ADC²¹

GAME AUDIO: DATA & CONTEXT FOR RICHER NARRATIVES IN SOUNDTRACKS

XAN WILLIAMS & DOMINIC VEGA



Avalanche Studios Group













EXTINCTION

Eurocom Entertainment Software (2007 - 2012)







(as part of main project team)



eurocon











(feature sound design & tech sound support)







Niclas Frohagen Principal Sound Programmer







About The Talk



Who's it for?



If you're new to music design



What we want to tell you... About the talk



Talk with programmers like we would in the studio



Show some of the methods we use to turn data into narrative



How we think about narrative state



...and why About the talk



1. See Something in the game



See Something in the game We want to put sound to it



See Something in the game We want to put sound to it We work out how











The Foreshadowing Example



The Foreshadowing Example

Video: Dino Controller & Foreshadowing Example





The Foreshadowing Example





The Data Bit



Types of Data The Data Bit



Types of Data

(As categorised by me)



Types of Data

Stuff we gather Stuff we cerve



Stuff We gather Types of Data



Go find it!



For example, Time of Day



Video: Passing Data (ARC) (time_of_day)

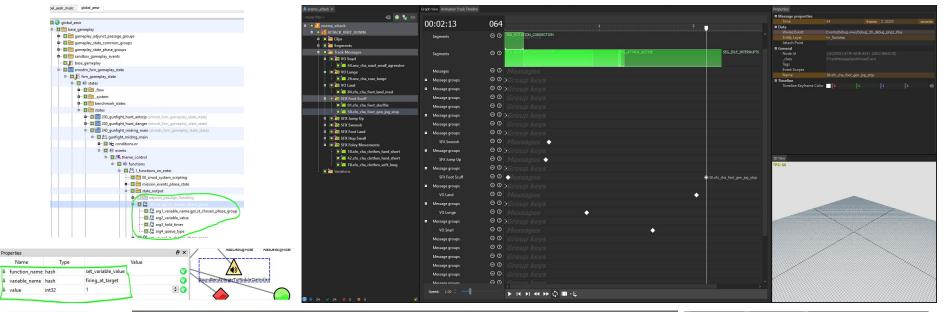


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🚺 GameSoundUpdate.cpp - Open 🛛 🗙 🛛 🕂
  → C ▲ Not secure | opengrok/xref/shoebill-main/source/project/Game/Sound/GameSoundUpdate.cpp#2151
xref: /shoebill-main/source/project/Game/Sound/GameSoundUpdate.cpp
Home | History | Annotate | Line# | Scopes# | Navigate# | Raw | Download
                                                                                                        Search only in /shoebill-main/so
2126
2127
        #define GAME SOUND MODULE BINDINGS(module) \
2128
                static CSoundModule* _##module = 0; \
2129
                if (! ##module) \
                        ##module = SoundModule GetModuleFromNameHash(ctx, HASH ##module); \
2130
2131
                if ( ##module)
2132
2133 E
                void UpdateSoundModuleBindings()
2134
                {
2135
                        SSoundModuleContext* ctx = GameSoundModule_GetContext();
2136
                        if (ctx)
2137
2138
                                static CHashString applicator("update game world conditions");
2139
2140
                                GAME_SOUND_MODULE_BINDINGS(variables_gameworld)
2141
2142
                                        // update time and update speed
2143
2144
                                                 ASSERT(CLandscapeManager::Instance != 0);
2145
                                                 const float time = CWorldTime::Instance->GetCurrentTimeOfDay();
2146
                                                 ASSERT(Base::CClock::Instance != 0);
2147
                                                 const float gamespeed = Base::CClock::Instance->GetUpdateSpeed();
2148
2149
                                                 GameSoundModuleDeferred Send4(HASH variables gameworld,
2150
                                                         HASH set variable values,
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2152
                                                         HASH gamespeed, gamespeed,
2153
                                                         applicator.get().
2154
                                                         E_SOUND_MODULE_DEFERRED_URGENCY_LEVEL_MEDIUM);
2155
2156
2157
                                        // update rain
2158
                                        {
2159
                                                 ASSERT(CLandscapeManager::Instance != 0);
                                                 const float rain = CLandscapeManager::Instance->GetPrecipitationDensity(PRECIPITATION_TYPE_
2160
```

GameSoundModuleDeferred_Send2(HASH_variables_gameworld, HASH_set_variable_value, HASH_preci

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Balancing Requests



Crash Bug VS. **3 day task**



Crash Bug VS. **30 minute task**



Single line to push data to us





Smallest time per task possible



S "Expensive" tasks.



If it's only for us, then it's an Audio task.





Stuff We derive Types of Data



Why?



Single source of truth?



Absolutely.



But....



Many perspectives







