HOMEWORK CLASS 16

On Class 16 we've talked about strategic models. Strategic models, contrary to random models, consist of models to generate networks which involve choice instead of chance, each agent choses to connect or not to connect on the network according to the utility gained with that connection.

"Network structures play an important role in the organization of some significant economic relationships. Informal social networks are often the means for communicating information and for the allocation of goods and services which are not traded in markets. Among such goods one can mention not only invitations to parties and other forms of exchanging friendship, but also information about job openings, business opportunities, and the like. In the context of a firm, the formal network through which relevant information is shared among the employees may have an important effect on the firm's productivity. In both contexts, the place of an agent in the network may affect not only his or her productivity, but also his or her bargaining position relative to others and this might be reflected in the design of such organizations.

The main goal of this paper is to begin to understand which networks are stable, when self-interested individuals choose to form new links or to sever existing links. This analysis is designed to give us some predictions concerning which networks are likely to form, and how this depends on productive and redistributive structures. In particular, we will examine the relationship between the set of networks which are productively efficient, and those which are stable. The two sets do not always intersect. Our analysis begins in the context of several stylized models, and then continues in the context of a general model."[1]

In the attached Netlogo file you will find an implementation of the 'Connections Model' proposed in the Matthew O. Jackson and Asher Wolinsky paper cited above. Please consult the info tab of the model to check is functioning.

In the same paper, the authors propose a different model named 'Co-authorship Model' in which the utility for each agent is given by:

$$u_i(g) = \sum_{j:\, ij \in g} \left[\frac{1}{n_i} + \frac{1}{n_j} + \frac{1}{n_i n_j} \right] = 1 + \left(1 + \frac{1}{n_i} \right) \sum_{j:\, ij \in g} \frac{1}{n_j},$$

Where n_i and n_j are the number of neighbours of agent I and j.

The task of this homework is to substitute the 'calc-utility' procedure of the Netlogo model file and verify the proposition 4 of the paper:

"Proposition 4. In this co-author model:

(i)   if N is even, then the strongly efficient network is a graph consisting of N/2 separate pairs, and

(ii)   a pairwise stable network can be partitioned into fully intraconnected components, each of which has a different number of members. (If m is the

number of members of one such component and n is the next largest in size, then $m > n^2$.)" [1]

(1) Jackson, M. O., & Wolinsky, A. (1996). A strategic model of social and economic networks. Journal of economic theory, 71(1), 44-74.

See also the slides for Class 16

Please return the result in a modified Netlogo file plus any text you would like to return.