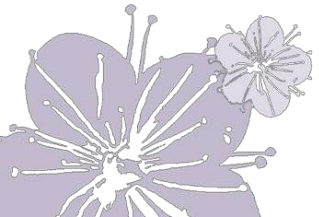
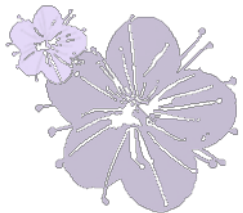
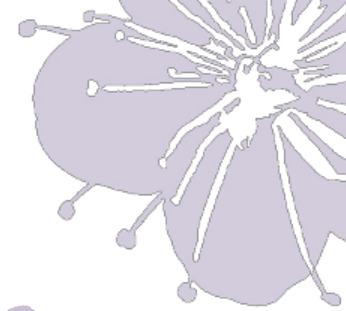


HW2

Remarks

CS 550000 Computer Graphics
April ,2017
CGVLab,NTHUCS



What you need to deal with in HW2

The “Matrices”

The “Matrix”



<cmath> may help

```
#include <cmath>
```

```
//calculating rotation matrix
```

```
float sinX = sin(rotationX);
```

```
float cosX = cos(rotationX);
```

```
Matrix4 Rx = Matrix4(1, 0, 0, 0,  
                      0, cosX, -1*sinX, 0,  
                      0, sinX, cosX, 0,  
                      0, 0, 0, 1);
```



Matrix class

(provided by Matrices.h and .cpp)

Matrix initialization

```
//calculating rotation matrix
float sinX = sin(rotationX);
float cosX = cos(rotationX);
Matrix4 Rx = Matrix4(1, 0, 0, 0,
                      0, cosX, -1*sinX, 0,
                      0, sinX, cosX, 0,
                      0, 0, 0, 1);
```

```
float sinY = sin(rotationY);
float cosY = cos(rotationY);
Matrix4 Ry = Matrix4(cosY, 0, sinY, 0,
                      0, 1, 0, 0,
                      -1*sinY, 0, cosY, 0,
                      0, 0, 0, 1);
```

```
float sinZ = sin(rotationZ);
float cosZ = cos(rotationZ);
Matrix4 Rz = Matrix4(cosZ, -1*sinZ, 0, 0,
                      sinZ, cosZ, 0, 0,
                      0, 0, 1, 0,
                      0, 0, 0, 1);
```

Matrix multiplication

```
Matrix4 R = Rz*Ry*Rx
```



Vector class

(provided by Matrices.h and .cpp)

initialization

```
Vector3 eyePos(eyeX, eyeY, eyeZ);
```

```
forwardVector = eyeLookAt - eyePos;
```

operation

Another Vector3



MVP matrix



$$\mathbf{MVP} = \mathbf{P} * \mathbf{V} * \mathbf{M} = \mathbf{P} * (\mathbf{V_r} * \mathbf{V_t}) * (\mathbf{T} * \mathbf{S} * \mathbf{R} * \mathbf{N})$$

P: projection matrix

V: viewing matrix

→ Vr: viewing rotation, Vt: viewing translation

M: model matrix

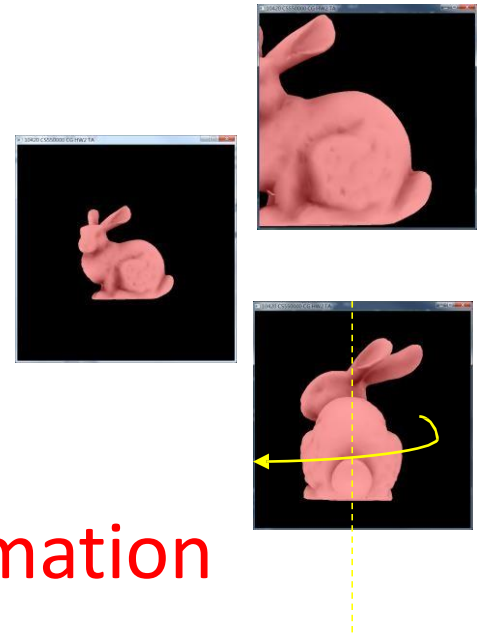
→ T: model translation, S: model rotation,
R: model rotation, N: Normalization



