

PADP lab Program 6

Code:

```
#include<stdio.h>

#include<omp.h>

#include<math.h>

#include<stdlib.h>

#define CLUSTER_SIZE 4

#define POINTS_SIZE 1000000

#define PRINT_POINTS 0


int cluster[CLUSTER_SIZE][2] = {{75, 25}, {25, 25}, {25, 75}, {75, 75}};

long long cluster_count[CLUSTER_SIZE];

int points[POINTS_SIZE][2];


void populate_points() {

    long long i;

    for(i = 0; i < CLUSTER_SIZE; i++) {

        cluster_count[i] = 0;

    }

    for(i = 0; i < POINTS_SIZE; i++) {

        srand(i);

        points[i][0] = rand() % 100;

        points[i][1] = rand() % 100;

    }

}
```

```
double get_distance(int x1, int y1, int x2, int y2) {
    int x = x2-x1, y = y2-y1;
    return (double)sqrt((x * x) + (y * y));
}
```

```
int main() {
    double t;
    populate_points();
    long long i;
    if(PRINT_POINTS != 0) {
        for(i = 0; i < CLUSTER_SIZE; i++) {
            printf("\nCluster %lld : (%d, %d)", i+1, cluster[i][0], cluster[i][1]);
        }
        printf("\n\n");
    }
}
```

```
int nt = 0;
printf("Enter number of threads: ");
scanf("%d", &nt);
```

```
t = omp_get_wtime();
```

```
#pragma omp parallel for private(i) shared(points, cluster) reduction(+:cluster_count) num_threads(nt)
for(i = 0; i < POINTS_SIZE; i++) {
    double min_dist = 100, cur_dist = -1;
    int j, cluster_index = -1;
```

```

for(j = 0; j < CLUSTER_SIZE; j++) {

    cur_dist = get_distance(points[i][0], points[i][1], cluster[j][0], cluster[j][1]);

    if(cur_dist < min_dist) {

        min_dist = cur_dist;

        cluster_index = j;

    }

}

if(PRINT_POINTS != 0) {

    printf("\n(%d, %d) belongs to (%d, %d)", points[i][0], points[i][1],
cluster[cluster_index][0], cluster[cluster_index][1]);

}

cluster_count[cluster_index]++;

}

t = omp_get_wtime() - t;

for(i = 0; i < CLUSTER_SIZE; i++) {

    printf("\nCluster (%d, %d): %lld", cluster[i][0], cluster[i][1], cluster_count[i]);

}

printf("\n\nTime taken: %lf\n", t);

return 0;

}

```

## Output:

```
Activities Terminal Nov 27 21:35
mahesh@mahesh-VirtualBox: ~/Desktop/padp
mahesh@mahesh-VirtualBox:~/Desktop/padp$ ./a.out
Enter number of threads: 2
Cluster (75, 25): 2543
Cluster (25, 25): 2533
Cluster (25, 75): 2530
Cluster (75, 75): 2394
Time taken: 0.000836
mahesh@mahesh-VirtualBox:~/Desktop/padp$ ./a.out
Enter number of threads: 4
Cluster (75, 25): 2543
Cluster (25, 25): 2533
Cluster (25, 75): 2530
Cluster (75, 75): 2394
Time taken: 0.028851
mahesh@mahesh-VirtualBox:~/Desktop/padp$ ./a.out
Enter number of threads: 8
Cluster (75, 25): 2543
Cluster (25, 25): 2533
Cluster (25, 75): 2530
Cluster (75, 75): 2394
Time taken: 0.003347
mahesh@mahesh-VirtualBox:~/Desktop/padp$ gcc -fopenmp prog6.c -lgd -lm
mahesh@mahesh-VirtualBox:~/Desktop/padp$ ./a.out
Enter number of threads: 1
Cluster (75, 25): 25406
Cluster (25, 25): 25563
Cluster (25, 75): 24969
Cluster (75, 75): 24062
Time taken: 0.005943
mahesh@mahesh-VirtualBox:~/Desktop/padp$ ./a.out
Enter number of threads: 2
Cluster (75, 25): 25406
Cluster (25, 25): 25563
Cluster (25, 75): 24969
Cluster (75, 75): 24062
Time taken: 0.002939
mahesh@mahesh-VirtualBox:~/Desktop/padp$ ./a.out
Enter number of threads: 4
Cluster (75, 25): 25406
Cluster (25, 25): 25563
Cluster (25, 75): 24969
```

## Graphs:



