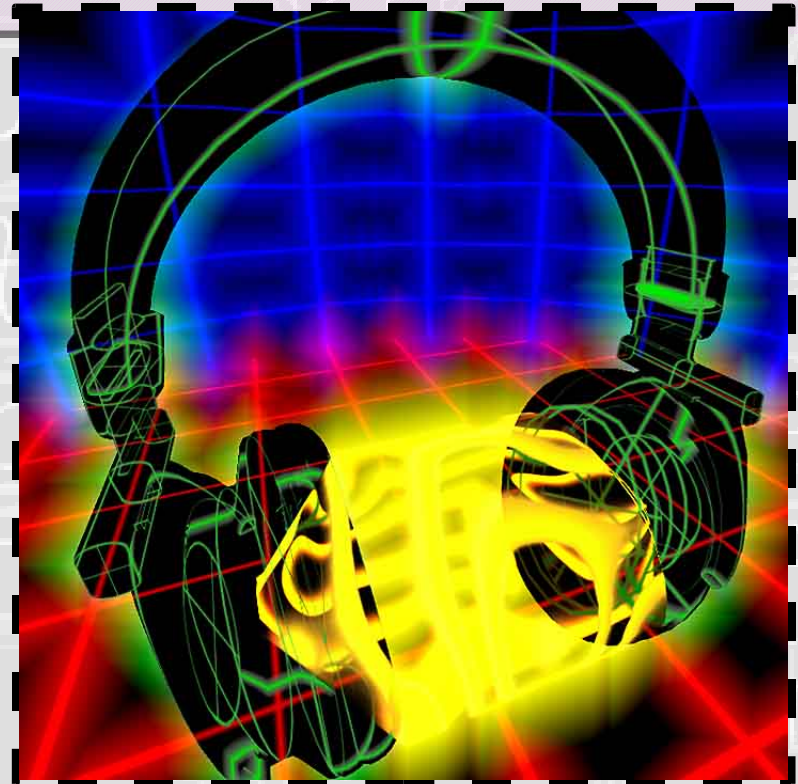


# **2010 Latin AES:: ::Video Game Audio**

Leonard J. Paul  
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<http://VideoGameAudio.com>

<http://twitter/VideoGameAudio>



# Overview



Romeo Punch Impact for *Facebreaker*

# Overview of Games Industry

- Weekend sales for Grand Theft Auto IV exceeded \$500 million vs. The Dark Knight sales of \$159 million
- However, film industry is still larger due to DVD sales, rentals, TV rights etc...
- Growing game markets are digital downloads and online gaming
- “AAA” games \$15+ million budget
- So, video games are big business

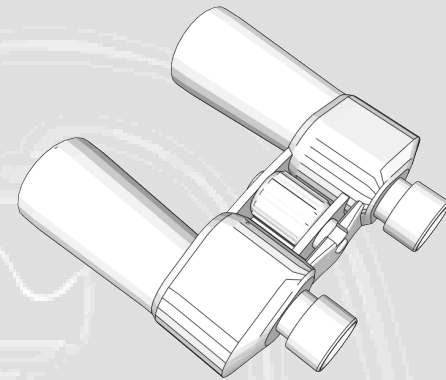


# Game Salaries

- US mainstream video game industry salary in 2009 average was \$75,573 USD
- Sound designers and composers earned an average of \$82,085
- Most game audio professionals tend to be more experienced



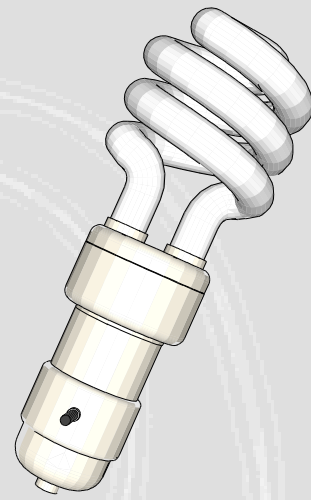
# Game Audio Overview



- **Creative** :: The artistic side of making audio for games
- **Technical** :: The mechanics of how audio is produced for a game platform
- **Manage** :: Balance time, money & resources
- **Goal** :: Combine the technical & creative to create a seamless experience for the player



# Creative



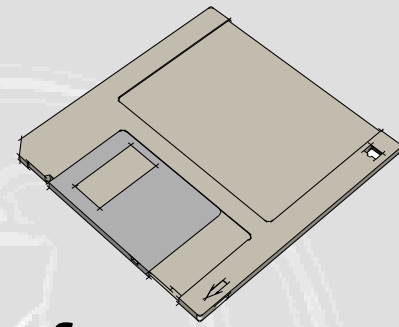
- **Sound Effects** :: Design, style, recording, synthesis, editing, compositing, mastering
- **Speech** :: Characters, script, casting
- **Music** :: Mood, emotion, pacing, genre, spotting, compose, instrumentation, arrangement, recording

# Technical



- **Sound Effects** :: Define how the sound reacts to physics & environment to select or generate the sounds to trigger
- **Speech** :: Select dialogue dependent on game actions to sound “intelligent”
- **Music** :: Songs respond dynamically and emotionally underscore the game

# Resources



- **CPU** :: More real-time effects & voices of decompression will take more processing
- **RAM** :: Fast access to samples and more channels results in more memory usage
- **HD** :: Hard drive is fast but space is limited
- **SD** :: Flash RAM fairly fast but space is small
- **Disc** :: Slow latency but large
- **Web** :: Expensive to stream over web



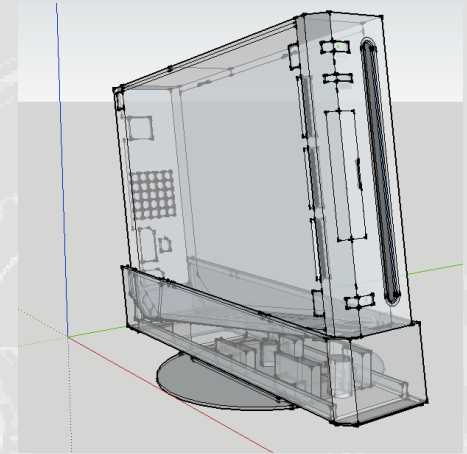
# Design



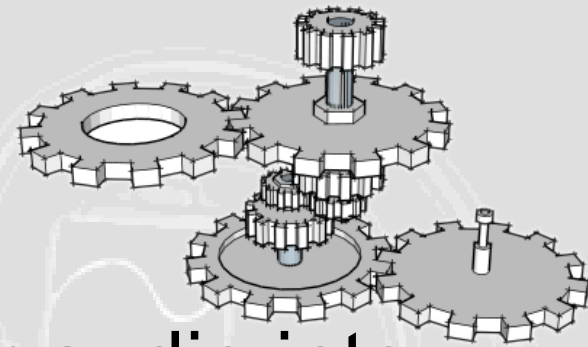
- Top-down or bottom-up approach
- Top-down means you figure out your “big idea” and worry later about how to actually do it
- Bottom-up means you look at what the hardware and software is capable of and figure out creative ways to get the most of them
- Typically one alternates between the two as technical issues and process limitations will force you to be more resourceful

