Assignment 3

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1 Overview

This program finds all prime numbers between one and a number taken as a command line argument between one and 2$\hat{}$32. It prints out the number of primes in the range, and prints the numbers to an output file named *primes.txt*.

2 Functions

The program contains one source file called "main.cpp". This file contains four functions that each handle a separate task. They are: main(), bit_indexes_from_number(), print_bitmap(), check_if_bit_index_is_prime().

2.1 main()

The main() function handles the program. It should probably have been split into more functions, but none of them seemed large enough to need their own function. All the thread creating is done here, so the function acts as a sort of home base for the other threads.

2.2 bit_indexes_from_number()

This function takes in an unsigned long long int and decides what the indexes of the number will be to locate the bit in the bitmap. The first component of the two values it returns is the index of the long long that the bit is in. The second component is the offset in that long long.

2.3 print_bitmap()

This function prints the contents of the bitmap such that bits set to 0 are written to the output file containing all the primes. It also prints out the the screen the number of primes in the range.

2.4 check_if_bit_index_is_prime()

This function simply takes in the index returned from bit_indexes_from_number() and checks if the value is set to 0.

3 Design

The program works by iterating through the list if numbers (represented as a bitmap) and when it finds a 0 bit, determines that number is a prime, and creates threads to mark its multiples as 1, representing non-primes.

4 Work Log

Tue Feb 14 20:26:31 2012	Working.
Mon Feb 23 21:23:49 2012	Increasing number of threads decreases total amount of time it takes, but total number of primes is off by a couple.
Mon Feb 23 20:08:20 2012	Changed the method used to find primes back to the way it originally was, hopefully this time it works better.
Mon Feb 24 17:34:19 2012	Working most of the time, with parallelization, getting faster with more threads, but not always getting right number of primes.
Mon Feb 24 16:35:26 2012	WORKING VERSION. Making optimizations.
Sun Feb 27 22:24:09 2012	Parellel working with some amounts of threads, but not all.
Sun Feb 27 20:32:22 2012	Works with one thread. adding parallel.
Sun Feb 28 20:32:22 2012	Everything works.

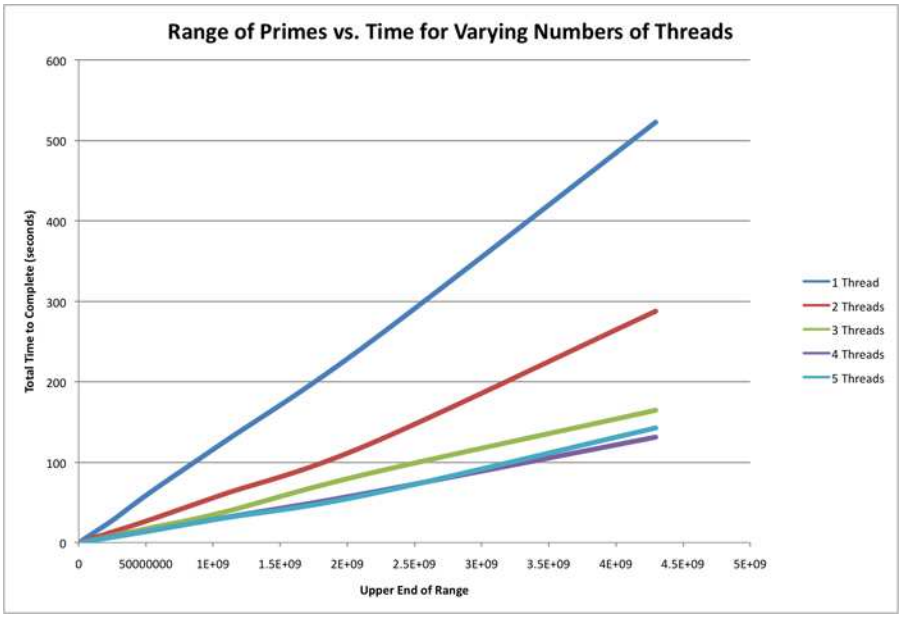

Figure 1: A graph of time vs file size