Composing Music for VR Games: “Adventure Time” Case Study

Erik Desiderio
erik desiderio music

Overview

- Introduction
- Video
- Mixing Music for VR
- Implementation
- Q & A

Introduction

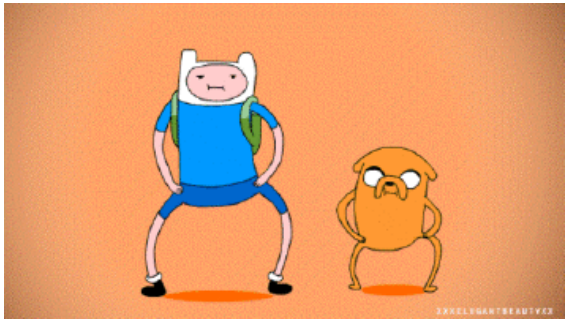
Erik Desiderio

- Composer for *This Means War!* by Kabam, *Emmy Award Show*, *Entourage, Duck Dynasty*
- Music Producer for *Immortals*, *The Borgias*, *Raising Hope*
- Model Ship Builder
- Last Name rhymes with “Car Stereo”

Video

http://www.erikdesiderio.com/adventure-time-vr-video/

Music



- Instrumentation
  - Game Music vs. Show Music
    - Music for game is unique. No themes from show
    - Show has ukulele and 8 bit sounds
    - Game has natural sound, real instruments
      - Clarinet, Banjo, Fretless Bass, Accordion, Harmonica, Cornet, Whistling, etc. No Ukulele!
  - Most sound effects came from show

Project Details

- Adventure Time: Magic Man's Head Games
- Gear VR, Oculus, Vive, PSVR
- Turbo Button for Cartoon Network
  - Met the game designer in a bar
  - Worked on 6 games together, from small mobile games to VR

Turbo Button

- SMS Racing

Turbo Button

- Floor Plan

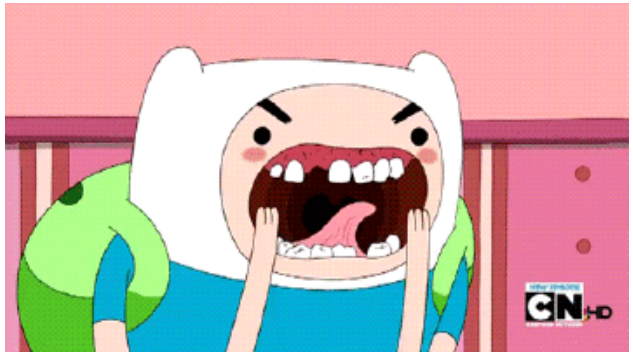
Mixing Music for VR

- Headphone Mixing
- Correct Type of Headphones
- Music Localization
- Binaural Sound Processing

Do not use!

