

Parallel Ant Colony Optimization with CUDA

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Overview

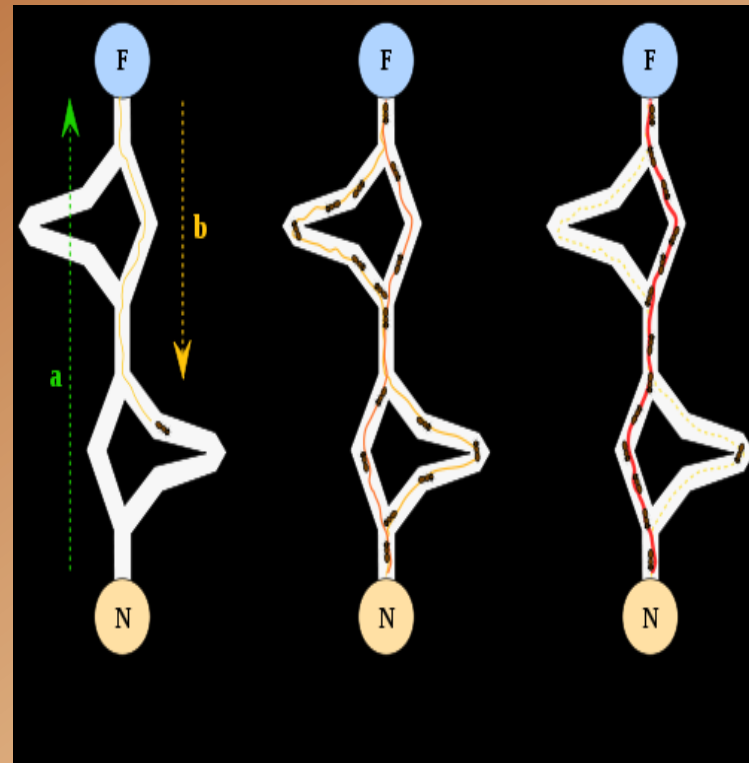
- CUDA a language for programming NVIDIA GPUs
 - GPUs are a highly parallel architecture
- Ant Colony Optimization (ACO) used for solving hard problems
 - Can be parallelized on the GPU

Project Highlights:

- CUDA implementation of ACO algorithm
- Traveling Salesman Problem (TSP) as case study

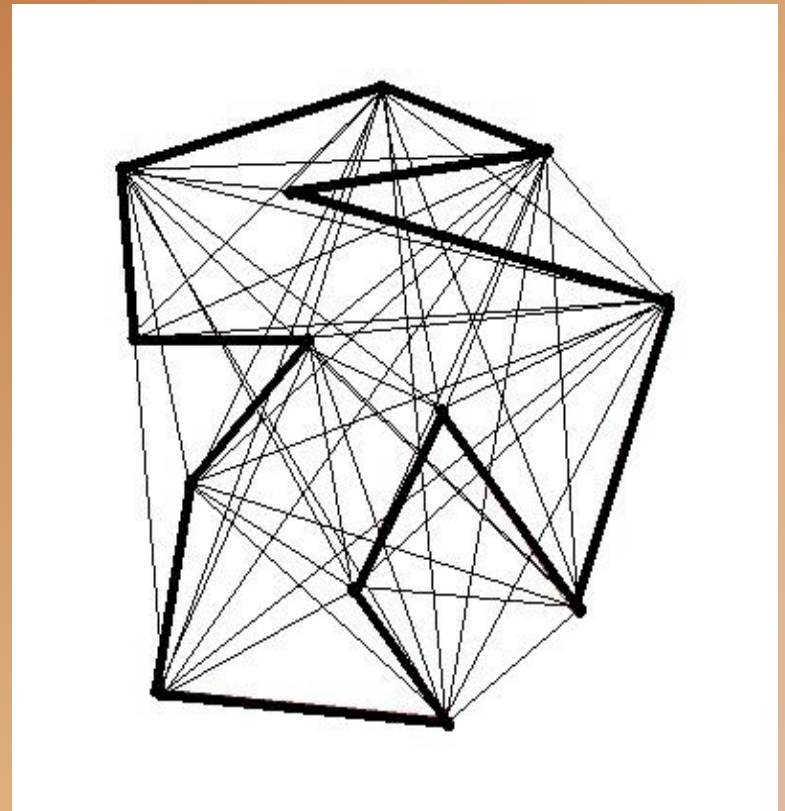
ACO Algorithm

```
ACO_MetaHeuristic {  
  while(not_termination) {  
    constructSolutions();  
    pheromoneUpdate();  
    daemonActions();  
  }  
}
```

