

**OpenGL ES:  
iPhone and  
Android**

**CSCI 4830/7000**

**Advanced Computer Graphics  
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# Apple iOS Devices

- Supports OpenGL ES 1.1 or 2.0
  - Newer devices support 1.1 AND 2.0
- User interface is Objective C
  - Links to C and C++ code
- Develop with Xcode on Mac only
- Emulator for all devices
  - Slower than native devices
  - Almost perfect emulation

# Getting iOS Tools

- Download Xcode from Apple
  - 4GB download
- Provides compiler, frameworks, etc
- Create project in Xcode
- Select target iPhone/iPad
- Emulator launched on run

# Android Devices

- Supports OpenGL ES 1.1 or 2.0
  - Newer devices support 1.1 AND 2.0
- User interface is Java
  - Link to C/C++ code with JNI
- Develop with NDK
- Emulator for phones and tablets
  - Slower than native devices
  - Emulator DOES NOT support OpenGL ES 2.0

# Android Tools

- Download Android SDK and NDK
  - android-sdk\_r16-linux.tgz
  - android-ndk-r7-linux-x86.tar.bz2
- Add Android tools to PATH
  - ....../android-sdk-linux\_x86/tools
  - ....../android-sdk-linux\_x86/platform-tools
  - ....../android-ndk-r7
- Get updates and install AVDs
  - android
  - Start emulator (Tools > Manage AVDs)

# Execution on Android

- Create project  
android update project -p .
  - makes build.xml from AndroidManifest.xml
- Build JNI library  
ndk-build -B
- Build APK  
ant debug
- Upload to emulator or device  
adb install -r bin/xxxx.apk
- Makefile implements all steps

# Android Alternatives

- Eclipse
  - Provides an IDE similar to Xcode
  - Get ADT plugin, SDK and NDK
- Install to hardware
  - Edit */etc/udev/rules.d/51-android.rules*
  - View with *adb devices*
  - Install with *adb install -r xxxxx.apk*

# Portable OpenGL ES Code

- Write the bulk of the code in C++
  - OpenGL ES 1.1 will run on all devices
  - OpenGL ES 2.0 will run on newer devices
- Write minimal code in interface language
  - Objective C - link to C/C++
  - Java - call C/C++ using JNI
- Currently no system agnostic libraries like SDL and GLUT for all devices



# Assignment 5

- Create an application that displays a scene in 3D on the iPhone/iPad or Android
  - Build objects yourself
  - Explore advanced features such as lighting, textures, ...
- Groups are permitted
  - Pair up with somebody ahead of the curve
  - Presentations are still individual
    - Volunteer if this is your thing