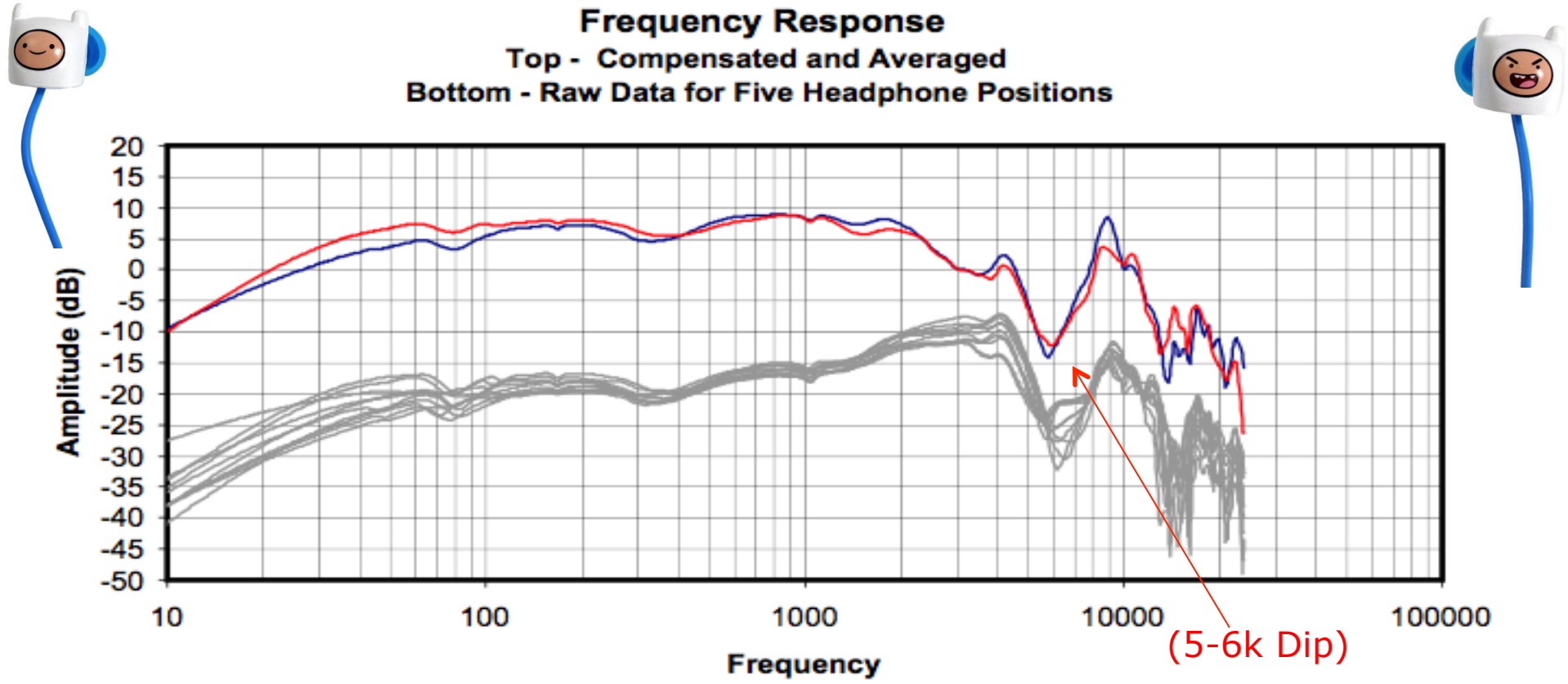
Headphone Mixing

- If you are mixing through speakers, stop! You're doing it wrong.
- Use speakers for soundtrack album



Headphone Mix v. Speaker Mix

- Instrument panning is exaggerated in headphones
- Reverb is less subtle in headphones
- Often 5k notch in headphones, Speakers attempt to be flat


Frequency Response
Top - Compensated and Averaged
Bottom - Raw Data for Five Headphone Positions
Amplitude (dB)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
10
100
1000
10000
100000
Frequency
(5-6k Dip)

Use Stereo Headphones

- Using surround modeling headphones may produce unintended effects
- Surround processing ≠ Binaural processing

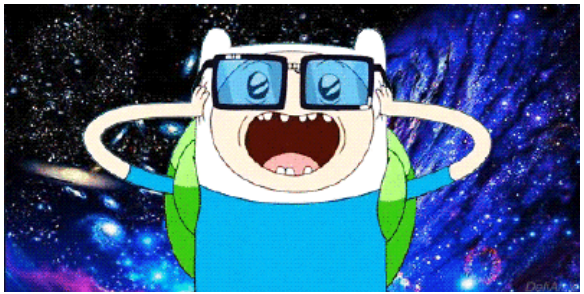
Oculus Rift Built in Headphones

Oculus Headset

All Other VR Headsets

Music Localization

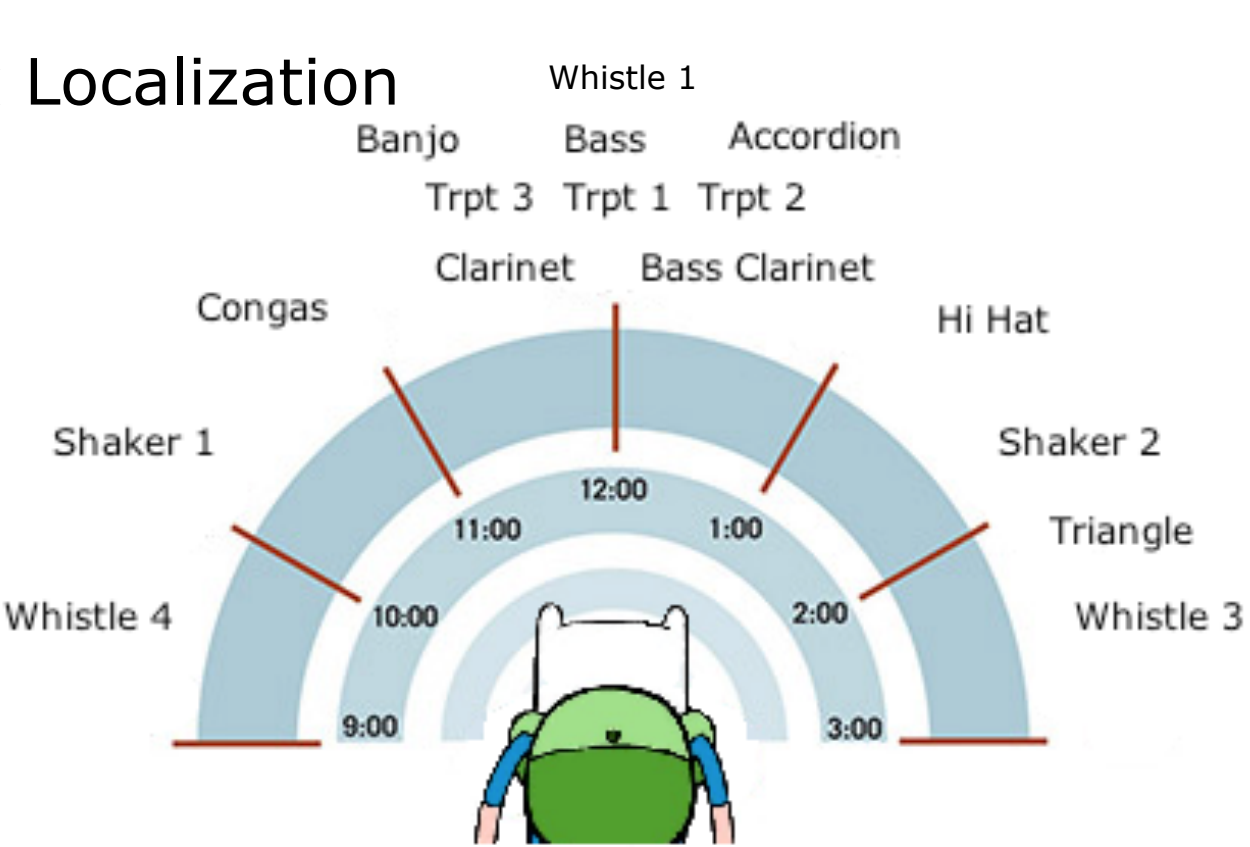
- Localizing = controlling where the listener perceives a sound to come from
- Not dialog localization, which refers to taking a game and putting it into a different language



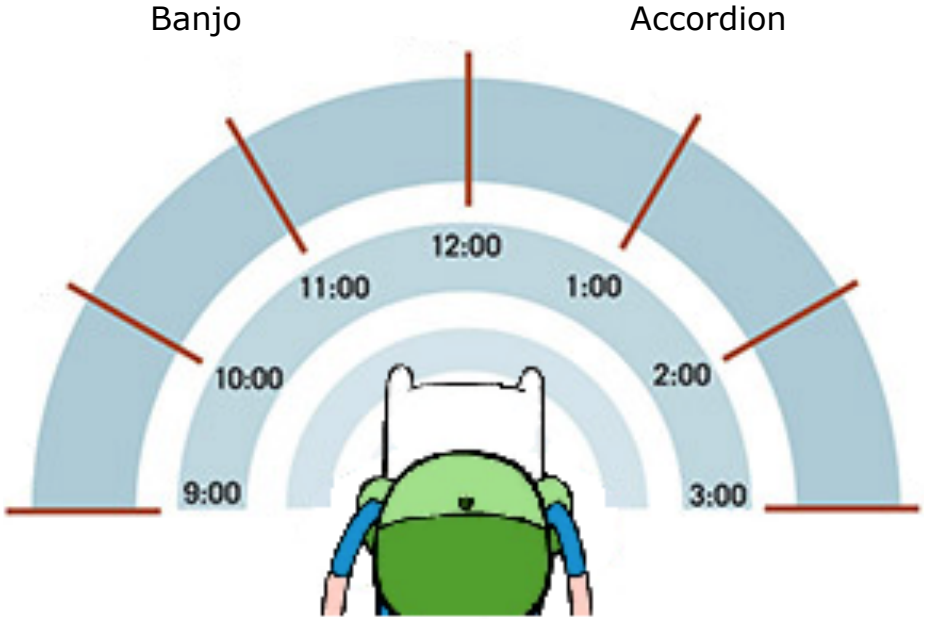
Localizing Music v. SFX

- Independent of game environment/ head location
- Reverb not in game environment, can be pre-mixed
- SFX must be correlated to objects/actions
- SFX reverb must be generated in game, realistic

2D Mix Localization



2D Mix Localization



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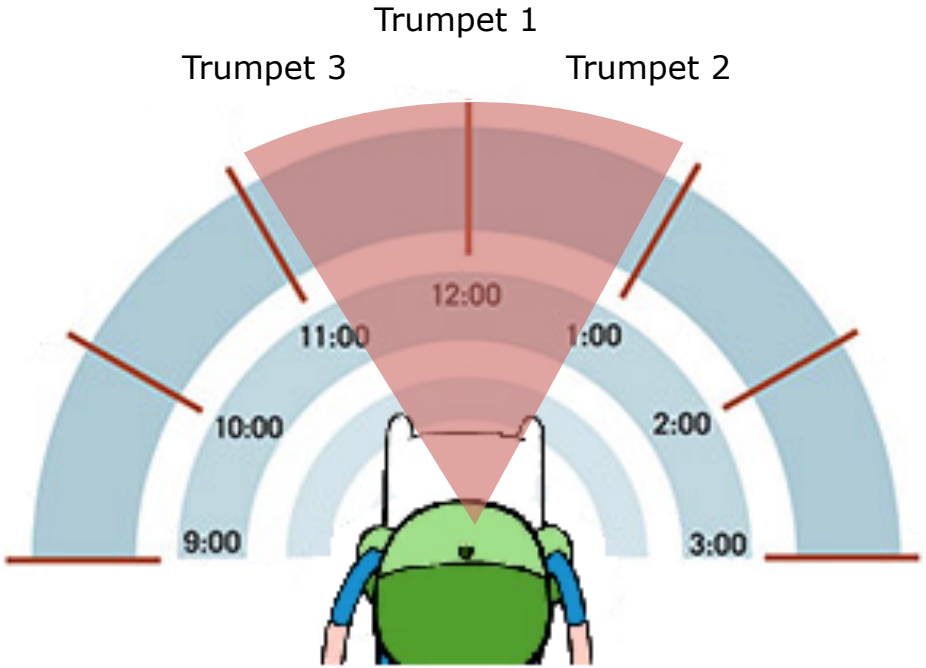

