

Lecture 28

Audio Design

The Role of Audio in Games

Engagement

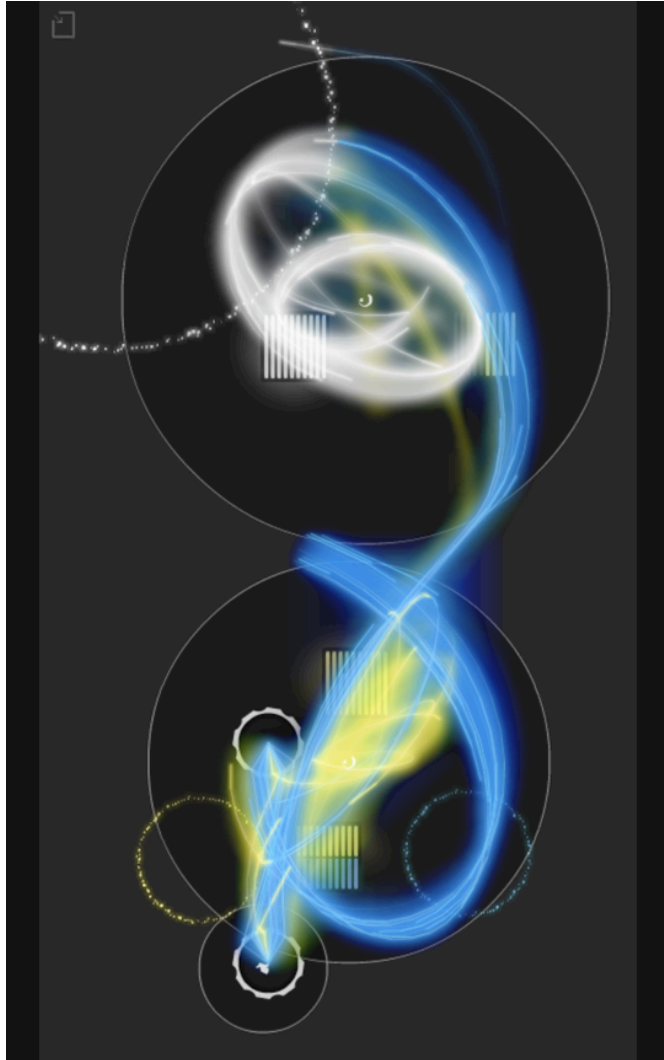
- **Entertains** the player
 - Music/Soundtrack
- Enhances the **realism**
 - Sound effects
- Establishes **atmosphere**
 - Ambient sounds
- Other reasons?



The Role of Audio in Games

Feedback

- **Indicate** off-screen action
 - Indicate player should move
- **Highlight** on-screen action
 - Call attention to an NPC
- Increase **reaction** time
 - Players react to sound faster
- Other reasons?



History of Sound in Games

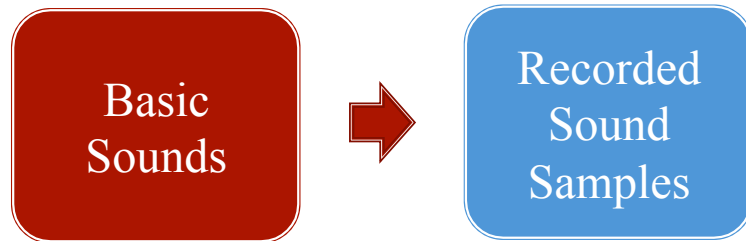
Basic Sounds

- Arcade games
- Early handhelds
- Early consoles

Early Sounds: *Wizard of Wor*



History of Sound in Games



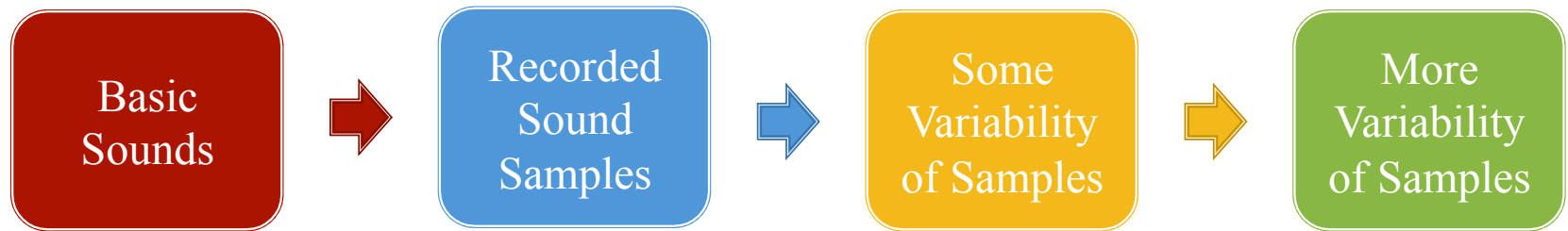
- Arcade games
- Early handhelds
- Early consoles
- Starts w/ MIDI
- 5th generation (Playstation)
- Early PCs

History of Sound in Games



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- Sample selection
 - Volume
 - Pitch
 - Stereo pan

History of Sound in Games



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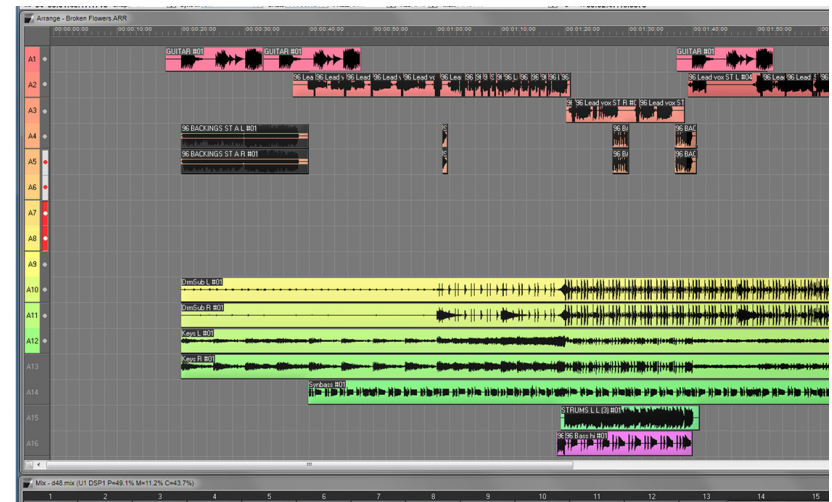
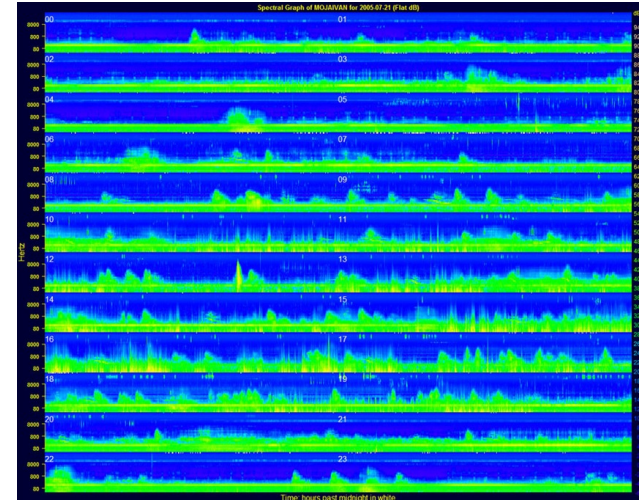
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- Sample selection
- Volume
- Pitch
- Stereo pan

- Multiple samples
- Reverb models
- Sound filters
- Surround sound

The Soundscape

- Mix of simultaneous sounds
 - Sounds can be layered
 - Sounds can be sent to multiple “channels”
 - Effectively no limit
- **Goal:** Make it **transparent**
 - Do not distract the player
 - Too much is cacophony
- **Goal:** Make it **effective**
 - What is its purpose?