# Technical

- Discover the limits of the software and hardware and push them
- Expand the software capabilities and design better audio tools to suit the game
- Realize that often you will be pressed by the team for space & CPU, so hold your ground
- Things can work one day and be broken (and useless!) the next

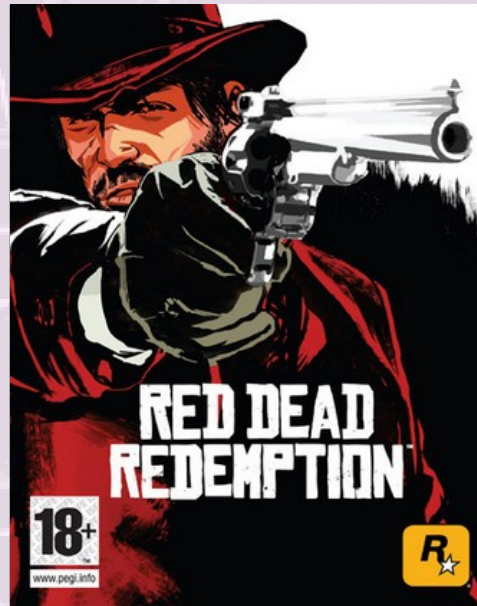


# Organization



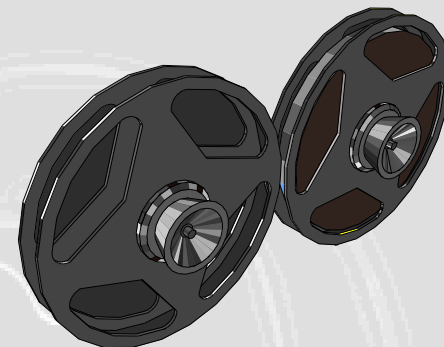
- What do you need to do to get your audio into the game? Over-prepare for the worst
- What tools and resources are you going to use and what software will support your creative design? Work well with your coder & producer
- A good process can be found by making all the right mistakes once and taking risks - exciting!
- Audio is always last, so be prepared for feature drop, no money, no time & no love :)

# Examples



- Let's see how audio might be done for a current game, such as Rockstar's western action game *Red Dead Redemption*

# Simple Ambience

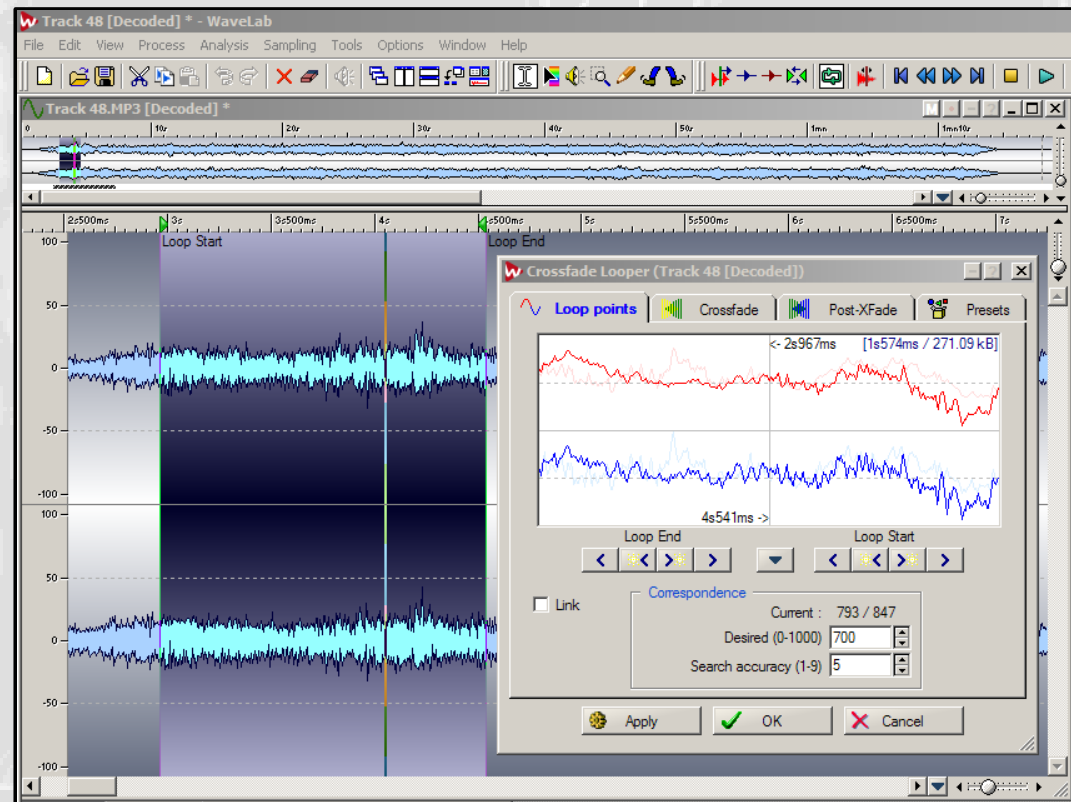


- Creative challenge is how do we make a realistic sounding ambience that can be heard for a long time?
- Technical challenges include how to fit it in memory, data compression type, making a seamless loop, mixing it at the right level and making it transition smoothly to the next ambience

# Loop Editing

- Looping using Wavelab:

- Start/End
- Zero crossing
- Live audition
- Auto x-fades
- Crossfade loop
- Volume flatten
- Pitch flatten
- Spectral edit



