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COMS 4995: Parallel and Functional Programming

Project Report

For my final project for this class, I would like to create a 3-Partition Problem solver that takes in an input of a set of integers and returns a list of sets. The solver will attempt to partition the input set into three different subsets where each subset will have an equal sum. I would be working alone in this project, and I believe this problem is simple enough to be completed alone with a given time frame yet allows me to explore many different types of parallel computations. 3-Partition Problem is a NP-Complete problem that could potentially be solved in polynomial time using dynamic programming; however, for this project, I would like to not avoid dynamic programming and solve it in a brute force manner using parallel programming.

I am looking to explore the different ways I could split the available tasks amongst the different threads. My current idea is to have the main thread create all of the possible subsets and while doing so it will be assigning the checking computations to other available threads. If one of the threads finds a possible set, then the solver will return the partition. This plan seems to be the most obvious solution, since it requires the least amount of coordination between the threads. I also thought about having the main thread to traverse through each possible combinations of sets and then assigning different threads to do calculate the sum of each subsets, but I realized that method limited the number of threads to be needed. I also believe that this method will have an issue of certain threads finishing the computation earlier than other threads and wasting compute time if the subsets are divided into varying sizes. I have yet to consider all of the options and I

would like to try splitting the tasks in different ways and finding the best possible task delegation through trial and error.

At first, I am going to focus on the 3-Partition Problem solver, but if I am successfully able to finish it in time with ample amount of time left over, I would like to create a N-Partition Problem solver that can not only can solve any partitions number of partitions, but will solve and return possible partitions for 1 to N different partitions. I think it would be fascinating to try to solve a multiple parallel programming problems at once through parallel programming.