

Title	Analysis of Behaviors of Mobile Agents in Agent-Based Network Applications
Author(s)	Wenyu, Qu
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Description	Supervisor:Hong Shen, 情報科学研究科, 博士

Abstract

Mobile agents technology has been a popular topic in the area of information engineering for several years. Lots of expectations have been laid on them, but large-scale usage of agents is still waiting. One of the main reasons for the immaturity of agent technology is that we have not been able to make it effective enough to meet the strict requirements put on it. This dissertation addresses the problems of what affects the performance of agent-driven networks and how to improve the network performance. In detail, we analyze some key parameters for characterizing the behaviors of mobile agents, such as population distribution, probability of success, migration time, life expectancy, and propose new effective models based on the analytical results. The main contributions of this dissertation are outlined as follows:

- We address the problem of mobile agent-based network routing. Several routing models and stochastic analysis are presented. We first focus on the traditional ant-like routing algorithm, analyze both the population distribution and the probability of success as two important parameters for measuring the network performance. Based on our analytical results, we proposed several agent-based routing strategies for improving the network performance and presented relevant analysis. We also extend our solution to solve the problem of mobile agent-based e-shopping. Extensive simulation experiments are conducted to evaluate our proposed solutions over a wide range of performance metrics in comparison with existing solutions proposed in the literature.
- We address the problem of fault-tolerant execution of mobile agents. we propose a new fault-tolerant execution model of mobile agents, which effectively combines the replication approach and the checkpointing approach. The behaviors of mobile agents are statistically analyzed through several key parameters, including the migration time from node to node, the life expectancy of mobile agents, and the population distribution of mobile agents, to evaluate the performance of our model. We compare the performance of our solutions with other solutions over various performance metrics through extensive simulation experiments. The simulation results show that our solutions outperform existing solutions proposed in the literature.
- We address the problem of agent-based peer-to-peer networks. We consider the problem of traffic congestion when agents roaming in the network and propose a new agent-based model which can balance the network traffic. We also prove the convergence of the approximating function to the optimal solution and analyze the properties of the approximate function to show the rationality of our algorithm.