COMP 5233: Homework #2

Due: 10/07/2015, Wednesday

1. Write a Pthreads and an OpenMP program to calculate Pi in parallel using the following algorithm.

Our running Example: The PI program
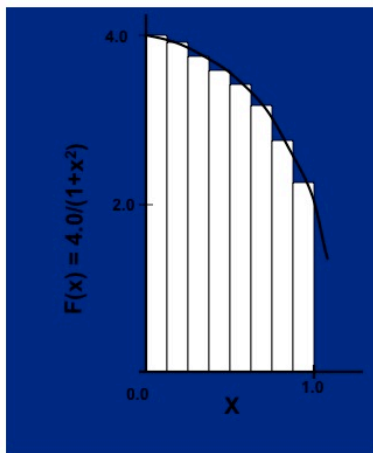
Numerical Integration

Mathematically, we know that:

$$\int_0^1 \frac{4.0}{(1+x^2)}\, dx = \pi$$

We can approximate the integral as a sum of rectangles:

$$\sum_{i=0}^{N} F(x_i)\Delta x \approx \pi$$

Where each rectangle has width Δx and height $F(x_i)$ at the middle of interval i.

Sequential code is like the following:

```
static long num_steps = 10000000000;
double step;
void main ()
{       int i;
        double x, pi, sum = 0.0;
        step = 1.0/(double) num_steps;
        for (i=1;i<= num_steps; i++){
                x = (i-0.5)*step;
                sum = sum + 4.0/(1.0+x*x);
        }
        pi = step * sum;
}
```

2. A **prime pair** or **twin prime** is a prime number that has a prime gap of two, in other words, differs from another prime number by two, for example the twin prime pair (41, 43). You need to write a parallel program (choose from Pthreads or OpenMP) to find the total number of prime pairs between 2 and 50,000,000. Your grade will be not only determined by the correctness of the total number, but also depends on your program performance. Your program should print the number of prime pairs and the total execution time of your program.

The following is the grading percentage for evaluating your program.
Correctness: 60%
Performance: 40%

Please submit all of your program source codes to Ecourses by 10/07/2015.