Homework 4 – Averaging Image

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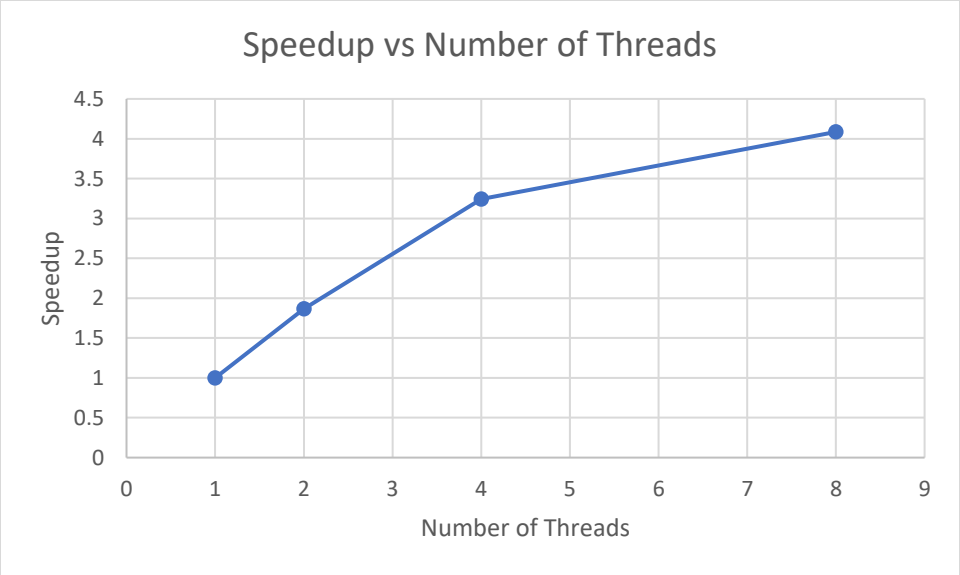
1. Object of the project:
    a. The object of this assignment is to apply k-means clustering for image segmentation on a color picture then parallelize the code by using OpenMP.
2. Details:
    a. To start, I decided the number of generators (*k*) and iterations for k-means I wanted. After the initial values were chosen, I had to check which generator had the shortest color distance to each pixel's color and then group that pixel to the generator's group. This process led to *k* groups of pixels of which I would take the average color and set that average color as the new generator, giving me *k* new generators. I repeated this process for the specified iteration number. Lastly, I took each pixel and replaced its color by its group's generator and wrote that to a new JPG file.
3. Results:
    a. Threads: [1, 2, 4, 8]
    b. Time Elapsed (s): [45.1757, 24.2237, 13.9301, 11.0577]
    c. Speedup: [1, 1.865, 3.243, 4.086]



4. Performance Improvements:
    a. I wrapped the main 3 steps in an *omp parallel* method and wrapped some of the for loops in their own *omp parallel for* methods to increase speedup due to parallelization. I didn't wrap all for loops in *omp parallel for* methods because some of them required serialization or led to slowdown if wrapped in a parallel method.
5. Bugs Encountered:
    a. No bugs were encountered on this assignment.