An effective method of counting critical points in question is described which yields comprehensive results for non-degenerate quadrilateral linkages and reveals a number of curious phenomena. In particular, we prove that cyclic configurations are critical points of the signed area function on moduli space and their number is determined by the topology of moduli space.

The number of cyclic configurations of quadrilateral linkages can be two or four. The number of cyclic configurations is two if and only if the sum of lengths of the biggest and smallest side lengths of quadrilateral linkages is greater than the sum of lengths of the two other sides. Moreover, the number of cyclic configurations is equal to the two times the number of components of moduli space. For non-degenerate pentagon linkages, it is established that cyclic configurations are again critical points of the signed area function but the number of critical points is not determined by the topology of moduli space.