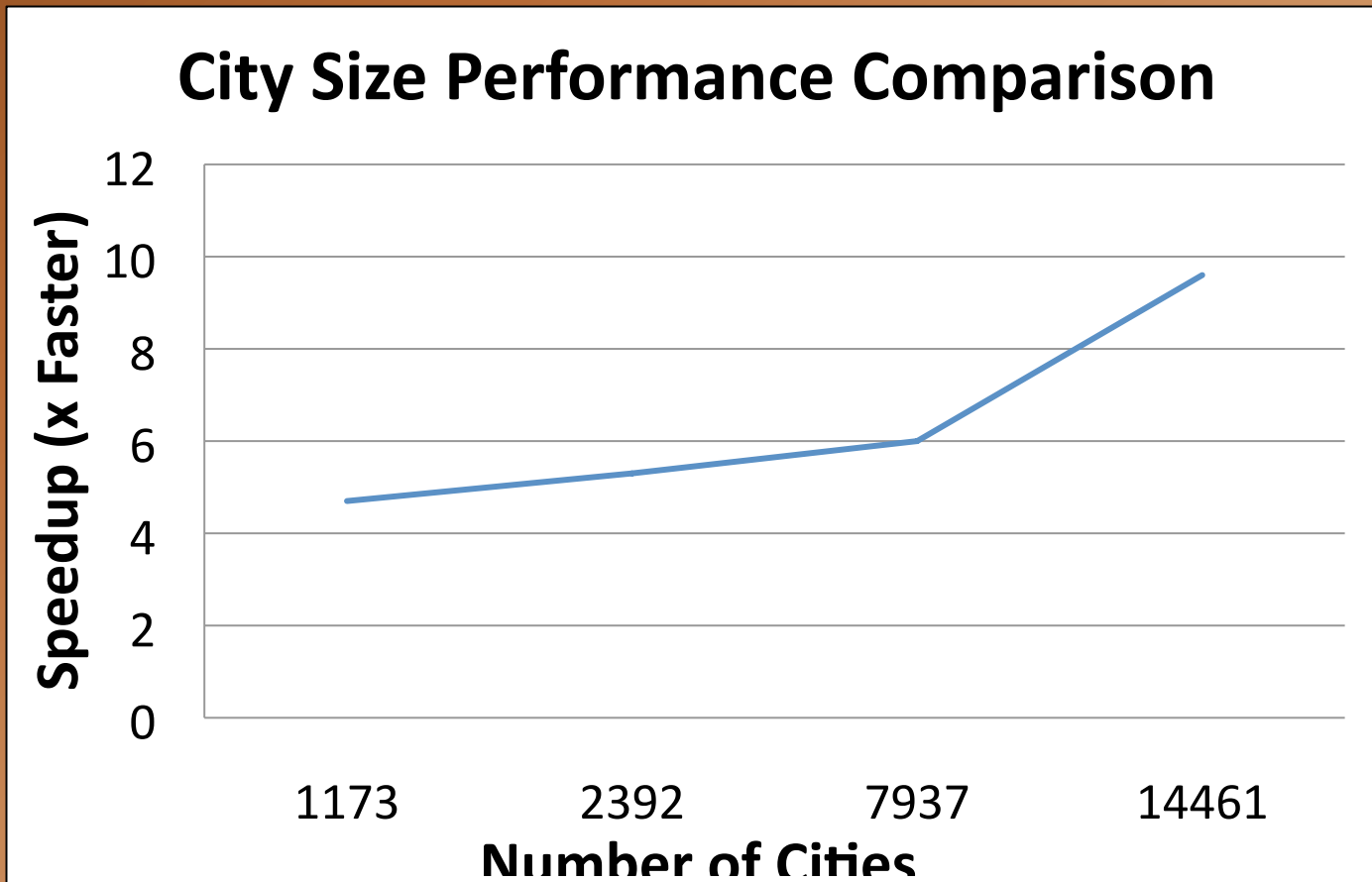


Traveling Salesman Problem

- Strongly-connect graph
- Symmetrical
- Sample code existed
- $O(n!)$: optimal solution

