

Mobile Application Development (Design and)

17th class

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Today

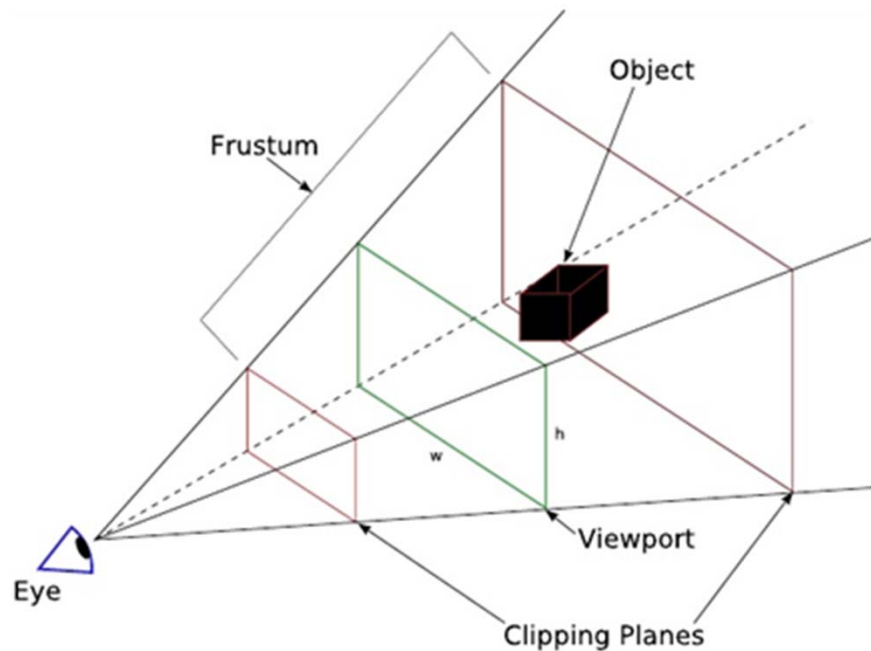
- Q&A
- 3D Graphics – look at some code
- LiveWallpaper - look at some code
- DoubleFlip: A Motion Gesture Delimiter for Mobile Interaction
 - Weixun Ge
- Swap designs
- Tomorrow: More useful tools

Q&A

- onDestroy for service and file saving problem when using a task killer
- Controlling sound playing precisely
 - JetPlayer (?)
- Real time step detection – deceptive

3D graphics with OpenGL

- Projection – “window into another world”



OpenGL ES (embedded systems)

- OpenGL: 1992
- Implements Viewports and lighting
- Tries to hide hardware issues
- ES subset of OpenGL
 - Android, Symbian, iPhone
- Not all phones have 3D hardware!

Tutorials (prepare to invest time!)

- NeHe Android
 - <http://insanitydesign.com/wp/projects/nehe-android-ports/>
- OpenGL ES Tutorial for Android
 - <http://blog.jayway.com/2009/12/03/opengl-es-tutorial-for-android-part-i/>
- OpenGL ES from the Ground Up
 - <http://iphonedevelopment.blogspot.com/2009/05/opengl-es-from-ground-up-table-of.html>

OpenGL ES

- Key class: GLSurfaceView
 - Glue to connect OpenGL ES to view system and Activity lifecycle
 - Handles
 - Frame buffer pixel format
 - Rendering thread management
 - Programmer focuses on defining a renderer for the view
- Not using onDraw as in 2D ... Surface

Rendering

- Implement GLSurfaceView.Renderer
 - onSurfaceCreated
 - onSurfaceChanged
 - onDrawFrame

OpenGL options (a few of many)

Option	Description
GL_BLEND	Blend the incoming color values with the values already in the color buffer.
GL_CULL_FACE	Ignore polygons based on their winding (clockwise or counterclockwise) in window coordinates. This is a cheap way to eliminate back faces.
GL_DEPTH_TEST	Do depth comparisons, and update the depth buffer. Pixels farther away than those already drawn will be ignored.
GL_LIGHT <i>i</i>	Include light number <i>i</i> when figuring out an object's brightness and color.
GL_LIGHTING	Turn on lighting and material calculations.
GL_LINE_SMOOTH	Draw antialiased lines (lines without jaggies).
GL_MULTISAMPLE	Perform multisampling for antialiasing and other effects.
GL_POINT_SMOOTH	Draw antialiased points.
GL_TEXTURE_2D	Use textures to draw surfaces.

Build a model

- Example in book: in code (just a cube)
- For anything practical, you need a 3D design program
 - Maya
 - 3DS max
 - Blender
 - Milkshape 3D (free,?)

Lighting and material

- Ambient
- Diffuse
- Specular

Frames per second

- Render based on time elapsed
- Aim for 60FPS
 - 16.76 ms between calls to `onDrawFrame`

Live wallpaper graphics

- Android 2.1+
- Pros
 - Coolness factor
 - Presence
- Cons
 - Battery life
 - Widgets
 - Competition with other apps for space

Live wallpaper service

- Implement MyEngine class
 - onDestroy
 - onSurfaceCreated
 - onSurfaceDestroyed
 - onSurfaceChanged
 - Called after structural changes (format or size) have been made to the surface. You should at this point update the imagery in the surface. This method is always called at least once, after surfaceCreated(SurfaceHolder).
 - onVisibilityChanged
 - Called to inform you of the wallpaper becoming visible or hidden. *It is very important that a wallpaper only use CPU while it is visible..*
 - onOffsetsChanged

Engine call order

```
onCreate
  onSurfaceCreated
    onSurfaceChanged (multiple calls, get width/height)
    onOffsetsChanged
    onVisibilityChanged
  onSurfaceDestroyed
onDestroy
```

- During Engine lifetime, Surface created that represents background of home screen

Wallpaper interaction

- onCommand
 - Process a command that was sent to the wallpaper with `sendWallpaperCommand(IBinder, String, int, int, int, Bundle).onTouchEvent`
- onTouchEvent
 - For supporting raw touch events