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Neural Network Based Priority Assignment for Job Scheduler

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Abstract

This paper describes the design and implementation of a neural network-based job priority assigner system for a job scheduling environment. Scheduling deals with the allocation of resources over time to perform a collection of tasks. Scheduling problems arise in domains as diverse as manufacturing, computer processing, transportation, health care, space exploration, and education. In the case of a neural network (NN) based scheduler, once the job attributes are properly trained for a specified schedule, it will never miss that related scheduling pattern for that particular job. An NN based scheduling procedure can successfully overcome the local minima of its error surface. This paper reports on research which established that a back propagation neural network-based priority procedure would recognize jobs from a job queue by estimating each job's priority. Once the priorities are assigned, it is not possible to alter the priorities under any circumstances.

Keywords: *Backpropagation, priority, queue, deadline, resource, processing time.*

Introduction

Scheduling refers to the act of assigning resources to tasks or assigning tasks to resources. One way to do this is to generate a timetable with explicit start times for each task in such a way that only one task at a time requests the resource. This is often called static scheduling or timetable scheduling. This is the way airliners schedule their flights. Another solution for scheduling is to assign numbers, called priorities, to the tasks and choose for execution the task with the highest priority. Scheduling decisions occur whenever there are more outstanding requests than the number of available resources. The exact priority assigned is unimportant; only the relative priority order is important because it determines which tasks are the highest priority ones. With scheduling based on priorities instead of a timetable, there is no loss of generality because if one can change priorities at any time and also have the option of introducing idle tasks, then one can emulate every timetable. There are many approaches used to find solutions to job scheduling problems. Dispatch rules have been used to solve job scheduling problems (Baker 1984). These rules lack a global view of the shop and they usually build up a large amount of bottleneck in a complex industrial situation. Fuzzy based scheduling allows the representation by fuzzy sets and linguistic variables and inference from vaguely formulated knowledge (Slany 1994). The main disadvantage is the tremendous computational effort that is needed to handle the complex industrial problems. Also, they need to maintain a huge fuzzy knowledge base (rules) which is a time-consuming process.

Inflexibility of the artificial neural network (ANN) in job scheduling was detected by (Zweben 1994) while investigating the use of neural network in optimization problems (Interante 1997). Apart from the priority assigner design, the intention of our research was to carryout certain studies to find out a suitable feed forward NN for job scheduling environment. The analysis used the famous backpropagation algorithm (Rao 1996) for testing various NN topologies.

The organization of this paper is as follows. After the introduction, the neural network selection section describes the various testing and simulations to find a suitable NN. Next, the priority assigner design section presents in detail the model of NN based priority assigner. After that, the testing section describes computer simulation of the assigner. Finally the conclusion section concludes this paper.