

GIVING A VOICE TO THE MACHINES OF HORIZON ZERO DAWN

PINAR TEMIZ | SOUND DESIGNER
GUERRILLA GAMES



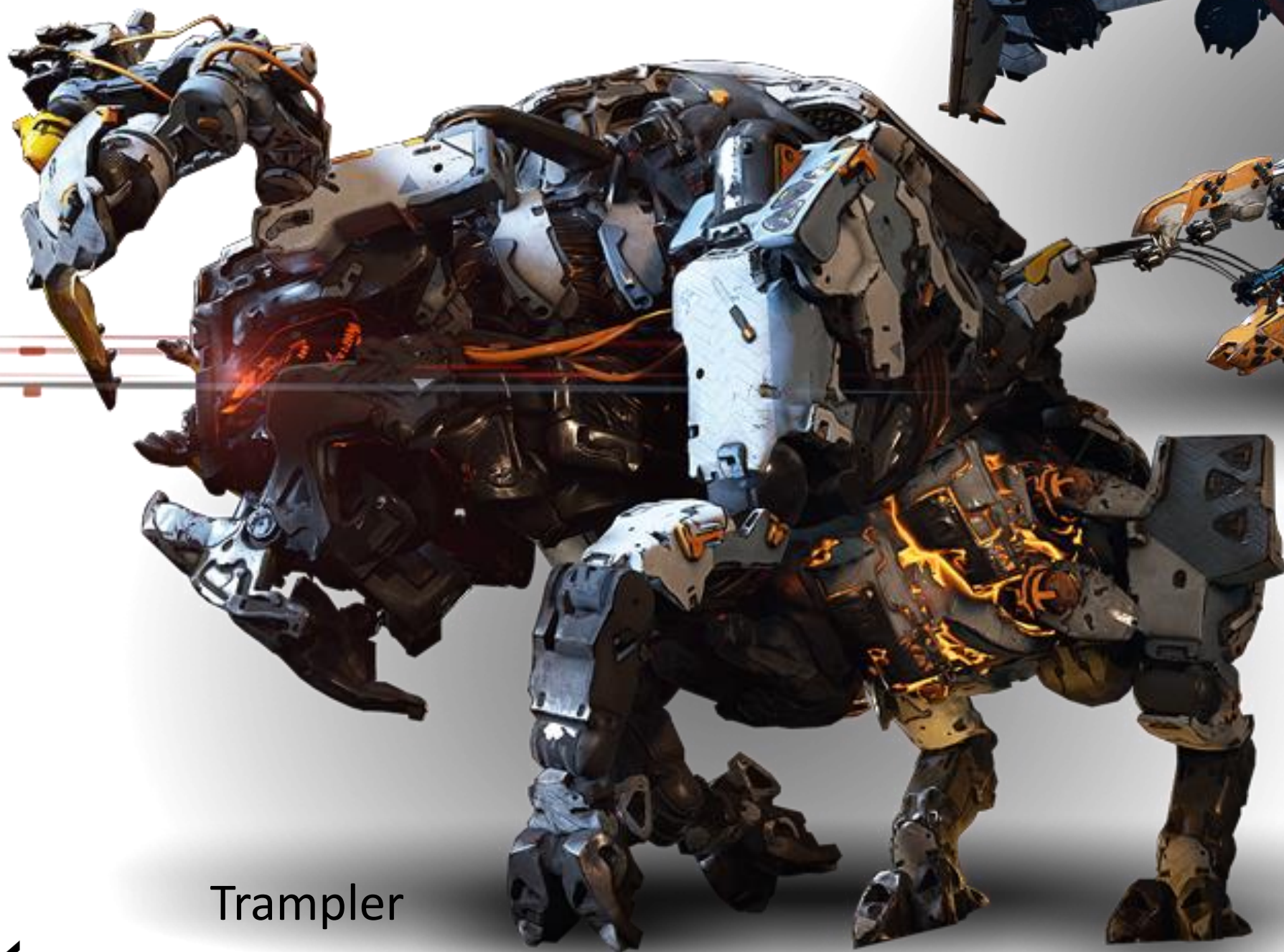
GUERRILLA

WHAT'S THAT SOUND?

?



WHICH ONE?



Trampler



Glinthawk



Watcher



AWESOME!



BUT FIRST...



WHERE IT ALL STARTED





KILLZONE[®]

SHADOW FALL







MEET THE OWL





FROM KILLZONE TO...









