Development Support of Learning Agent on Repository-Based Agent Framework

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ABSTRACT

Agent-oriented computing is a technique for generating an agent that operates autonomously according to behavioral knowledge. Moreover, an agent can have a characteristic called “learning” skill. More efficient operation of an agent can be expected by support an agent designer who designs and develops an agent equipped with “learning” skill. The authors propose a design support mechanism of a learning agent on a repository-based agent framework called the DASH framework. The proposed mechanism enables an agent designer to design and implement the learning agent without great expertise, thereby reducing the designer’s burden. Herein, they explain the DASH framework, Q-Learning, and the proposed design support mechanism. Moreover, the authors demonstrate the effectiveness of the proposed method using some experiments.

Keywords: Agent-Oriented Computing, DASH Framework, Learning Agent, Q-Learning, Repository-Based Agent Framework

1. INTRODUCTION

In recent years, network services have developed greatly along with the rapid spread of the internet. The importance of the network service in a society in which we are surrounded has risen. User’s needs are diverse. Moreover, they change frequently based on the advent of new service and updates of existing services. Therefore, the necessity has risen for development of a flexible system that performs automatically. Some researchers are now particularly addressing agent-oriented software computing as a means to achieve a flexible system.

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Agent-oriented computing is a technique for generating agents that operate autonomously by adding a function to the object to change their own parameters and procedure responding to the environment. Moreover, an agent can study the best action from results of past actions. These characteristics are called “Learning” skills. More efficient operation of agents can be expected by realizing a “Learning” skill.

In this research, our aim is to support an agent designer who designs and develops the agent equipped with “Learning” skill. We propose a design support mechanism of a learning agent on a repository-based agent framework called DASH. The proposed mechanism enables an agent designer to design and implement the learning agent without high expertise. Therefore, we can dramatically reduce the designer’s burden.

As described in this paper, we first explain the DASH framework (Fujita, Hara, Sugawara, Kinoshita, Shiratori, 1998; Hara, Sugawara, Kinoshita, & Uchiya, 2002; Sugawara, Hara, Kinoshita, & Uchiya, 2002) and Q-Learning as the assumption knowledge. Next, we illustrate the design support mechanism, which provides some functions to develop the learning agent. Finally, we verify the effectiveness of the proposed method through some experiments.

2. DASH FRAMEWORK

In this research, the Distributed Agent System based on Hybrid architecture (DASH) framework, which is the newest version of distributed agent framework we have developed, is used.

2.1. Overview

The DASH framework is the latest repository-based multi-agent framework developed by our research group (Figure 1). The essential functions of this framework can be summarized in Figure 1.

Figure 1. DASH: Repository-based multi-agent framework
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