Alexander duality in experimental designs

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Abstract   If F is a full factorial design and D is a fraction of F, then for a given mono-
mial ordering, the algebraic method gives a saturated polynomial basis for D which
can be used for regression. Consider now an algebraic basis for the complementary
fraction of D in F, built under the same monomial ordering. We show that the basis
for the complementary fraction is the Alexander dual of the first basis, constructed by
shifting monomial exponents. For designs with two levels, the Alexander dual uses the
traditional definition for simplicial complexes, while for designs with more than two
levels, the dual is constructed with respect to the basis for the design F. This yields
various new constructions for designs, where the basis and linear aberration can easily
be read from the duality.

Keywords   Alexander dual · Factorial design · Linear aberration