Chapter 5
From Virtual to the Simulated World:
An Agent-Based Model of Friendship Network in Second Life

Sadaf Alvi
University of Karachi, Pakistan

Shah Jamal Alam
University of Michigan, USA

ABSTRACT

Second Life is a virtual world that allows users to engage in various social activities, meet friends, form communities, attend events of interests, and trade online with other users represented through their virtual 3D avatars. For social and behavioral scientists, this provides an opportunity to investigate the dynamics of social interaction and formation of interpersonal and group affiliation ties. We present a prototype agent-based model that takes into account a number of qualitative and quantitative studies of social networking in Second Life. Initial results concerning friendships and acquaintance ties are reported.

INTRODUCTION

Understanding social systems and the dynamics of empirical social networks has always been a challenge for social ethnographers (Schensul et al., 1999). For ethnographers and social networks researchers, acquiring relational data about actors and their ties (such as friends, advice networks or social clubs) could be challenging. While gathering such data is both time consuming and expensive in many situations, relevant issues such as the 'boundary-specification' problem can affect the conclusions drawn from the analysis of such networks (Degenne and Forsé, 2003). The boundary-specification problem as posed by Niklas Luhmann refers to the task of specifying inclu-

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sion rules for actor or relations in a network study (Kossinets, 2006). In practice, inferences drawn from the analysis of such empirical networks are not taken back to the original respondents or validated against the target system.

Recent technological advances coupled with the availability of faster and cheaper internet services have opened new research frontiers and challenges for social and behavioral scientists in understanding human social interaction in the cyberspace. The tremendous increase in the use of social networking sites in the last few years has not only linked millions of people around the global but have also accelerated the advancements in the development of communication devices such as 'smart phones'. On the other hand, having millions of subscribers imply that the social networking sites have to make relentless efforts in scaling up their servers and back-end databases in order to minimize risks such as outage or system unavailability. Managing 3D virtual sites is a further challenge in terms of fast and interactive rendering of the virtual world as well as requiring fast internet and powerful computers at the client side. The enormity of demographic, social networking data of the users has also tremendously increased the challenges for computer scientists developing tools of knowledge discovery and data mining techniques. It is also challenging for the social and behavioral scientists to analyze similarities and differences in social networks of online communities and the 'traditional' social networks (e.g. friendship networks) from the real world (Pfeil et al., 2009; Pollet et al., 2010; Subrahmanyam et al., 2008; Wellman, 2004).

In contrast to online social networking communities, (3D) virtual worlds provide the environment where real actors participate through their 'alter-egos' or *avatars*. Individuals may wish to keep their identity hidden and/or interact with other avatars similar to the real world. For example, in the massively multiplayer role-playing game *World of Warcraft*[1] *(WoW)*, people can make alliances, join hands on common objectives, have friends and foes and build ties that may change in the passage of time. Linden labs™' virtual world Second Life[2], provides a much more general environment for individuals to socialize, trade and build their own spaces inside the virtual world. Whereas in the real world, there is a dearth of offline social networks data, in particular, longitudinal data, logs of all activities of avatars and events in these virtual worlds open up the opportunities for social and behavioral scientists to test theories concerning generalized exchange, norms, friendship ties, trust and reputation (c.f. Bainbridge, 2007; Krotoski, 2007). As we discuss in the following section, Linden Labs have shared users' interaction data to researchers interested in studying social interaction in online communities and virtual worlds. This allows researchers to conduct ethnographic and social network studies within Second Life as well as to study users' behavior by analyzing data over a given time period using data mining techniques and statistical methods (c.f. Bakshy et al., 2010).

Social systems are sources of complexity in themselves in the sense that interactions between individuals can give rise to unexpected and unpredictable behavior at the macro level. One way of understanding the interplay of such interactions is through simulating some aspects of the target system, whether it is from real or a virtual world. Agent-based social simulation is a modeling technique that is suitable for analyzing such systems, by capturing individual behavior and observing the generated behavior at the macro level (Gilbert & Troitzsch, 2005; Epstein & Axtell, 1996). In contrast to traditional 'top-down' modeling, agent-based modeling is developed in a 'bottom-up' fashion, i.e. the behavior and the processes are specified at the entities' level (Davidsson, 2001). While agent-based models have had a long history of application to real world social systems, simulating and understanding social dynamics in virtual world using agent-based models is scarce. There has been a growing interest, however, in the agent-based modeling and simulation of prefer-