The Dynamic Audio of Vessel

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Video Game Audio Articles by Leonard J. Paul

Leonard Paul attained his Honours degree in Computer Science at Simon Fraser University in BC, Canada with an
Extended Minor In Music concentrating in Electroacoustics. He began his work in video games on the Sega Genesis and
Game Boy Nintendo Entertainment System and has a fifteen year history in composing, sound design and coding for
games working for companies such as Electronic Arts, Blackbox Entertainment, Radical Entertainment, madrugado
entertainment, Rockstar Vancouver and Black Box Games. He has worked on over twenty major game titles totaling
over 6.4 million units sold since 1994, including award winning AAA titles such as GTA III, NBA Live 2k6, Need for
Speed: Hot Pursuit 2, NBA Live 99 as well as the Indie award winning title Retro City Rampage. [+]

NEWS: School of Video Game Audio

NEW: School opens to the public in early 2012
Click to apply

Presentations and Writings:

* Sold out green vinyl on eBay for $150: http://bit.ly/1i6tMce. Over $100 less for black or blue?
  http://bit.ly/1iqgXWc
  1 day ago
* "Now, Vessel is currently at a 98% Metascore! http://bit.ly/1dprkIy"
  2 days ago
* "This week we will add this new photo set - thanks @Jerikai! RT @oxbcoda: GDC 2012 - our complete photo set: http://bit.ly/5vqvVv"
  2 days ago
* "New RT diaries! Get ready for the rest of this lovely Saturday to playing Vessel @VideoGameAudio!"
  3 days ago
* "Wishing last talk #GameAudioGDC - Fri 4pm #3004 "Dynamic Audio of Vesse" - Indie audio track @ http://bit.ly/1bGjzaz"
  3 days ago

GDC 2012
San Francisco, USA
**Vessel** by Strange Loop Games

- Trailer video - http://www.strangeloopgames.com/
Music of *Vessel*

- Video on music – Jon Hopkins soundtrack in Vessel - YouTube
Vessel Sound Design

- Every sound was recorded on a Zoom H4N recorder
- No digital effects used except real-time FMOD fx
- Sounds from Columbian rainforests, 100 year-old clock towers & more
- Emphasis on real sounds
FMOD

- Robust audio library and designer tool
- Shipped in many games since 2002
- Cross-platform: PC, 360, PS3, Vita, Mac, iOS, Wii, 3DS + more
- Good: Parameter modulation, FX, cost & speed
- Cons: Mixing, interactive music & presentation
- Overall, it's a very strong toolset and library
- New FMOD Studio is coming very soon in 2012
Lua

- Free open source scripting
- Fast, easy and efficient
- Implementation layer between FMOD library and C++ code
- Allows sound artist to make complex state aware behaviours not possible in FMOD
- Used extensively throughout Vessel
- Doesn't require recompilation
- Great scripting language for video games
Data and Control Flow

Audio and data flow to the game code from FMOD with the possibility of control data from Lua.
Procedural Audio

- Generate audio in real-time based on rules and behaviours (physical modeling, modal synthesis etc.)
- Main advantage is the possibility of realism
- Drawbacks include realism, scalability, dev time & CPU time
- Can combine samples, effects & procedural audio
- Granulation is a common technique used in Vessel
Granulation

- Splits sample into small granules & decreases repetition
- Independent control of frequency and tempo
- Manual segmentation done in Vessel to preserve transients
Basic Examples

- Sequencing
- Layering
- Layered sequencing
- Spectral layering
- LFO Effects Modulation
- Asymmetric Loops
- Effect Curves
Sequencing

- A basic start, loop and stop layout for steam
- Yellow cue point marks the sustain section
Layered

- Lava fluro footsteps: Lava hiss is in layer one, gloopy squish sound in layer two and wet sloppy sound on bottom
Layered Sequencing

- Split attack and remainder of sample into chunks
- Randomize start times of samples for variation
Spectral Layering

- High frequencies on top layer and low frequencies on the bottom layer
- LP filter to separate layers and add distance
LFO Effects Modulation

- Slowly modulate volume, low-pass filter and crossfade between samples for variation
Asymmetric Loops

- Three loops of slightly different lengths are looped to simulate the blob charge weapon sound
Effect Curves

- Progress bar uses EQ with a changing centre frequency to simulate liquid filling a container.
Advanced Examples

- Multiple effects modulation
- Granulation
- Water
- Constraints
- Synthesis
- Lua scripting
Multiple Effect Modulation: Size

- The size corresponds to the pitch curve which drops with an increase in size
Multiple Effect Modulation: Speed

- Speed increases spawn rate on cog granules for top three layers, increases playback rate and volume
Multiple Effect Modulation: Distance

- Ambient gear sounds at bottom play when camera is distant and more of the granulated closeup gears played otherwise.
Water

- Dynamic water audio done in C++ by grouping collisions – drop_count on left in green circle, hardness is on right
- Slosh at bottom triggered by water movements
Constraints

- Used for squeaks and metal chain shakes
- Driven by angular velocity on joints
Granulation and Subtractive Synthesis

- Air is synthesized by subtractive synthesis
- Leather squeaks are granulated
Multiple Methods

- Combine granulation, layering, sequencing, fx modulation and more into the water suction weapon sound
Lua

```lua
-- LJP: start/stop looping behaviour
if (this.CurrentSpeed > 0.1) then
    if (not isSoundPlaying) then
        this.PlaySound(bellowsSoundName)
        isSoundPlaying = true
    end
    this.SetSoundParameterValue(bellowsSoundName, "percentage", (percent * 100))
else
    if (isSoundPlaying) then
        this.StopSound(bellowsSoundName)
        isSoundPlaying = false
    end
end
-- LJP: }

function Update()
    print ("Counter=" .. counter)
    -- decay the debounce timer
    this.debounceCounter = this.debounceCounter - 1
    if (this.debounceCounter < 0) then
        this.debounceCounter = 0
    end
    if (counter > this.threshold) then
        if (this.debounceCounter <= 0) then
            this.PlaySound(this.soundName)
            this.debounceCounter = this.timeDelay
            this.SetSoundParameterValue(this.soundName, "size", counter)
            -- clear the number of calls this past frame
            counter = 0
        end
    end
end
end
```

- Great for tuning behaviours not covered by FMOD such as sound event call debouncing
- Used a lot for interactive objects ("gizmos")
Workflow

- Vessel is a physics based game so rapid iteration to explore potential outcomes is key
- The sound artist can quickly update all data and behaviours without recompilation
- Address all bottlenecks as they appear
- Reload sound banks when pausing game
- Make content development as interactive as possible
Speed

1. Add new sound events – 5 seconds
2. Game connect via FMOD – 5 seconds
3. Reload individual Lua script – 10 seconds
4. Reload all soundbanks/scripts – 10 seconds
5. Rebuild FMOD 250MB soundbank – 15 seconds
6. Clean rebuild of all soundbanks – 300 seconds
Questions?

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