- + variables (using filter=ai)

- + sdtg_dino_small
- + sdtg_nme

- + sdtg_dino
- + sdtg_mdat_rule_low_intensity
- + sdtg_swarmer
- + sdtg_attacks_melee
- + sdtg_raptor_base
- + sdtg_species_raptor
- + tags
- [character::0x03bda347 (not found)]

- + variables (using filter=ai)
- + sdig_dino_small
- + sdtg_nme
- + sdtg_dino
- + sdtg_mdat_rule_low_intensity
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- sdtg_species_raptor
- character::0x99e8494a (not found)] gs

- + variables (using filter=ai)
- + sdtg_nme
- sdtg dino
- + sdtg_swarmer
- dtg_species_raptor sdtg_raptor_base sdtg_attacks_melee
- character::0x78243097 (not found)]

The Payer's sense of Combat



SThe omniscient combat state



Many perspectives



Bringing us to....



The State Bit



(stuff we derive, cont.)



The "State Machine" The State Bit



HOW?



Video: "State Machine"





States are sel-evaluating



TRUEPriority 2TRUEPriority 5Priority 5FALSEPriority 8



TRUEPriority 2TRUEPriority 5Priority 5FALSEPriority 8



The "State Machine" Variables > Value



router - variables_demo (using filter=[;])

+ pause counter : -1

+ variables:

- + time_of_dawn: value=6.000 (previous=5.000) (max=6.000)
- + time_of_day: value=17.000 (previous=15.000) (max=17.000)
- + time_of_dusk: value=18.000 (previous=14.500) (max=18.000)



A extra data derived Detter logic

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• • • • • • • • • • • • • • • • • • •					tags		
• • • var_nme_any_detected.gte.1							
🖕 🗖 🙀 events							





enemies > 1 & state_previous == combat) Then post_combat_tension



Logic helps arrange consecutive state





Logic helps contextualise data

🙇 + 🔫 = gunfight_combat



What is kind of scripting is this..? The State Bit



What is this..?

Good Question 🤔 🤷



Decision Tree? The State Bit



Decision Tree

Multiple state machines are used together



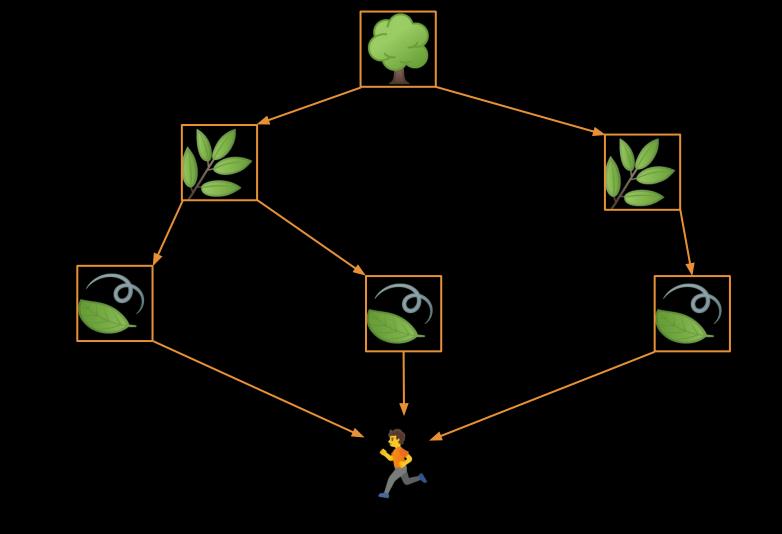
What type of decision tree ?



https://web.stanford.edu/class/cs123/lectures/CS123_lec08_HFSM_BT.pdf

2.4 Hierarchical Finite State Machine (HFSM) & Behavior Tree (BT)







Maintainability Scalability Reusability





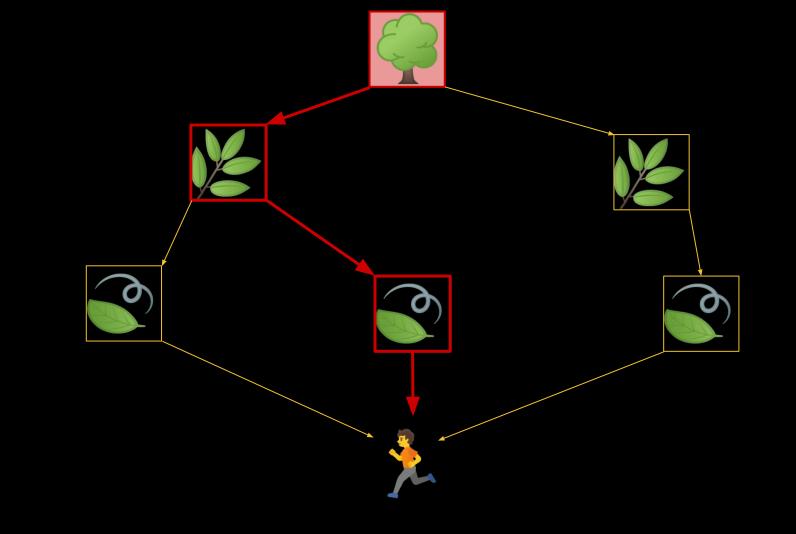
(no leaving leaf nodes)



Tree Traversal Issue

- Always start from root node
- This isn't a very efficient way to do things, especially when the behavior tree gets deeper as its developed and expanded during development.
- Store any currently processing nodes so they can be ticked directly within the behavior tree engine rather than per tick traversal of the entire tree







Similar but different



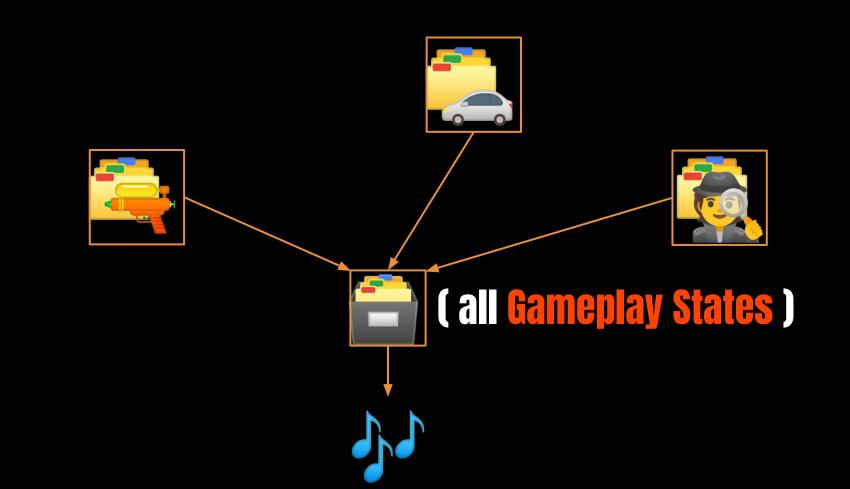
(**Gameplay Type** State Machines)



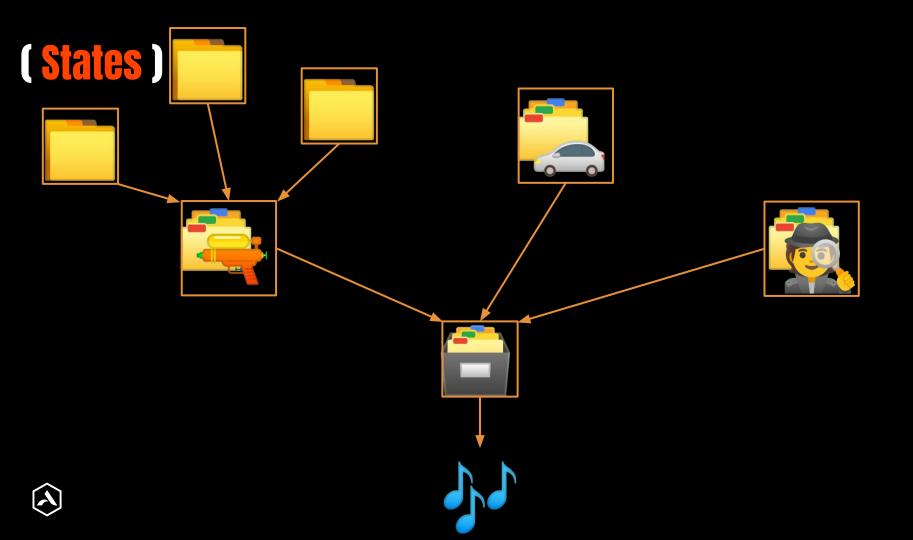


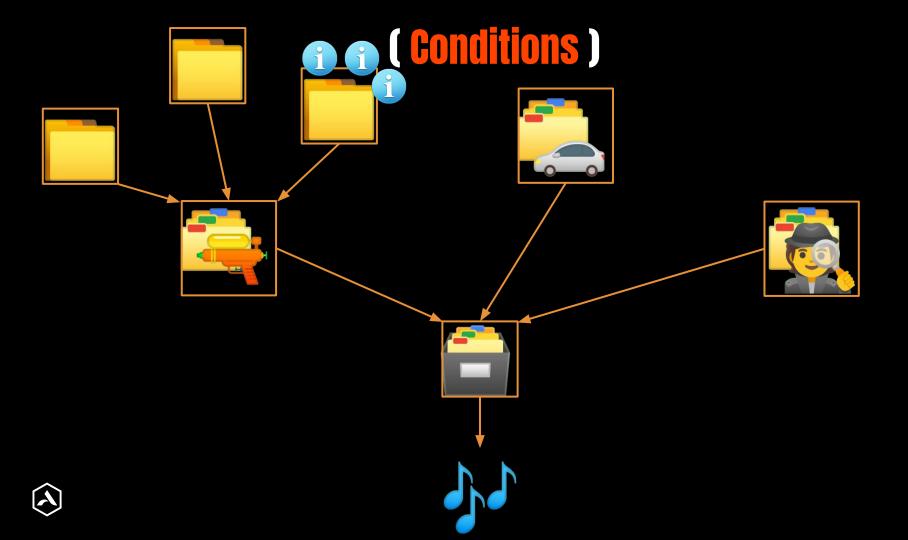






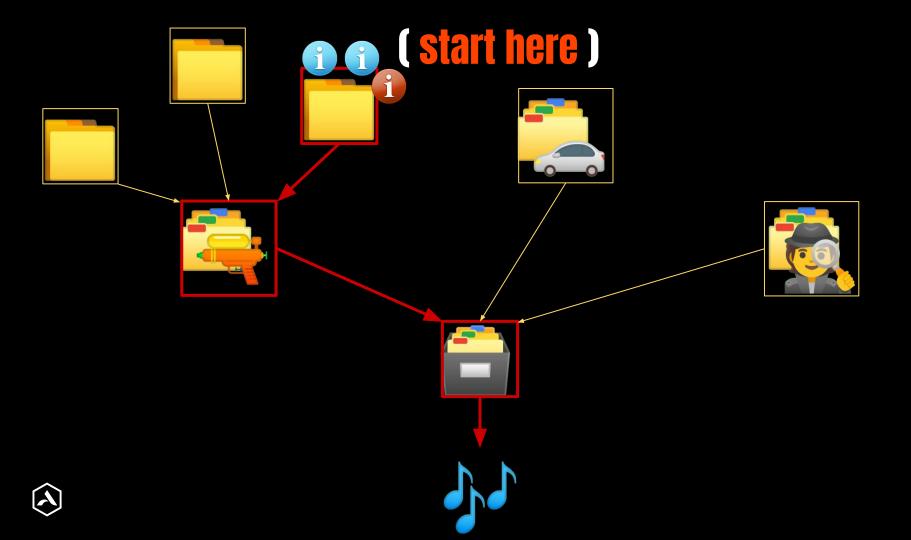
 $\widehat{\boldsymbol{\lambda}}$





Execution?









Ce Data Tributaries 🗸





Inheritance The State Bit



Behavior Inheritance

- HFSM combines hierarchy with programming-bydifference, which is otherwise known in software as *inheritance*.
- As class inheritance allows subclasses to adapt to new environments, behavioral inheritance allows substates to *mutate* by adding new behavior or by overriding existing behavior.
- State nesting introduces another fundamental type of inheritance, called *behavioral inheritance*



Templating Activities & Logic Behavioural Inheritance



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Multiple state machines talk to each other Hierarchical FSM



Maintainability Scalability Reusability





(leaving leaf nodes)



Visual: (Readability) (Learnable 🍪 🍩)





The State Bit

Good Question: "You breezed past Transitions"

(and other scripting tricks)





State as Context, Automation The State Bit



Loop and Reopons Tom Time Give Reverse & Resion Reposition Length Horizontal Coor New Stem 🔑 🥔 Align 🗮 Touchy

Tracklaying



Automation

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TracklayingTriggering(sequencing & editing)(implementation)

Automation (mixing / mastering) State (culling / mixing / modulation)



Sequences of Regions and Automation Curves



Narrative Context for Sounds



pssst remember the pre- and post- combat tension?

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Image:	General			
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Narrative Time

