InfoLab

IC621: Distributed and Parallel Computing

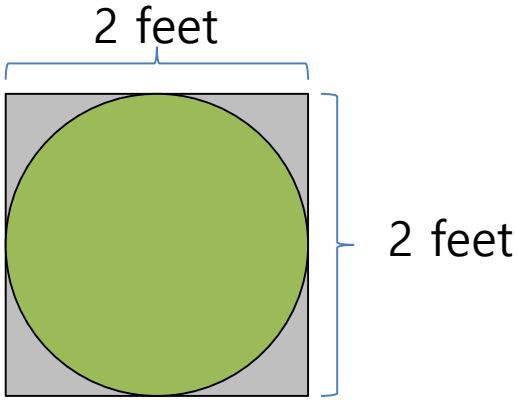
Lab 04: Pthread (π)

Min-Soo Kim

DGIST 대구경북과학기술원
Daegu Gyeongbuk Institute of Science & Technology

π calculation using Monte Carlo method

- **Suppose we toss darts randomly at a square dartboard**
  - area of square : 4 square feet
  - area of circle : π square feet
- **Suppose the points that are hit by the darts are uniformly distributed (and we always hit the square)**



$$\frac{\text{number in circle}}{\text{total number of tosses}} = \frac{\pi}{4}$$

InfoLab DGIST 대구경북과학기술원

- **Estimating the value of π with a random number generator (called Monte Carlo method)**

```
number_in_circle = 0;
for (toss = 0; toss < number_of_tosses; toss++) {
   x = random double between -1 and 1;
   y = random double between -1 and 1;
   distance_squared = x*x + y*y;
   if (distance_squared <= 1) number_in_circle++;
}
pi_estimate = 4*number_in_circle/((double) number_of_tosses);
```

- **Your program:**
  - main thread should read in the total number of tosses and print the estimate of π
  - each thread should find local `number_in_circle` and local `number_of_tosses`
  - you should use `long long int`s for the number of hits in the circle and the number of tosses (for high accuracy)

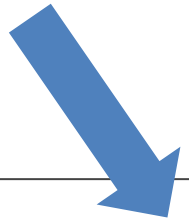
Submission

- **Source code**

- **Report**
  - # threads
  - elapsed time
  - `number_in_circle`
  - `number_of_tosses`
  - your estimate of π

- **Submit your codes by 1:00pm, 10/17(Tue) to TAs (bm010515@dgist.ac.kr, chan150@dgist.ac.kr)**

```
1  void* Thread_sum(void* rank) {
2     long my_rank = (long) rank;
3     double factor;
4     long long i;
5     long long my_n = n/thread_count;
6     long long my_first_i = my_n*my_rank;
7     long long my_last_i = my_first_i + my_n;
8
9     if (my_first_i % 2 == 0)  /* my_first_i is even */
10       factor = 1.0;
11    else  /* my_first_i is odd */
12       factor = -1.0;
13
14    for (i = my_first_i; i < my_last_i; i++, factor = -factor) {
15       sum += factor/(2*i+1);
16    }
17
18    return NULL;
19 }  /* Thread_sum */
```



```
for (i = my_first_i; i < my_last_i; i++, factor = -factor) {
   my_sum += factor/(2*i+1);
}
pthread_mutex_lock(&mutex);
sum += my_sum;
pthread_mutex_unlock(&mutex);
```


InfoLab DGIST 대구경북과학기술원

InfoLab

Thank you!

DGIST 대구경북과학기술원
Daegu Gyeongbuk Institute of Science & Technology