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Locations

- Menu
 - Introductory music
- Cut-scenes
 - Dialog, soundtrack
- Ambient
 - Moving about
- Event driven
 - Interacting with objects

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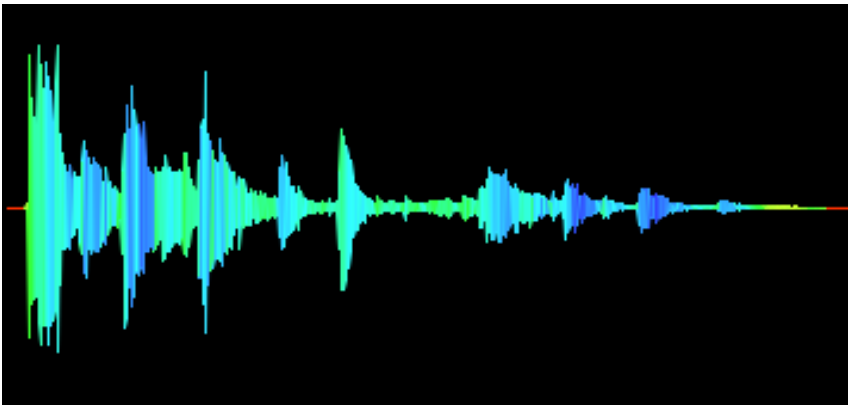
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The Soundscape

Components

- Music
- Sound Effects
- Dialogue



Locations

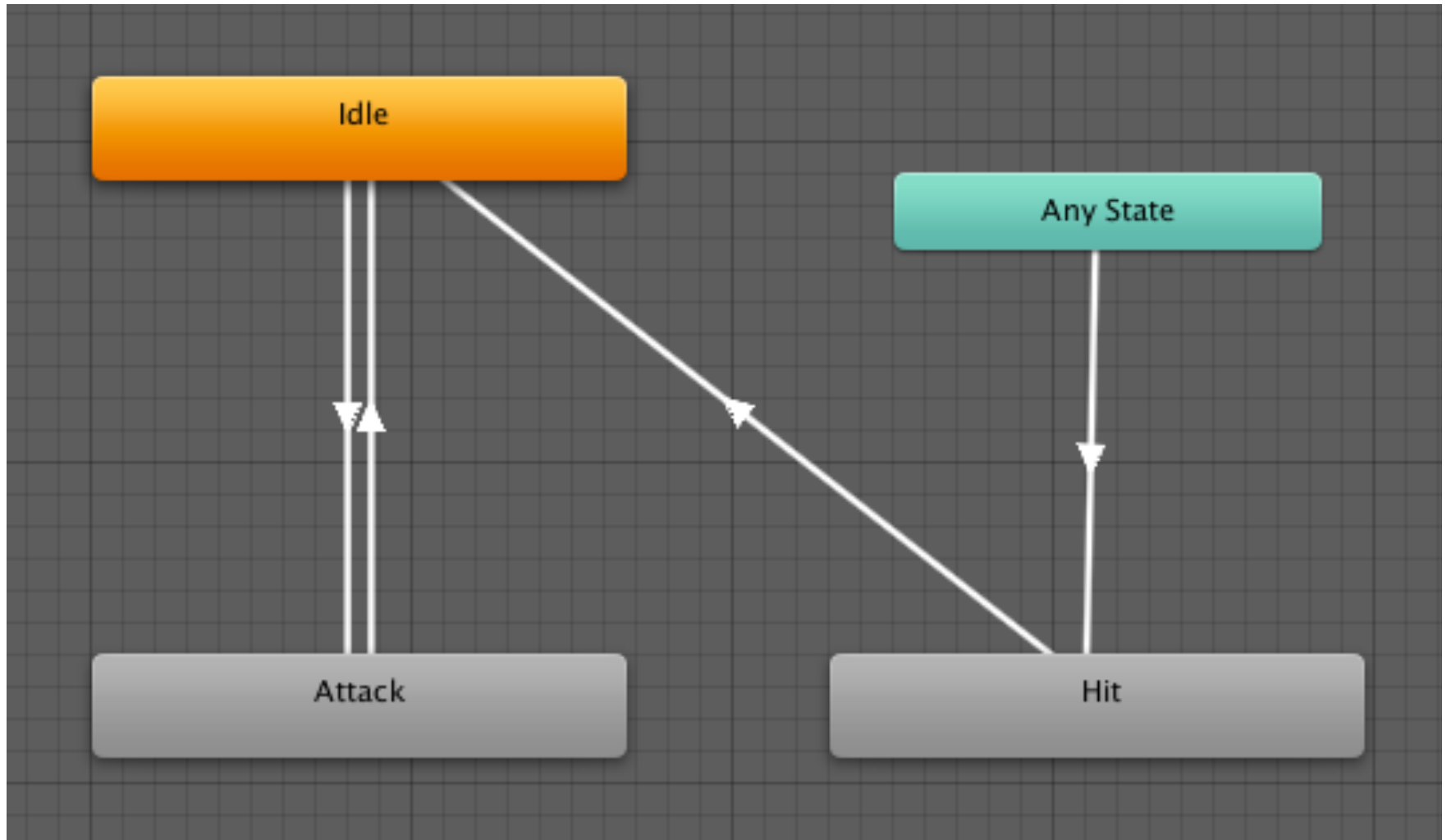
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Designing Music

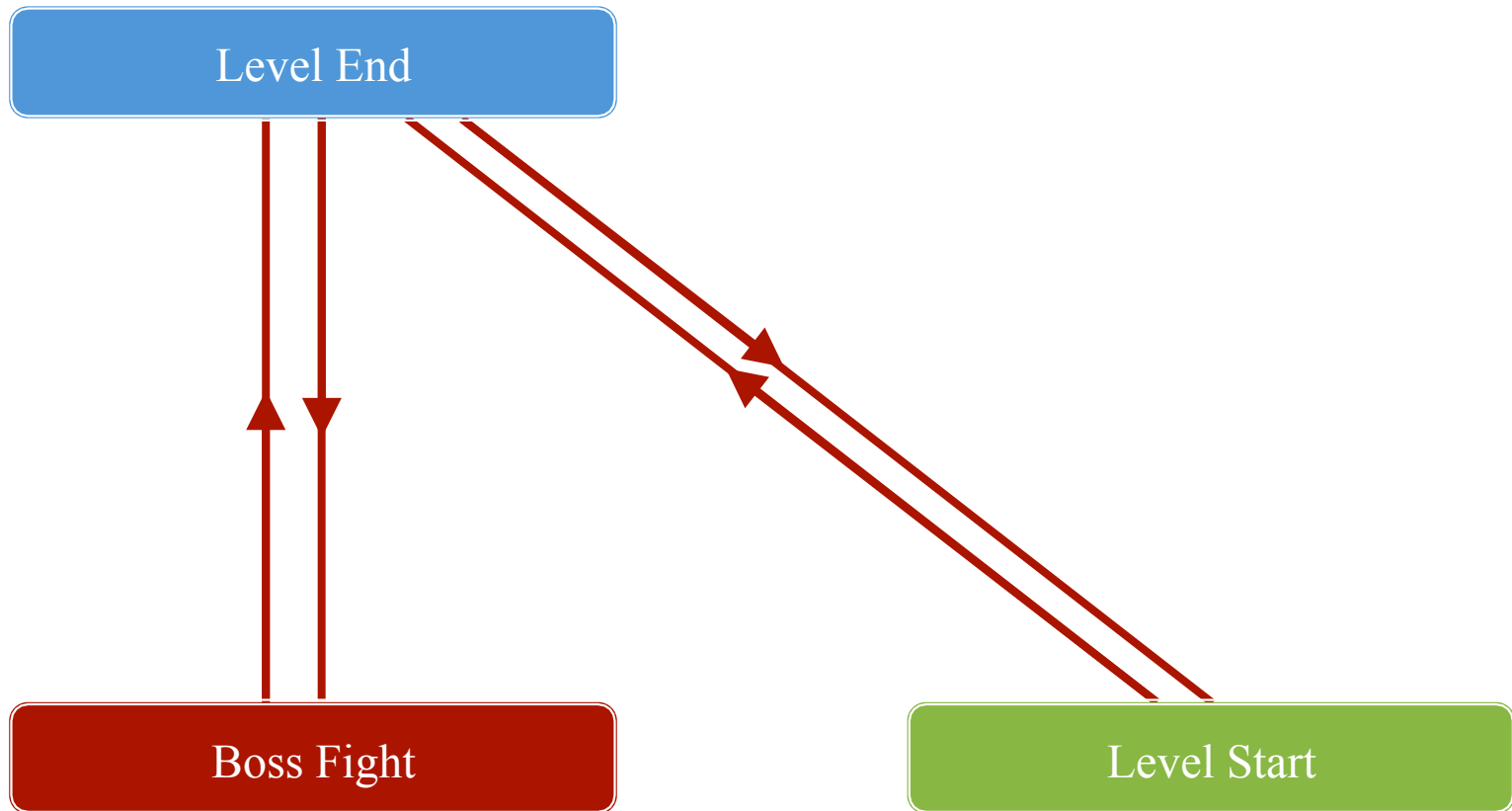
- Basic element: **the loop**
 - Soundtrack has no set end
 - Record single music unit
 - Have it match on ends
 - Keep repeating as a loop
- Very similar to textures
- Also support **transitions**
 - Support multiple loops
 - Each can flow into another
 - Allows “theme” switching