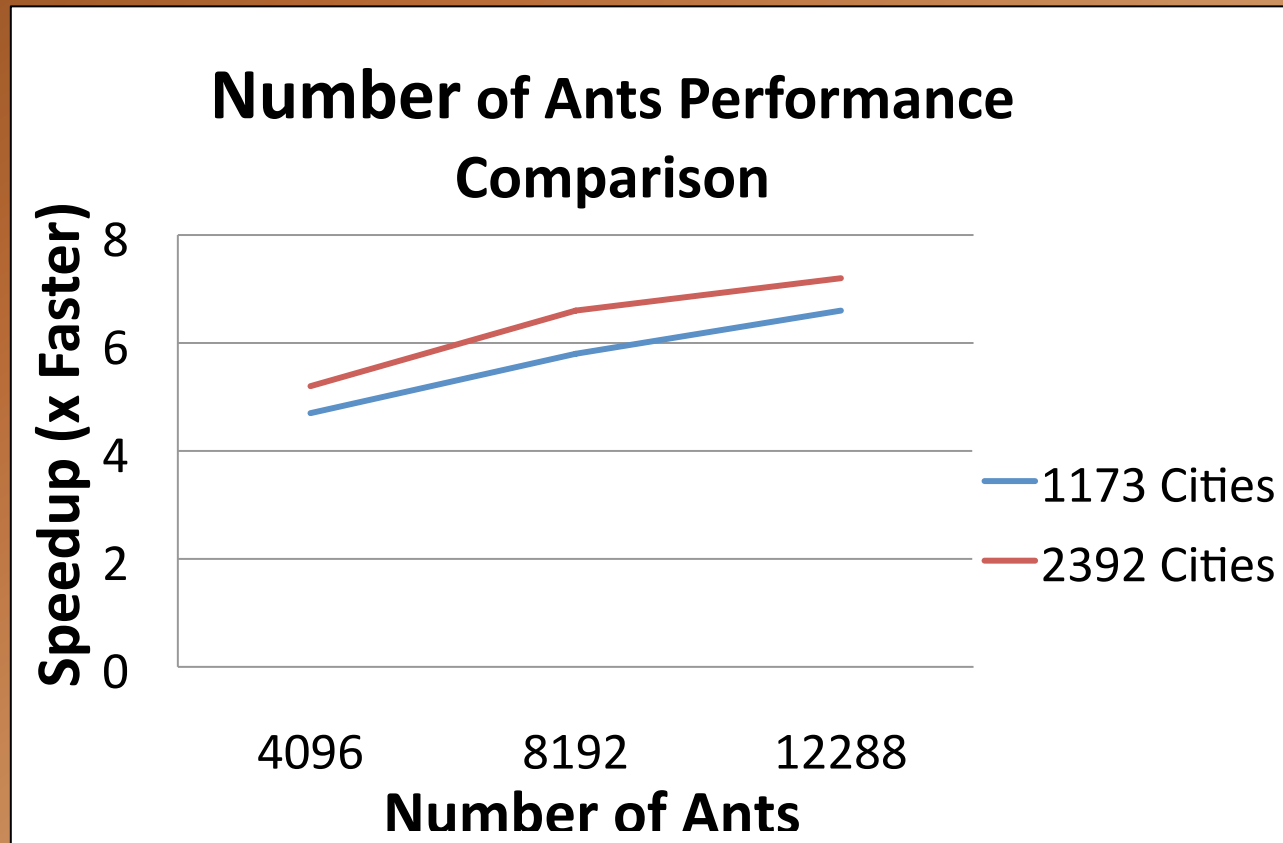


Results



Speedup of CUDA over sequential implementation as problem size (number of cities) increased

Results (cont'd)



Speedup of CUDA over sequential implementation as number of ants increased

Conclusion and Future Work

- Good speedup from the sequential version was obtained
- Work on improving performance even more
- Split work up among several kernels
- Run multiple simulations at once
- Try different problems