Chapter 12
Model Based Approach for QoS Constrained Communication and Data Integration among Multiple Agents

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ABSTRACT

Meeting the agreed quality of service in a resource crunched data network is challenging. An intelligent element is required to carry out the activities involved. The inferences drawn with different rules need to be merged. Agents are useful for handling this responsibility in data networks and help in resource sharing. An agent is basically an entity that can be viewed as perceiving its environment through sensors and acting upon its environment through effectors. To handle the network traffic, the agents acquire the traffic status and provide the information on the availability of resources to the source of the traffic. Hence the study on agent communication has become important. Intelligent agents continuously perform the activities including perception of dynamic conditions in the environment, reasoning for interpretation of the perceptions, solve problems, draw inferences and determine actions.

INTRODUCTION

The Data getting exchanged among the distributed agents, that broker for computation or storage, often create problems up on integration with rest of the system, partly because it fails to meet the service quality constraints and partly because it fails to get updated at the right time.

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Multiple agents are extremely used in applications involving distributed databases, smart user interfaces, world-wide web, mobile computing, distributed design and manufacturing, information gathering, decision support (using heterogeneous distributed data and knowledge sources), open systems, collaborative computing etc. In all these application, substantial data gets exchanged over the network resulting on the congestion. Agents driving
these applications are to handle the utilization of the resources optimally and avoid the network getting in to congestion.

In this chapter the problem of quality based data exchange among the agents and data integration from multiple agents will be addressed. A probability of data loss or corruption will be associated with each agent and it changes dynamically with time as the data encounters any queue or dependency in the journey across the different agents. Specifically when the agents have to work on the shared resources, they need to fall in the queue. This resembles a distributed computing scenario.

At the destination, the agent will predict the trends in this feedback signal ‘k’ steps in advance and uses this information for controlling the size of the data originating from the source agent.

The shifted feedback information may be used to achieve some quality of service (QoS) deadlines such as the absolute delay guarantee, fraction of the data lost etc. Simulation results prove that the usage of shifted signals can reduce the data loss, resource requirement and improve the service quality in terms of overall successful operations in a given time.

The trend analysis will be done by an intelligent element. Although conventional neural networks can be used for this task, they suffer with two major drawbacks. Firstly, the training period is too large and it may not be possible to provide the requisite data. The second drawback is that of a large prediction error. In this work, a modified architecture called differentially fed artificial neural networks (DANN) has been made use. It overcomes both of these drawbacks. Here, a portion of the output is tapped, differentiated many times and used as the additional input. The new architecture comes with a wagon of interesting properties that are made use here.

**BACKGROUND**

The present day network traffic supporting the multimedia data with different QoS constraints have to be routed across the network in real time. Conventional techniques cannot catch up the fluctuations in the traffic making it necessary to use an intelligent element to memorize the changes. A comparison of different techniques used for providing the QoS is discussed in (Manjunath, R., & Shyam, V., 2008). Although a feedback based controller such as random early detection (RED) provides the congestion status information (Hollot, C., Misra, V., Towsley, D., & Gong, W, 2001) to the data source to alter the transmission rate subsequently, the technique is less adaptive for the fast changing network traffic. Hence, intelligent elements are required to predict the traffic in advance to provide sufficient time for the sources to act.

Neural networks exhibit massive parallelism making them ideal for real time applications. In any system making use of neural networks, when such an element is transferred to silicon the resources such as Buffer size, speed of decisions, area of the associated circuitry etc put stringent constraints making the algorithms of implementation competitive.

The traffic controller proposed here is based on the agents that implement a broker based model. The algorithm employs neural networks to compute desired transmission rate of the source in order to prevent congestion in the subnet. Obtained results prove that the neuro-computing approach is better than the conventional one. This is possible because of the unique learning and memorizing capabilities of the neural network based on the previous experiences.