< [www.Steinberg.net](http://www.Steinberg.net) >



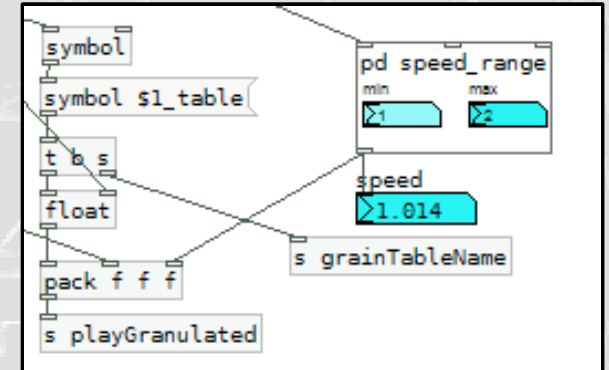
# Layered Ambience



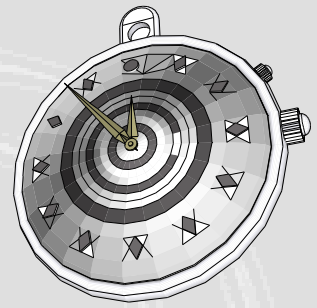
- A layered ambience is made up of several different loops
  - Country ambience could consist of frogs, wind, birds and flies
- Reactive ambience would have frogs and birds disappear for a while after a gunshot
- Flies would decrease with wind and vice-versa

# Procedural Sound Design

- Generate audio in real-time based on rules and behaviours
- Has been used in games since the beginning
- Parametric, generative & real-time (ie. flexible)
- Can combine samples with synthesis
- Allow flexibility of layers and real-time effects instead of stereo mixdown



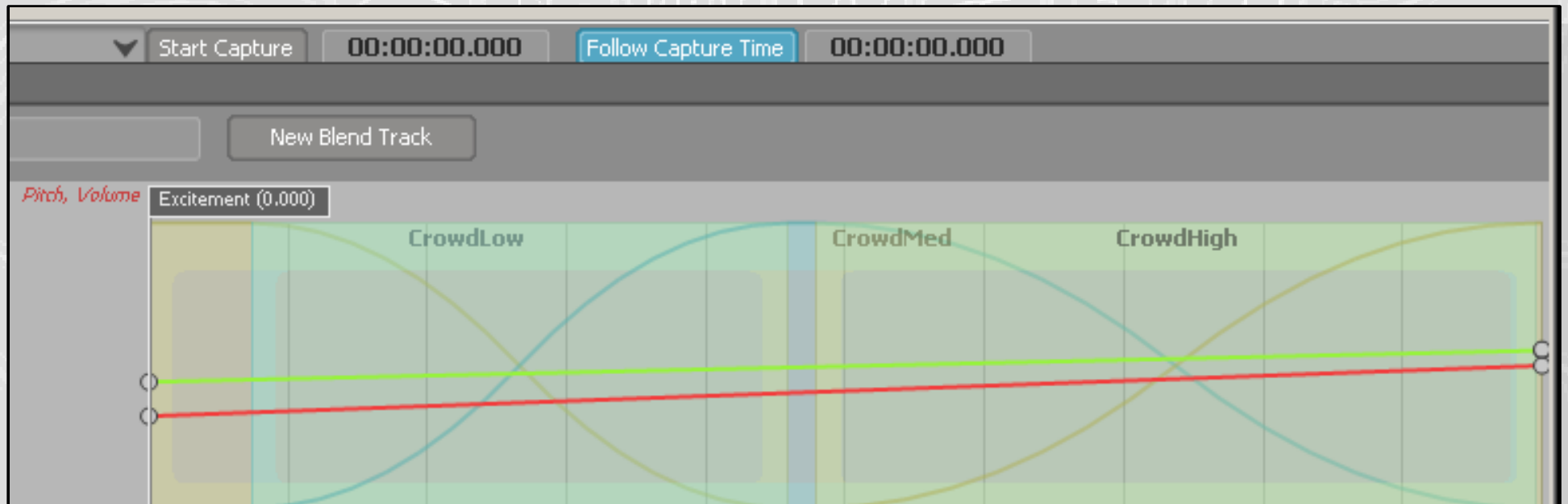
# Time-of-day Ambience



- City ambience of horses, dogs, distant wolves and crows could react to time
- Crows and wolves would trigger randomly with more crows during the day and wolves at night
- Horses would be more present during the day and dogs during the morning and early evening hours
- Could use a Blend container in Wwise with the RTPC as the time of day

# Blend Container in Wwise

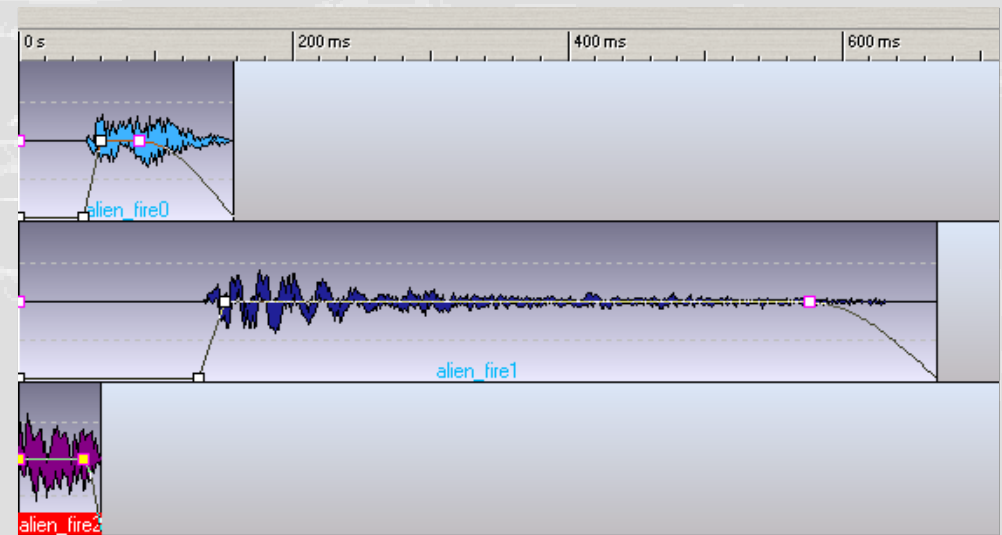
- Use blend containers in Wwise and react to RTPC (real-time parameter control) from game:



Crowd Blend Container In Audiokinetic Wwise

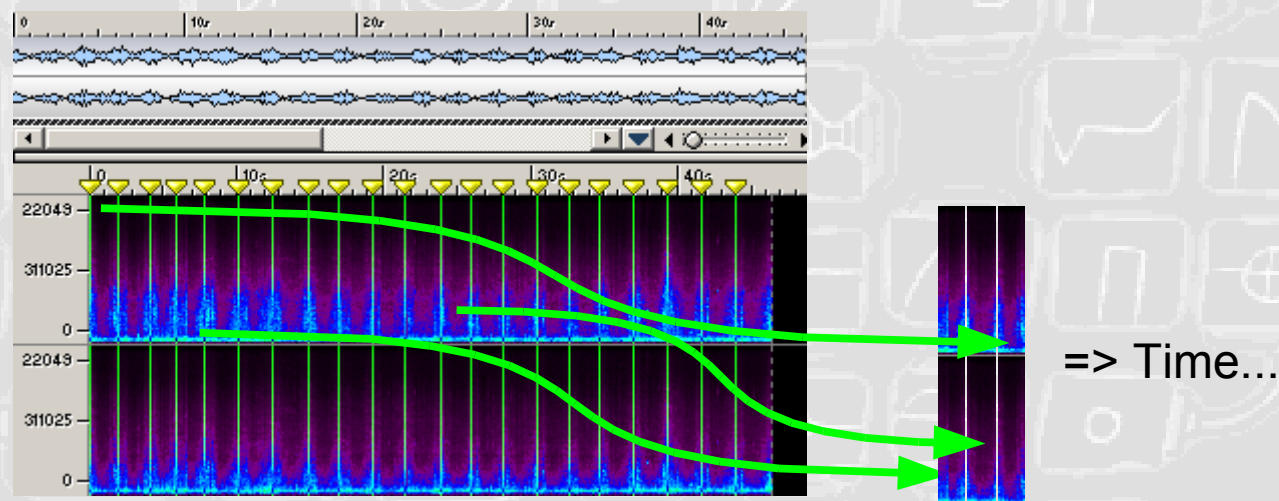
# Gunshots

- Creative challenge is the difficulty of making a loud sound frequently heard sound satisfying
- Use layering of recordings and include a low-end sweetener with printed effects for maximum impact
- Can use real-time effects to add variation and cue location



# Granular Concatenation

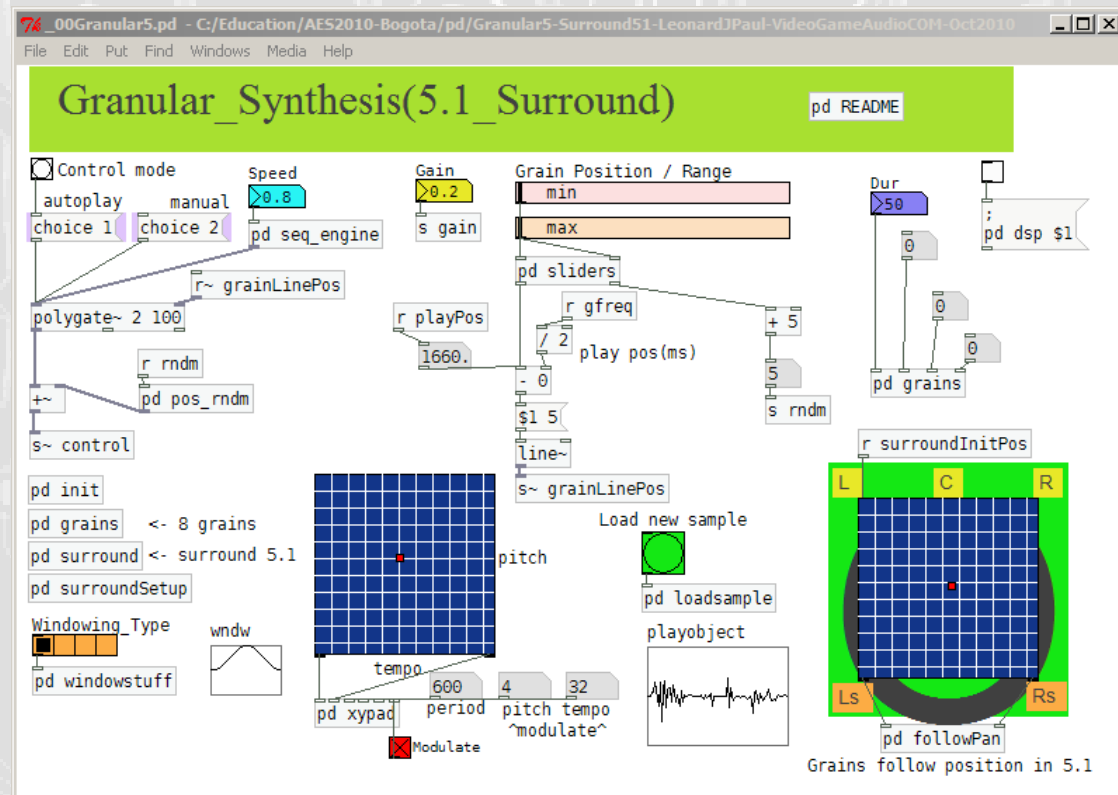
- Split the sound into grains on transients and concatenate them randomly in real-time:





# Granular : Speech

- Slightly change the tempo contour of a line of speech while playing back to increase variation:

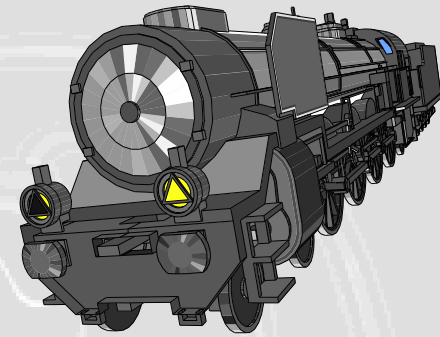


# Simple Synthesis

- In Retro City Rampage almost all sounds are synthesized from pulse, triangle and noise waves
- Mod tracker allows sound artist control over parameters and mix of synthesis and samples but is also tricky to learn