Geometrical Transformation

- Manipulate 3D models
 - Translation, scaling, rotation

$$\begin{matrix}
 \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} & \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} & \begin{bmatrix} \square & \square & \square & \square \\ \square & \square & \square & \square \\ \square & \square & \square & \square \\ \square & \square & \square & \square \end{bmatrix} \\
 \mathbf{P} & \mathbf{V} & \mathbf{M}
 \end{matrix}$$



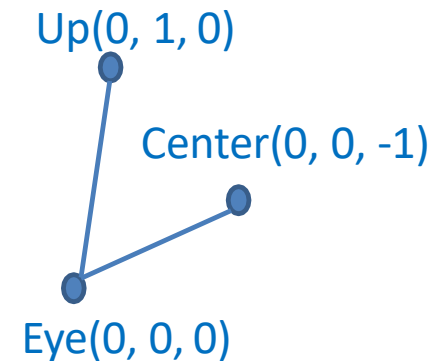
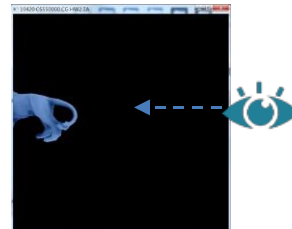
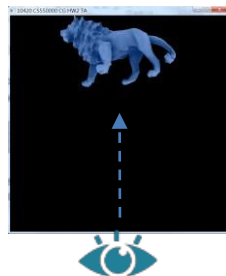
- Normalize the model with transformation matrix!



Viewing Transformation

- Display 3D models from different view.
 - Eye position, center position, up position

$$\begin{array}{c}
 \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{array}{c} - \\ | \\ - \\ - \end{array} \begin{array}{c} \boxed{} \quad \boxed{} \quad \boxed{} \quad \boxed{} \\ \boxed{} \quad \boxed{} \quad \boxed{} \quad \boxed{} \\ \boxed{} \quad \boxed{} \quad \boxed{} \quad \boxed{} \\ \boxed{} \quad \boxed{} \quad \boxed{} \quad \boxed{} \end{array} \begin{array}{c} - \\ | \\ - \\ - \end{array} \begin{array}{c} \boxed{} \quad \boxed{} \quad \boxed{} \quad \boxed{} \\ \boxed{} \quad \boxed{} \quad \boxed{} \quad \boxed{} \\ \boxed{} \quad \boxed{} \quad \boxed{} \quad \boxed{} \\ \boxed{} \quad \boxed{} \quad \boxed{} \quad \boxed{} \end{array} \\
 \mathbf{P} \qquad \qquad \mathbf{V} \qquad \qquad \mathbf{M}
 \end{array}$$

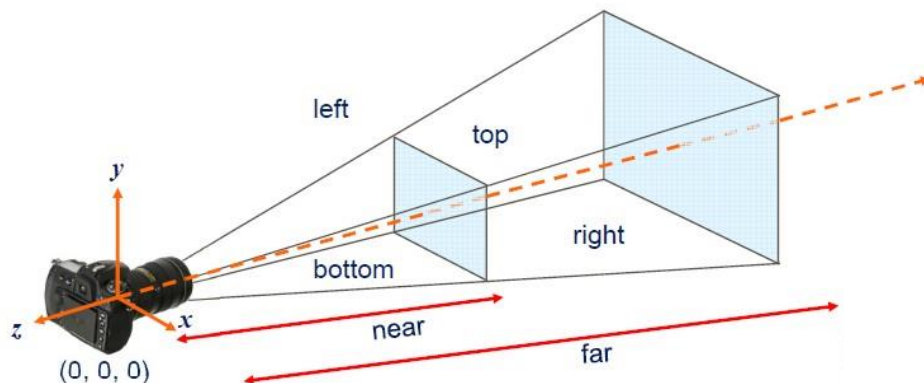
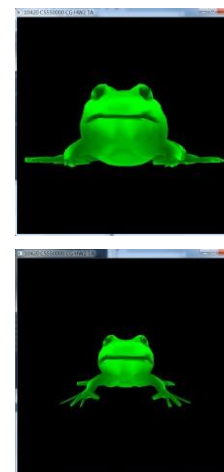


