Chapter 18
Multiagent Social Computing

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ABSTRACT

This article provides a framework for extending social networks to social computing. When people join social networks, such as Facebook and discussion groups, their personal computers can also join the social networks. This framework facilitates sharing of computing resources among friends and groups. Computers of friends and groups act autonomously to help each other perform various tasks. The framework combines many key technologies, including intelligent agents, multi-agent system, object space, and parallel and distributed computing, into a new computing platform, which has been successfully implemented and tested. With this framework, any person will have access to not only the computing power of his or her own personal computer but also the vast computing power of a community of computers. The collective capabilities of humans and computers working in communities will create complementary capabilities of computing to achieve behaviors that transcend those of people and computers in isolation. The future of computing is moving from personal computers to societies of computers.

INTRODUCTION

This article extends the concept of socially intelligent computing to provide a framework that facilitates sharing of computing resources among people in communities. When people joins online communities, such as social network sites (e.g., Facebook, Myspace, and Orkut), discussion groups, Wikipedia, or cloud computing sites, their personal computers can also join the communities. This framework provides system design processes, methods, and tools to harness the collective capabilities of humans and computers. Large number of computers working together and helping either other in the communities creates new collectively intelligent systems. Any people
on the Internet can join computing communities and so does any networked computers, creating social computing systems ranging from few persons to an Internet-scale cloud of machines and people. The collective capabilities of humans and computers working in communities will create complementary capabilities of computing to achieve behaviors that transcend those of people and computers in isolation (National Science Foundation, 2010).

Current researches on parallel and distributed computing and grid computing attempt to employ a very large number of computers to solve very large computing problems. These researches focus solely on computing speed. They partition a very large computing problem into small pieces, send each piece to be computed by a computer, and then wait for all the results. This centralized control method of computing simply ignores the problem of collaboration between computers. On the other hand, current researches on distributed file sharing based on peer-to-peer networks attempt to allow every person to share his/her files and storage spaces through a decentralized network. This distributed file sharing method facilitates sharing of storage spaces but ignores the needs to share computing power.

Our projects attempt to create a platform for computers themselves to collaborate with each other to share computing power. In this platform, computers can help each other both in term of running applications and providing computing power. If a person needs to complete some tasks that are not capable on his own personal computer, his computer will ask other computers for help. His computer makes requests to other helping computers, which complete the required computations and return the results back to his computer. If a person working on certain job needs more computing power, her computer will ask other idle computers for help. Any person using a computer will have access to not just the computing power of his/her own computer but also the vast computing power of a community of computers.

Our projects combine many key technologies, including parallel and distributed computing, intelligent agents, multi-agent system, object space, and multicast protocol, to form a unified computing platform. The platform should require minimal user involvement and system administration. To achieve this, our projects extend the notions of intelligent agents (Plekhanova, 2002) and multi-agent system (Shamma, 2008; Dignum, 2009) to conceive of a computer as a whole including its software and hardware as an active agent. A computer acts autonomously like a person in a community. Computers, having various abilities and workloads, join together to form workgroups where they can help each other both in terms of the abilities and the workloads. This in turn requires a share place for the computers to communicate with each other. To achieve this, our projects extend the concept of Object Space to become an Active Space, which can function as a rendezvous, a repository, a cache, a responder, a notifier, and a manager of its own resources. This further requires a computer to be able to broadcast its requests to some or all computers in the workgroup. To achieve this, our projects use multicast network protocols for the communication.
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