Chapter 4

Personalized Content Representation through Hybridization of Mobile Agent and Interface Agent

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ABSTRACT

Mobile agent has an ability to co-operate with heterogeneous network environment. There are specific predefined techniques to impart mobility to an agent. As a result, the agent behaves only in predefined way. To impart other features beside mobility that helps in interfacing the destination network to complete the intended job, a mobile agent need to be incorporated with additional functionalities. One of such functionalities is ability to access local user profiles, preferences, and other resources as well as other local agents to present information in user’s context. To meet this demand, hybridization of mobile and interface agent that facilitates development of customized application is discussed in this chapter. The multi-agent architecture, described in this chapter, encompasses this hybrid agent to access user profile and fuzzy indicator matrix. Both the profile and matrix are further utilized to construct content preference list according to users’ perspectives. The indicator matrix enlists typical interest and preferences of a group, such as purpose of surfing/using the system (research, teaching, learning, problem solving, etc.); level information needed (highly technical, conceptual, mixed, etc.), media preference (type of document such as text, code, video, etc.). The system is designed as multi-tier structure called resource tier, service tier, and application tier to provide resources, third party services, and application support to learners, instructors, and administrator groups. The chapter utilizes the proposed generic multi tier architecture for a personalized learning (p-Learning) system and discusses its design in detail including working of different agents, mobility and ticket management, user profile structure, and risk management policies. The chapter concludes with discussion on results and future research directions.
INTRODUCTION

The expectation from society and industry towards Information and Communication Technologies (ICT) is always increasing. In the situation where the application scope covers more than one domain areas, Multi Agent System (MAS) offers adequate solution. MAS is nothing but a consortium of multiple agents with diverse functionalities to carry out different tasks. MAS encompasses different agents such as collaborative agent, interface agent, query agent, and mobile agent. A mobile agent has ability to move to different destinations. Like all other agents, the mobile agent possesses virtues of autonomy, co-operation, and learning along with the mobility. These agents need to travel and execute in heterogeneous networks. For this purpose, they need to interact with local network resources and agents. However, it is not advisable to embed the presentation, preference, and other resource information into the mobile agent itself for the two basic reasons, network load and flexibility. Though the agent mobility does not require continuous network connectivity, Embedding additional content may increase the load. At the users side the requirement and preferences are continuously changing. There is a requirement of having an interface utility that keeps track of local resources, user preferences to present information in a customized way. As it is not feasible to embed such information into a mobile agent itself, the information is kept at receiver/local level. However, a generic logic to access the information can be added into the mobile agent. Agent with the mobility mechanism and interface capabilities can meet the purpose. This chapter introduces hybridization of mobile and interface agent to get dual advantages.

The chapter elaborates fundamental topics in its preliminary sections and discusses the aforementioned hybridization. Section on Agents discusses introductory concepts of agents which includes characteristics and typology of agent. Agent should be blessed with artificial intelligence techniques to enhance its characteristics like autonomy, co-operation, and learning. Section on Multi-Agent Systems briefly introduces basic concepts of multi-agent systems and their characteristics along with work done. The generic layered architecture of typical multi-agent systems is proposed in this section. The architecture encompasses tiers like repository tier, service tier, domain agent tier, and control and presentation tier. The proposed p-learning system discussed in further sections utilizes this architecture. Further sections highlight agent communication, standards, tools, and protocols. After introducing these introductory concepts, next section discusses mobile agent systems consisting of characteristics, major mobile interactions, and life cycle of a typical mobile agent. This section also introduces mobility mechanisms considering weak and strong mobility of agents giving code segments for repetitive jobs. The section concludes by providing advantages of the mobile agent technology. Succeeding sections introduce user interface agents and discuss a hybrid agent by hybridizing mobile and interface agent technologies by providing need and advantages of such hybridization. A case of p-Learning which is a customized form of learning called personalized learning is discussed further. The architecture for the proposed p-Learning system is described in detail. The resource, service, and application tiers are also described and discussed. Each tier provides services to different user groups like administrator, instructors, and learners. The chapter concludes with discussions on advantages and disadvantages of the system along with future expansion in the area of mobile computing and p-Learning.

AGENTS

Agent is an entity that works on behalf of its user to carry out intended tasks in a given domain. Agent can be a software program, hardware embedded with software instructions or human. Agents used