#0	1: Pulse1	2: Pulse2	3: Tri	4: Noise	5: DPCM
00	C-3 01 .. E33	G-3 01 .. E33	E-2 05 v00RCE	C-2 06 ..	...
01	...	...	...	...	...
02	...	...	...	...	...
03	...	...	...	...	...
04	...	...	...	...	...
05	...	...	...	...	...
06	...	...	...	...	...
07	...	...	...	...	...
08	...	...	...	...	...
09	...	...	...	...	...
0A	...	...	...	...	...
0B	...	...	...	...	...
0C	...	...	...	...	...
0D	...	...	...	...	...
0E	...	...	...	...	...
0F	...	...	...	...	...
10	C-8 04 v41 D0F	...	...	...	...
11	...	...	...	...	...
12	...	...	...	...	...
13	...	F#9 04 v46 D0F	...	...	...
14	...	...	...	...	...
15	...	G-8 03 v38 D0F	...	...	...
16	F#8 02 v56 D0F	...	...	...	...
17	...	...	...	...	...
18	...	...	...	...	...
19	F#8 02 v56 D0F	...	...	...	...
1A	C-8 04 v00	...	...	...	...
1B	F#7 01 v48 D0F	F#9 04 v46 D0F	...	...	...
1C	...	...	...	...	...
1D	C-8 04 v41 D0F	...	...	...	...
1E	...	...	...	...	...
1F	...	...	...	...	...
20	...	...	...	...	...
21	...	G-8 03 v38 D0F	...	...	...
22	...	...	...	...	...
23	C-8 01 v27 D0F	...	...	...	...
24	...	...	...	...	...
25	...	...	...	...	...
26	F#8 02 v56 D0F	...	...	...	...
27	C-8 04 v00	F#9 04 v46 D0F	...	DF2	...
28	F#7 01 v48 D0F	...	...	...	...
29	...	...	...	...	...
2A	...	...	...	...	...
2B	...	...	...	...	...
2C	...	...	...	...	...
2D	...	G-8 03 v38 D0F	...	...	...
2E	...	...	...	...	...
2F	...	...	...	...	...
30	...	...	...	...	...
31	...	...	...	...	...
32	...	...	...	...	...
33	...	...	...	...	...
34	...	...	...	...	...
35	...	...	...	...	...
36	...	...	...	...	...
37	...	...	...	...	...

# Train Sounds



- Use loops for far, medium and close recordings of train sounds
- Crossfade in real-time between depending on distance
- Add slight playback rate modification to loops for additional modulation
- Add train track sound
- Add reverb from environment

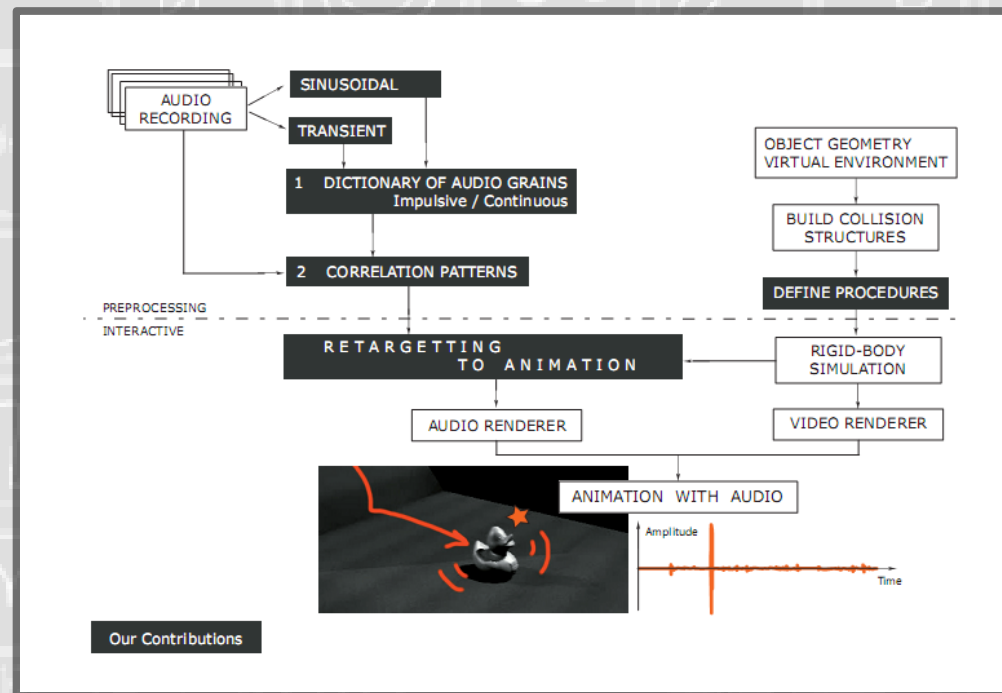
# But...

- Often there isn't enough time, so people will go with “what they know” and advanced techniques are overlooked
- Long time required for development and tuning
- Leap of knowledge and time to learn for those invested in older techniques
- Requires more CPU for DSP and synthesis
- Balance creative & technical ? =>



# Current Research

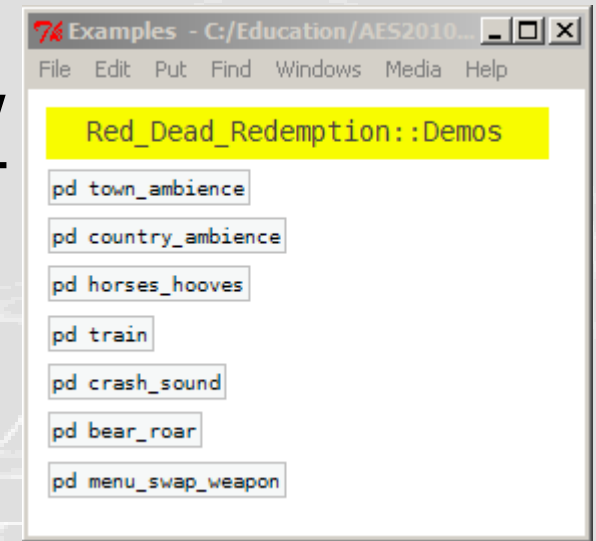
- Utilize a hybrid method of samples plus modal & granular synthesis to make audio for games (Cécile Picard et al.):