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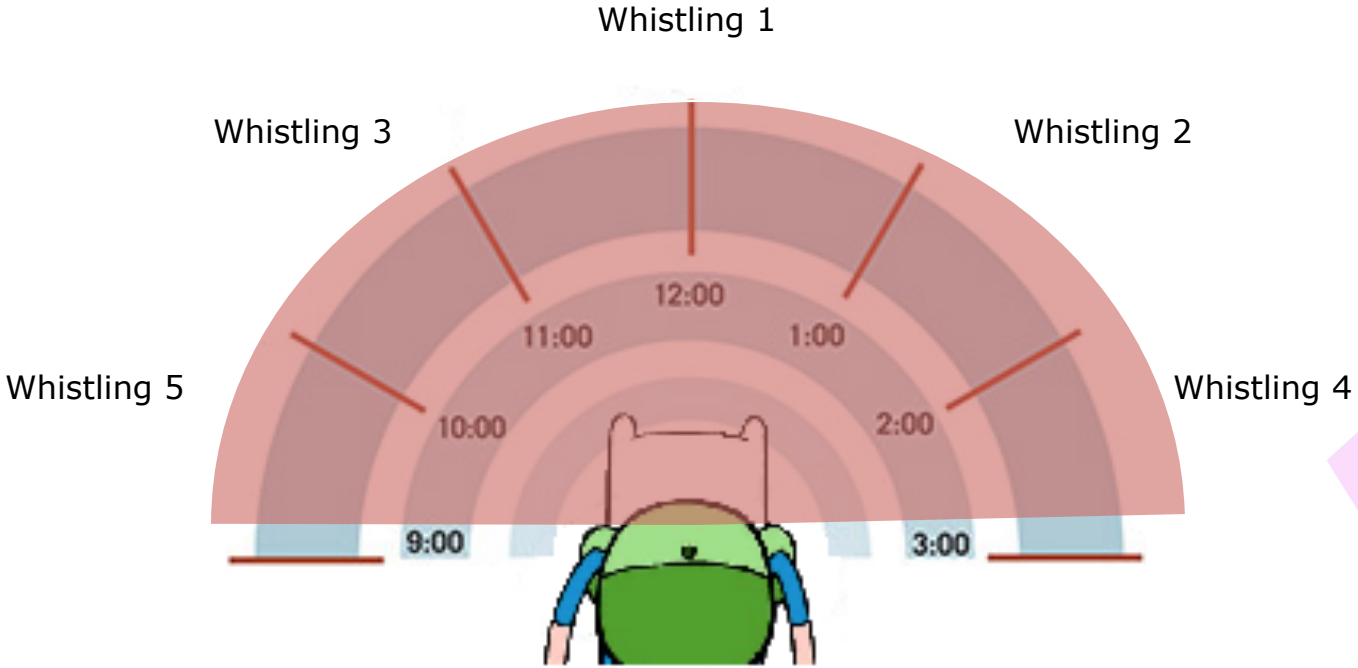
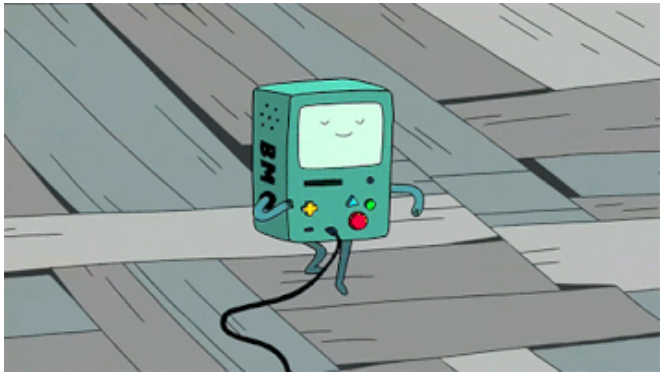


Mix Width Tips

- Less instruments, narrower mix
- More instruments, wider mix
- Still keep melody in center of mix



Music Localization Techniques

- #1 Simple Panning
  - This will increase volume on one channel, decrease volume on the other channel making the source appear from that side

