Parallel Processing 4/12/2020

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Project Proposal

**Problem**

We will implement a Monte Carlo Decision Tree Algorithm to play the game Connect Four on a scalable game board. We will seek to optimize the decision time per move through multithreaded parallelization. The goal will be to see an efficient speedup relative to the problem size.

**Solution Algorithm**

A decision tree called Monte Carlo Tree Search (or MCTS) will be used to represent the probabilities of every move that can be made during the computer’s turn. A node can be expanded to represent the probabilities of success from future moves. New nodes will be used to recalculate the score associated with parent nodes. The nodes with the highest probability of success will be selected to expand the tree and determine the best move to be made.

**Parallelism**

To allow our solution to scale and handle larger problems, we are implementing multithreading on GPU using Cuda10. We will parallelize the generation of nodes and backpropagation of probability calculations. The calculation of subtrees will be distributed across processing units.