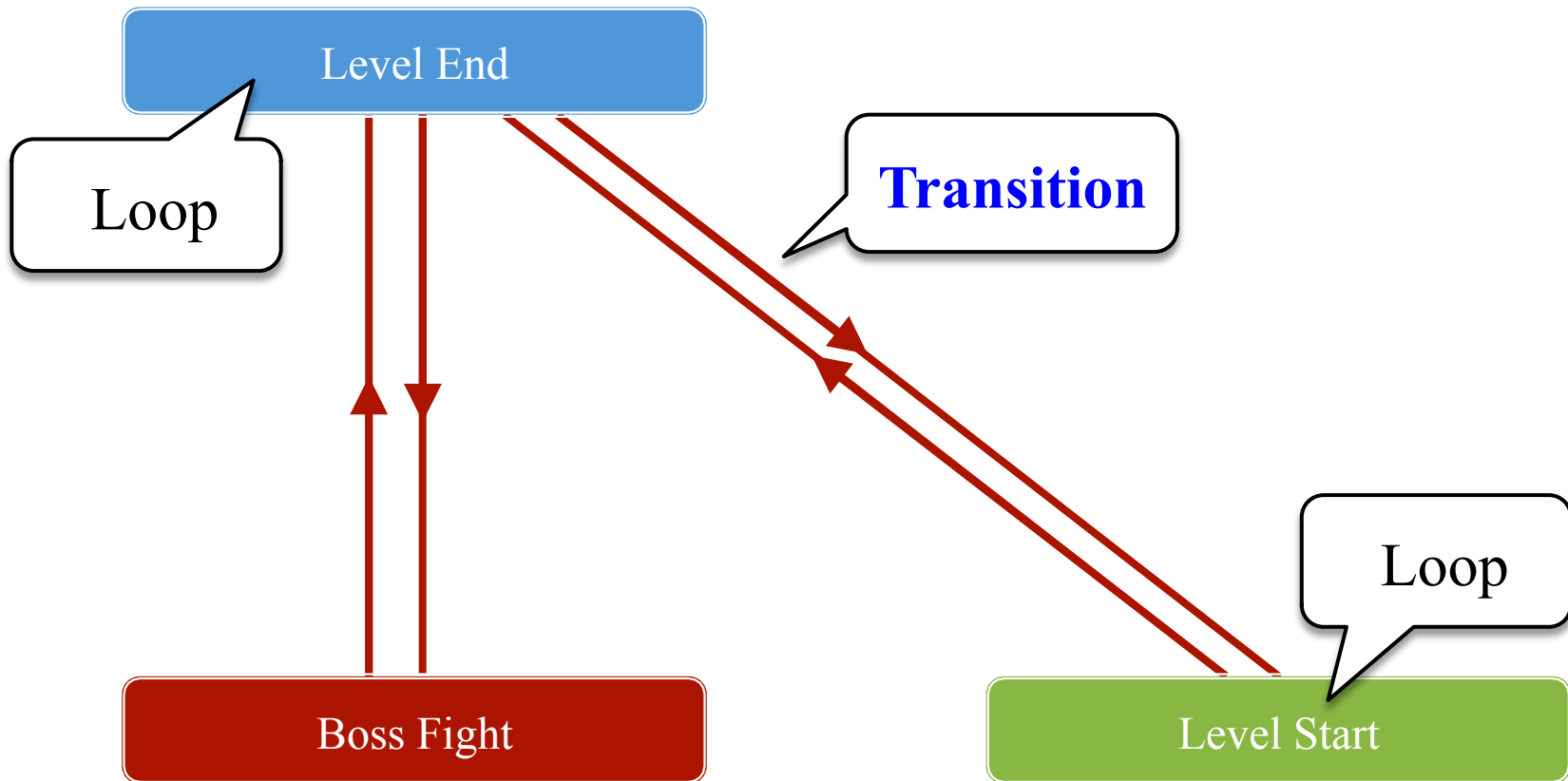
Recall: Animation State Machines



Applies to Soundtracks

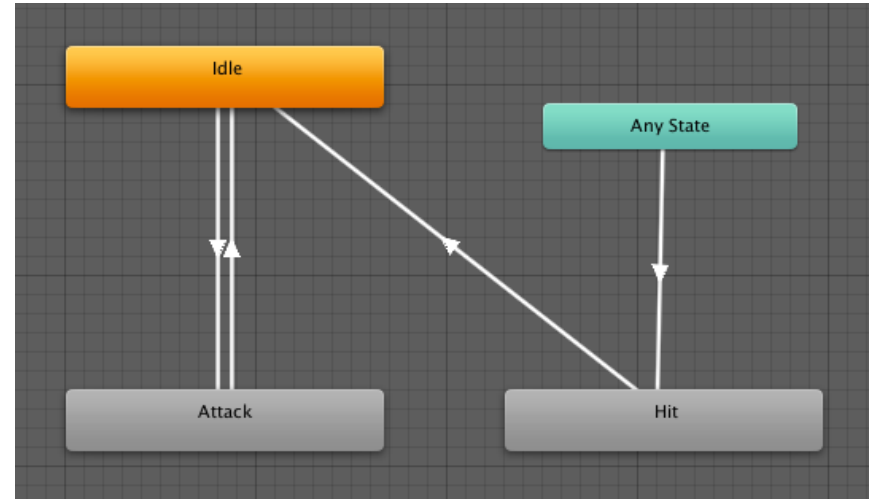


Applies to Soundtracks



Designing Sound Effects

- Directly tied to animations
 - Play when animation starts
 - Stop when animation ends
- Stock sound effects
 - Free sound libraries
 - Commercial licensing
 - **Example:** sounddogs.com
- Foley artists
 - Record to match animation
 - Standard in movies



Recording Dialogue

- Professional voice acting
 - Tools from movies & TV
 - Professional studios
 - But can do remotely
- Games have challenges
 - Interactive dialogue
 - Variable PC choices (fem-Shep)
 - Variable NPC pairings (party banter)



No Image	Character name	female operator H	
	Tendency	Shy, Timid	
	Set the character	Very silent and shy, Talk like a whispering	
	Age	23	
	Item name during the game	N/A	
Number	Situation	Script	Emotion
[01]	Enter the main gate	[1-1] Wel, Welcome...	
[02]	Access greeting	[1-2] Welcome to the SD Gundam Capsule Fighter...	
[03]	Message arrive	Thank you for accessing SD Gundam Capsule Fighter...	
[04]	Gift arrive	Hey, There is a message...	
[05]	Level up(Waiting room)	Hey, There is a gift...	
[06]	Out of energy(Waiting room)	The unit has been leveled-up..	
[07]	Message confirmation	You need a more energy...	
[08]	Gift confirmation	There is a new message... Can you check it?	
[09]	Game end	There is a new gift... Can you check it?	
[10]	Friend registration	End the game. Please visit again.	
[11]	Unit auction registration	Registered the friend. Please check in the friend list.	
		[11-1] Registered the unit on the auction list.	
		[11-2] The unit will be automatically traded when another fighter asks for a	

Interactive Dialogue

<p><i>Mr. pulse</i></p> <p>Defying this order is violating the law -- you have to let her out. ➕</p>	<p>(VO): sure, gruff, all business</p> <p>[It doesn't matter.] - (VO): stern, definitive, unyielding</p>
<p>That's a funny way of saying what you mean, because...</p>	<p>(VO): gruff, put off</p>
<p>...and the way you're letting that psychopathic out. The woman's...</p>	<p>(VO): gruff, no nonsense</p>
<p>This is bigger than Sederis, or you, or me. The Council's orders must be obeyed.</p>	<p>[Release her immediately.] - (VO): stern, all business</p>

Sound Processing

- **Dynamic mixing**

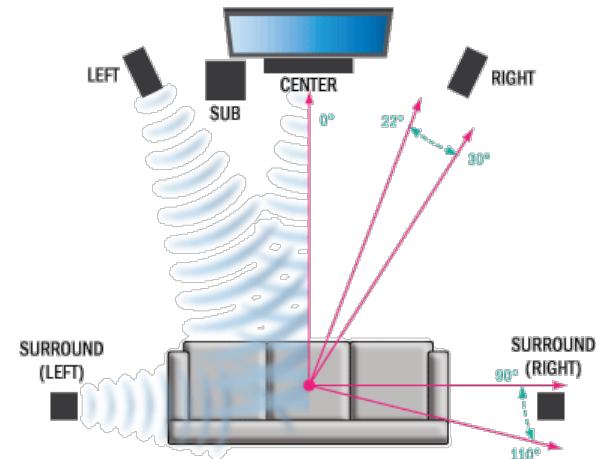
- Volume controller
- Frequency equalizers

- **Special effects**

- Reverb
- Low/High pass

- **Channel editing**

- Stereo sound (2 channels)
- Surround sound (5.1, 7.1)