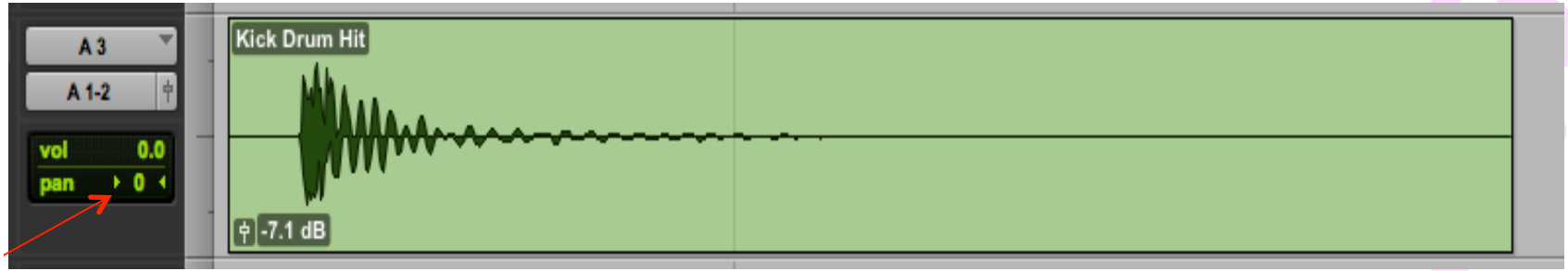
Pan Left

Pan Center

Pan Right

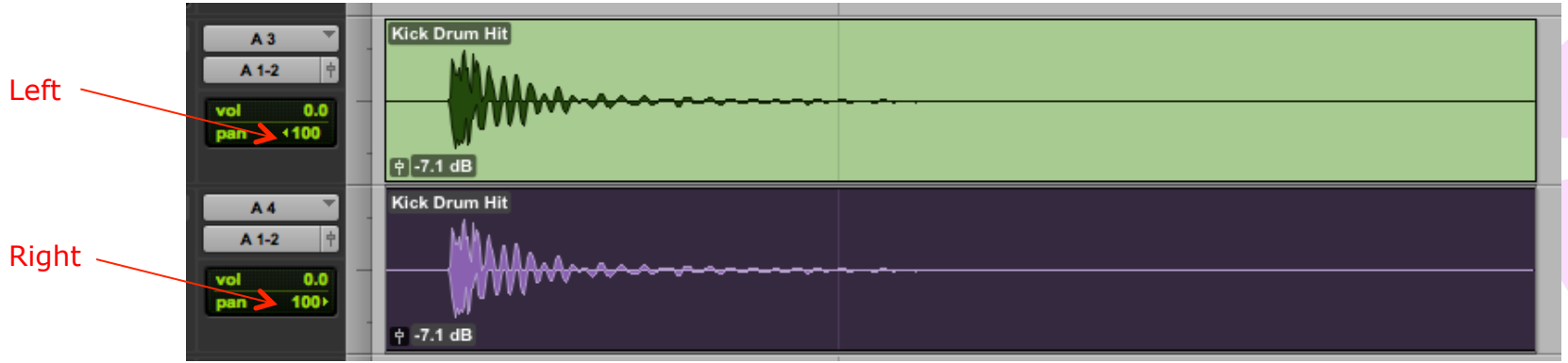
Music Localization Techniques

- #2 Delay one channel of a duplicated mono file by 1-2 milliseconds
  - Step one, start with mono audio file panned center



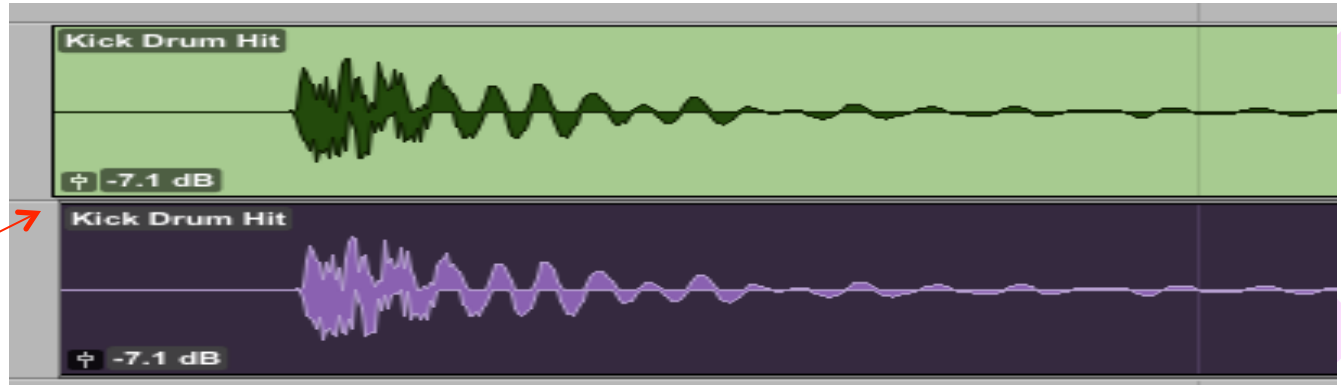
Music Localization Techniques

- #2 Delay one channel of a duplicated mono file by 1-2 milliseconds
  - Step two, duplicate and pan hard left and right



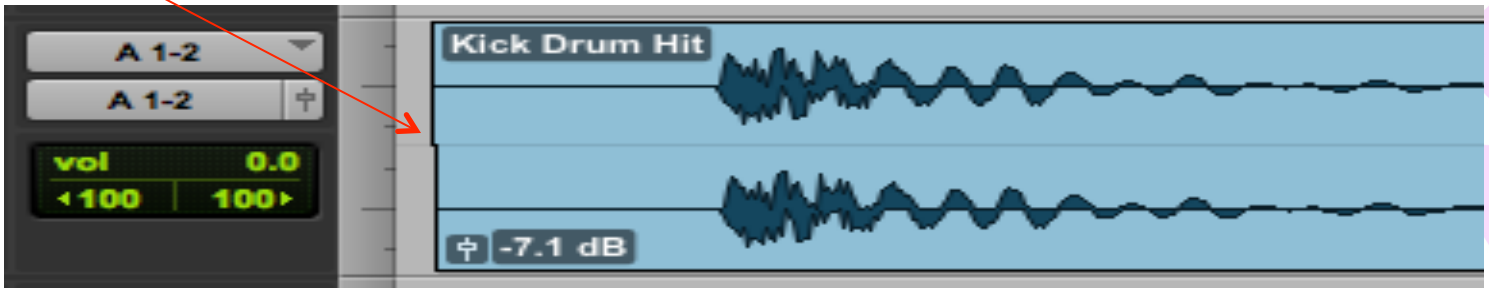
Music Localization Techniques

- #2 Delay one channel of a duplicated mono file by 1-2 milliseconds
  - Step three, nudge one file 1-2 ms to the right



Music Localization Techniques

- #2 Delay one channel of a duplicated mono file by 1-2 milliseconds
  - You can copy them to a stereo track panned center



Music Localization Techniques

- #3 Add reverb early reflections or EQ to one side

- These 3 techniques affect horizontal placement, Still In **2D**!!!