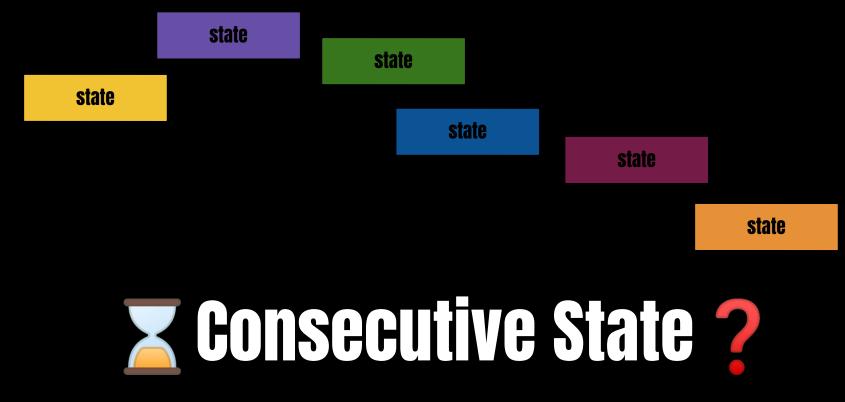


Linear Time



End Seginning Parameters Middle ?











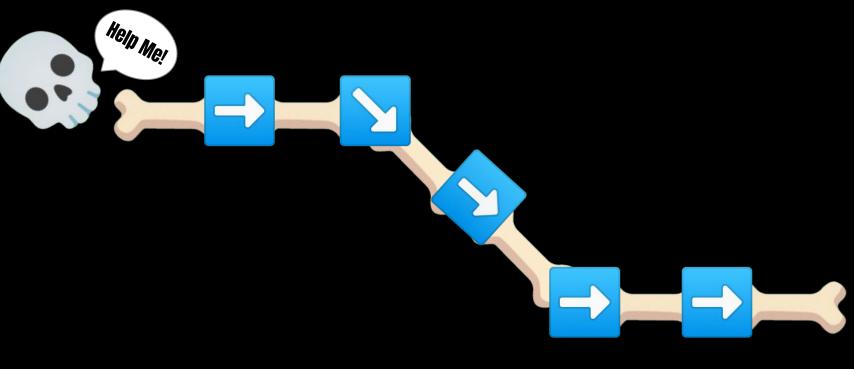


Middle S End S









Narrative Backbone



States are the Tracks and Regions we put Automation on



The Building Blocks The State Bit



Stuff we gather





$\widehat{\boldsymbol{\boldsymbol{X}}}$



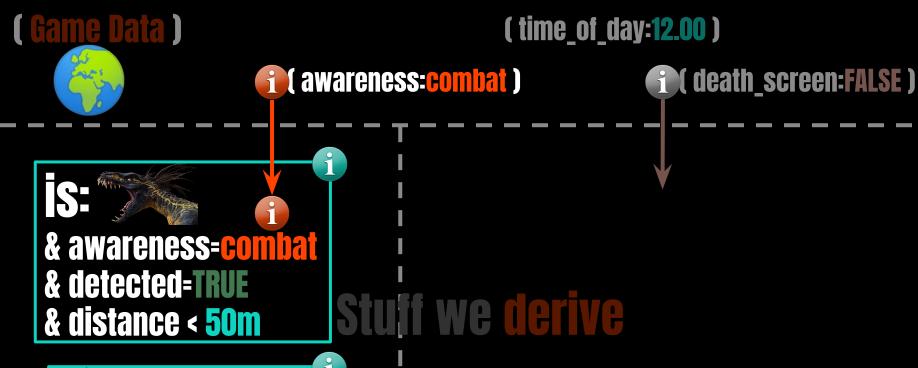
(time_of_day:12.00)

i (awareness:combat)

(death_screen:FALSE)

Stuff we derive



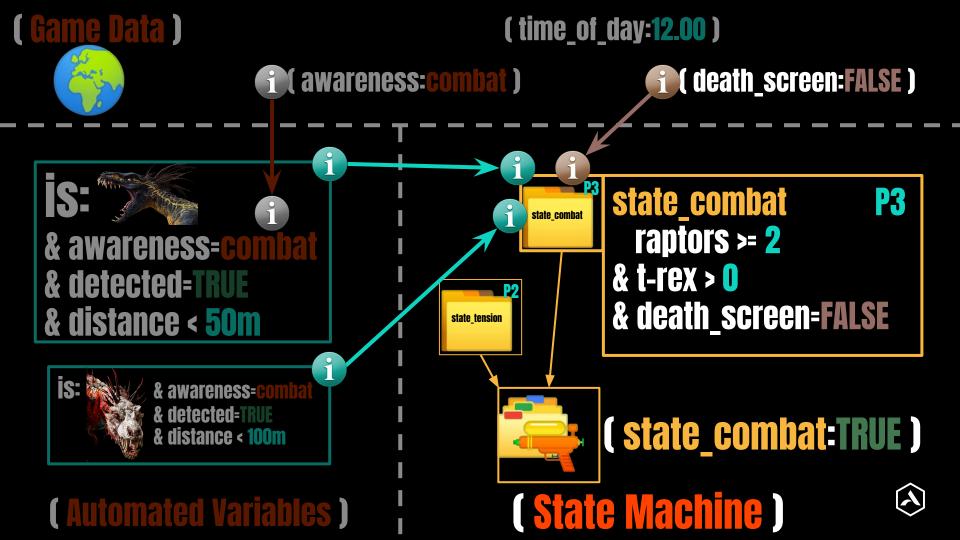


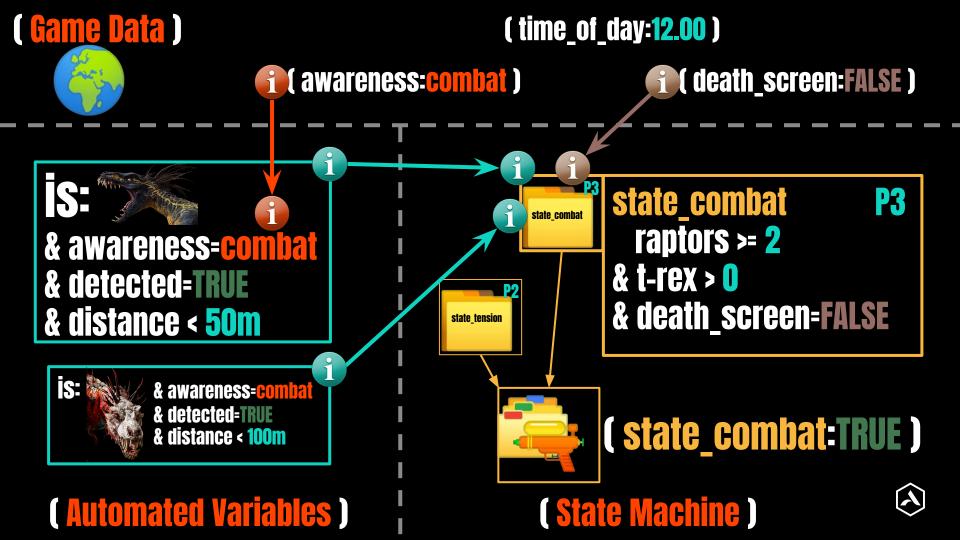


& awareness=<mark>comba</mark> & detected=TRUE & distance < 100m

(Automated Variables)









Full Project Example







INSANITY RULES

















Insanity Rules...

....Really?







Rage 2: Music Design Full Project Example





Don't Panic!





We just have to solve:





$\mathbf{X} \operatorname{Beginning} \rightarrow \operatorname{Middle} \rightarrow \operatorname{End} \mathbf{X}$





In an Open World... 😿





The demands of the Game's Design





The wants of the Music Design





Game Design 🕥

Music Design





Game Design 🔀 Mapping 🐼 Music Design





💡 Mad Max 🗪 💡 Rage 2





$\mathbf{X} \operatorname{Beginning} \rightarrow \operatorname{Middle} \rightarrow \operatorname{End} \mathbf{X}$





Music Design: States for Gameplay Narrative Progression exploration 🔀 danger/anticipation -> combat intro x **X2** Mad Max combat bad good -> compate max x ⊗ danger/aftermath → RAGE 2

Music Design: States for Interrupting Moments

health critical / repair 🔥 death **A** overdrive **Combat performance(good / bad) A**etc.





Music Design: States for Gameplay Types (Activities) open_world_combat, encampment_combat, race, boss, defense_tower, vehicle_combat, mutant bash tv, exploration. settlement, frontend, etc.





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112_stinger13_170.wav112_stinger11_170.wav112_stinger11_170.wav112_stinger12_170.wav112_stinger12_170.wav112_stinger12_170.wav										f12_stinger11_170.wav	tinger08_2pu_170.wav	tinger08_2pu_170.wav		
linger14_2pu_1170.wavf12_slinger12_1170.wav										f12_stinger12_170.wav	tinger10_2pu_170.wav	tinger10_2pu_170.wav		
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RAGE 2

			va04_shortsound	va04_longsound	va04_intro_stinger	New Action Preset	Delete Action Preset
	0:		SH 💿	SH 👘	S M 🙌		
Queued: (0)			Silent	Silent	Silent	Name	Inital Theree
reset_gf_nidmg_nain_pray	- 🕨	⊳ 2	VA_04_danger_shortsound	VA_04_danger_longsound	2	 sy00_state_blocked_event sy00 state boot event 	Any Any
on Preset	default 👻		VA_04_danger_shortsound	VA_04_danger_longsound	3	 syc0_state_objec_event syc0_state_oditor_event 	Any Any
	vehact04 🔫		VA_04_chase_shortsound	VA_04_chase_longsound	4	 sydo_state_contex_cvent syd0_state_mission_event 	All N
ted Tracks	AL		VA_04_chase_shortsound	VA_04_chase_longsound	5	> sy00_state_none_event	
to Bar	No jump (1)		VA_04_chase_shortsound	VA_04_chase_longsound	6	bi88_roam_main_bed	
	Select 💌		Silent	Silent	7		
			Silent	Silent	Silent		
	19 \$		VA 04 highcomb shortsound	VA 04_highcomb_longsound	<5>: va04_introsting_1		
dalone Stingers	10	1010		VA 04 lowcomb longsound	Silent	 fi88_state_frontend_bed 	
	Play Stoper	Þ	VA_04_highcomb_shortsound	VA 04 highcomb longsound	11	HE8_state_load_bed	
		51		VA 04 highcomb longsound	12	• fi88_state_pause_bed	
Undo Redo View			Silent	Silent	13	 va88_hunt_danger_bed va88_hunt_anticip_bed 	Any Any
or		0 D.10		VA 04 lowcomb longsound	14	 va88_skimish_middle_bed 	Any Any
		101		VA_04_lowcomb_longsound	15	 va88_skirmish_middle_defence 	
		> 10		VA 04 highcomb longsound	16	SetLevel	
		D-1		VA_04_highcomb_longsound	17		
		100		Silent	Sient	vall_skirnish_middle_offence	
		V15	Constant of the second s		<5>: va04 introsting 1	va88_boss_climax_bed	
			va04_race_shortsound audio/vehact04/va04_race_shortsound.wav	va04_race_longsound audio/vehact04/va04_race_longsound.wav	<5>: va04_introsting_1 o/vehad04/va04_introsting_1.wav		
			absisivements-wat4_rate_anoresone.wav	approveracts+wap4_race_orgsourceasy	o/vehad04/va04_introsting_2.wav		
					o/vehact04/va04_introsting_3.wav		
					o/vehact04/va04_introsting_4.wav		
					o/vehact04/va04_introsting_5.wav	▶ gf00_default	
			va04_race_shortsound	va04_race_longsound	Silent	gf_hunt_danger_intro	
