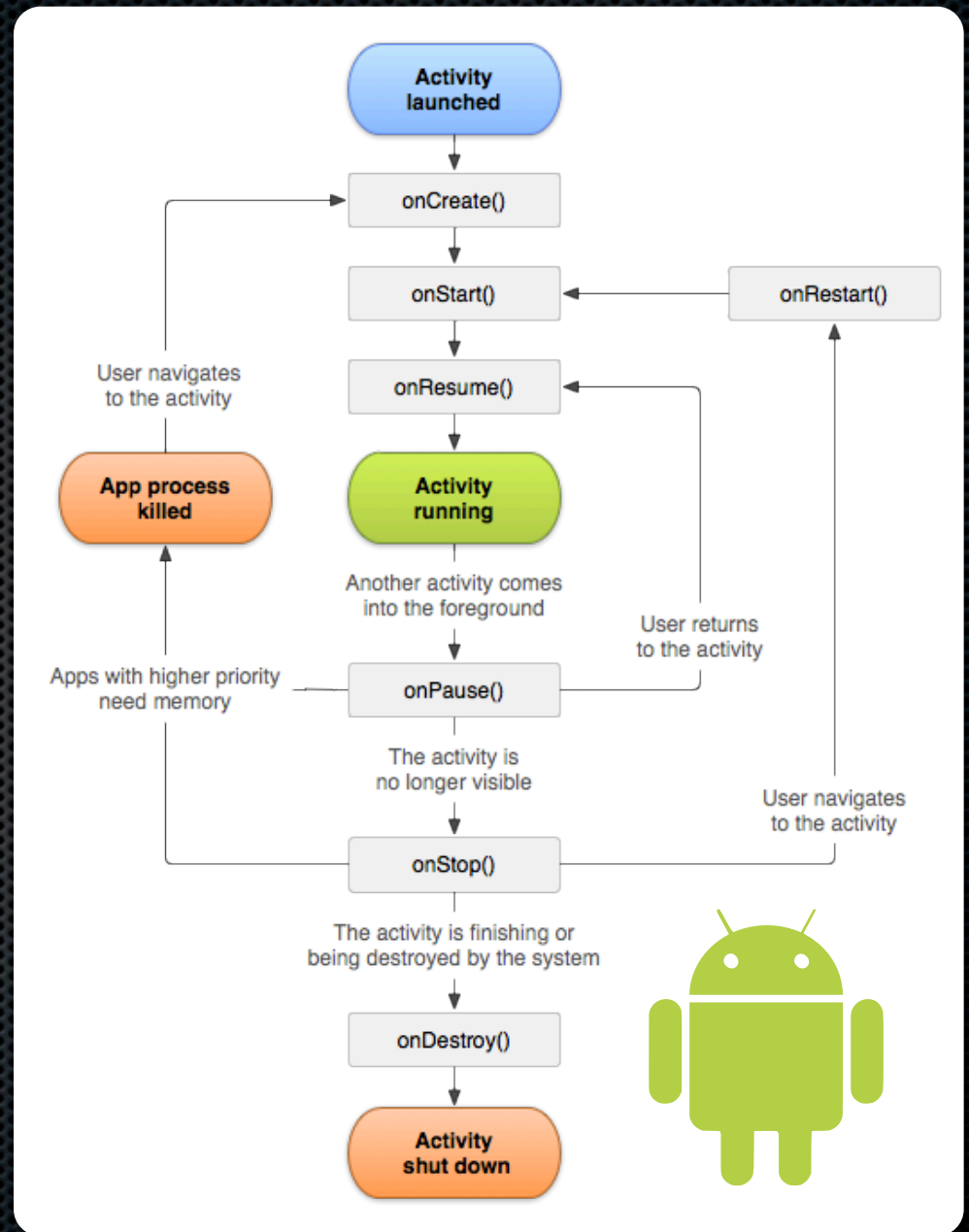


# Mobile Application Programming: Android

OpenGL UI

# Activities

- ❖ Apps are **composed of activities**
- ❖ Activities are self-contained tasks made up of **one screen-full** of information
- ❖ Activities **start one another** and are **destroyed commonly**
- ❖ Apps can **use activities belonging to another app**



# OpenGL ES

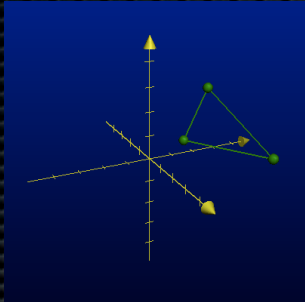


- ✦ C-Based **Performance-Oriented** Graphics Library
  - ✦ **Wrapper libraries** provided for Java, C#, etc.
- ✦ Produces 2D images from **2D** or **3D** geometric data
- ✦ **Mobile** version of OpenGL
  - ✦ Includes nearly all OpenGL functionality
  - ✦ Removes seldom-used or legacy features
  - ✦ Used by **non-mobile platforms** also (eg. Playstation 3)





