**M13 Programming Report**

**My program works correctly.**

**Theoretically, the recursive algorithm should be slightly less efficient than the iterative algorithm. This is because in the recursive method you have to make calls to the function multiple times, in comparison to the iterative function that does not have to make such calls. This is of course under the assumption that the two algorithms have the same basic time complexity of O(nlogn). Because of this, we would leave the iterative model as represented by the time complexity O(nlogn), but would change the recursive model to be represented by O(Anlogn), where the A is some constant. We add this constant in to represent the time taken by calling the recursive function. We can confirm this by examining our plot attached below. In the plot, we are showing the results of dividing the running time of the recursive algorithm by the iterative algorithm as the activity problem they analyze grows. If we divided these time complexities, it would be Anlogn/nlogn. This result of this division would be just the constant A. As we can see, the graph below overall shows a horizontal line with minor variation. This horizontal line is what we would expect out of a representation of a constant. Also, since this number is fairly consistently above the value of 1, that confirms our theory that the recursive algorithm takes more time than the iterative algorithm. So, through our testing and analysis of our plot, we can confirm that the recursive algorithm is less efficient than the iterative algorithm.**

**How to compile: Navigate to the directory (I was on bmm0066@tux251). The file is just in that home directory. StudyOverhead.java should be there. Type in “javac StudyOverHead.java”. After compilation finishes, type in “java StudyOverhead”. The program should run and it will output to the system how many iterations are done, it will run to 2000. Once done, there should be a file called “Output.csv” with all the output data.**

**(I trimmed the first 500 data points off so the initial overhead execution time wouldn’t affect the plot.)**

Chart, scatter chart

Description automatically generated