

Report on Labwork 9

TRAN Thi Hong Hanh

November 24, 2019

1 Explain how you implement the labwork?

- Implement Kuwahara filter following the instruction on the slide.

```
__global__ void kuwahara(uchar3 *input, uchar3 *output,
                        int width, int height, int winSize)
{
    int tidX = threadIdx.x + blockIdx.x * blockDim.x;
    if (tidX >= width)
        return;
    int tidY = threadIdx.y + blockIdx.y * blockDim.y;
    if (tidY >= height)
        return;
    int tid = tidY * width + tidX;

    double window[4] = {0.0};
    double SD[4] = {0.0};
    int meanRGB[4][3] = {0};
    int pxCount[4] = {0};
    int winPos;

    for (int x = 1 - winSize; x <= winSize - 1; x++)
    {
        for (int y = 1 - winSize; y <= winSize - 1; y++)
        {
            int rows = tidX + x;
            int columns = tidY + y;
            if (rows < 0 || rows >= width || columns < 0 || columns >= height)
                continue;
            int positionOut = rows + columns * width;

            int red = input[positionOut].x;
            int green = input[positionOut].y;
            int blue = input[positionOut].z;
```

```

        if (x >= 0 && y <= 0)
        {
            winPos = 3; // bottom right
        }

        if (x <= 0 && y <= 0)
        {
            winPos = 2; // bottom left
        }

        if (x >= 0 && y >= 0)
        {
            winPos = 1; //top right
        }

        if (x <= 0 && y >= 0)
        {
            winPos = 0; // top left
        }
        meanRGB[winPos][0] += red;
        meanRGB[winPos][1] += green;
        meanRGB[winPos][2] += blue;

        window[winPos] += max(red, max(green, blue));
        pxCount[winPos]++;

        SD[winPos] += pow((max(red, max(green, blue)) - window[winPos]), 2.0);
    }
}

for (int i = 0; i < 4; i++)
{
    SD[i] = sqrt(SD[i] / (pxCount[i]));
    window[i] /= pxCount[i];
    for (int j = 0; j < 3; j++)
    {
        meanRGB[i][j] /= pxCount[i];
    }
}

double minSD = min(SD[0], min(SD[1], min(SD[2], SD[3])));
if (minSD == SD[0])
    tidX = 0;
else if (minSD == SD[1])
    tidX = 1;
else if (minSD == SD[2])

```

```

        tidX = 2;
    else
        tidX = 3;

    output[tid].x = meanRGB[tidX][0];
    output[tid].y = meanRGB[tidX][1];
    output[tid].z = meanRGB[tidX][2];
}

```

- Command:

```
./labwork 10 ../data/cloud.jpeg
```

- Result:

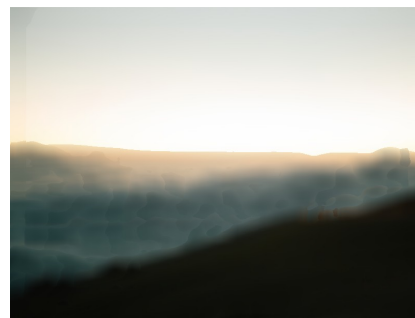
```

USTH ICT Master 2019, Advanced Programming for HPC.
Warming up...
Starting labwork 10
[ALGO ONLY] labwork 10 ellapsed 513.5ms
Labwork 10 ellapsed 520.9ms

```



(a) Original image



(b) Fine-art transformation

Figure 1: The output image after fine-art transformation compared to the original one.