Enhancing the 3D Experience

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The Total 3D Experience

• Consists of Visual *and* Auditory input
  - Stimulate different senses
  - Use different parts of the brain

• The more senses are stimulated, the more real an experience feels

• The better the 3D experience, the better the game
Audio is Underrated

- Audio is probably the most under-rated element in a game
- There are companies that value audio but, generally speaking it does not get the respect it deserves
- Audio is often considered just before you ship

- So, are the machines running?
Ear Is Hard To Trick

- Audio Is Psychological
  - It is hard to measure

- If you have bad audio, people notice
  - They might not realize what it is - but what they experience feels wrong

- Audio is less forgiving than video
  - Skips, pauses, missing frames

- Audio synch needs to be within 100ms of graphics
3D Audio

- 3D audio is experiencing real world sound
  - Location – Direction
  - Size – Width and Height
  - Speed – Doppler
  - Power – Amplitude
OpenSL ES™ – The Easy Way to 3D Audio

- **Create theater-quality audio experience**
  - In a mobile device!

- **Profiles reduce application customization**
  - Applications can query available profiles
  - Develop to a specific profile or profile combination

- **Full 3D audio functionality enhances any gaming experience**
  - Perfect companion to OpenGL ES

- **Designed for implementation by either a hardware or software solution**
  - Unlike any other advanced audio API
Designed with Audio Application Developers in Mind

- Full range of effects and controls – including advanced 3D effects such as Doppler and virtualization
  - Experience rich, enhanced sound from locations other than the handset, even moving, for the ultimate multimedia experience

- Advanced MIDI
  - Use the output of the MIDI engine as a 3D sound source, making the ring tone appear to be coming from a different direction than the music

- 3D Audio makes OpenSL ES the natural choice for any audio application
  - Better gaming experience; 3D audio for conferencing calls; more vivid music experience
A Standard for Tomorrow’s Smartphone User

- Smartphones are rapidly approaching 25% of all handsets sold worldwide
  - Steadily increasing market share
  - Expected to exceed 50% by 2012

- Entertainment is a major selling feature of smartphones
  - Games, Multimedia

- Success in the smartphone market is dependent on user experience

- Audio & Multimedia performance is quickly becoming an important factor
  - Market needs differentiating factor
  - Form factor limits screen growth
  - Important for operator services
OpenSL ES Adoption – Standardizing Mobile Audio

OpenSL ES now supported in Android 2.3 NDK

Platform Providers

IP Vendors

OpenSL ES

Handset Manufacturers

SRS

Offers a full Phone-Music-Game OpenSL ES solution

First adopter of OpenSL ES

Nokia

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Driving forces behind enabling high-performance audio in mobile devices
OpenSL ES Profiles

Game-centric mobile devices
Advanced MIDI functionality, sophisticated audio capabilities such as 3D audio, audio effects, ability to handle buffers of audio, etc.

Music-centric mobile devices
High quality audio, ability to support multiple music audio codecs, audio streaming support

Basic mobile phones
Ring tone and alert tone playback (basic MIDI functionality), basic audio playback and record functionality, simple 2D audio games
OpenSL ES – Object-Oriented Audio

- **OpenSL ES has an object-oriented programming model**
  - Simplifies common use cases – but also extensible

- **Engine Objects are central to any OpenSL ES session**
  - Objects created using methods on the Engine Object interfaces

- **OpenSL ES Objects enable PLAY and RECORD of audio**
  - Perform some operation on an input and emit the result as output
  - Can handle almost any audio use case

- **Objects have control interfaces**
  - For application
The **OpenSL ES 1.1 Advantage**

- **Object-based audio for architectural simplicity**
  - Reduces development time

- **Native access for speed**
  - Necessary for high-performance audio applications

- **Advanced functionality for full application control**
  - Everything from simple playback to 3D audio

- **Profiles reduce fragmentation**
  - Phone, Music, Game

- **Advanced simplicity**
  - Reduces development time
  - Facilitates porting
• Same API regardless of underlying solution
  - hardware accelerated
  - software implementations

• Simplifies porting between platforms
  - Spend application development time on application development, not porting

• Meets the demand for high-performance audio
  - Opens up the market for advanced audio applications
  - Provides mobile consumers with a home-theater-like immersive audio experience

• OpenSL ES does for audio what OpenGL ES does for graphics
  - It brings your 3D application alive!
// Check for the Game profile
(*engine)->getInterface(engine, SL_IID_ENGINECAPABILITIES, &engineCaps);
(*engineCaps)->QuerySupportedProfiles(engineCaps, &profiles);

if(profiles && SL_PROFILES_GAME) GameProfile = TRUE;
Matching the Audio to the Video

• Don’t use generic audio tracks
  - Too recognizable by the user
  - Modify or supplement to fit the specific situation

• Matching the audio to the scene enhances the 3D perception
  - Stimulate more senses for a better experience

• Sometimes no audio is best!
  - Can be very effective
Vary the Audio

• Don’t use the same track over and over
  - Vary with a few extras
  - Use double tracks of different lengths

• When using background ‘Drone’ sound
  add small point effects for detail
  - Break the monotony

• Use different audio tracks for right and left
  - Certain background sounds are Right and Left ear specific
Equalizer of Death

- Lower the 3D effect and apply a low pass filter - cut the treble - when the player’s health is low
  - This will lower the clarity and disorient the player
  - Like blurring the screen does in the graphics world
Cinematic Stereo Widening

- Widen the sound during cinematic points
- Example: The player walks down a small hallway into a big room
  - Add suspense to a dramatic scene
- Start off with a narrow sound stage and then widen it as the room opens up
Bigger Explosions

- Apply a bass boost effect to enhance the explosion's boom
  - Note that bass boost is different than just increasing the bass
- Afterwards apply a low pass filter for a short time to shock the player audibly
Engulfing Sounds

- Apply stereo widening to sounds that encompass the player
  - Crowd noise
  - Fire
  - Rain, Wind, Weather
  - Traffic
Point sounds

- Create a single point sound moving in 3D space to distract the player
  - Fly buzzing around the player’s head
- Continually update position
- Vary the distance
The Classic

- Good Ol’ Fashion Shotgun
- The shotgun is everyone’s favorite weapon
  - Why? Because it goes BOOM!
To Create the Best 3D Experience

- Plan the audio when creating the video
- Don’t overuse common audio effects
- Stimulate as much of the brain as possible
- Combine sounds & experiment
- Listen to real world examples
Any Questions?
Thank You