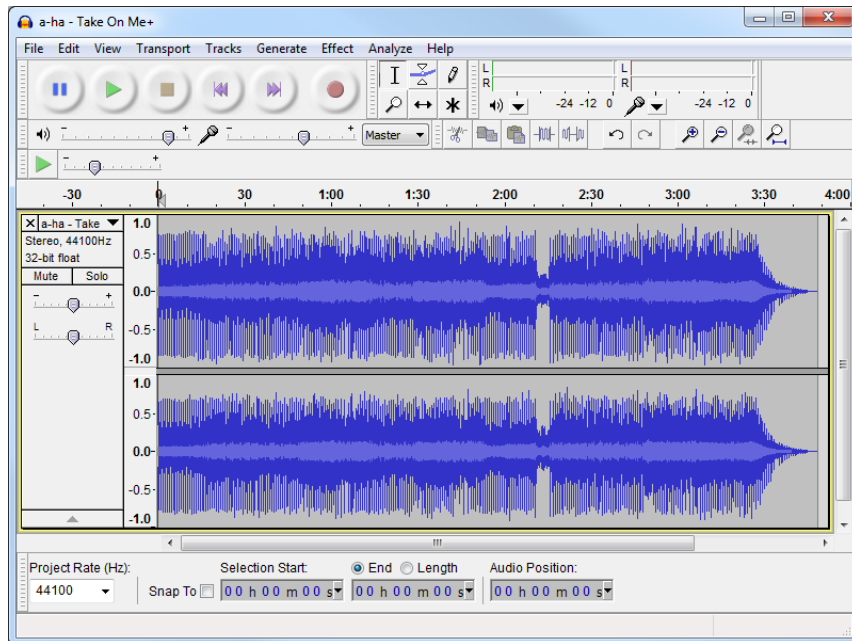


Reverb Example

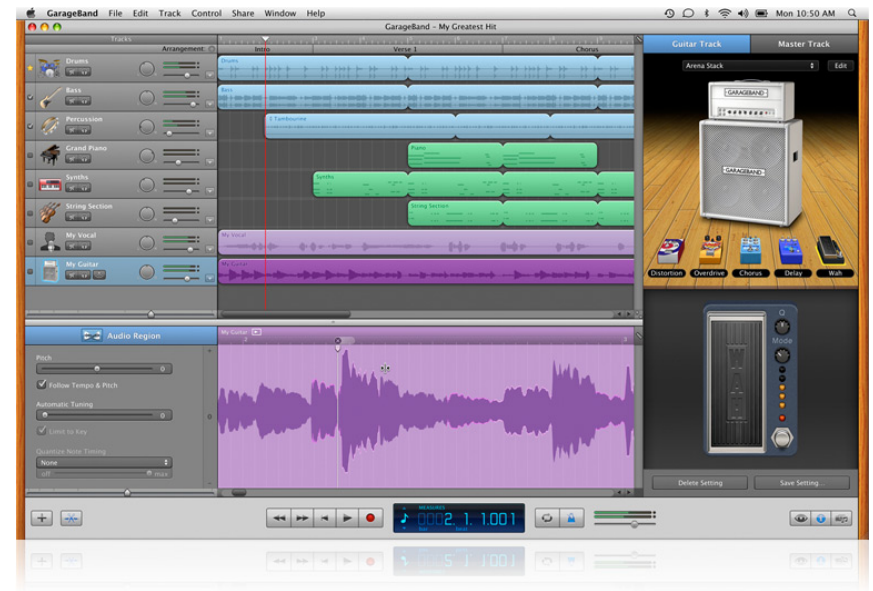
Clean Loop

Static Sound Processing

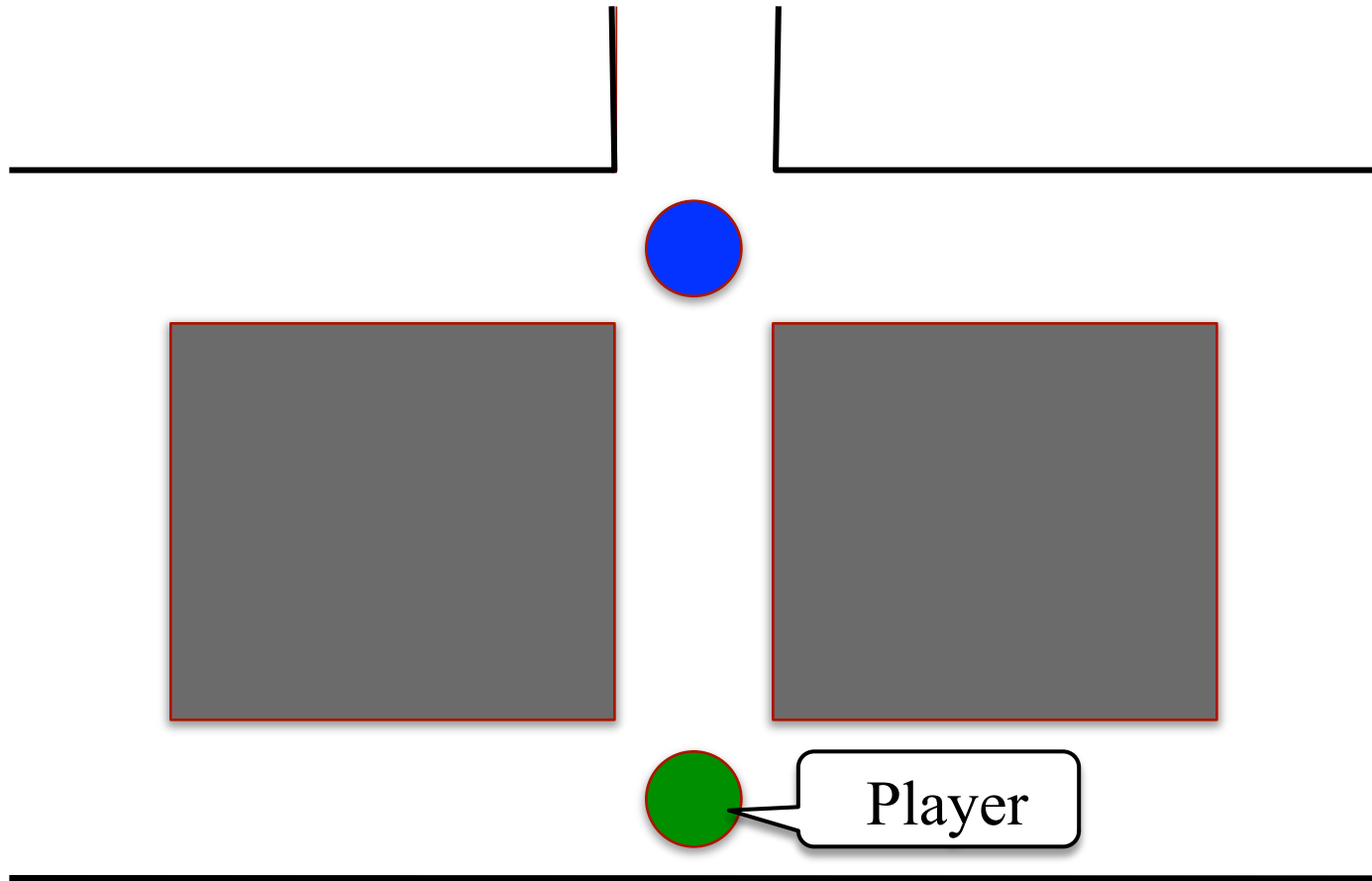
Audio Editors



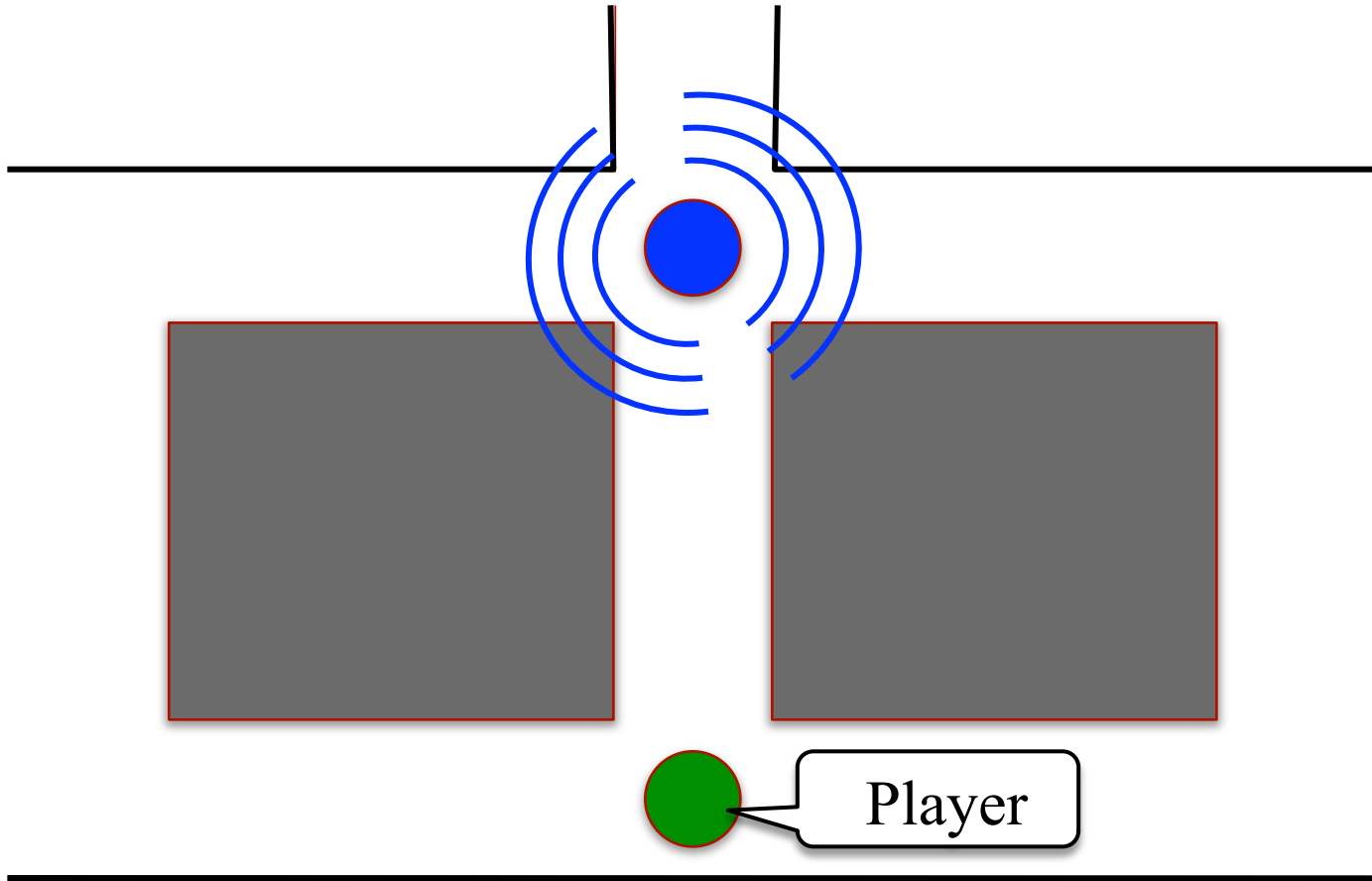
Multi-track Editors



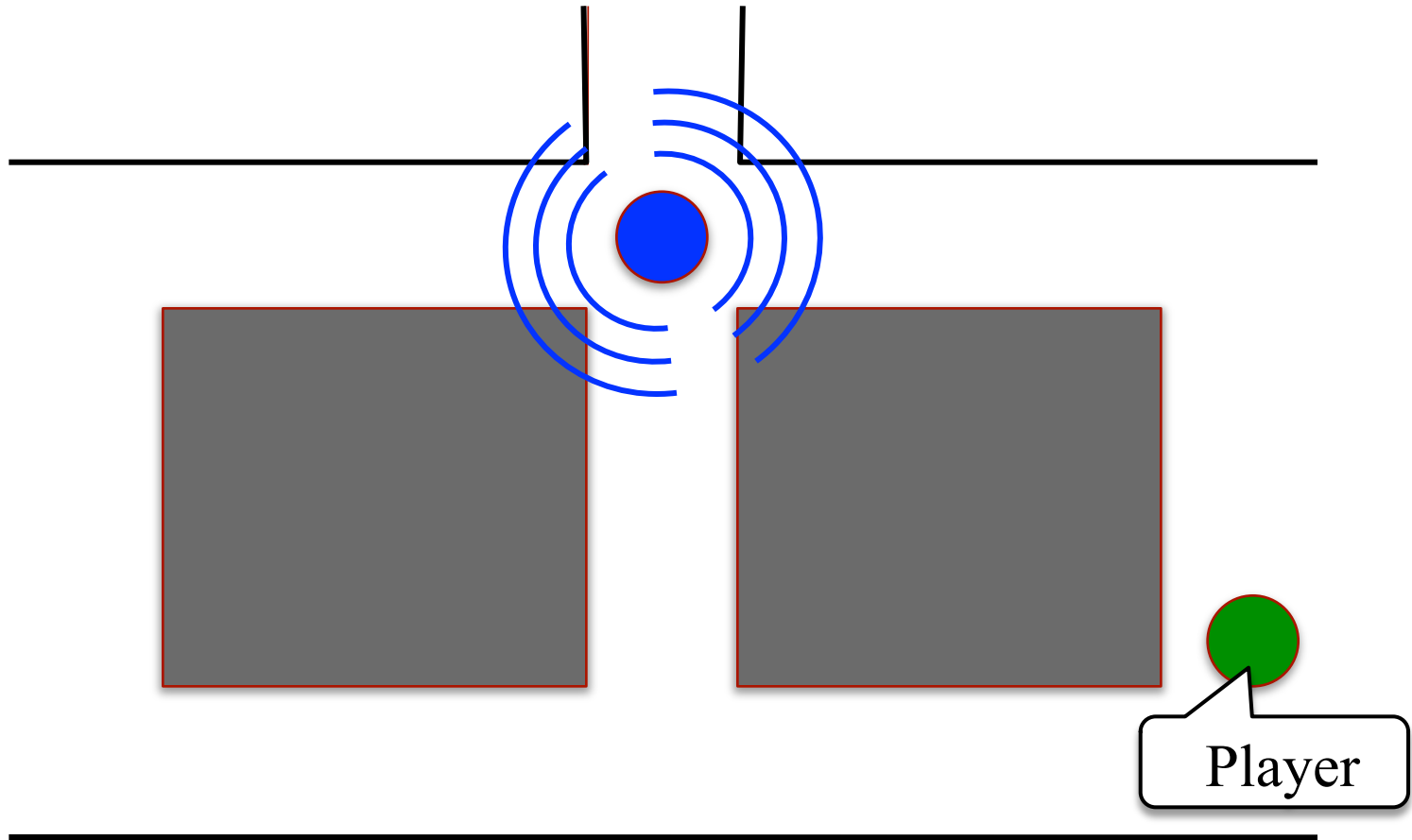
The Need for Dynamic Processing



The Need for Dynamic Processing



