

OS HW3

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Technique - bilinear interpolation

$$f(x,y)=z$$

four points $x_1 < x_2$ $y_1 < y_2$

$$f(x_1,y_1)=z_1 \quad f(x_1,y_2)=z_2 \quad f(x_2,y_1)=z_3 \quad f(x_2,y_2)=z_4$$

Using (t,u) to replace (x,y)

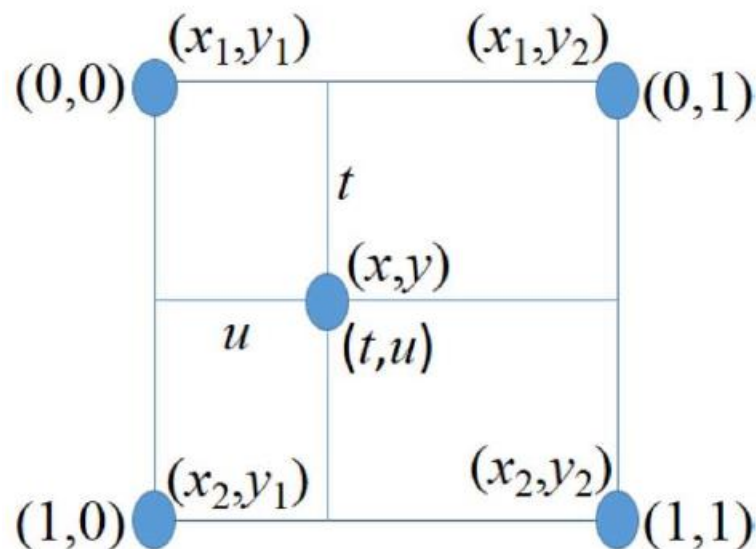
$$z = au + bt + cut + d$$

$$a = z_3 - z_1$$

$$b = z_2 - z_1$$

$$c = z_1 - z_2 - z_3 + z_4$$

$$d = z_1$$



Technique - bilinear interpolation

- Ratio = 7



Technique - rotation

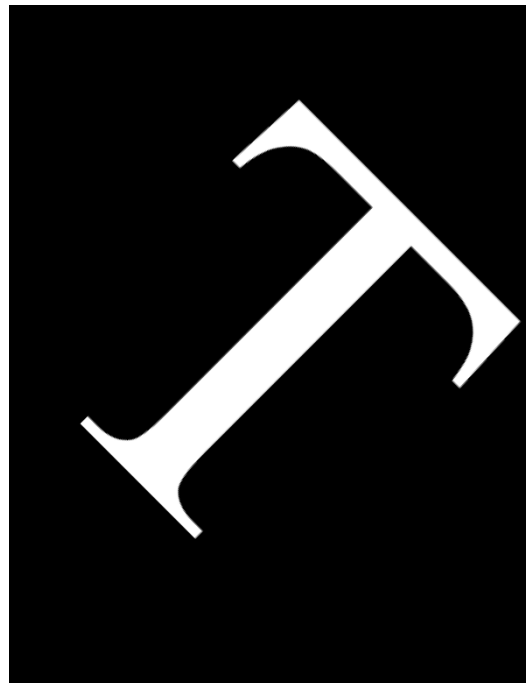
- Angle = 45°

Rotation

$$\begin{bmatrix} \cos \theta & \sin \theta & 0 \\ -\sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$x = v \cos \theta - w \sin \theta$$

$$y = v \cos \theta + w \sin \theta$$



Technique - shear

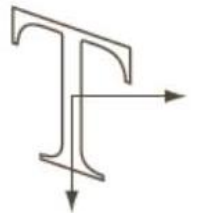
- Vertical = 0.45

Shear (vertical)

$$\begin{bmatrix} 1 & 0 & 0 \\ s_v & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$x = v + s_v w$$

$$y = w$$



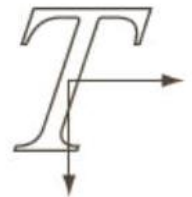
Technique - shear

- Horizontal = 0.45

Shear (horizontal)

$$\begin{bmatrix} 1 & s_h & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{aligned} x &= v \\ y &= s_h v + w \end{aligned}$$



Goal

- Using **pthread** to speed up this program. (100 points)
- output1.bmp : bilinear interpolation
- output2.bmp : bilinear + rotation
- output3.bmp : bilinear + shear(v)
- output4.bmp : bilinear + shear(h)
- output5.bmp : bilinear + shear(v) + rotation + shear(h)

About this program

- Line 18
 - `char *inputfile_name = "input.bmp";`
- Don't modify input file name.
- (5 points)

About this program

- Line 19
 - `char *outputfile_name[5] = { "output1.bmp", "output2.bmp", "output3.bmp", "output4.bmp", "output5.bmp"};`
- According to your student ID. Change output file names.
- Ex : **0316001**_output1.bmp, ..., etc.
- (5 points)

About this program

- Don't modify bmpReader.h and bmpReader.cpp.
- (5 points)

About this program

- You can include other library above **line6**.
- You can write down your code in main program between **line110** and **line177**.
- Or write down your code between **line92** and **line93**.
- Modify 0316001 to your student ID in **line188**.

About this program

- We **only use** the following commands to compile your program.
 - `g++ -std=c++11 -Wall -O -c example.cpp bmpReader.cpp -pthread`
 - `g++ -std=c++11 -o a.out example.o bmpReader.o -pthread`
- (5 points)

Requirement

- Deadline : 2016/12/23(Fri) PM 23:59
- Upload your code to E3 **before deadline**. And **check** your homework version.
- Filename : studentID.cpp (5 points, only one file)
 - Ex : **0316001.cpp**
- Make sure your program can execute in **BSD1**.
- If you have any questions, welcome to EC637.

Score

1. Output images must be correct. (70 points)
2. According to your maximum speedup.
Ex : 9 times.
 - a. Speedup between 6 and 9. (30 points)
 - b. Speedup between 3 and 6. (20 points)
 - c. Speedup between 1 and 3. (10 points)
 - d. Speedup below 1. (-10 points)