CSC 360 Assignment #2 Part 2
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Data Parallelism and L1 Fitting Analysis: Single vs Multithreaded Solutions

Hardware used to perform tests: 2012 Macbook Pro MacOS Catalina

- Processor 2.3 GHz QuadCore Intel Core i7

For this assignment I created 2 .c files, a single and multi-threaded version of the problem. I ran each program through a few sets of data:

- the small 18 point data set from the assignment spec with the first 6, 10, 14, and 18 data points
- the larger 10 year data set
- and just the year 2002 from the 10 year data set

My results were the following:

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Katherines-MacBook-Pro:Data Parallelism kat$ ./test.sh
gcc     -c -o dataPar.o dataPar.c
gcc -o dataPar dataPar.o
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**Single Thread Small Data Set**
The minimum sum using 6 points.
Lowest error is 1.624996 at points 0 and 4, with slope 1.325001.
Took 0.000027 seconds to complete calculation.
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The minimum sum using 10 points.
Lowest error is 6.599998 at points 2 and 7, with slope 1.920000.
Took 0.000024 seconds to complete calculation.
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The minimum sum using 14 points.
Lowest error is 8.857144 at points 3 and 10, with slope 2.242857.
Took 0.000033 seconds to complete calculation.
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The minimum sum using 18 points.
Lowest error is 11.300001 at points 10 and 17, with slope 2.100000.
Took 0.000035 seconds to complete calculation.
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**Multi Thread Small Data Set**
The minimum sum using 6 points.
Lowest error is 1.624996 at points 0 and 4, with slope 1.325001.
Took 0.000872 seconds to complete calculation.
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The minimum sum using 10 points.
Lowest error is 6.599998 at points 2 and 7, with slope 1.920000.
Took 0.000778 seconds to complete calculation.
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The minimum sum using 14 points.
Lowest error is 8.857144 at points 3 and 10, with slope 2.242857.
Took 0.001052 seconds to complete calculation.
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The minimum sum using 18 points.
Lowest error is 11.300001 at points 10 and 17, with slope 2.100000.
Took 0.001127 seconds to complete calculation.
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**Single Thread Large Data Set 10 Years**
The minimum sum using 3652 points.
Lowest error is 862937.000000 at points 135 and 3081, with slope -0.002716.
Took 131.645529 seconds to complete calculation.
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**Single Thread Large Data Set Year 2002data.csv
The minimum sum using 365 points.
Lowest error is 59554.781250 at points 50 and 306, with slope -0.816406.
Took 0.128440 seconds to complete calculation.
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**Multi Thread Large Data Set 10 Years**
The minimum sum using 3652 points.
Lowest error is 862937.000000 at points 841 and 3081, with slope -0.002679.
Took 145.619974 seconds to complete calculation.
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**Multi Thread Large Data Set Year 2002data.csv
The minimum sum using 365 points.
Lowest error is 59554.781250 at points 50 and 306, with slope -0.816406.
Took 0.221951 seconds to complete calculation.
rm *.o dataPar
Katherines-MacBook-Pro:Data Parallelism kat$
```

Clearly the multi-threaded solution takes longer to complete, due to creating too many threads which increased overhead. If I had implemented this solution with fewer threads the multithreaded program would be faster than the single thread with large data sets.