HORIZON



GIVING A VOICE TO
THE MACHINES

WHAT ARE
THESE
MACHINES?



WHAT DO THEY SOUND LIKE?

HOW DO YOU START DESIGNING SOUND
FOR A WORLD THAT DOESN'T EXIST YET?

LET ALONE ITS CHARACTERS...



YOU GOTTA START SOMEWHERE!



Style definition

- These key words are to be used as a checklist indicator for the function as a check to see if our key words define the style and
- The keywords between the different factions should be a clear readable differentiation between both factions.

	Tree huggers Faction specific	Military Faction
Functionality	-Maintain the "balance" -Self sustaining as group.	-Warfare
Origin	-Designed and evolved in form and function inspired by fauna.	-Military human
Shapes	-Mike Nash samples -Mood board TBD -Animalistic silhouette	-Military
Technology	-Far future -Energy dense.	-Near future -Adaptive
Materials	-Bio degradable Lightweight hard composites. -Flexible	-Hard plastic -Ballistic
Construction	-Lightweight injection molding -Soft joints	-Lightweight -Functional -Rigid
Mechanic	-Bio-gel muscles	-Hydraulic -Use with movement
Trademarks	-External removable canisters and multiple slot configurations.	-Extra joint adaptivity -Stabilization mount -Additional
Coloring	-Natural colors -Bare materials -Limited paint only for marking.	-Military -No camouflage -Simple Human
Movement	-Elegant	-Multi-jointed -Rigid body -Fast

EXPLORATOR

This page shows a number of designs that have both functions.



KEY DIFFERENCES

These keywords describe the main differences between the 2 robot factions.

ROBO-HC WILDLIFE

- Generally peaceful
- Graceful, Animal-like
- Defensive

Far Future Tech (1000 yrs from now)