			va04_race_shortsound	va04_race_longsound		gf_hunt_danger_bed	
			va04_race_shortsound	va04_race_longsound		gf_hunt_anticip_intro	
			Silent	Silent		gf_hunt_anticip_bed	
			Silent	Silent		gf_hunt_anticip_climax	
			VA_04_danger_shortsound	VA_04_danger_longsound			
		Þz	Silent	Silent		• gf_miding_main_bed	
		100	Tradis Stinger Tradis Mixer Track Groups Genera	tors Transition Settings		> gf_miding_main_pray	
		Re	ments set Zoom M 4 6 9 100 122 144 18		 199 192 194 196 199 40		



Good Question: *"That's a lot of music boxes to fill..."*











Rage 2: Implementation Project Example





1 Activity



1 State Machine





encampment_combat

enc_danger enc_anticipation enc_combat_intro enc_combat_bad enc_combat_good enc_combat_climax enc_aftermath

<u>veh</u>icle_combat

veh_danger veh_anticipation veh_combat_intro veh_combat_bad veh_combat_good veh_combat_climax veh_aftermath

open_world_combat

owc_danger owc_anticipation owc_combat_intro owc_combat_bad owc_combat_good owc_combat_climax owc_aftermath





Activity Inheritance





Rage 2 Open World Encounter Activity State Machine

smodm_gpl_st_activity_owenc	Properties				
<node filter=""> 🛛 🐼 🍢 📀</node>	Transform				
Image:	Attach Max Tilt				
Image: Section of the section of	Attach To Ground				
= 🔲 👑 smods fsm gpl state group base	Attach To Mesh				
🛉 🛛 \Bigg debug_visualisation (smodc_graph_fsm_setup)	Attach To Water				
🖕 🗖 🖬 gpl_st_activity_owenc	Transform			•3	
= 🗖 🕼 states				•	
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Interpretation in the second secon	Transform Translation	0 0	0	•	
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🛉 🔲 💾 175.gfafter.camp_complete_screen (smods_gpl_st_active_state)	Event Scopes				
200.gfdanger.base (smods_gpl_st_active_state)	Name	450.gfcomb			
210.gfdanger.nme_area_occupied (smods_gpl_st_active_state)	Node Id	{6F8EED58-82B0-4			
🕈 🔲 🚆 300.gfanticip.base (smods_gpl_st_active_state)	Tags				
Image: State and State	_class				
450.gfcomb (smods_gpl_st_active_state)	■ State				
gfcomb	Module Name				
■ ■ 🕷 conditions.OR	Priority	450			
🗧 🗏 💘 continuous.detect_any_presence.AND	State Name	gfcomb			
enemy_types.OR	State Selection Output				
🗘 🔲 🙀 presence_of_onfoot_enemies.and	Use Group Variable				
	Use State Variable				
	state_phase_group_module				
 Image: Second sec	state_phase_group_value	gfcomb			
■ ■ prayer_slow (sindus_cond_variation_enemy_vs_transport.OR	state_phase_group_variable				
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□ ■ V cinternon_uniter (gfcomb)	■ ai				
a beta set a	Navmesh Merge	None (0)			
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 999.blocked (smods_gpl_st_active_state) 	Add Referenced Fmod Banks				
	= random				
🛚 🔳 🙀 variables	Random Mode	None (0)			
	Random Probability				







bas_danger bas_anticipation bas_combat_intro bas_combat_bad bas_combat_good

bas_aftermath

<u>enc</u>ampment_combat 👦

bas_danger bas_anticipation enc_combat_intro (NEW) enc_combat_bad (NEW) enc_combat_good (NEW) enc_combat_climax (added) bas_aftermath

Open_world_combat owc_danger (№) bas_anticipation (removed) bas_combat_intro

 $(removed \times)$

RAGEZ

bas_combat_intro bas_combat_bad bas_combat_good

bas_aftermath

A

Activities resolved by Gameplay State Machine



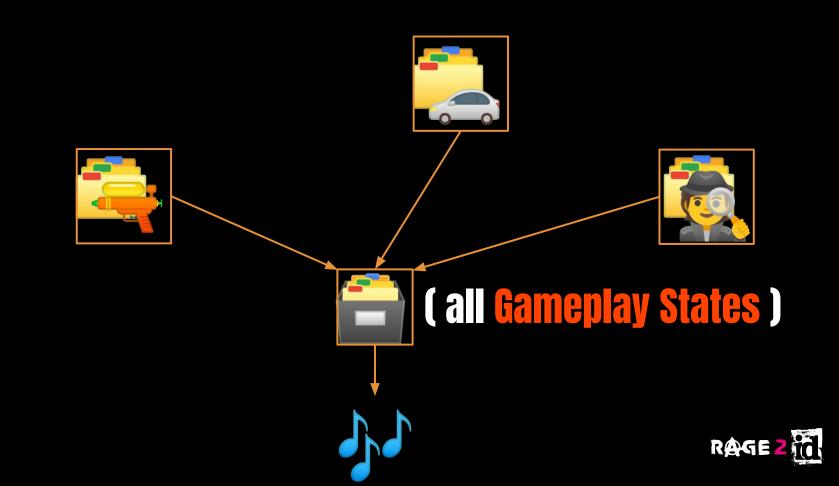


Rage 2 Multiple Activity State Machines

modm_gpl_st_activity_eox	Propertie
ode fiter> 🛛 🛛 😓 💿	" Transform
smodm_gpl_st_activity_convoy	General Event Scopes
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a gp_state_group_s	Node Id {350419D0-D731-4E8F-A6A8-BAA2C88874ED}
	Tags
a a a batter a contraction and a state a contraction and a contr	_class entitvinstance
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 Image: Comparison of the second second	Module Name opl st activity convoy Priority 220
 Image: State (smods_gpl_st_active_state) Image: Image: Image	State Name vaanticip
 Image: Index gradinger (smods_gpl_st_active_state) Image: Image: Im	State Selection Output
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210_granuap (smods_gpl_st_active_state) 220_vaanticip (smods_gpl_st_active_state)	Use State Variable no (0) variables gameolav
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4 420_vacomb (smods_gpl_st_active_state)	state_phase_group_variable activity convov
20_vacima (smods_gp[_st_active_state)	= State Timers
