

Lab Two : Print Primes

Learning Outcome:

Multi threaded Programming using a Use Level thread package (pthreads)

Problem Statement:

Write a multi threaded program that outputs all prime numbers upto N (10^{10}) using t threads, where N and t are command line (input) arguments. You should use the Sieve of Eratosthenes to do find if a given number is prime.

Method:

First implement the **naïve approach** as discussed in class, which divides the domain $[2..N]$ into t partitions and assigns each partition to one of the t threads. That will be the baseline. Then do the **load balanced** one where each thread picks up a “free” number to test if it is a prime.

The first deliverable is that that your program is multithreaded and prints all the relevant prime numbers. You will also show how much time each thread spends during the execution of the program. This will need to be formatted for both textual and graphical display.

The results must be shown in the form of a graph where the baseline is plotted along with the load balanced version. Please use gnuplot for the same.

Most important, we will only type make and all results should be generated.

Submission:

Please submit the source files which are in the proper directory structure with a Makefile and README. Do not submit any object or binary files. Please ensure that a graph and text file containing the results for $N=10^{10}$ and $t=10$ is present in the zip file that you submit.

Reference Material:

- Short One : <https://www.cs.cmu.edu/afs/cs/academic/class/15492-f07/www/pthreads.html>
- Detailed One: <https://computing.llnl.gov/tutorials/pthreads/>
- A nice Example: <https://www.geeksforgeeks.org/print-numbers-sequence-using-thread-synchronization/>
- Sieve of Eratosthenes: https://en.wikipedia.org/wiki/Sieve_of_Eratosthenes