

Rutgers University
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Ellipsoids: applications, generalizations, and open problems

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Abstract

There are two well-known facts about ellipsoids: (1) they can be parametrized by simple quadratic polynomials and (2) with respect to second-order linear equations, e.g., Newtonian potential problem, the interior solutions are again quadratic polynomials. For these properties, ellipsoids are the “favorite” shapes of applied scientists. We will first discuss how these properties are used in different physical settings including elasticity, hydrodynamics, and electromagnetics. Next, we present a proof of a lesser-known property of ellipsoids, i.e., the solution to a second-order linear elliptic system with a polynomial source term supported on an ellipsoid is again a polynomial of the same degree, and the applications of this property. Finally, we discuss a few possible generalizations, applications and associated open problems.