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## Maximum Frustration in Signed Complete Bipartite Graphs

### Abstract for the Combinatorics Seminar 2009 February 9

The *frustration index* of a signed graph is the smallest number of edges whose sign reversal yields a balanced signed graph (i.e., where all circles have positive sign product). In 1966, Petersdorf showed that the maximum frustration of a signed complete graph  $K_n$  is equal to  $\lfloor (n-1)^2/4 \rfloor$ , and it is achieved by the all-negative signing. This is the only interesting graph family for which the problem has been solved. Using convex geometry, I show that the maximum frustration for a signed  $K_{l,r}$  is bounded above by

$$r \cdot \lfloor l/2 \rfloor \cdot [ 1 - 2^{-(l-1)} \text{binom}( l-1, \lfloor (l-1)/2 \rfloor ) ]$$

and that this bound is achieved by a signing of  $K_{l,2^{l-1}}$ .

From:

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Last update: **2020/01/29 19:03**