Binaural Sound Processing

- Good for vertical localization, adds **3D** in headphones

What is 3D Audio?

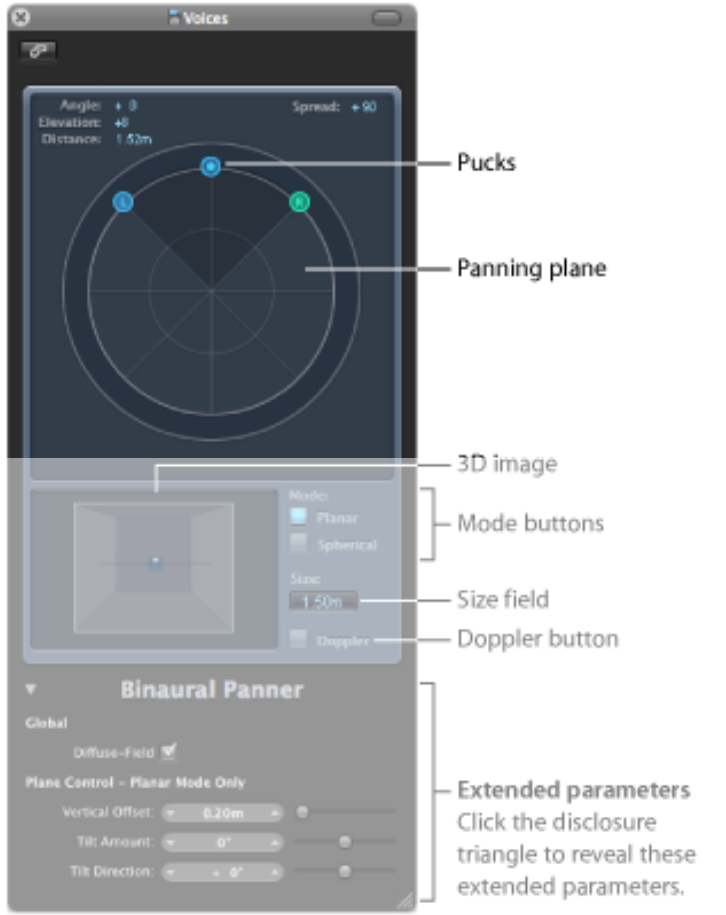
- Not limited to horizontal plane
- Height (above/below)
- Depth (near/far)
- Around (360 degrees)

Creative Mixing in 3D

- Wow, now I can mix in 3D, Now what?
  - Approaches for vertical:
    - Bass on bottom, treble on top
    - "Wedding Cake" Approach
      - Cake: Bass & Drums on bottom
      - Icing: Melody higher up
      - Figure/Candles: Synths, Shakers

Binaural Plug-Ins

- Logic Sequencer Plugin
  - Processes audio before it is in game engine
  - Doesn't tax game cpu resources, it's free!



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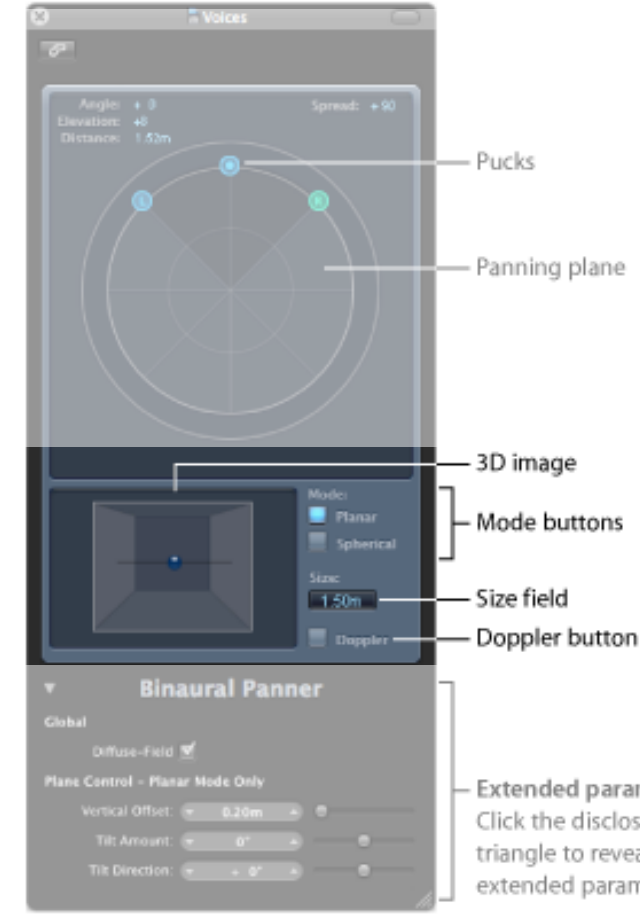

