Balanced Triad Formation explained by Homophily-induced Dyadic Interactions

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The evolution of social (signed) triads towards the so-called balanced state with either three or one positive link [1] often results in the formation of clusters of positively-linked agents. We argue that such cluster formation can also emerge from *dyadic* interactions if these interactions are determined by homophily between agents. Without knowledge of triads in their neighbourhoods, the agents modify their opinions so as to minimize a social tension defined via the weighted sum of opinion overlaps with friends and opinion discordance with enemies. The model exhibits a transition from unbalanced- to balanced society at a critical temperature which depends on the number of *independent* binary opinions, G, the mean degree, K, and the relative strength of positive interactions to that of negative ones, α. As α exceeds 1/2, a transition between the absorbing states with different fractions of balanced triads occurs.

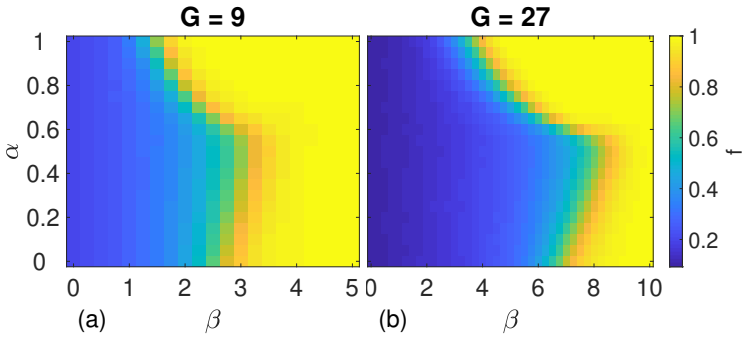

Fig. 1. Order parameter, $f = (n_+ - n_-)/(n_+ + n_-)$, where n_+ and n_- are the numbers of balanced (i.e. with an even number of negative links) and unbalanced ((i.e. with an odd number of negative links) triads, respectively, as a function of the relative strength of positive interactions to that of negative ones, α, and the inverse temperature, β, for two different numbers of independent opinions: (a) $G = 9$ and (b) $G = 27$. Results are averaged over 100 runs on ring networks with mean degree $K = 8$ and the number of nodes $N = 1000$.

References

1. Heider, F.: Attitudes and Cognitive Organization. Journal of Psychology 21, 107 (1946)