LEBANESE AMERICAN UNIVERSITY
SCHOOL OF ARTS AND SCIENCES
DEPARTMENT OF COMPUTER SCIENCE & MATHEMATICS
BYBLOS

CSC 447: Parallel Programming for Multicore and Cluster Systems

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Lab 3
Parallel PI
Due: February 7, 2018

I. Parallelize the following Code:

```
#include <stdio.h>
#include <math.h>
#define STEPS 1000000000

void main()
{
 double step_size = 1.0/STEPS, t = 0.5 * step_size, sum = 0;

 while (t < 1.0)
 {
 sum += sqrt(1-t*t) * step_size;
 t += step_size;
 }
 sum *= 4;
 printf("Computed PI = %.10lf\n" , sum);
 printf("Difference to Reference is %.10lf\n", M_PI - sum);
}
```

Propose at least three parallel solutions for the above problem. In each case, try the simulation for STEPS 100 to 1000000000. Use the optimal number of threads on your machine and explain why it was selected as such.

II. Parallelize the following code:

```
#include <stdio.h>
#include <stdlib.h>

int main(int argc, const char * argv[]) {
    int i, inTheCircle=0, numTrials = 1000000;
    double x, y, pi;

    srandomize();
    for (i=0; i< numTrials; i++){
        x = random()% 2,147,483,647;
        y = random()% 2,147,483,647;
        if ((x*x + y*y) < 1.0)
            inTheCircle++;
    }
    pi = 4*inTheCircle/numTrials;

    printf("%f %ld\n", pi, rand()% 2,147,483,647);
}
```

What are the challenges that this problem poses? Simulate your simulation from STEPS 100 to 1000000000. Use the optimal number of threads on your machine.

Requirement

Implement your code and signoff with your TA to show it works.