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	Image: Second state s
modm_gpl_st_activity_ew	= 🔲 🔄 gpl_st_plr_biome
ode fiter> 🛛 🕄 😓 👁	a tes
🗏 👑 smodm_gpl_st_activity_owenc 🛛 🔅 🗠	000.none (smods_gpl_st_active_state)
🖕 🗖 🔄 smodm_gpl_st_activity_gunfight (smodm_gpl_st_activity_gunfig	Ill arctic_coastal (smods_gpl_st_active_state)
🖕 🗖 💾 smods_fsm_gpl_state_group_base	Illing 100.arctic_ice (smods_gpl_st_active_state)
🖕 💷 🔀 gpl_st_activity_owenc	Interpretation in the second secon
= 🗖 🕅 states	Image: Interpretation of the second secon
Image:	Image: International State (State)
Ill a state in the second s	Ill and a state a s
Iso.gfafter (smods_gpl_st_active_state)	Image: International state in the state i
ITS.gfafter.camp_complete_screen (smods_gpl_st_active_s	
Image: Section 1 - Section 2005 -	
Image:	■ 55: ▼ 202 ▼ 277 ▼ 25: ■ smodm_gp[_st_pn
🛱 🗖 🐸 300.gfanticip.base (smods_gpl_st_active_state)	
🕈 🔲 🛗 310.gfanticip.nme_area (smods_gpl_st_active_state)	<node filter=""> 🛛 🕄 🗞 🕯</node>
4 450.gfcomb (smods_gpl_st_active_state)	smodm_gpl_st_prey >
500.gfclmax (smods_gpl_st_active_state)	🔹 🔳 🕍 smods_fsm_gpl_state_group_base
999.blocked (smods_gpl_st_active_state)	🛎 🔲 📴 gpl_st_prey
E Transitions	🕈 🔳 🔯 states
🖕 🔲 🙀 variables	Image: Book of the second s
■ 783 ✓ 428 @ 355 @ 109 🛒	📮 🗏 📅 100_basic (smods_gpl_st_active_state)
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ode filter> 🛛 🛛 🔂 😓 💿	200_swarm (smods_gpl_st_active_state)
smodm_gpl_st_activity_nmecamp	4 00_post_critical (smods_gpl_st_active_state)
activity_gunfight (smodm_gpl_st_activity_gunfight)	Image: Some state in the state is a state in the state i
Image: State_group_base	Image:
a gpl_st_activity_nmecamp	In transitions
🕈 🔳 🕪 states	
Image:	🔛 smodm_gpl_st_preda
Ill a state in the state of	<node filter=""> 🚳 🔂 🌜</node>
Iso.gfafter (smods_gpl_st_active_state)	= 🔳 👑 smodm_gpl_st_predator 🛛 🔷 🕹
ITTS.gfafter.camp_complete_screen (smods_gpl_st_active_s	Image: Second
200.gfdanger.base (smods_gpl_st_active_state)	= Image_st_predator
210.gfdanger.nme_area_occupied (smods_gpl_st_active_st	• • • • states
300.gfanticip.base (smods_gpl_st_active_state)	Image: Second
🔹 🔲 🎬 310.gfanticip.nme_area (smods_gpl_st_active_state)	a 100 basic (smods gpl st active state)
450.gfcomb (smods_gpl_st_active_state)	200_killstreak (smods_gpl_st_active_state)
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□ 🖸 transitions 🗸 🗸	· I G transitions









encampment_combat

enc danger enc anticipation enc combat intro enc combat bad enc combat good enc combat climax enc_aftermath





<u>veh</u>icle_combat

veh danger veh anticipation veh_combat_intro veh_combat_bad veh combat good veh combat climax veh aftermath



gameplay_state

enc_danger veh_danger enc_anticipation veh anticipation enc_combat_bad veh_combat_bad enc_combat_good veh_combat_good enc_combat_intro veh_combat_intro enc_combat_climax veh combat climax enc aftermath==veh aftermath RAGE 2



Rage 2 (all) Gameplay States

👑 smodm_fsm_gameplay_state 🔹 👑 smodm_fsm_eias_musicstate 🛛	Properties	
<node fiter=""></node>	🎨 💿 🖣 1. component	
smodm_fsm_gameplay_state	Name state.from_previous.EQ.exploration	
🗴 🛛 🚺 tsm. gameplay_state	= 2. condition	
k.	Operand1 state	
	Operand2 exploration	
	Operation equals (0)	
	= 3. type	
	Operand1 Type variable (1)	
	Operand2 Type constant (0)	
	Value Type string (3)	
	= General	
	Node Id {52EE664A-7B41-4DCE-A57C-B8A44F4B398A}	
	_dass SSoundModuleCondition	
	event_scopes	
	tags	





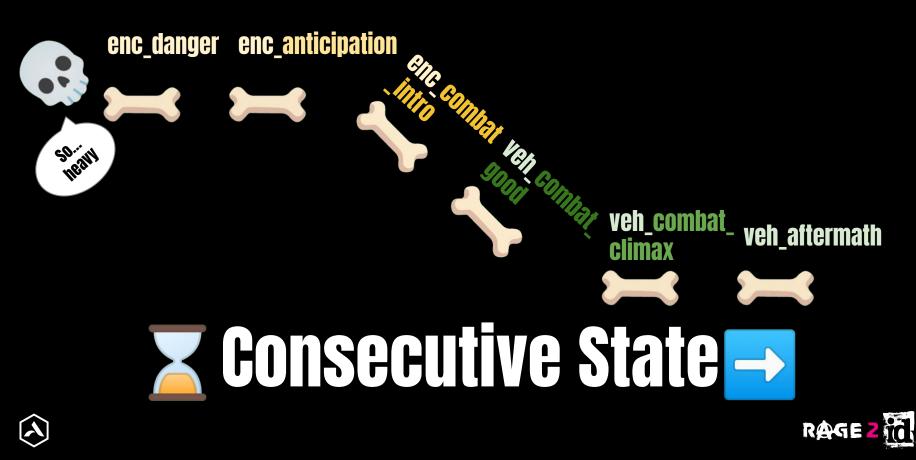


Good Question: "Wait... Wasn't that two state machines?"













Rage 2: Implementation Game 7 Activities 1 **Gameplay State Machine** Middleware RAGE 2



Gameplay State Machine







Narrative Sections

danger / anticipation combat_intro combat_bad / _good combat_climax aftermath



Interrupts

A health_critical / repair death overdrive Combat performance etc.

Activities

open_world_combat, encampment_combat, race, boss, defense_tower, vehicle_combat, mutant_bash_tv, exploration, settlement, frontend, etc.





va04 shortsoun

va04_longsound

VA_04_danger_longsound

VA 04 chase longsound

VA 04 chase longsound

VA 04_highcomb_longsound

VA 04 highcomb longsound

VA_04_highcomb_longsound

VA 04_lowcomb_longsound

VA 04 lowcomb longsound

va04_race_longso

autiovebart04va04 race los

va04 race longsound

