

The Heider Balance and the Looking-Glass Self

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We consider the dynamics of symmetric interpersonal relations which leads to balanced states in a fully connected network. Here this approach is applied to directed networks of N actors with asymmetric relations, and it is generalized to include self-evaluation of actors, as in the 'looking-glass self' theory [1]. The dynamics proceeds according to the equation [2]:

$$\frac{dx_{ij}}{dt} = (1 - x_{ij}^2) \sum_{k \in [0, N] \setminus \{i, j\}} x_{ik} x_{kj}$$

where $x_{ij} = \pm 1$ expresses positive/negative relation of actor i towards actor j , and k denotes other actors. In accordance with the above formula, once i is friendly towards k and k is friendly towards j or both these relations are hostile, the product $x_{ik} x_{kj}$ is positive and contributes to an increase of x_{ij} in time. On the other hand, if k is friendly to i but i is an enemy of k (or the opposite), this product is negative and contributes to a decrease of x_{ij} .

For asymmetric relations, we obtain new sets of stable but unbalanced configurations. Taking the Sampson data [3] as initial values of x_{ij} , we reproduce some of these configurations.

A new index F of self-acceptance is proposed - the relation of an actor to him/herself is positive, if the majority of his/her positive relations to others are reciprocated, which can be expressed mathematically as:

$$F_i = 0.5 \sum_k (1 + x_{ik}) x_{ki}$$

In our stable configurations of relations obtained under the above dynamics, the self-evaluation of some actors is negative. This result allows to identify these actors from sociometric data, as those in [3]. Except for data scientists, the results can be of interest for teachers and class tutors.

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References

- [1] Cooley C.H., (1964) Human Nature and the Social Order. Schocken Books, New York.
- [2] Krawczyk M.J., Wołoszyn M., Gronek P., Kułakowski K., & Mucha J., (2019) The Heider balance and the looking-glass self. *submitted* (arXiv:1903.12464).
- [3] Sampson S., (1969) Crisis in a cloister. *unpublished doctoral dissertation*. Cornell University.