The Need for Dynamic Processing



The 90s: Hardware Support



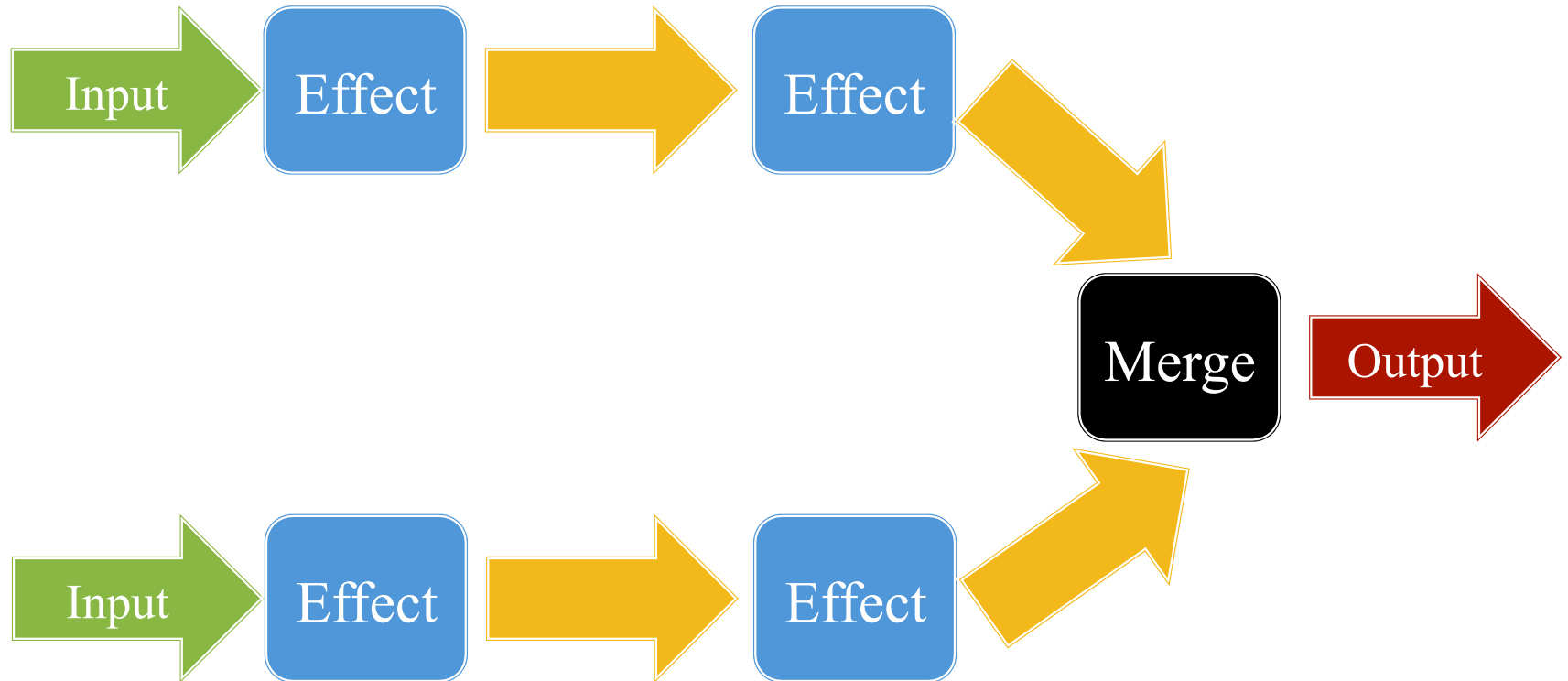
- PCs had dedicated hardware
 - Support for MIDI and music
 - Built in effects (e.g. reverb)
 - Many DOS games used this
- Huge source of problems
 - Support was very uneven
 - Configurations often failed
- Still exist, but unused
 - No standard like OpenGL
 - OpenAL has not caught on



