ABSTRACT

In today’s dynamic network environments like smart cities, information evolves in distributed resources and in different forms or modalities. An agent or a system that wants to be actively part of this evolution has to be interactive, adaptive, autonomous and intelligent. The paper presents a new version of a distributed model-framework (called Demos) based on autonomous, intelligent agents with anticipatory responses. The first version of the system was proposed by Mertoguno (1998), and the new features (LG Graphs, SPNs and NNs) were embedded in the version presented here. The Demos model is mainly based on the development of an adaptive distributed knowledge base system. Knowledge is represented in a form of frames with internal stochastic Petri-net graph for local representations (KR). A major advantage for the Demos model having a distributed (possibly across the net) is the adaptive knowledge base. Here the authors present the design of an adaptive knowledge model and its challenge, which lays principally on how to learn new knowledge by synthesising SPN forms, and how to develop anticipatory responses at an agent’s site. The development of the Demos prototype has a great range of applicability, such as in autonomous negotiating teams, autonomous distributed units for energy efficient distribution, autonomous multiple mobile robots space exploration and maps generation, autonomous intelligent information agents (WWW), automatic information synthesis and fusion, etc. Here the authors have used this model for management of the electric power on a grid of a smart city.

Keywords: Adaptive Distributed Knowledge-Base, Autonomous Multi-agent Systems, Natural Systems, Neural Nets, Stochastic Graph KR, Stochastic Graph KR for the Electric Grid-Smart Cities

DOI: 10.4018/IJMSTR.2014100105
1. INTRODUCTION

In complex scientific environments, high performance distributed computations and autonomy are the main characteristics for successful experimentation. Examples of such environments are autonomous negotiating teams (ANT) (Rubenstein-Montano & Malaga, 2002; Penamora & Wang, 1998; Rangaswamy & Shell, 1997; Young, 1975) using genetic algorithms, distributed autonomous units of energy (DAUE) (Tsoukalas & Uhring, 1997; Tsoukalas, 1997; Alamaniotis et al., 2014), autonomous multiple robots (AMR) (Bourbakis, 1997; Bourbakis & Findler, 2001), WWW intelligent information agents (Mertoguno 1998; Finin, 1995; Maturana, 2005), etc.

An important goal in computational science & engineering is to develop a unified environment where experimental and computational models can interact with and complement each other in the problem-solving environments. Such as known environments have been described as Distributed Autonomous Agents (DAA) for problem solving environment (Blake, 2003; Lawton & Domsak, 2004; Lau & Zhang, 2003; Charton et al., 2003; Szer & Gharipuil, 2004). Another important characteristic of the DAA environment is its ability to access information. Information of all kinds, including that, which was traditionally published in archival journals or conference proceedings, is increasingly available on line. Besides being concentrated in traditional repositories such as libraries, such information is also increasingly distributed, residing in workstations and computers belonging to individual researchers or research groups, and linked together to form an infosphere. The World Wide Web (WWW, Web) is an example of such a system. A DAA is thus an environment that provides all the computational facilities necessary to solve a target class of problems. These features include advanced solution methods, automatic or semiautomatic selection of solution methods, and ways to easily incorporate novel solution methods. Moreover, DAAs use the language of the target class of problems, so users can run them without specialized knowledge of the underlying computer hardware or software.

Scientific computing systems are becoming increasingly ubiquitous. While one component of the developed ubiquity involves computers that are mobile and connected over wireless links, another equally important aspect is that everyone can use them. In other words, ubiquity aims at bringing computers everywhere, and for everyone. This requires that systems be easy to use, and that interaction with such systems follows an indirect management, rather than a direct manipulation, approach. In order to develop adaptive-dynamic systems that are truly easy to use, DAAs need to provide the user with a high level abstraction of the complexity of the underlying computational facilities. The user is not expected to be knowledgeable in selecting appropriate numerical, symbolic and parallel systems, along with their associated parameters, that are needed to solve a problem. One of the main goals of these DAAs is to assist the user in carrying out the numerical solution of mathematical models and analyze their solutions. Depending on the mathematical characteristics of the models, there are “thousands” of numerical methods to apply, since very often there are several choices of parameters or methods at each of the several phases of the solution. On the other hand, the numerical solution chosen must satisfy several objectives, primarily involving error and hardware resource requirements.

An adaptive distributed knowledge base system is a system that has the ability to evolve its knowledge according to its environment (Tanimoto, 1990; Giarratano & Riley, 1994). A multi-agent system (Holland, 1995) is one of the models, which can be used to build an adaptive knowledge base. In this paper a Distributed, Autonomous Intelligent Agents Model (Demos) is proposed and its design is based on the Multi-Agents theory. The Demos prototype is mainly based on the development of an adaptive knowledge base system. In the approach presented here, the adaptive knowledge base evolves its contents actively, by interaction with its environment and among agents, as
Emotional Prediction and Content Profile Estimation in Evaluating Audiovisual Mediated Communication
www.igi-global.com/article/emotional-prediction-and-content-profile-estimation-in-evaluating-audiovisual-mediated-communication/133283?camid=4v1a