<http://www-sop.inria.fr/members/Cecile.Picard/index.html>

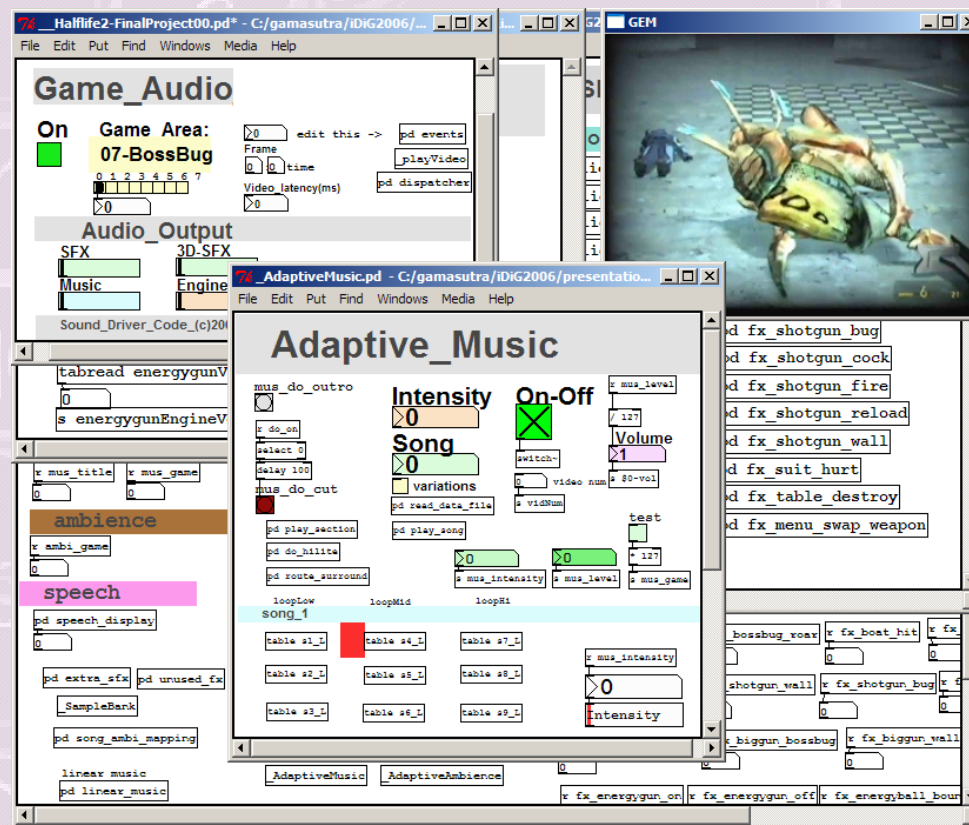
# Demo Review

- Using Pure Data:
  - Procedural ambience
  - Time of day ambience
  - Granulation : Horse's hooves
  - Engine : Trains
- Now, let's examine *Half-Life 2* and OSC:
  - Granulation, layering and more





# Prototyping



# Game Audio Pipeline

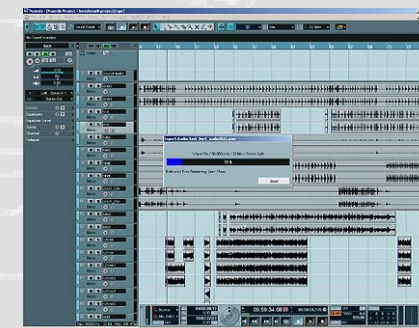
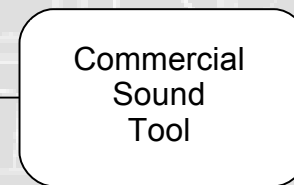
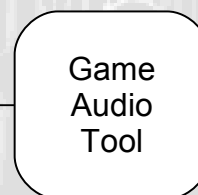
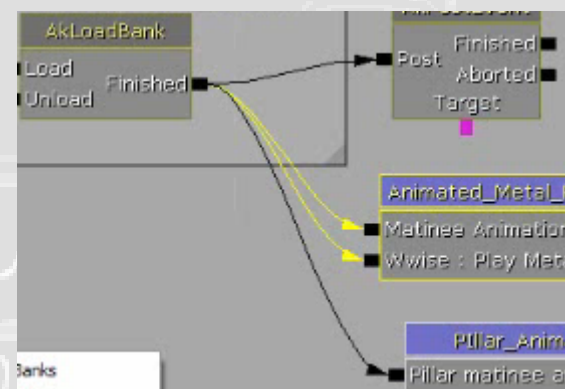
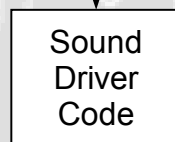
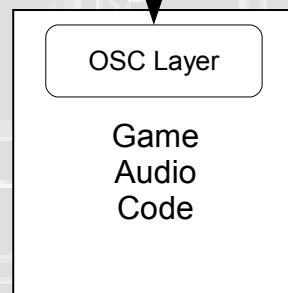
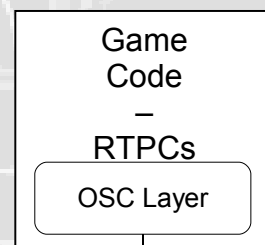
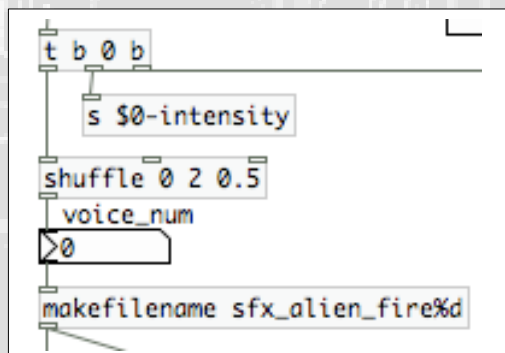


```

ep.m_nSpeakerEntity );
if ( ep.m_pflSoundDuration )
{
    *ep.m_pflSoundDuration = engine
}

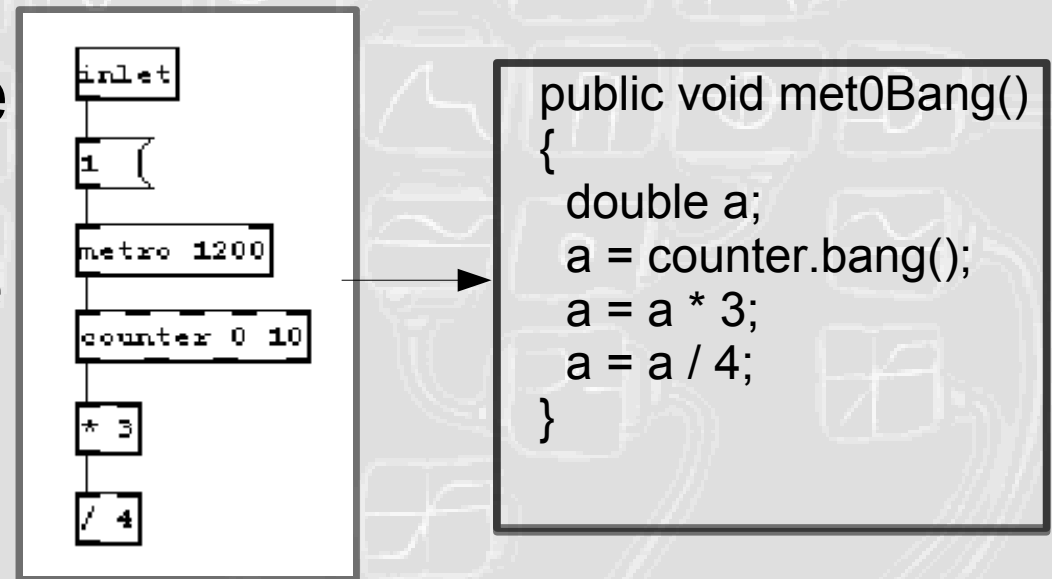
TraceEmitSound( "EmitSound: Raw
ep.m_pSoundName, entindex );

// LEN: Send trace via OSC
    
```



