Parallel wavelet-based clustering algorithm on GPUs using CUDA

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Abstract

There has been a substantial interest in scientific and engineering computing community to speed up the CPU-intensive tasks on graphical processing units (GPUs) with the development of many-core GPUs as having very large memory bandwidth and computational power. Cluster analysis is a widely used technique for grouping a set of objects into classes of "similar" objects and commonly used in many fields such as data mining, bioinformatics and pattern recognition. WaveCluster defines the notion of cluster as a dense region consisting of connected components in the transformed feature space. In this study, we present the implementation of WaveCluster algorithm as a novel clustering approach based on wavelet transform to GPU level parallelization and investigate the parallel performance for very large spatial datasets. The CUDA implementations of two main sub-algorithms of WaveCluster approach; namely low-frequency component decomposition of wavelet transform and connected component labeling are presented. Then, the corresponding performance evaluations are reported for each sub-algorithm. Divide and conquer approach is followed on the implementation of wavelet transform and multi-pass sliding window approach on the implementation of connected component labeling. The maximum achieved speedup is found in kernel as 107x in the computation of extraction of the low-frequency component and 6x in the computation of connected component labeling with respect to the sequential algorithms running on CPU.

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Misbehavior nodes detection and isolation for MANETs OLSR protocol

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Abstract

Intrusion Detection Systems (IDS) in Mobile Ad hoc Networks (MANETs) is required to develop a strong security scheme it is necessary to understand how malicious nodes can attack the MANETs. Focusing on the Optimized Link State Routing (OLSR) protocol an IDS mechanism to accurately detect and isolate misbehavior node(s) in OLSR protocol based on End-to-End (E2E) communication between the source and the destination is proposed. The collaboration of a group of neighbor nodes is used to make accurate decisions. Creating and Broadcasting attackers list to neighbor nodes enable other node to isolate misbehavior nodes by eliminate them from routing table. Eliminating misbehavior node(s) allow the source to select another trusted path to destination. The simulation results showed that the proposed mechanism is able to detect any number of attackers while keeping a reasonably low overhead in terms of network traffic.

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Predicting food demand in food courts by decision tree approaches

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Abstract

Fluctuations and unpredictability in food demand generally cause problems in economic point of view in public food courts. In this study, to overcome this problem and predict actual consumption demand for a specified menu in a selected date, three decision tree methods (CART, CHAID and Microsoft Decision Trees) are utilized. A two year period dataset which is gathered from food courts of Hacettepe University in Turkey is used during the analyses. As a result, prediction accuracies up to 0.83 in R2 are achieved. By this study, it's shown that decision tree methodology is suitable for food consumption prediction.

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