Data read from Scene and OBJ files



OpenGL ES Primitive Processing

Vertex Shader

OpenGL ES Rasterizer

Fragments resulting from rasterization

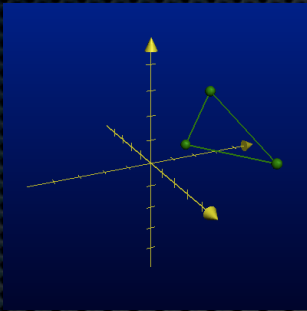
Frame Buffer

Fragment Shader

OpenGL ES Fragment Processing



# Shaders

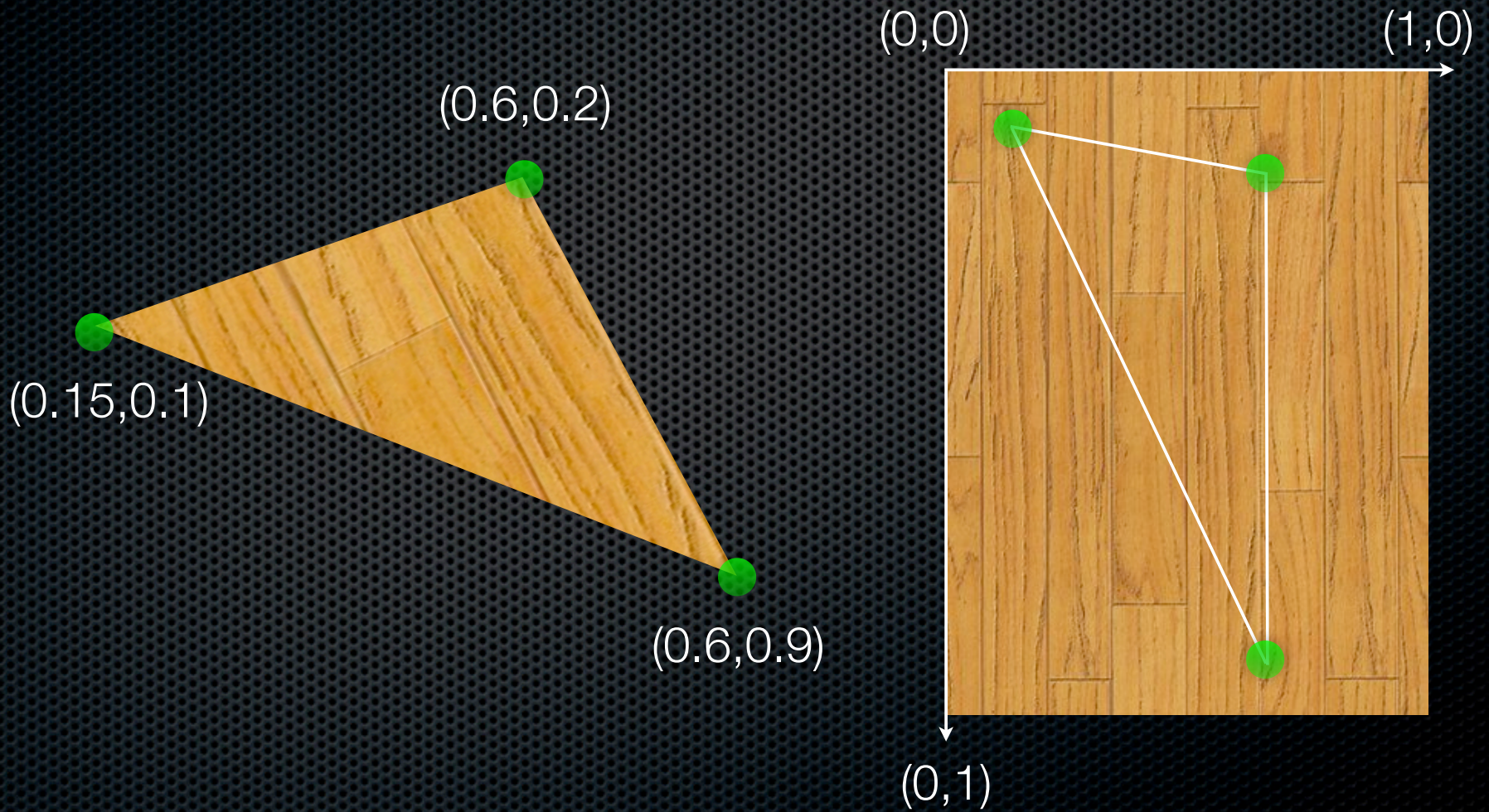


```
attribute vec4 position;  
attribute vec2 textureCoordinate;  
  
uniform mat4 modelView;  
uniform mat4 projection;  
  
varying lowp vec2 textureCoordinateVarying;  
  
void main()  
{  
    gl_Position = projection * modelView * position;  
    textureCoordinateVarying = textureCoordinate;  
}
```

```
uniform sampler2D textureUnit;  
  
varying lowp vec2 textureCoordinateVarying;  
  
void main()  
{  
    gl_FragColor = texture2D(textureUnit, textureCoordinateVarying);  
}
```