va04_race_longsound

VA_04_danger_longs

Silent

Loop Tradis Stinger Tradis Mover Track Groups Generators Transition Settings

Silent

va04_intro_stinger

.o/vehact04/va04_introsting_1.wa

4/va04_introsting_2.wav 4/va04_introsting_3.wav 4/va04_introsting_4.wav

a04_introsting_5.wa

1020

sy00 state mission even

sv00 state none event

bits roam main foo

bills roam main car

biss journey main bec

fi88_state_frontend_be

fill_state_load_bed

fi88_state_pause_bec

va88_hunt_anticip_bed

va88_skirmish_middle_defenc

va88 boss climax defend

va88 boss climax offence

bi00_default

gf00_default va00_default

of hunt danger bed

gf_hunt_anticip_intro
 gf_hunt_anticip_bed

) of hunt anticip climat

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B A @ E A F 3 C							
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		gf12_short_sounds	gf12_long_sounds	gf12_intro_stinger	New Action Preset	Delete Acton Preset +	
0:3			SH 01	бн 🕂			
ed: (1)	⊳1 S	Silent	Silent	1	Name > sy00 state blocked event	Initial Theres	
gf_nidmg_nain_pray 🔹 膨)2 S	Silent	Silent	2	+ sy00_state_boot_event	Any .	
eset default *	⊳3 G	3F_12_danger_shortsound_18juni	GF_12_danger_longsound_18juni	3	+ sy00_state_editor_event	kıy ·	
gunight12 👻	D4 G	3F_12_anticip_shortsound_18juni	GF_12_anticip_longsound_18juni	4	+ sv00 state mission event		
	⊳s G	GF_12_anticip_shortsound_18juni	GF_12_anticip_longsound_18juni	5	> sy00_state_none_event		
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Select 💌	>7 8	Silent	Silent	7			
	>8 S	Silent	Silent	Silent			
1 1		3F_12_bed_shortsound_18juni	GF_12_bed_longsound_18juni	<5>: af12 introsting 1			
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ledo Wew				ht12igf12_introsting_4.wav			
				ht12/gf12_introsting_5.wav			
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				SHORE	va88_skirmish_middle_defence		
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	>22 G	GF_12_critical_shortsound_18juni	GF_12_critical_longsound_18juni	22			
		Silent	Silent	23	gf_midrrg_main_intro		
		Silent	Silent	24			
		GF_12_od_shortsound_18juni	GF_12_od_longsound_18juni	25			
	26 2	pe_rz_od_snortsound_rojum	GP_12_0d_longsound_rejuin	20			
			20	20	• gf_midmg_climes_bed		1
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	Reset Zo	tion	gf12_combat_exit	gf12_combat_tr	gf12_combat_p	gf12_fray_punct	gf12_fray_enter
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	Reset Zo	Image: second	gf12_stinger01_170 f12_stinger01_170 f12_stinger03_170.wav tinger04_2pu_170.wav	SM (12 gf12_stinger01_170 f12_stinger01_170.wav tinger02_4pu_170.wav f12_stinger03_170.wav	gf12_stinger01_170 f12_stinger01_170.wav tinger02_4pu_170.wav f12_stinger03_170.wav	S.M. () gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav	SM 01 gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav
	Reset Zo	with an arrow of the second		SM (b) gf12_stinger01_170 .f12_stinger01_170.wav .tinger02_4pu_170.wav .f12_stinger03_170.wav .tinger04_2pu_170.wav	SM UT gf12_stinger01_170 f12_stinger01_170.wav tinger02_4pu_170.wav f12_stinger03_170.wav tinger04_2pu_170.wav	SM gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav	SM 011 gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav
	Reset Zo	Image: second	SM (1) gf12_stinger01_170 . f12_stinger01_170 wav f12_stinger03_170 wav tinger04_2pu_170.wav f12_stinger06_170 wav tinger07_2pu_170.wav	gf12_stinger01_170 (f12_stinger01_170 (f12_stinger01_170.wav tinger02_4pu_170.wav tinger03_170.wav tinger04_2pu_170.wav tinger05_2pu_170.wav	SM () gf12_stinger01_170 f12_stinger01_170.wav tinger02_4pu_170.wav tinger03_170.wav tinger04_2pu_170.wav tinger05_2pu_170.wav	S.M. () gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav	SM 01 gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav
	Reset Zo	with an arrow of the second	SM (1) gf12_stinger01_170 . f12_stinger01_170 wav f12_stinger03_170 wav tinger04_2pu_170.wav f12_stinger06_170 wav tinger07_2pu_170.wav	SM (b) gf12_stinger01_170 .f12_stinger01_170.wav .tinger02_4pu_170.wav .f12_stinger03_170.wav .tinger04_2pu_170.wav	SM UT gf12_stinger01_170 f12_stinger01_170.wav tinger02_4pu_170.wav f12_stinger03_170.wav tinger04_2pu_170.wav	S.M. () gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav	SM 01 gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav