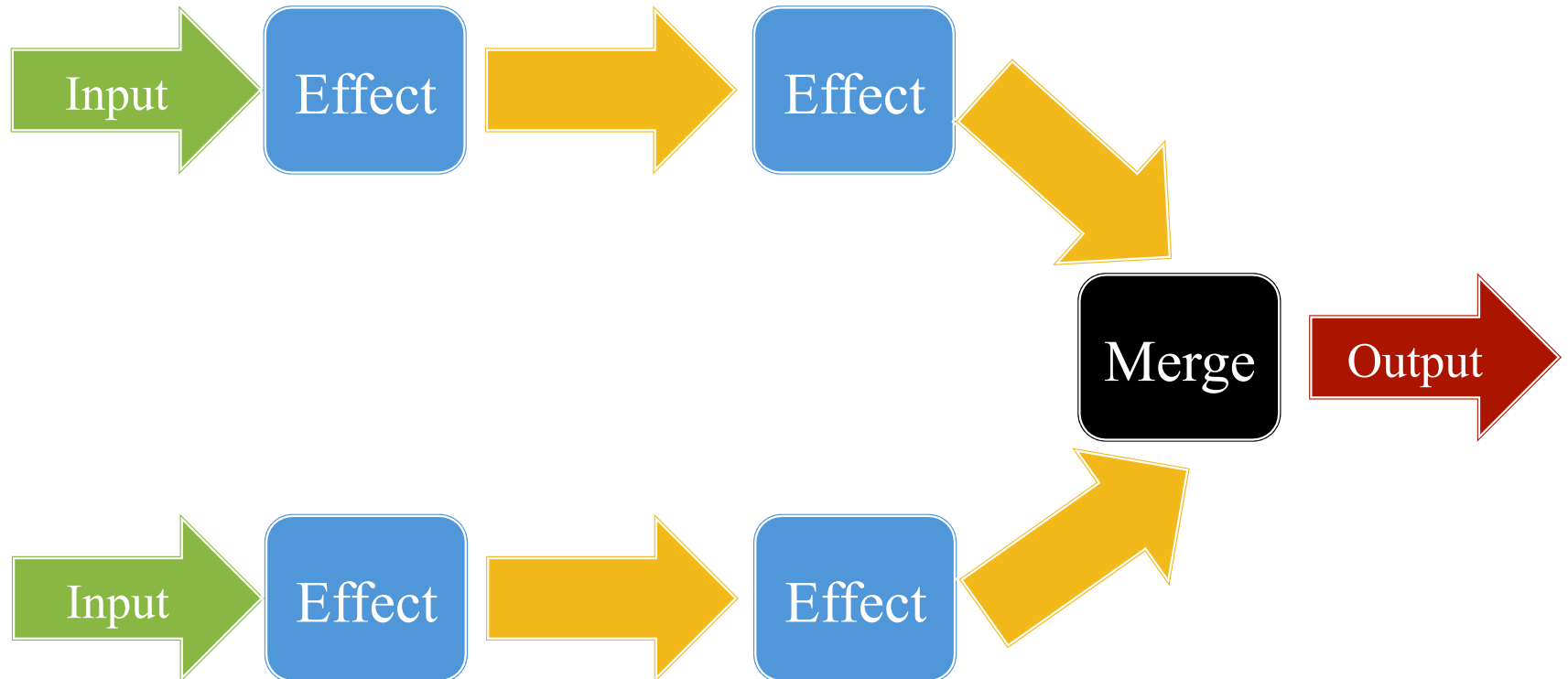
Software Solutions: DSP Programming



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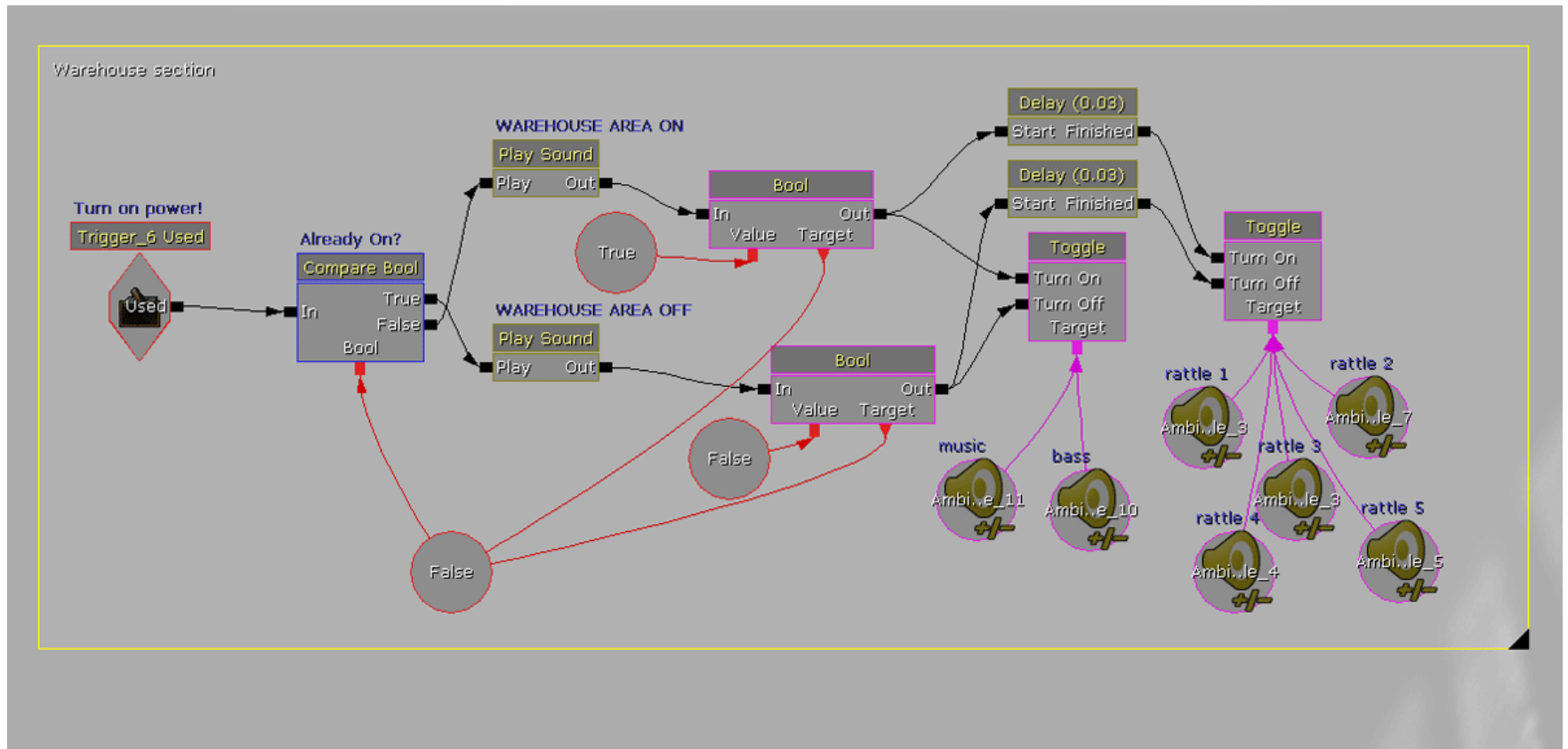