Projection Transformation

- Project 3D models on screen in different way.
 - Parallel(orthogonal), perspective

$$\begin{bmatrix} \square & \square & \square & \square \\ \square & \square & \square & \square \\ \square & \square & \square & \square \\ \square & \square & \square & \square \end{bmatrix} \begin{bmatrix} \square & \square & \square & \square \\ \square & \square & \square & \square \\ \square & \square & \square & \square \\ \square & \square & \square & \square \end{bmatrix} \begin{bmatrix} \square & \square & \square & \square \\ \square & \square & \square & \square \\ \square & \square & \square & \square \\ \square & \square & \square & \square \end{bmatrix}$$

P
V
M



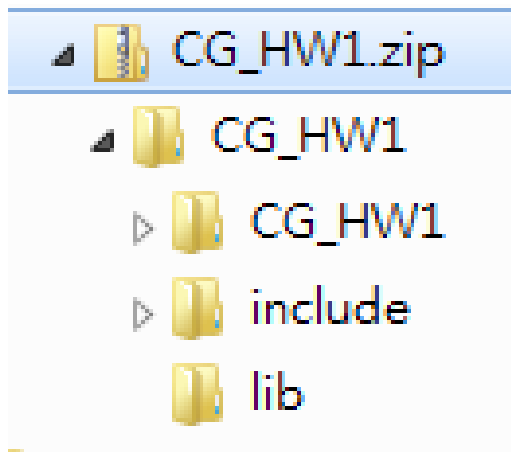
Submission

- Due date: **April 19th, 2017**
- Submit your project to **iLMS**.
- Filename: **HW2_XXXXXXXXX.zip**
- Put both “**lib**” and “**include**” folder in your zip file



位置: 計算機圖學Computer Graphics > 作業 ✓ 新增 | 複製

項次	標題	分組作業	已評分 / 繳交	期限	動作
1	HW1: Draw Some Geometry Models		0 / 0	04-06 23:59	編輯 刪除



名稱	大小	類型
CG_HW1.sdf	31,700 KB	SQL Server Compact ...
CG_HW1.suo	44 KB	Visual Studio Solutio...
CG_HW1.sln	1 KB	Microsoft Visual Stud...
CG_HW1.opensdf	0 KB	OPENSDF 檔案
CG_HW1		檔案資料夾
Debug		檔案資料夾
ipch		檔案資料夾

建立日期: 2015/3/17 下午 08:09
大小: 24.0 MB
資料夾: cg_hw1-f20be826

***** Remove “ipch” folder and “.sdf” file. *****



If there's no .sdf

Delete :

(1) .VC.db

(2) .vs folder

they are about 87% similar to .sdf file

名稱	修改日期	類型	大小
.vs	2017/3/14 下午 0...	檔案資料夾	
CG_HW1	2017/3/14 下午 1...	檔案資料夾	
Debug	2017/3/14 下午 0...	檔案資料夾	
Release	2017/3/14 下午 0...	檔案資料夾	
CG_HW1.sln	2016/3/22 下午 0...	Microsoft Visual ...	1 KB
CG_HW1.suo	2016/3/23 下午 0...	Visual Studio Sol...	18 KB
CG_HW1.VC.db	2017/3/14 下午 1...	Data Base File	29,124 KB