	Reset Zo	with an arrow of the second	SM (1) gf12_stinger01_170 . f12_stinger01_170 wav f12_stinger03_170 wav tinger04_2pu_170.wav f12_stinger06_170 wav tinger07_2pu_170.wav	gf12_stinger01_170 (f12_stinger01_170 (f12_stinger01_170.wav tinger02_4pu_170.wav tinger03_170.wav tinger04_2pu_170.wav tinger05_2pu_170.wav	SM () gf12_stinger01_170 f12_stinger01_170.wav tinger02_4pu_170.wav tinger03_170.wav tinger04_2pu_170.wav tinger05_2pu_170.wav	S.M. () gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav	SM 01 gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav
	Reset Zo	with an arrow of the second	G M (1) 	S M () gf12_stinger01_170 f12_stinger01_170.wav .singer02_4pu_170.wav singer04_2pu_170.wav singer04_2pu_170.wav f12_stinger06_170.wav singer07_2pu_170.wav	S M (b) gf12_stinger01_170 f12_stinger01_170.wav tinger02_4pu_170.wav tinger03_170.wav tinger04_2pu_170.wav tinger06_2pu_170.wav tinger06_170.wav	S.M. () gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav	SM 01 gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav
	Reset Zo	with an arrow of the second	() ()	M M	© M © M 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	S.M. () gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav	SM 01 gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav
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	Reset Zo	with an arrow of the second	Gitti Construction Gitti Constructio	M M	() ()	S.M. () gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav	SM 01 gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav
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	Reset Zo	with the second secon	Comparison of the second			S.M. () gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav	SM 01 gf12_stinger06_170 f12_stinger06_170.wav tinger08_2pu_170.wav f12_stinger09_170.wav
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 $\widehat{\mathbf{A}}$

default

vehact04

Events Queued: (0)

Affected Tracks

Go to Silence

va04_combat_enter *

Player Undo Redo View

Inspector

Action Preset of midmo main man

Loop Tracks

VA_04_danger_shortsound

* >4 VA 04 chase shortsound

Sile

Silen

>13 Silent

≥3 VA_04_danger_shortsound

5 VA 04 chase shortsound

6 VA_04_chase_shortsound

9 VA 04 highcomb_shortsound

>10 VA_04_lowcomb_shortsound

>11 VA 04 highcomb shortsound

>12 VA_04_highcomb_shortsound

>14 VA_04_lowcomb_shortsound

15 VA 04 lowcomb shortsound

16 VA_04_highcomb_shortsound 17 VA_04_highcomb_shortsound 18 Stent 19 va04_race_shortsound

audio/vehant04/va04_race_shor

va04 race shortsound

>21 va04_race_shortsound

>22 va04_race_shortsound

>23 Silent

24 Silent 25 VA_04_danger_shortsound

25 Silent

Reset Zoom

0:1 5 F

No jump (D) 🗢 🗘

(Re-1Activate Level

19 0

Play Stoper



e But after all that,





the Narrative Backbone





the Narrative Backbone is in place V

Why is no one helping me...?

 $\widehat{(\mathbf{A})}$





Principles Learned





There'll never be a **"System" Principles Learned**



Principles

https://splice.com/blog/interactive-music-system-video-games/

Something to keep in mind when building an interactive music system for a game is that **there's no magic bullet to creating the system**. Just because a particular strategy worked really well for one game, it doesn't mean that it'll be right for your game in the same exact way. That being said, **basic principles derived from one game mechanic can easily be translated to another**. Learning transfer is one of the most important things to keep in mind when doing video game music research.



Ronny Mraz



A **System** is a collection of organised things; a whole composed of relationships among its members.

A **Paradigm** is an example serving as a model or pattern; a template.





Standardise your Principles





Learn solutions for common problems





Just like solving for





Sound Design





Programming





Technical Sound Design?





Music Design









Principles Learned: Analogies you can work with

Like,



"Activities as Context"



Sounds simple, but...



deas take iteration



Y Mad Max => Y Rage 2



Find what works for your game





And your brain





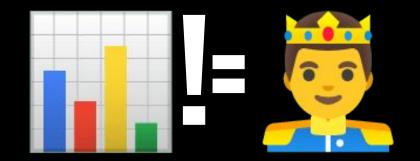
Game Design S Me C Music Design



Reuse them



Principles Learned: Analogies you can work with exploration 🔀 danger/anticipation -> combat into X combat bad/good -> compate max x danger/aftermath 2 $\widehat{\mathbf{A}}$