Main function is to maintain the balance in Earth's ecosystem

Represents the beauty of nature

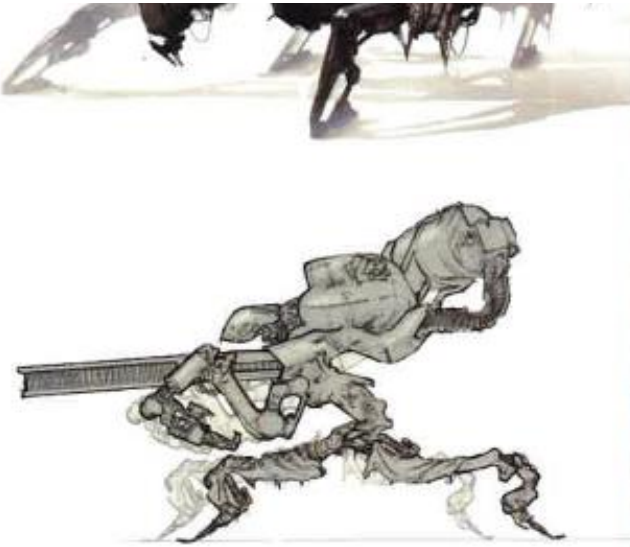
THE OLD MACHINES

- Hyperaggressive
- Inscrutable, Tormented
- Offensive

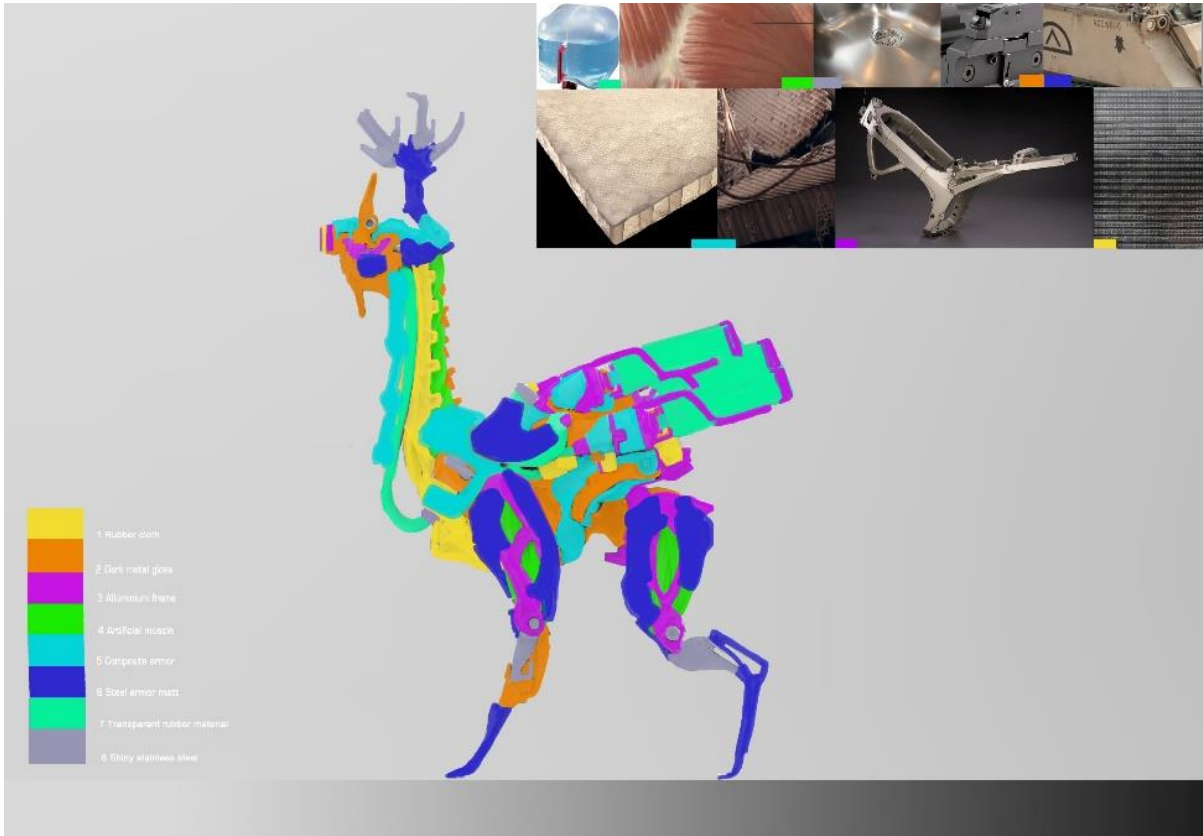
Near Future Tech (40 yrs from now)