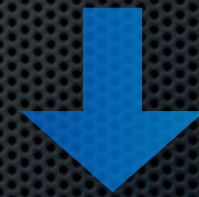


# Texture Coordinates



# Alpha Blending

```
glEnable(GL_BLEND);  
glBlendFunc(GL_SRC_ALPHA,  
            GL_ONE_MINUS_SRC_ALPHA);
```



# Sprites





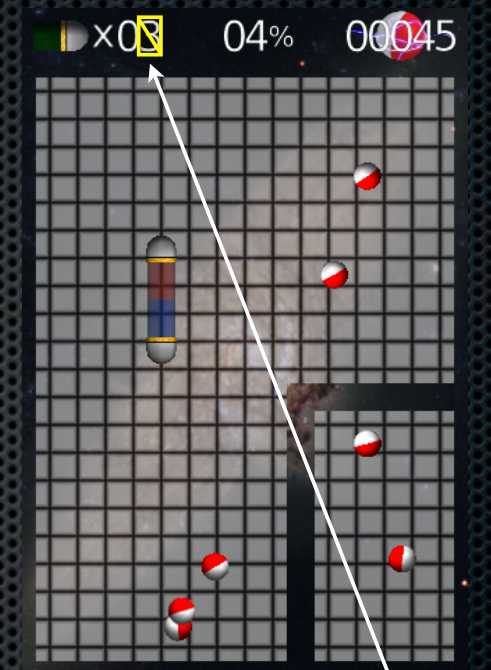
# Sprites



- Texture
- Sprite
- Special Sprite
- Continuous Sprite

# Sprites

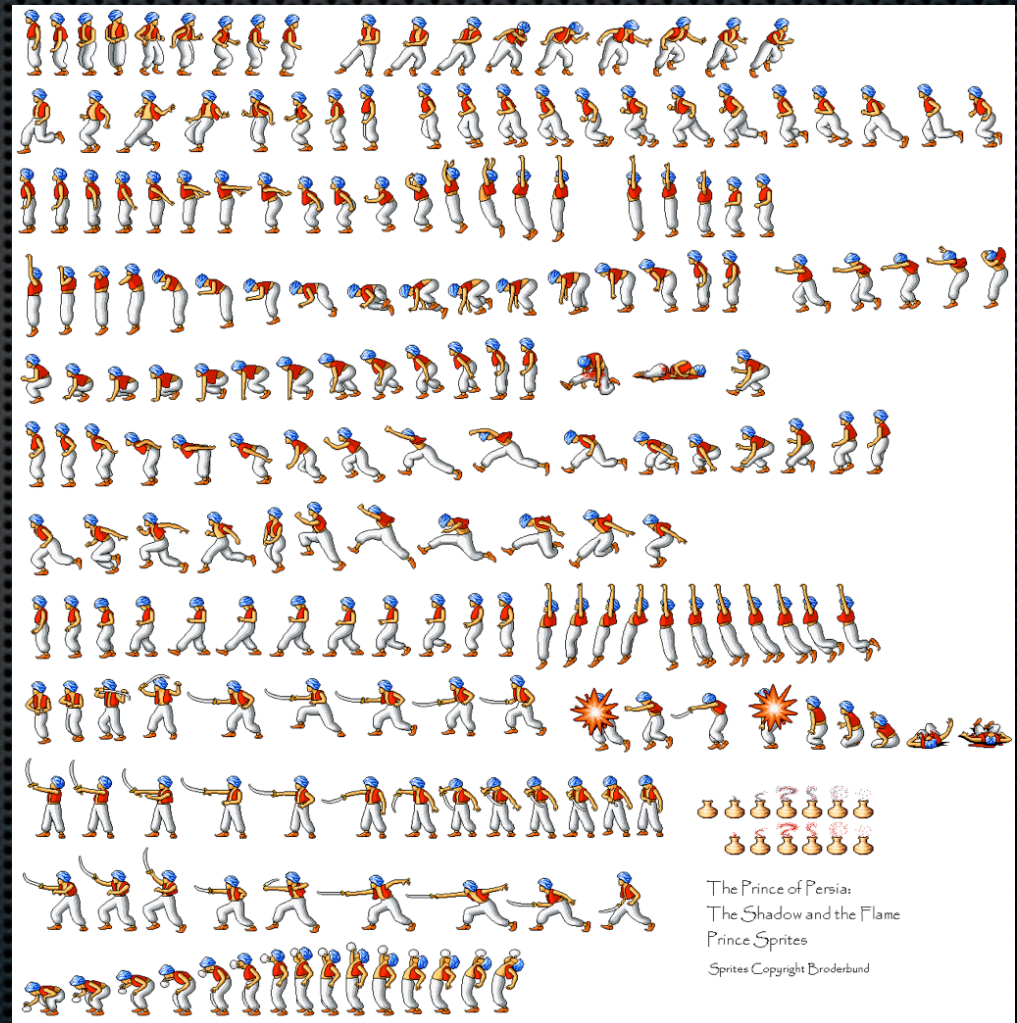
- ✦ Built by texturing a quad (2 triangles)
  - ✦ Geometry
    - ✦ Translation, Rotation, Scale
  - ✦ Texture
    - ✦ Bound Texture
    - ✦ Texture Coordinates
    - ✦ (Optional) Texture Matrix