In other words,



Use Names, Not Mbers









Gameplay -> Numbers -> States



Gameplay 💉 Numbers? 💉 States?



Rage 2 Combat Ranges

show gameplay fsm	Gameplay & Music State	show music fsm: show theme:					
gameplay_mission_manual: music	_elias_theme_manual: section	on_intro_manual:					
gunfight_climax_scale: choose a level 🗸 c	hoose_a_level reset	resend					
fsm_gameplay_state: choose a state 🗸 state_name reset							
fsm_elias_musicstate: v state_name reset							
show	Combat Ranges		ranges_manual:				
range_awareness_npc	min: 0.0	max:	40.0				
range_awareness_omni	min: 0.0	max:	40.0				
range_awareness_plr	min: 0.0	max: 🗾	40.0				
range_local_kill	min: 0.0	max: 💶	40.0				
range_threat_npc	min: 0.0	max:	40.0				
range_threat_plr	min: 0.0	max:	40.0				





Numbers: Difficult to sculpt general rule



Numbers: Difficult to sculpt general rule



Subers: Time consuming to script specific contexts



States: I know what I want



States: I know what I want



States: I want it now



States: Let me set it



Gameplay Numbers States



Gameplay Numbers Names



Second Extinction Music State Machine

💾 smodm_	fsm_music ×		Properties		
<node filte<="" th=""><th>S 20</th><th>• •</th><th>= 1. component</th><th></th><th></th></node>	S 20	• •	= 1. component		
= 🗆 💾 sr	nodm_fsm_music	>	Name	svar_game_design_music_choice.eq.this_state	
	game_design_music_choice		2. condition		
0	📲 game_design_music_choice.set.combat_high		Operand1	svar_game_design_music_choice	
e [📲 game_design_music_choice.set.combat_low		Operand2		
a [📲 game_design_music_choice.set.exploration		Operation	equals (0)	
	game_design_music_choice.tension_post_combat		= 3. type		
	📲 🚰 game_design_music_choice.tension_pre_comb		Operand1 Type	variable (1)	
= 🗆 🖥	fsm_music		Operand2 Type	constant (0)	
	te states		Value Type	string (3)	
	Image: Interpretation (smods_fsm_shoebill_music_state)		General		
	20.tension_pre combat (smods_fsm_shoebill_music_state)		Node Id	{BEADE607-9D9C-4BD9-92F6-79BF4B3107B0}	
	30.tension_post_combat (smods_fsm_shoebill_music_state)		_class	SSoundModuleCondition	
	 Image: Image: Image Image: Image: Imag		event_scopes		
			tags		
	 Imusic_clogic.(and).music_cnoice.not_overnaen Imusic_choice.not_overriden (scon_game_design_music_choice.not_overnaen) Imusic_choice.not_overriden (scon_game_design_music_choice.not_overnaen) Imusic_choice.not_overriden (scon_game_design_music_choice.not_overriden (scon_game_design_m				
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c c	🔋 🔳 🗮 from.variables_gameplay				
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E	• 💷 🌠 state				
	state_age				
	• • • state_type				



(state logic override)









The wants of the Music Design



The demands of the Game's Design



Some of it is Narrative State Design



It can be used for so much more...



Other uses for states

Mixing (snapshots)



Triggering Sounds



Affect sounds (modulate / select)



Gamestate / Game Flow (UI screens e.g. frontend)



Represent sections of scripted mission flow



Defining Key Locations



Feed or trigger culling rules



Feed / trigger mix rules (e.g. sidechain ducking)



Loading resources









You want to know:



What the Omniscient Game Director knows.





Where the player thinks they are. (how they could / should feel about that)



What the player thinks they are doing. (player story / game story)





Location







Find data that helps you derive the player's experience



Music / Sound Can tell you what you know (Reinforce)



Player Knowledge



Music / Sound Can tell you what you <u>don't</u> (Aluce)



(the Game's Design Intention)



Neither is better



Use both





Closing Thought

























Avalanche Careers Thanks for listening



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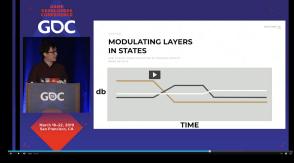
Avalanche Talks Thanks for listening



https://www.gdcvault.com/play/1025999/Building-a-Mixing -Sandbox-for

Building a Mixing Sandbox for 'Just Cause 4' Dominic Vega

(scripting mixing in FMOD) $\widehat{\}$



https://www.gdcvault.com/play/1026000/Music-in-a-Sandb ox-The

Music in a Sandbox: The Dynamic Music of Just Cause 4 **Ronny Mraz** (what it looks like using data GDC to script music in FMOD) GDC





Avalanche Studios Group