Main function is to destroy other machines and wage war

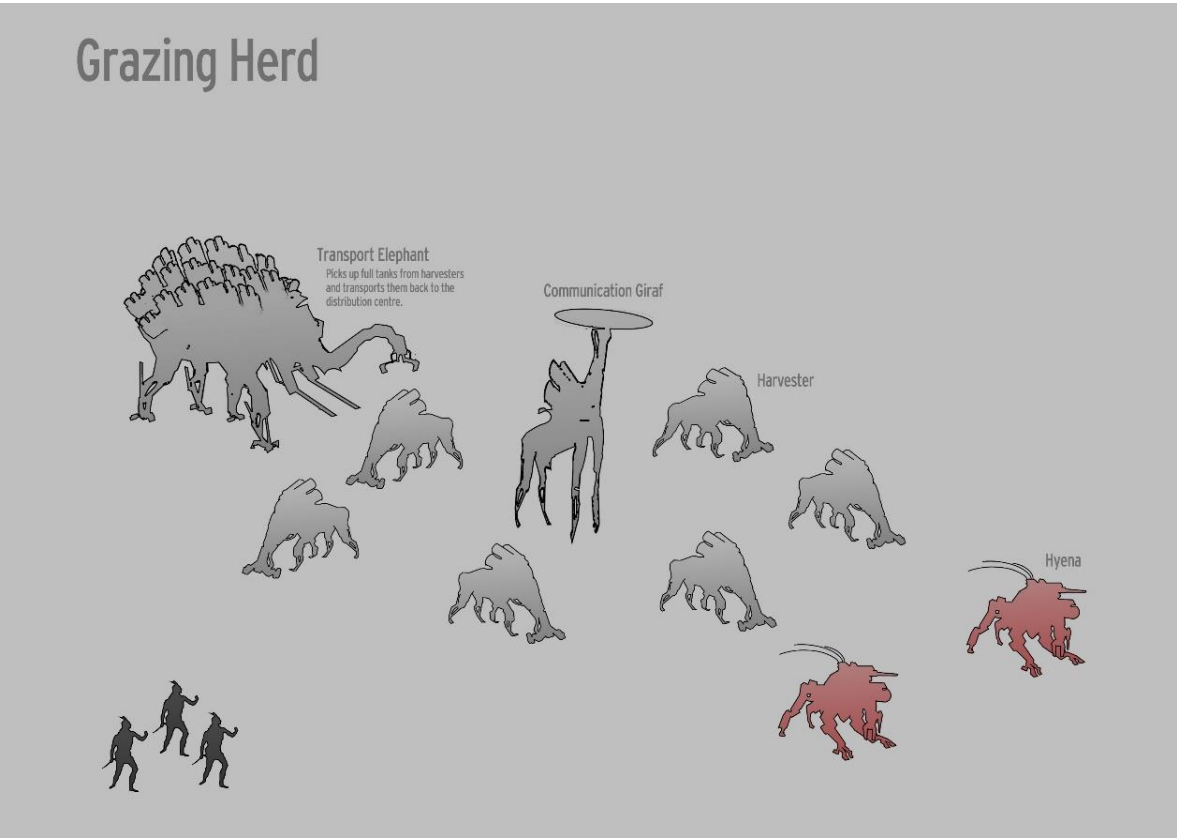
Represents the dark side of mankind