Takes memory and CPU away from the game

Development Tools

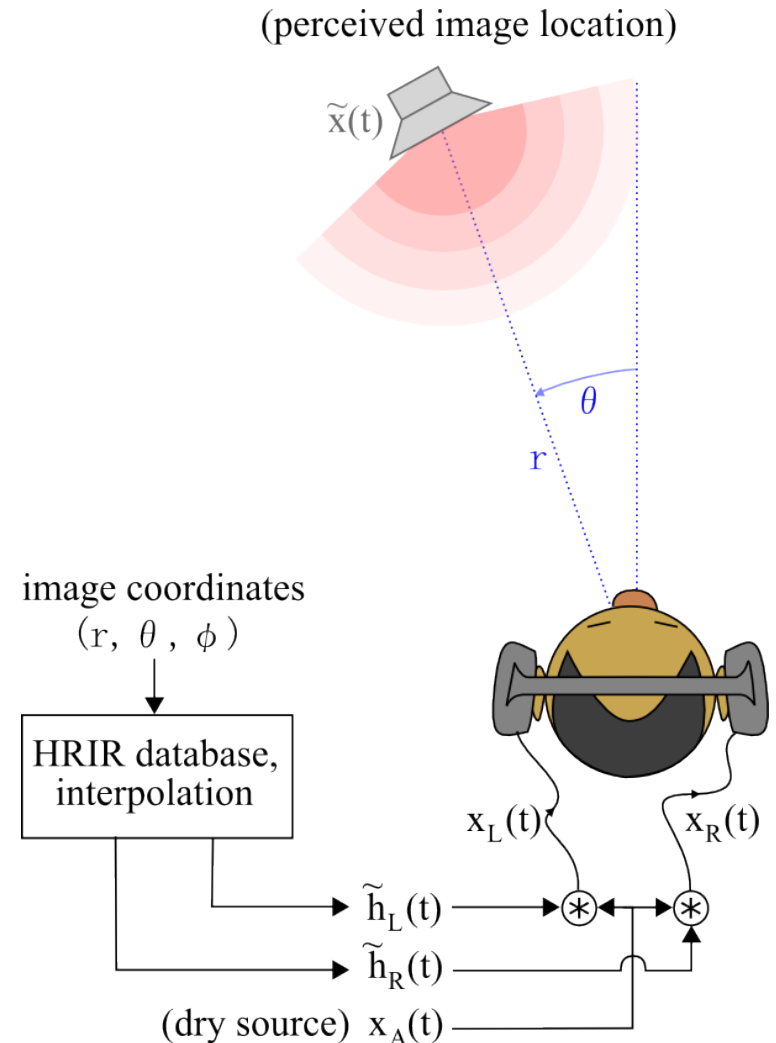


Example: UDK Kismet



Future Research Directions

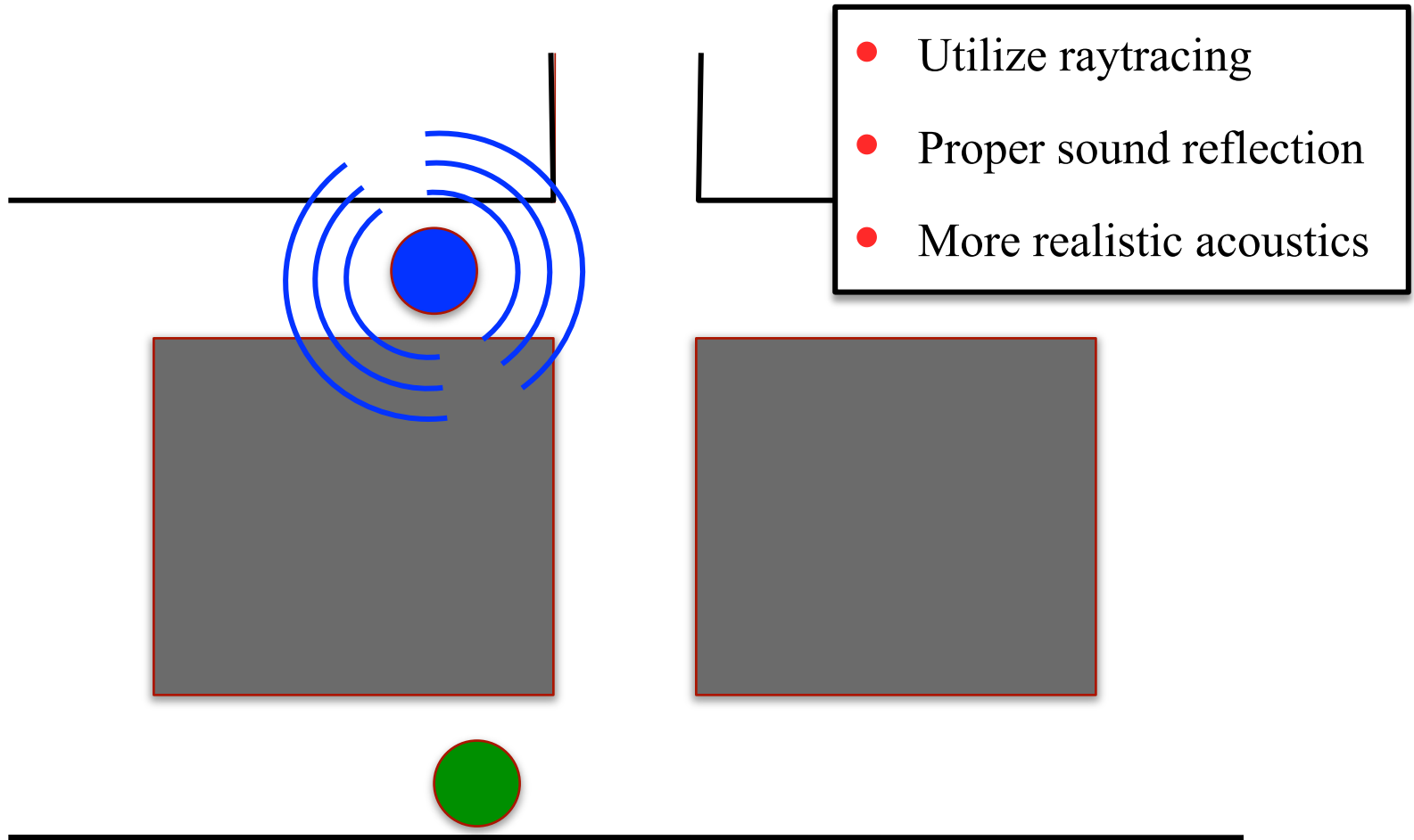
- **Sound rendering**
 - Eliminate the Foley
- **Reverb calculations**
 - Realistic acoustics
- **Binaural Synthesis**
 - Directional sound
- **Game Accessibility**
 - Games for the blind