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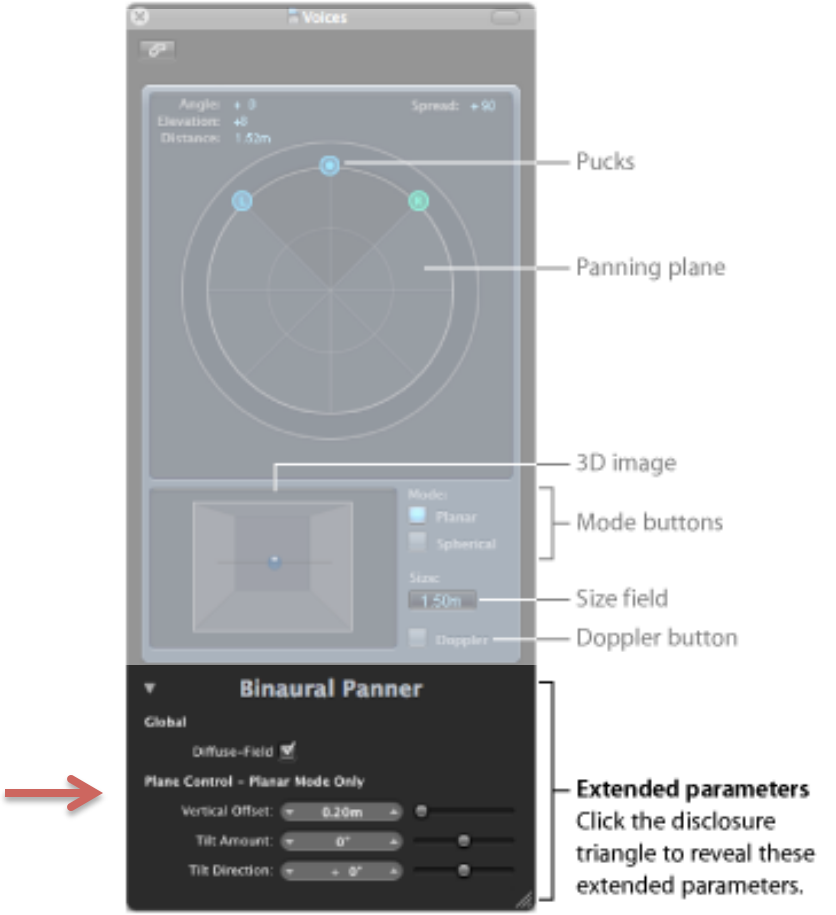


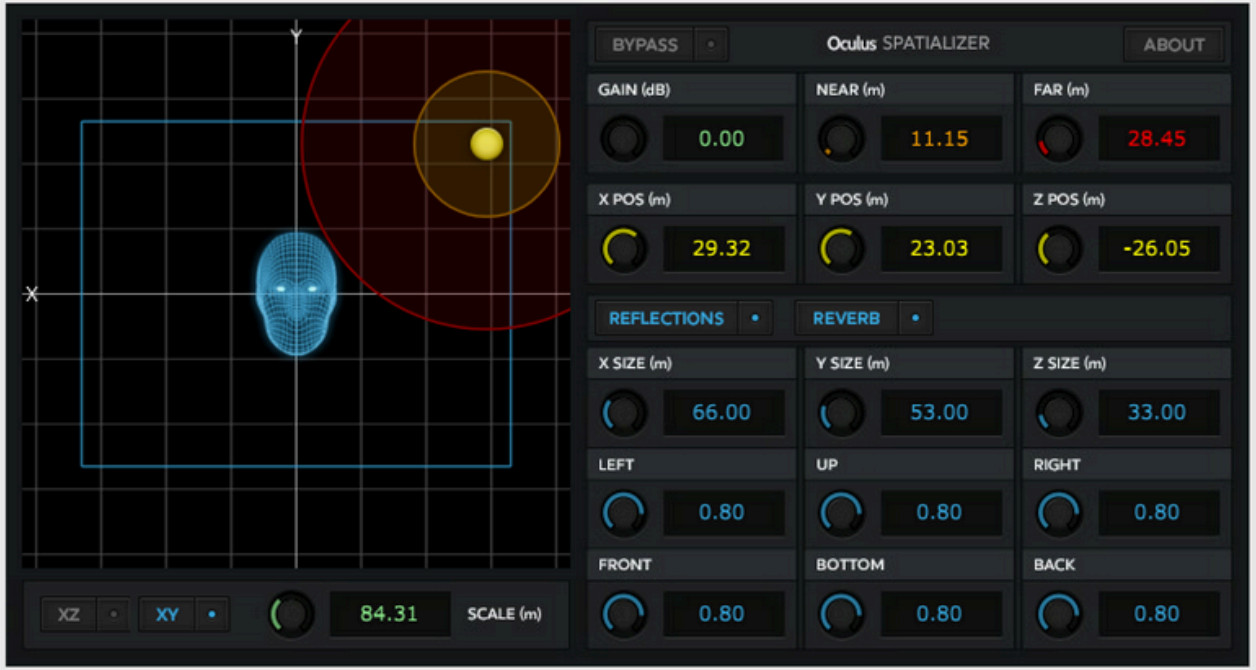
3rd Party Binaural Plugins

- 3Dception by Two Big Ears
- Real Space by 3D Audio
  - Use in Unity, Fmod, Wwise