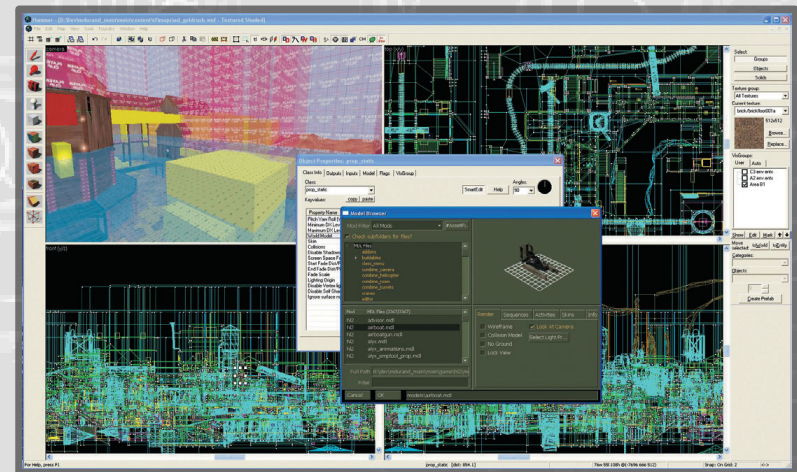
# Pure Data (PD)

- Relatively easy to learn open-source interactive audio implementation environment
- Can integrate directly into game code (as in EA's Spore), but not optimal as it is interpreted
- Create compiled code from (simple) patches as shown by pd2j2me



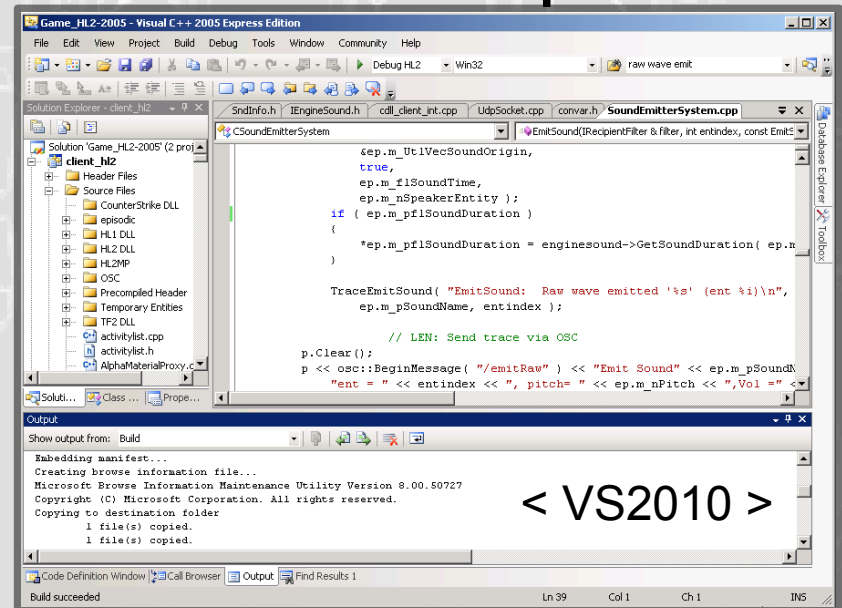
# Half-Life 2

- *Half-life 2* is a PC/Mac/360/PS3 game that won over 40 “Game of the Year” awards when released in 2004 and allows users to change the maps and other content of the game using the “Source engine” technology in C++
- *Left 4 Dead* and other games based on Source
- Make your own mods using the HL2 SDK



# Half-Life 2 Source Mod

- A mod is a modification of the game that can be quite simple or be advanced enough to create an entirely new game (ie. total conversion)
- Change code using Microsoft's free compiler *Visual C++ 2010 Express Edition*
- Cost for replicating this system is just the cost of the game - \$9.99





# Half Life 2 Demo



# A Job In Game Audio





# How Do I Get Into Games ?

- Research game audio and student sites
- Participate in forums such as SoundDesign on Yahoo
- Play games and critique the audio
- Learn tools like Wwise and Fmod
- Play with languages like Pure Data or Max/MSP
- Start making games: [www.moddb.com](http://www.moddb.com)



# Game Career Guide

The screenshot shows the Game Career Guide website. At the top left is the UBM TechWeb logo. Below it is a large 'GAME CAREER GUIDE' logo featuring a character with a 'G' on its chest. The top navigation bar includes a search box, a 'Get the latest Education e-News' section with an email input field and a 'sign up' button, and a menu with links: News, Features, Schools, Digital Counselor (marked 'NEW'), Student Games, Jobs, Community, Store, and Contact Us. The main content area has three sections: 1. 'Need Help Choosing the Right School?' with a 'DIGITAL COUNSELOR' banner and a 'CLICK HERE!' button. 2. 'FEATURED SCHOOLS' with a 'BRONZE' award for Southern New Hampshire University (SNHU) in Manchester, NH, highlighting its focus on story, design, production, technology, and gaming business. 3. 'GETTING STARTED' with a banner saying 'Let us help you get started on the right track!' and a 'CLICK HERE!' button. A bottom right section promotes 'NEW! Download & Play Student Games!' with a 'Tag: The Power of Paint!' and a '2009 Winner!' badge from the Independent Games Festival.

