Multi-GPU Graph Analytics

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Introduction - about Gunrock

Gunrock is a multi-GPU graph processing library, which targets at:
• High performance analytics of large graphs
• Low programming complexity in implementing parallel graph algorithms on GPUs

Homepage: http://gunrock.github.io

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Programming Model

Graph algorithm as a data-centric process
Frontier: compact queue of nodes or edges

Generation
Advance: visit neighbor lists
Filter: select and reorganize

Operation
Compute: per-element computation kernels in parallel can be combined with advance or filter

Samples
Graph traversal
Graph partition

Multi-GPU Framework

Input graph
Partition
Package data

Received data package
Package data

GPU1

Local input frontier
Push to peer
Remote input frontier
Merge frontier
Output sub-frontier
Full-size frontier
GPU2
GPP3
Sub-graphs
Sub-graph pool
Received data package
Package data

Output sub-frontier
Local input frontier
Push to peer
Remote input frontier
Merge frontier
Full-size frontier
Graph algorithms on GPUs

Future Work

• performance analysis and optimization
• extending Gunrock onto multiple nodes
• asynchronized graph algorithms

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References


Speedup of BFS for different graph types

Comparison with previous work on GPU BFS

Number of GPUs

Strong scaling on r-MAT graphs (scale 4K, each GPU processing 1GB/s)

Weak scaling on r-MAT graphs (scale 4K, each GPU processing 1GB/s)