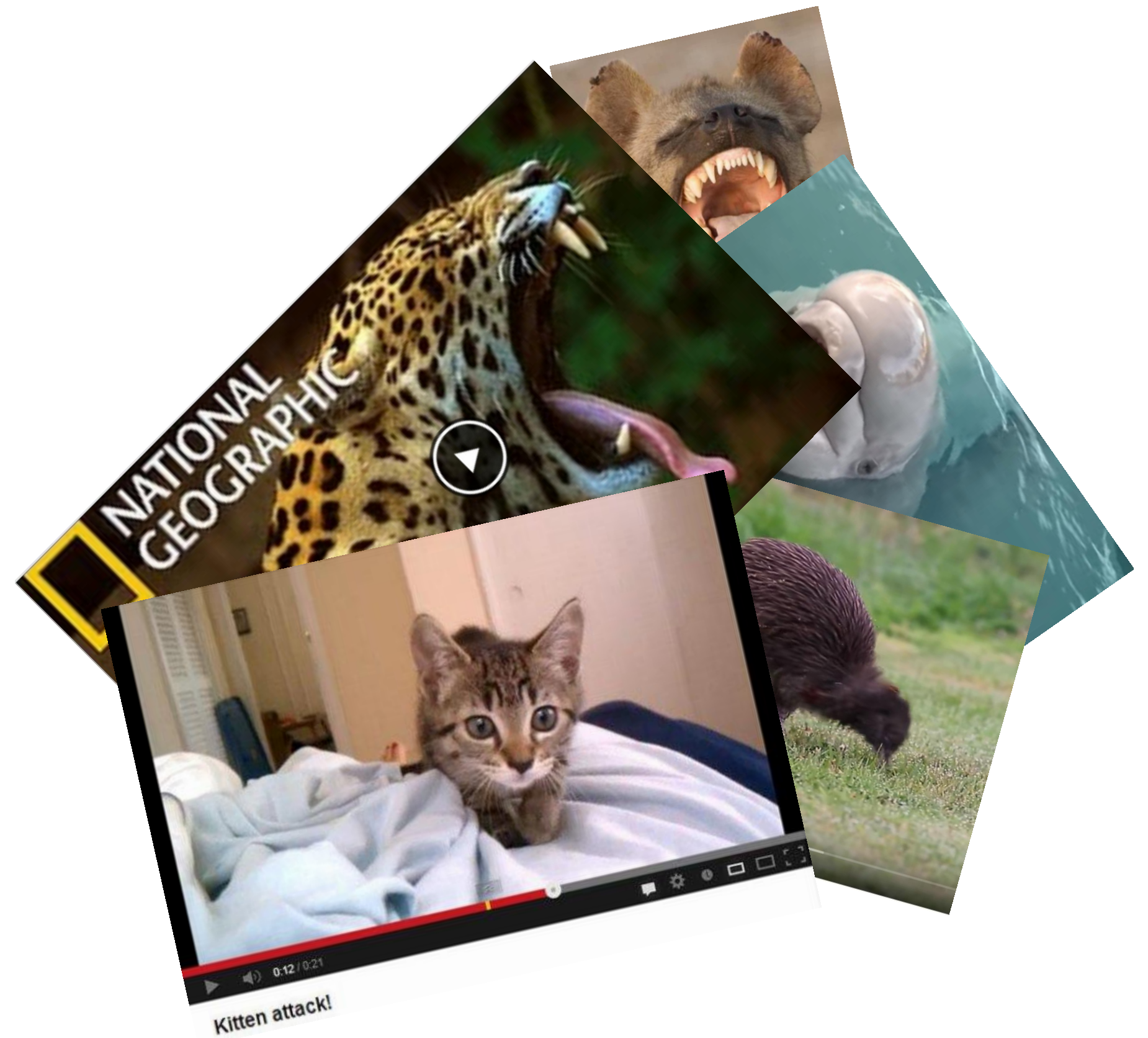
Finding New Ingredients



Thinking Outside The Box



Where To Look And Listen



Work It Like A Chef



MEANWHILE...




