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Incenter of triangle as a stationary point. (English) Zbl 1494.51007

Summary: We show that the incenter of an isosceles triangle is a stable equilibrium point of the electrostatic potential of certain point charges placed at its vertices. To this end, explicit formulas for these charges are given and the hessian of their electrostatic potential is computed. The behavior of this hessian in a family of triangles with the given inscribed and circumscribed circles is investigated and its extremal values are computed. As an application, we prove that each point in the unit disc is a stable equilibrium point of a certain triple of point charges on its boundary, which yields an explicit scenario of robust electrostatic control in Euclidean discs. In conclusion, several examples are presented which show that analogous problems are interesting and feasible for convex quadrilaterals.

MSC:
51M05 Euclidean geometries (general) and generalizations
51M15 Geometric constructions in real or complex geometry
78A30 Electro- and magnetostatics

Keywords:
electrostatic potential; electrostatic force; Coulomb law; stationary point; Hessian; stable equilibrium; incenter of triangle; circumcircle of triangle; Euler formula for triangle; Poncelet theorem

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References:
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