

PROJECT INTRODUCTION

Objectives

To explore ways of parallel/distributed computation via a simple parallel computing architecture for validated global optimal solutions to various problems.

Project Investigator / Manager

Wu Yong and A/Prof. Arun Kumar
Nanyang Technological University
wuyong@pmail.ntu.edu.sg
makumar@ntu.edu.sg

Period of Project

01 Jun 2004 – 31 Jul 2005

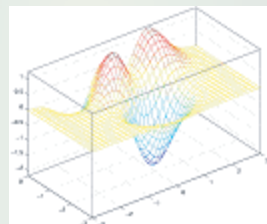
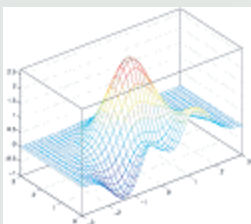
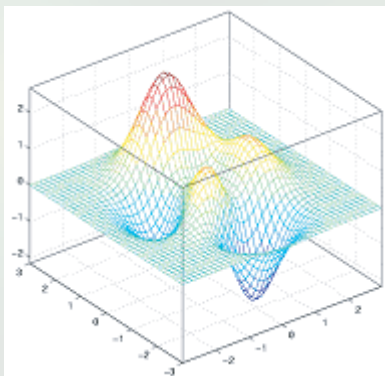
Abstract

By utilizing Interval Analysis, a decentralized parallel computation model is proposed for validated Global Optimization. Both the implementation of the model and the management of communication are easy to handle. The performance was tested within NGPP clusters.

PROJECT DETAILS

Description

Global Optimization using Interval Analysis normally employs the approach of branch-and-bound. The search space is divided into smaller sub-spaces recursively (branching), which in turn provide tighter and more discriminative bounds over different sub-spaces for assured sub-space disposal (bounding).



However, global optimization using interval analysis is a complex and computation-intensive approach, especially for high dimensional problems. Taking advantage of a large number of clusters and nodes over a Grid environment, the calculation can be greatly speeded up. Moreover, each individual processor can manage intervals in a decentralized way, which eventually reduces the data management complexity.

In the study, a parallel computation model is proposed. The novelty of the model is that there is no need to consider the problem of load balancing, and no need to design an initial decomposition scheme for problems under consideration.

The code executed over the Grid is written in C++ and the communication is carried out by MPI. The numerical experiments indicate that for most test problems, the model can achieve an almost linear speedup; sometimes, even super-linear speedup can be achieved.