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Short Communication

A Simple Framework for Modeling Collective Action Based on Complex Network Theories

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The institutionalized status differences have created systemic disparities between diverse social groups. In this case, people may tend to take collective action to challenge the inequality or injustice [1], as illustrated in strikes of disadvantaged individuals and protests against the American invasion to Iraq, or collective action of vulnerable groups to ask for their lost rights. Collective action is concerned by both governments and scholars, and various frameworks have been proposed to explain the collective action participation. For example, Relative Deprivation Theory (RDT) claims that individuals will experience anger and take actions when they are relatively deprived [2-4]. Social Identity Theory (SIT) indicates that the group identification may predict the likelihood of individuals' behaviors in social change decisions [5-7]. And Resource Mobilization Theory (RMT) states that collective action occurs only when people believe they possess the resources to sponsor an effective protest against the inequality or injustice [8,9]. Despite of the various frameworks explaining the collective action participation, two points can be concluded from those theories: social interaction plays an important role in gathering individual action; collective action is not the linear accumulation of individual action but the evolved result embedded in an integral environment. However, the mechanism to explain how the individual action formulates to a collective action still needs for further research, because an integrity structure with complexity and dynamics can hardly be restored by its sub-unit attributes [10]. Granovetter [11] proposed a similar conclusion that at the micro level, the accurate data and rich theories provide us enlightened ideas about interactions in small groups but how the interactions evolve massive actions has always puzzled us. By the analysis of dynamic models of segregation, Schelling [12] also pointed out that it is hard to predict the result of individual action and social interaction in small groups. This phenomenon can be explained by the complexity of collective action, such as randomness and instantaneity, making it difficult to reproduce the process, collect data, and build a statistical model, which leads to the traditional single-discipline method being difficult to meet the research of the evolution of collective action.

Complex network bridges the gap between the microscopic and macroscopic researches and provides a new perspective for the analysis of collective actions. It not only corresponds to contemporary theory of social governance, but also helps identify the inherent mechanism of the formation of nonlinear systems [13]. On the one hand, the characteristics of social groups, such as networking, diversification and self-organization, require new explorations on the mechanism, prediction and control of collective action with systematic, dynamic and complex thinking [13]. On the other hand, the interactions between individuals and its integral structure emphasized by complex network system are keys to explore the collective action. Theoretically, applying complex network theories into the exploration of collective action can not only extend the theory of collective action, but also promote the application of complex network theories.

Here, a simple framework for modeling collective action based on complex network theories is proposed as shown in figure 1. Social networks consist of nodes and edges, which represent individuals and relationships or interactions between these individuals respectively. Meanwhile from a macro perspective,

these nodes and their relationships form an integral structure that reflects the characteristic of the group behavior. Based on these three different network elements, three gathering modes corresponding to node, edge and structure can be summarized respectively. First, the node gathering is defined as individual action evolving to the collective action based on some specific individual attributes. Schelling's segregation model (1971) is one of the typical models, which assumes that an individual decides whether to move to other places according to his and his neighbors' attributes. McPherson's [14] proposed "homophily" principle can be also used to explain the node gathering, which denotes that individuals with the same attribute are more likely to be connected with positive relationships. To sum up, many reasons for collective actions or social dynamics can be attributed to the node attribute. Second, the edge gathering is individuals gathering into groups based on relation attributes. Actually the relationship can be typically classified as positive relationship denoting friend or cooperation and negative relationship denoting enemy or defection, and the network consisting of both positive and negative edges are called signed networks [15]. Based on this relationship attribute, individuals connected by positive edges gather into a same group, while keep far away with those connected by negative edges, and then the network will form a new gathering structure. This process is consistent with the theory of structural balance [16,17]. Structural balance has explained the dynamic evolution of network structures from a psychological perspective, which can be used to explore the evolution of collective action. Third, the structure gathering is discussed mainly related to the network density. Many scholars have focused on the importance of community structure on exploring collective action from this gathering aspect [13,18]. As an important branch of complex network theories, community structure theory which reflects the network gathering structure can support the exploration of collective action.

Based on the special paradigm of complex networks, we would like authors contribute their efforts on the innovation and application of network models in the new issue, and the research with the analysis of empirical data will be welcomed.

Figure 1: Framework for modeling collective action.

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