INTERACTIVE COMPONENTS



1. Sound is produced by **vocal folds**.
 2. Sound is produced by **glottis**.
 3. Sound is produced by **pharynx**.
 4. Sound is produced by **oral cavity**.
 5. Sound is produced by **nasal cavity**.
 6. Sound is produced by **lips**.

Component	Sound Produced
Vocal Folds	Voiced 'a'
Glottis	Voiced 'e'
Pharynx	Voiced 'i'
Oral Cavity	Voiced 'u'
Nasal Cavity	Voiced 'o'
Lips	Voiced 'y'

Sound is produced by **vocal folds**.



A collage of various documents and images. At the top left, a handwritten note on lined paper reads: "The first step is to identify the problem. The second step is to identify the cause of the problem. The third step is to identify the solution to the problem. The fourth step is to implement the solution. The fifth step is to evaluate the results of the solution." Below this is a small illustration of a person in a yellow shirt and blue pants, possibly a worker or a student. To the right of the note is a diagram of a mechanical part, possibly a piston or a valve, with a blue arrow pointing to it. Below the diagram is a table with the following structure:

Table 1: Data for the experiment	
Time (s)	Distance (m)
1.0	0.1
2.0	0.4
3.0	0.9
4.0	1.6
5.0	2.5

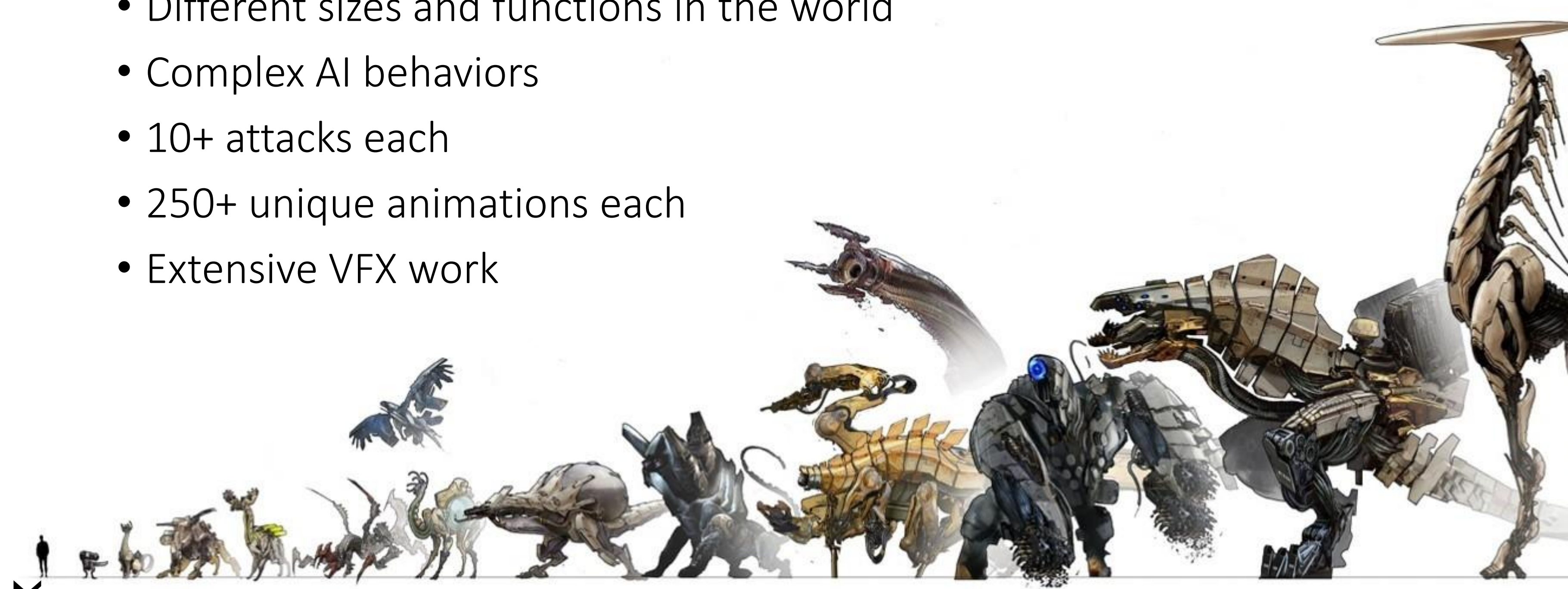
 Below the table is a small illustration of a person in a yellow shirt and blue pants, possibly a worker or a student. To the right of the table is a small illustration of a person in a yellow shirt and blue pants, possibly a worker or a student. At the bottom right, there is a small illustration of a person in a yellow shirt and blue pants, possibly a worker or a student.

