Small Perturbations of Polytopes

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Motivated by first-order conditions for extremal bodies of geometric functionals, we discuss an abstract notion of small (i.e., infinitesimal) perturbations of convex bodies. We show that these small perturbations can be represented by signed measures, recovering a notion of weak derivatives of convex-body-valued functions which was studied by G. Pflug and H. Weisshaupt. We give a full characterization of the set of realizable small perturbations in the case that the perturbed body is a polytope. As an application, we present a first-order condition for polytopal maximizers of the isotropic constant and other geometric functionals.