Accelerating Interactive 4-D Motion Analysis With GPU's

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Abstract

Given a reference path, the goal of this project is to successfully write an executable program using the GPU that allows doctors to visualize different paths in the body that will effect radiation treatment. Previously the work was done using the CPU which is the problem because it would not be feasible to get accurate results very rapidly. My research focuses around implementing the program on the GPU that will successfully produce different paths that will aid doctors in their future work.

Methods

Edited Previous Code written on the CPU:
- Understand Previous code written
- Understand GPU and its Architecture
  - C
  - C++

Learning New Programming Environment
- CUDA
- Matlab

Comparing
- Comparing the speedup of running the program on GPU vs. CPU

Useful Algorithms
- Least Squares Algorithm
- Dot Product Algorithm

Results

Code generated on CPU for small datasets runtime was 3 minutes
My results by rewriting the code to run on the GPU executed the code in 1 minute

Background

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Why GPU?

- Unique Architecture
- Ideal for parallel computing that doesn’t require a lot of communication
- Equipped with 128 streamed processors which allows programmable instructions to execute at the same time.
- Cost Effective
- Suitable for Compute Intensive Data Parallel Applications

Motivation

The goal of my research project prompted me to have three motivational stances:
- Explore new Hardware (GPU)
- Given a problem find an accurate solution
- Produce results that would effect the world

Conclusion and Future Implementations

My research is still maturing. However, based on our results, we find that our goals are obtainable and our methods are feasible.

Future Implementations:
- Re-edit code to work on larger data sets
- Use more than one GPU to increase speed

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