The collage contains several documents:

- A circular diagram with a grid and a red dot in the center.
- A table with multiple rows and columns, some of which are highlighted in blue.
- A form with a red stamp that says "RECEIVED" and a date "10/10/2010".
- A form with a green stamp that says "RECEIVED" and a date "10/10/2010".
- A form with a red stamp that says "RECEIVED" and a date "10/10/2010".
- A form with a green stamp that says "RECEIVED" and a date "10/10/2010".
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- A form with a green stamp that says "RECEIVED" and a date "10/10/2010".
- A form with a red stamp that says "RECEIVED" and a date "10/10/2010".
- A form with a green stamp that says "RECEIVED" and a date "10/10/2010".

What Could We Expect?

- Different sizes and functions in the world
 - Complex AI behaviors
 - 10+ attacks each
 - 250+ unique animations each
 - Extensive VFX work
- 



Perspective...

Killzone

Just a few sounds..



Horizon

So maaannnnnyyyy!!!



Tools & Engine

WORKFLOW
ENABLING
SOUND
DESIGNER

Sound Design

FUNCTIONAL

EVOCATIVE

Ultimate Goal

MEMORABLE &
CONVINCING

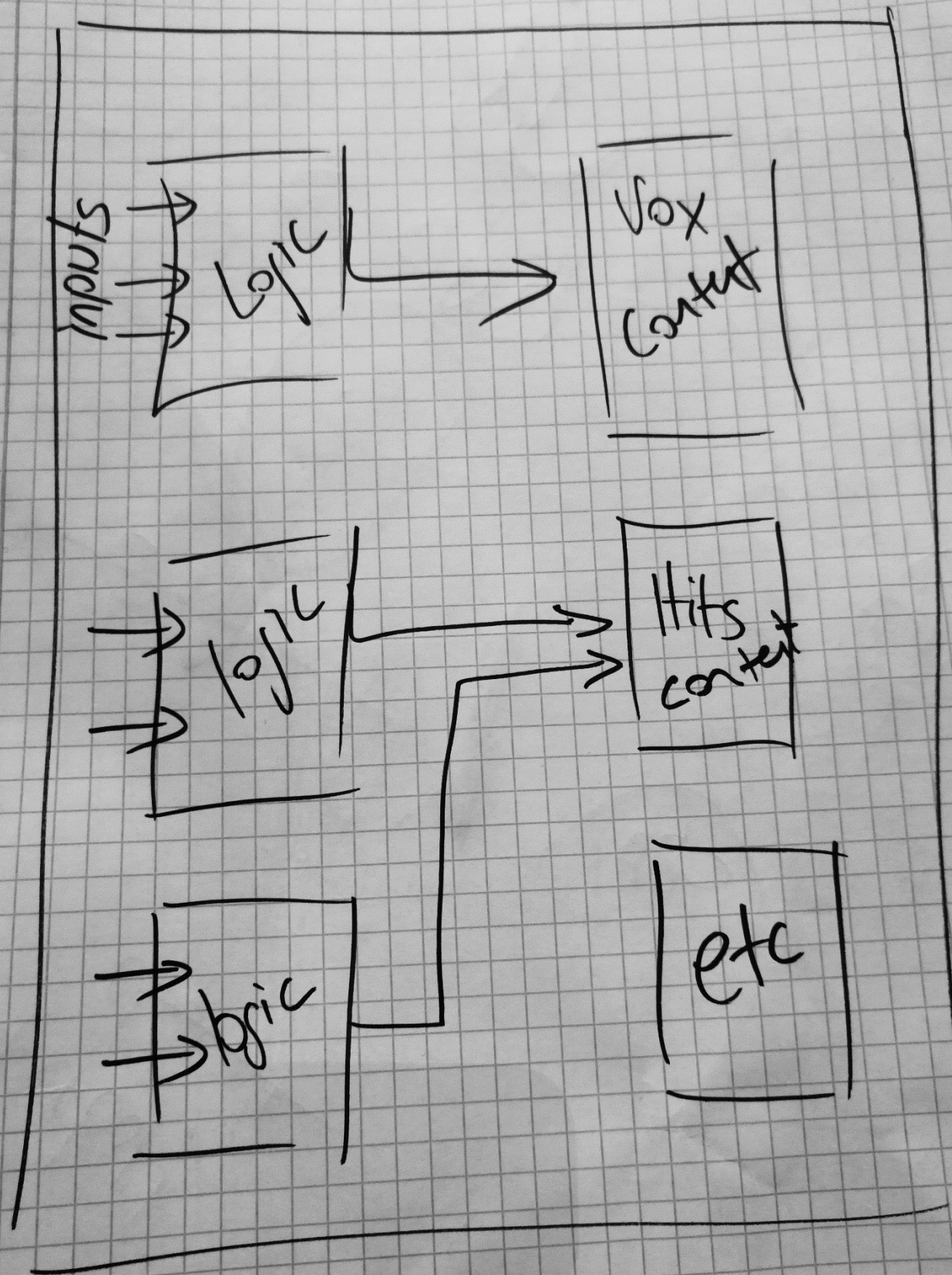


LOWER THE NUMBER OF SOUNDS PER ROBOT.

MAKE THE SOUNDS & THEIR LOGIC COMPLEX.



