12. Analyzing Norm Emergence in Communal Sharing via Agent-Based Simulation

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This paper describes an agent-based simulation study on the emergence of norms on information communal sharing. To carry out the study, we utilize our simulator TRURL, which (1) contains software agents with decision making and communication functions, and (2) has the capability to evolve artificial societies with specific characteristics defined by a given objective function to be optimized by genetic algorithms. Unlike the literature in social psychology research, which mainly applies evolutionary game theory to homogeneous agents for the simulation, TRURL focuses on the decision making behaviors of heterogeneous agents. Our experimental results have suggested that, contrary to the results of social psychology study so far, for information oriented properties, free riders in the society will not collapse the norm of communal sharing of the properties.

12.1 Introduction

A norm in a society generally means expected behaviors of the members, decision criteria of the members, and/or the evaluation criteria that the society expects. Norm constitutes social pressures to conform people in a group. There are various levels and forms among public and private norms. Examples of such norms are (1) customs resulting from daily repeated behaviors, (2) morality as criteria of right and wrong, and (3) the law as public forces.

In this paper, we will focus on a communal sharing norm. By the communal sharing norm, we means that people share their resources together. Such sharing of resources plays an important role as a reciprocal norm in human behaviors. Communal sharing encourages us to maintain human relations and closeness [12.1]. The resources for communal sharing include money, physical properties, services, love, social approval, and information [12.2]. Recent rapid development of the Internet has widely changed our society characterized by information networks. Based on the viewpoint, this paper analyzes the birth, growth, and stability of communal sharing of information resources in a society.

To carry out the study, we adopt an agent-based simulation model. Agent-based models can usually find macro phenomena from the interactions among agents. Although a model designer knows functions and natures of agents, (s)he doesn’t know what phenomena would happen as a whole during the simulation. Contrary, in the following aspects, our agent-based model is different from conventional macro models to analyze social phenomena. Our
approach is characterized by the facts that: (1) the simulation model consists of heterogeneous agents, which have functions of decision-making and communication; (2) we observe emergence of social phenomena as a result of optimization of a social macro index by genetic algorithms; and (3) we analyze the emergent phenomena and characteristics of each agent.

This paper is organized as follows: We first discuss several existing norm studies so far. Then, we briefly describe our simulator TRURL and apply it to the analysis on the communal sharing norm. Finally, we state the effectiveness of our agent-based simulation model.

12.2 Related Work on Studies of Norms

Norms include personal norms and group norms. They can prevent someone from doing deviant behaviors through rewards and punishments in order to reduce tensions in a group. Norms urge people to conform to common judgments and behavioral patterns. Norms are predominant means to control a society and/or firms. We classify studies of norms into the following areas.

*Economic institution analysis.* Economic institution analysis usually utilizes evolutonal game theory. Researchers on the area have discussed the emergence and stability of diverse economic institutions [12.3, 12.4, 12.5]. Their basic technique, evolutonal game theory analyzes economic institutions based on the concept of Evolutional Stable Strategy (ESS). Using the concepts, they have described the stability of economic institutions, the path dependency, and the complementarities of institutions. Aoki[12.6] has found two institutions of corporation systems as equilibrium points of the evolutonal game. Their approach is applicable to analyze the emergence and stability of economic institutes about norms, however, they do not consider dynamic interactions among agents nor mutual understanding about agents’ inside models.

*Social network.* In social network research, graph theory is often used. A center of an organization and a hidden relation among members are discussed using graph theoretic mathematical models [12.7]. In a network structure and a protocol analysis of electronic communities, socio-metric measures such as a degree of leadership existence have been proposed. They show birth, growth and maturity of norms in electronic communities.

*Social psychology and cognitive science.* In social psychology, norms of human behaviors have been investigated with various data of psychological experiments. Processes to form norms have been analyzed experimentally in terms of leadership [12.8], the effects of group pressure [12.9], and the influence of a consistent minority [12.10].

Intolerant members who show an attitude of refusing resource sharing are critical barriers for the free riders. The experimental results have shown that