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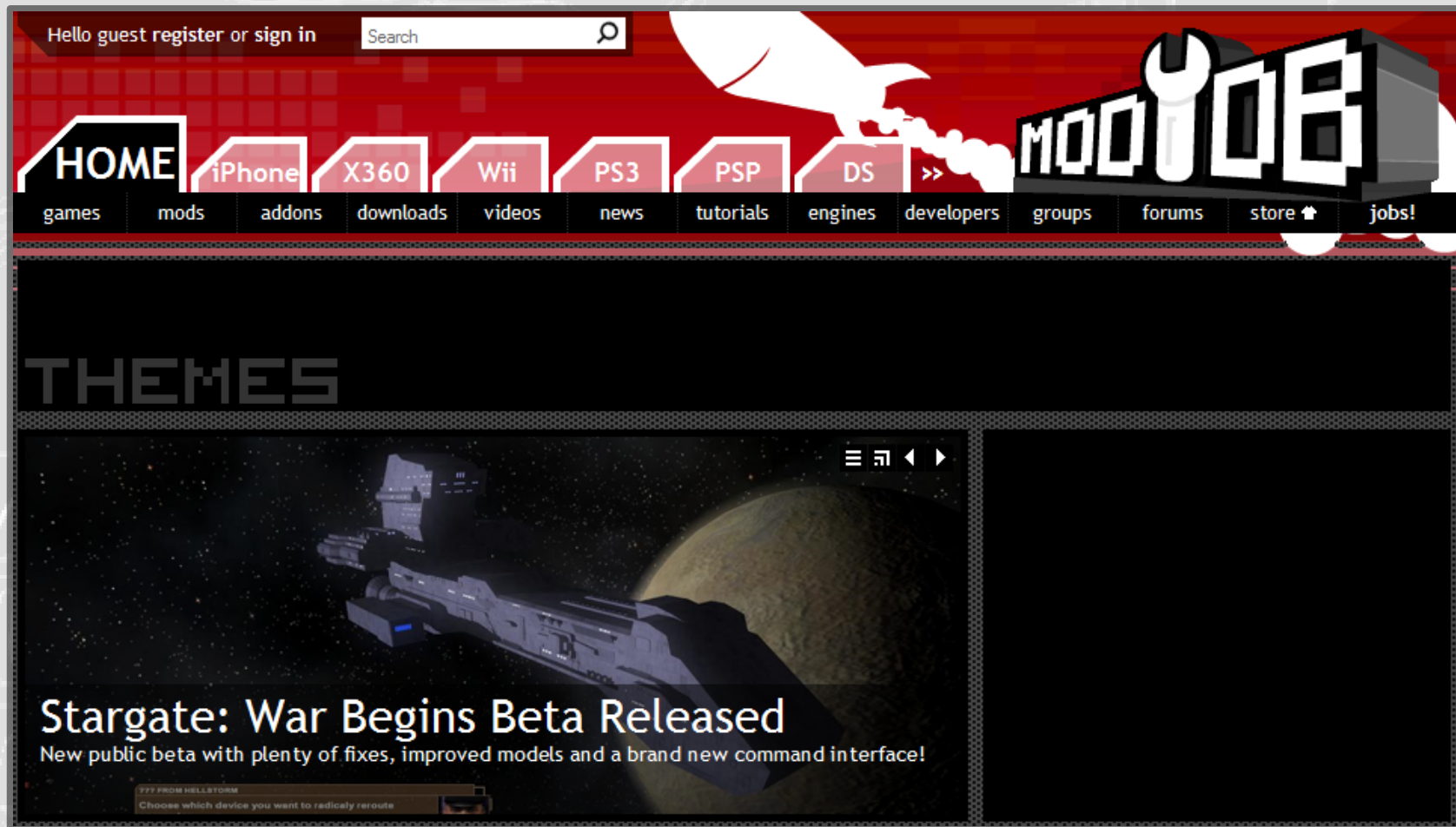
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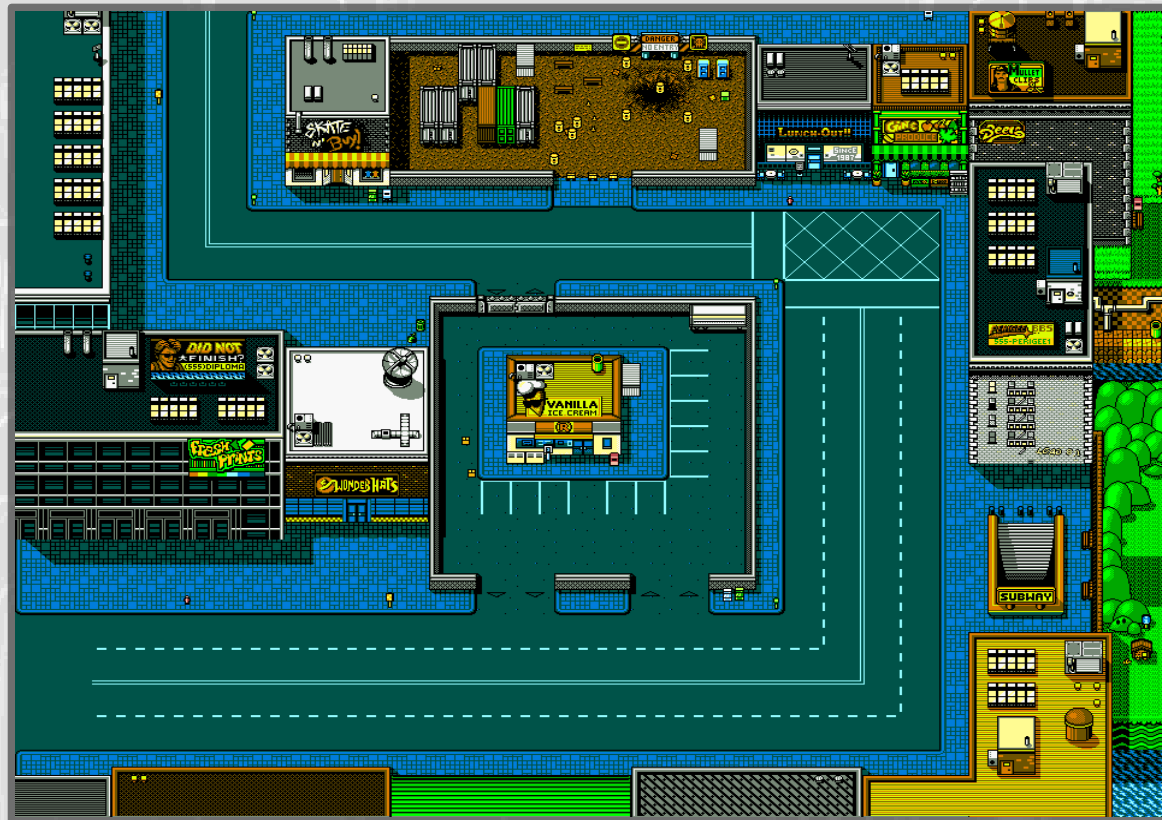
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INDEPENDENT GAMES FESTIVAL

# ModDB



# Independent Games

- 2010 – *Retro City Rampage* – (Vblank Ent.)



RetroCityRampage.com

# Questions ?

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