3DCEPTION

RealSpace3D Audio

Oculus Audio SDK



Limitations of Binaural Processing

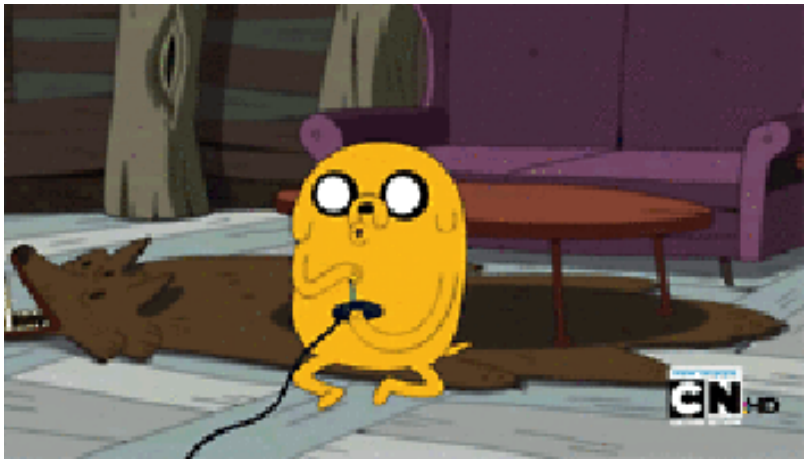
- Only for use on headphones
- Models generic human head

Limitations of Binaural Processing

- Plane/Cone of confusion

Surround v. Binaural

- Surround is great for speakers, still 2D
- Binaural is great for headphones, 3D

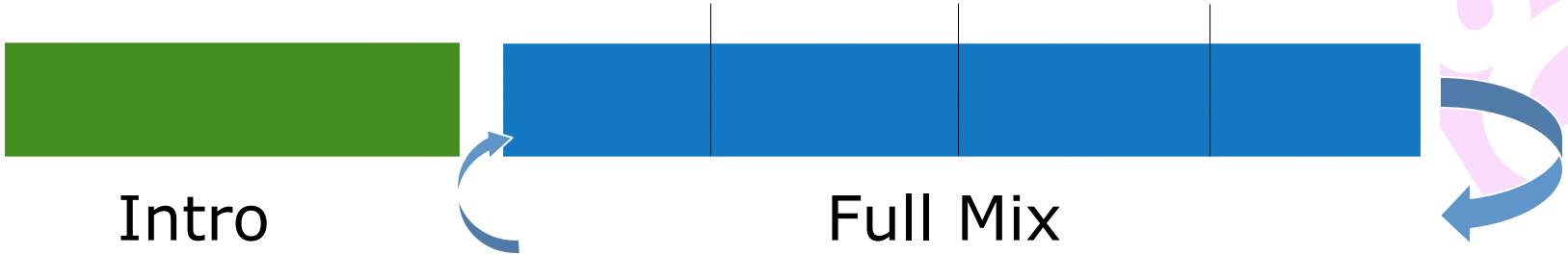


Implementation

- Game was created in Unity 4.6
- MasterAudio plugin for Unity

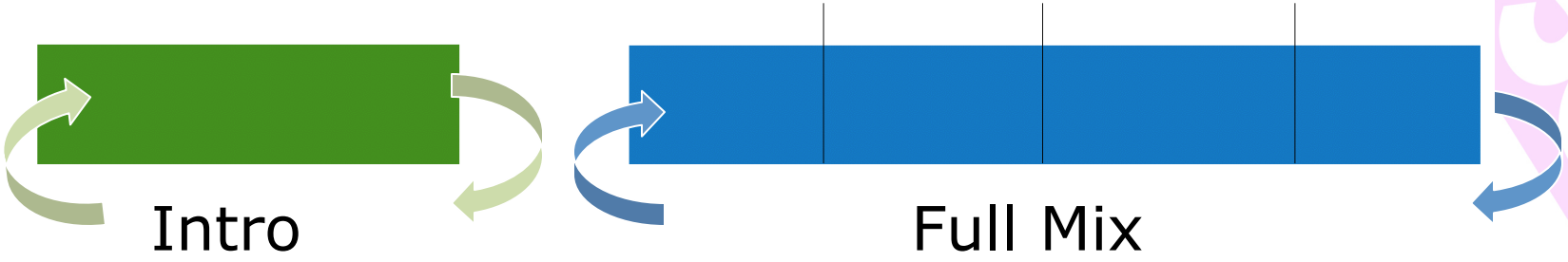
Adaptive Music Method 1

- 2 audio files:
  - 1 *Intro Mix* with clarinet light percussion and banjo
  - 2 *Full Mix Loop* all instruments
- Multiple start points for track



Adaptive Music Method 2

- Start full mix loop after a certain point
  - 2 audio files:
    - 1 *Intro Mix loop*, light mix
    - 2 *Full Mix loop,* all instruments



Adaptive Music Method 3

- Fade in additional layers
  - Multiple audio files play at the same time:
    - 1 “Exploration” loop, clarinet, banjo, synths
    - 2 Percussion Layer
    - 3 Melody and heavy drums

Adaptive Audio Implementation

- Additional Techniques
  - Pitch drop on character fall
  - Music volume lower during dialog
  - Smooth fade out on level completion
  - Spacial processing and reverb in sequencer

Adaptive Audio Implementation

- Changing Emotion with Music Mix

Adventure Time Binaural Mix

- Listen to it later in quiet room with Headphones on:
- erikdesiderio.com/atb/

Q & A

- Step up to the mic
- Ask me anything
- Please fill out survey
- Questions/insults: erik@erikdesiderio.com

Wrap up Room: 3022

Binaural Mix: erikdesiderio.com/atb/

THANK YOU!
CN HD