NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA SURATHKAL

DEPARTMENT OF INFORMATION TECHNOLOGY

IT 301 Parallel Computing LAB 6

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Write a parallel program (using Openmp) to convert a color image to grayscale and YIQ. The RGB values (in decimal) are already extracted and stored in “KittenRGB.txt” file. Read the input values from the file.

a. Compute the grayscale conversion using luminosity method, that is,

G=R*0.21+G*0.72+B*0.07.

b. Here is the RGB -> YIQ conversion:

Y = 0.299*R + 0.587*G + 0.114*B

I = 0.596*R – 0.275*G – 0.321*B

Q = 0.212*R – 0.523*G + 0.311*B

Analysis: Compare the time taken for the computation with Single thread and Multiple threads(2,4,8,16) . Prove that parallel computation is faster than serial. NOTE: The RGB.txt file has RGB values in single line and not matrix format. Ex: RGBRGB ...

The image used for extracting RGB values is 300 * 300 pixels jpg image

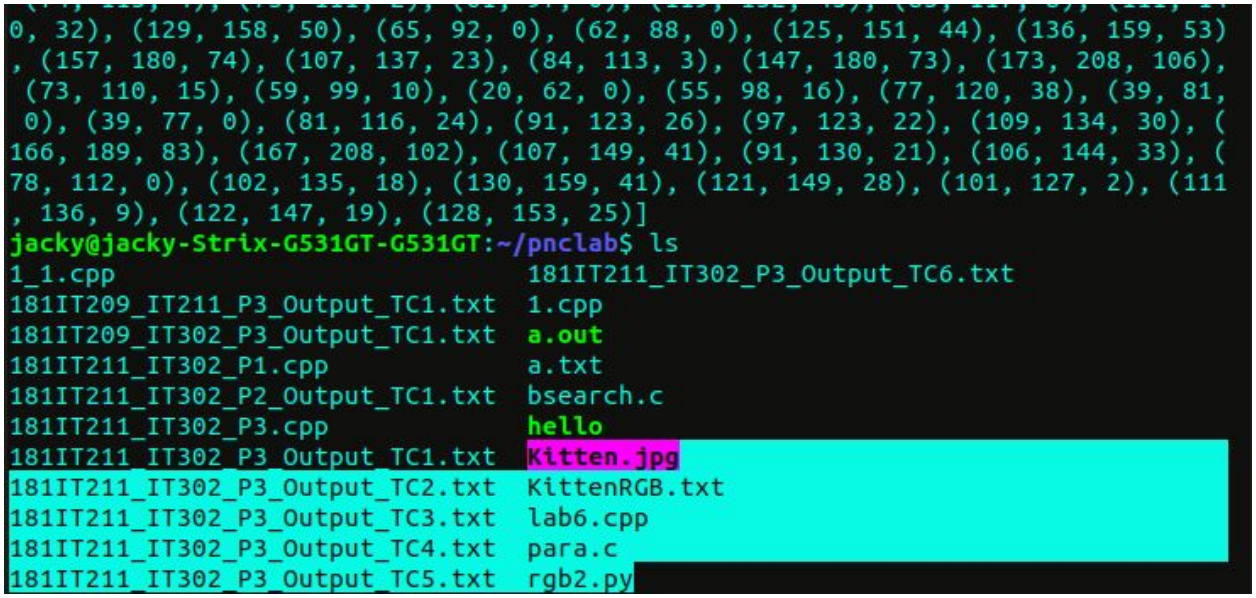
Code:

```
#include<bits/stdc++.h>
#include<omp.h>
using namespace std;
int main()
{
ifstream ptr;
int R,G,B,i;
double Gray;
ptr.open("KittenRGB.txt");
double t1,t2;
vector<vector<int>> v;
vector<int> m;
int size=300*300;
vector<double>Y(size,0),I(size,0),Q(size,0),Gr(size,0);
for(int i=0;i<size;i++)
{
m.clear();
ptr>>R;
ptr>>G;
ptr>>B;
m.push_back(R);
m.push_back(G);
m.push_back(B);
v.push_back(m);
}
ptr.close();
printf("1.serial execution\n");
t1=omp_get_wtime();
for(i=0;i<size;i++)
{
Gr[i]=(v[i][0]*0.21+v[i][1]*0.72+v[i][2]*0.07);
Y[i]=(0.299*v[i][0]+0.587*v[i][1] + 0.114*v[i][2]);
I[i]=(0.596*v[i][0]-0.275*v[i][1]-0.321*v[i][2]);
Q[i]=(0.212*v[i][0]-0.523*v[i][1]+0.311*v[i][2]);
}
t2=omp_get_wtime();
printf("Time taken =%lf s\n\n",t2-t1);printf("2.parallel execution with 2 thread\n");
t1=omp_get_wtime();
#pragma omp parallel num_threads(2)
#pragma omp for private(i) schedule(guided,100)
for(i=0;i<size;i++)
{
```