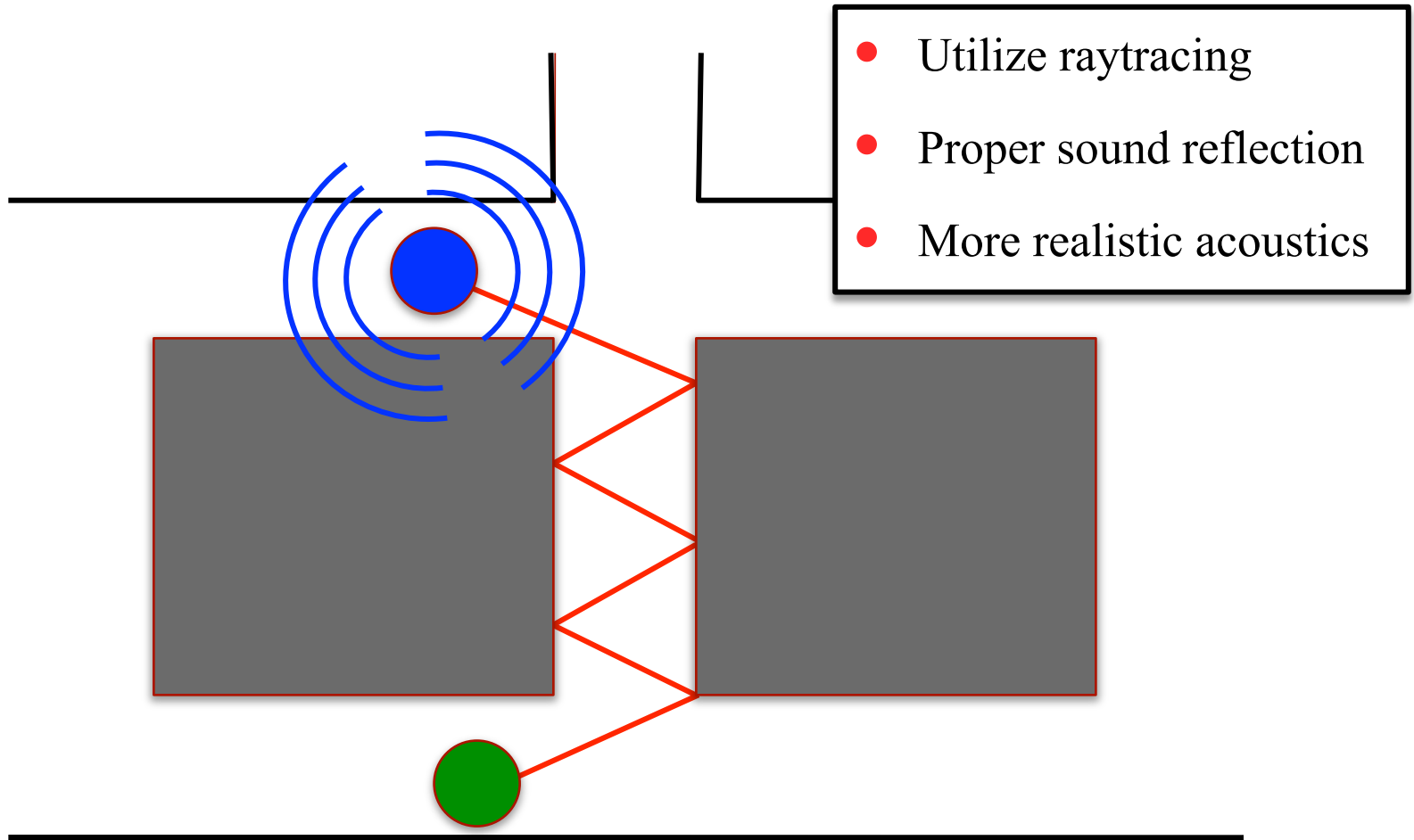
Sound Rendering



Reverb Calculations

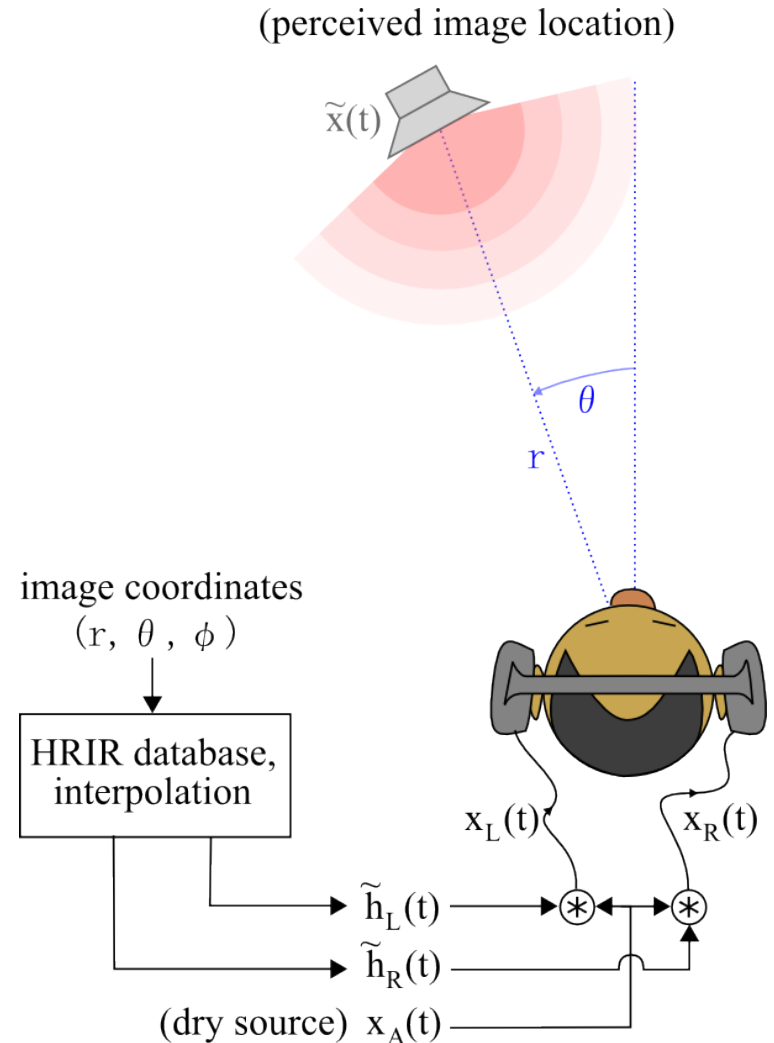


Reverb Calculations

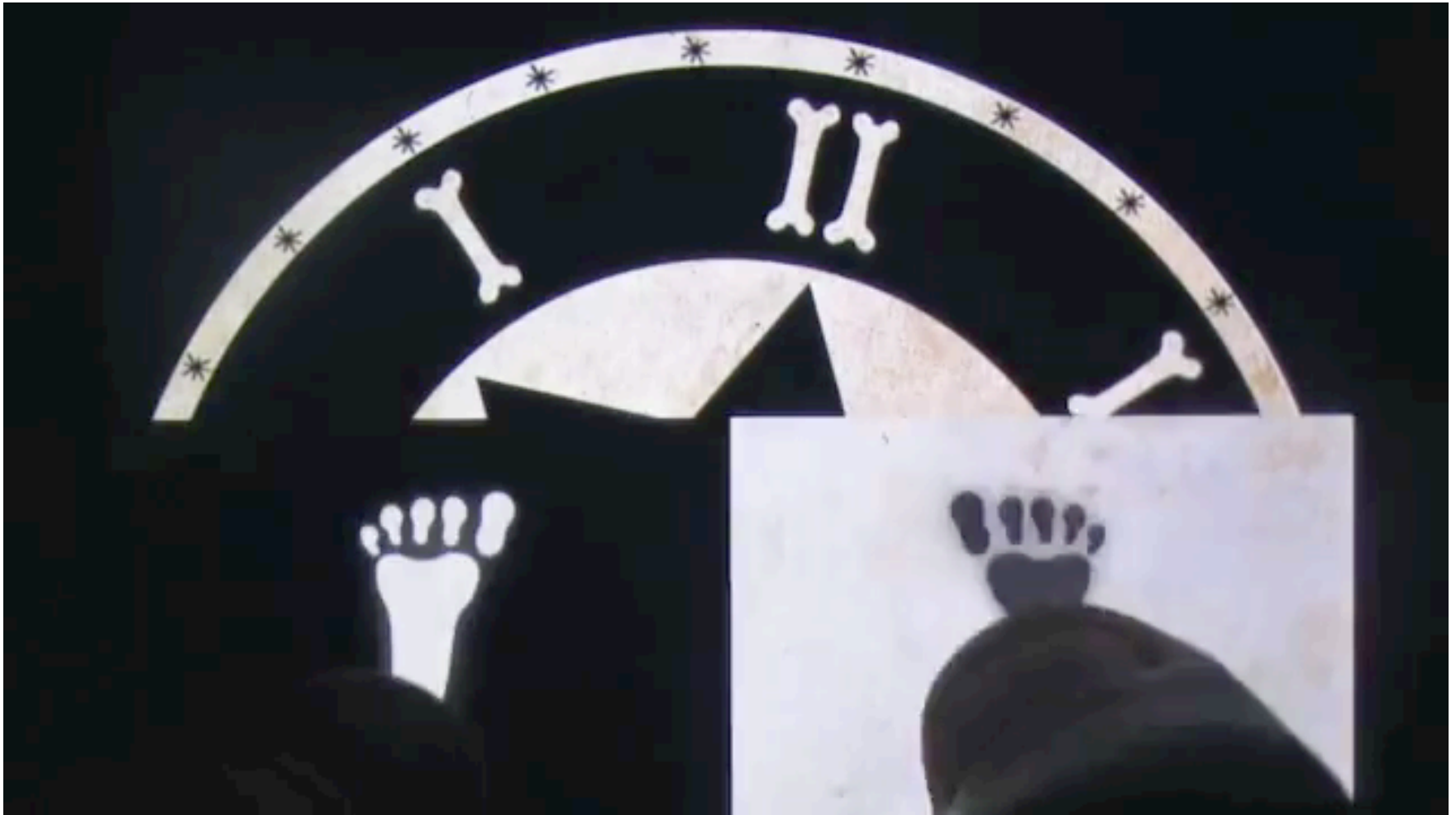


Binarual Synthesis

- Current 3D sound is fakey
 - Essentially volume control
 - Cannot pinpoint source
- **Goal:** realistic perception
 - Track the sound parallax
 - Account for shape of head
- Limited to headphones
 - Cannot do speakers (yet)
 - **Example:** Papa Sangre



Example: Papa Sangre



Game Accessibility

- Supporting blind gamers?
 - Sonify game elements for full audible feedback
 - Make sure text is supported by screen readers



Examples

- Mortal Kombat
- Ninja Gaiden III
- Karateka
- Castlevania:
Dracula X Chronicles

Summary

- Audio design is about creating soundscapes
 - Music, sound effects, and dialogue
 - Combining sounds is very similar to animation
- Sounds often require dynamic processing
 - Realistically implement obstacles blocking sound
 - Handle with digital signal processing (DSP)
- Audio processing is an area of active research
 - Sound rendering is the cutting edge of sound design