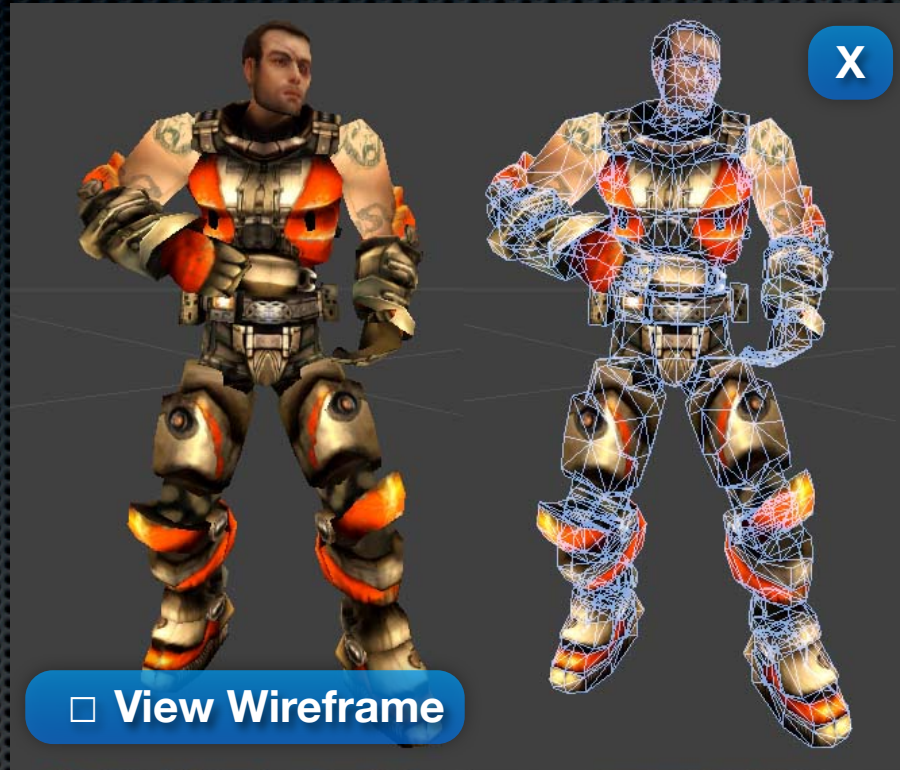
0123  
4567  
89AB  
CDEF

# Sprite - One Implementation

- ❖ Sprite
  - ❖ Position (x,y)
  - ❖ Animation
  - ❖ Current Tile List & Animation Time
- ❖ Animation
  - ❖ Texture
  - ❖ Tile Lists (2D)







GLCWindow : GLSurfaceView

GLCView : Object                      rootView

GLCLabel : GLCView

GLCImageView : GLCView

GLCLabel

GLCCheck : GLCView

GLCLabel

GLCCheck : GLCView

GLCLabel

GLCCheck : GLCView

GLCButton : GLCView