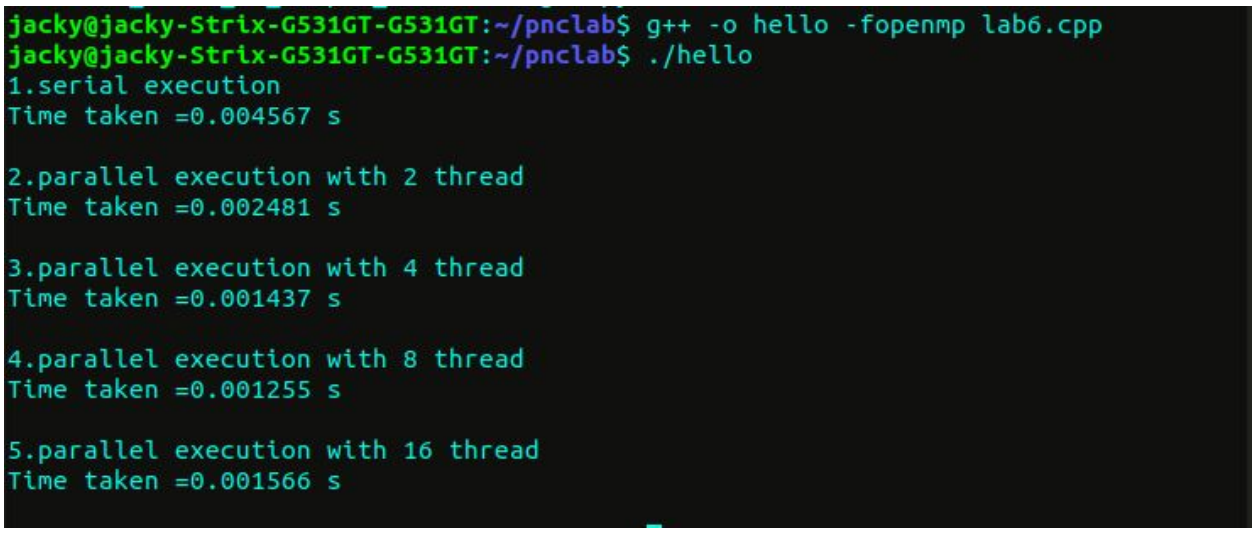
```
Gr[i]=(v[i][0]*0.21+v[i][1]*0.72+v[i][2]*0.07);
Y[i]=(0.299*v[i][0]+0.587*v[i][1] + 0.114*v[i][2]);
I[i]=(0.596*v[i][0]-0.275*v[i][1]-0.321*v[i][2]);
Q[i]=(0.212*v[i][0]-0.523*v[i][1]+0.311*v[i][2]);
}
t2=omp_get_wtime();
printf("Time taken =%lf s\n\n",t2-t1);
printf("3.parallel execution with 4 thread\n");
t1=omp_get_wtime();
#pragma omp parallel num_threads(4)
#pragma omp for private(i) schedule(guided,100)
for(i=0;i<size;i++)
{
Gr[i]=(v[i][0]*0.21+v[i][1]*0.72+v[i][2]*0.07);
Y[i]=(0.299*v[i][0]+0.587*v[i][1] + 0.114*v[i][2]);
I[i]=(0.596*v[i][0]-0.275*v[i][1]-0.321*v[i][2]);
Q[i]=(0.212*v[i][0]-0.523*v[i][1]+0.311*v[i][2]);
}
t2=omp_get_wtime();
printf("Time taken =%lf s\n\n",t2-t1);
printf("4.parallel execution with 8 thread\n");
t1=omp_get_wtime();
#pragma omp parallel num_threads(8)
#pragma omp for private(i) schedule(guided,100)
for(i=0;i<size;i++)
{
Gr[i]=(v[i][0]*0.21+v[i][1]*0.72+v[i][2]*0.07);
Y[i]=(0.299*v[i][0]+0.587*v[i][1] + 0.114*v[i][2]);
I[i]=(0.596*v[i][0]-0.275*v[i][1]-0.321*v[i][2]);Q[i]=(0.212*v[i][0]-0.523*v[i][1]+0.311*v[i][2]);
}
t2=omp_get_wtime();
printf("Time taken =%lf s\n\n",t2-t1);
printf("5.parallel execution with 16 thread\n");
t1=omp_get_wtime();
#pragma omp parallel num_threads(16)
#pragma omp for private(i) schedule(guided,100)
for(i=0;i<size;i++)
{
Gr[i]=(v[i][0]*0.21+v[i][1]*0.72+v[i][2]*0.07);
Y[i]=(0.299*v[i][0]+0.587*v[i][1] + 0.114*v[i][2]);
I[i]=(0.596*v[i][0]-0.275*v[i][1]-0.321*v[i][2]);
Q[i]=(0.212*v[i][0]-0.523*v[i][1]+0.311*v[i][2]);
}
t2=omp_get_wtime();
```

```
printf("Time taken =%lf s\n\n",t2-t1);
return 0;
}
```

Output:



After running rgb2.py file, which uses Python Imaging Library, All the points corresponding to rgb for given image(Kitten.jpg) are found and KittenRGB.txt file is generated.



Here, we observe that the time taken for serial execution is more than time taken in parallel execution.So parallel execution is faster than serial execution.

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