Robot Soundbank





DECIMA

Press **Esc** to exit full screen

Minimize

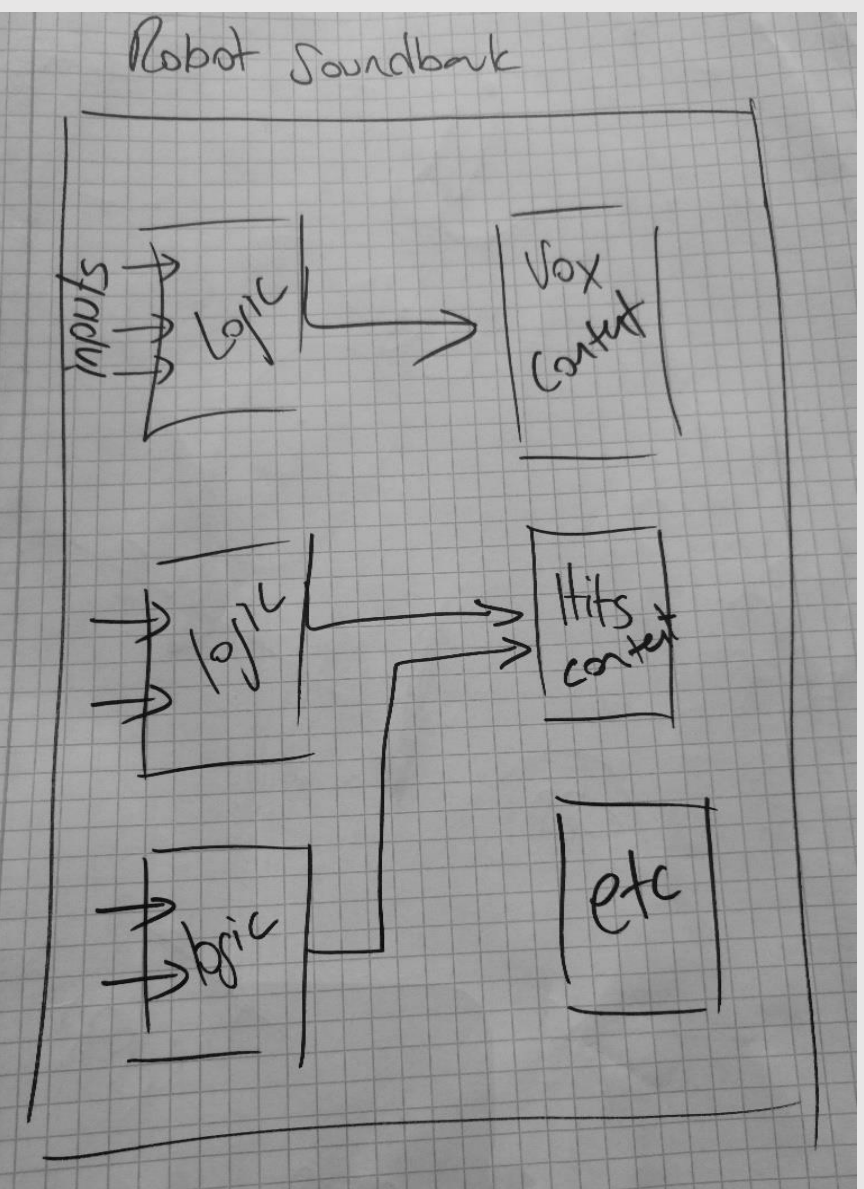


Inputs

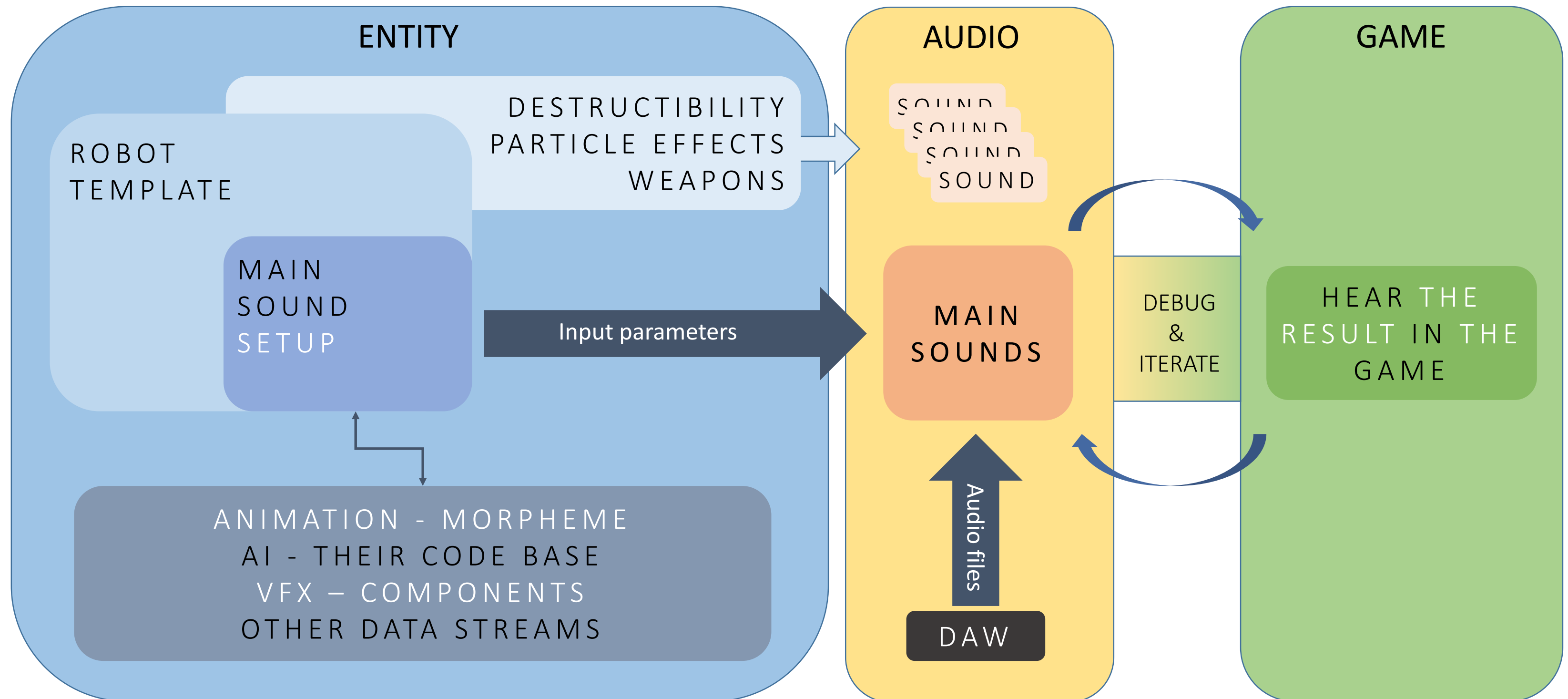
on_start
on_stop
Game Parameters

Wave

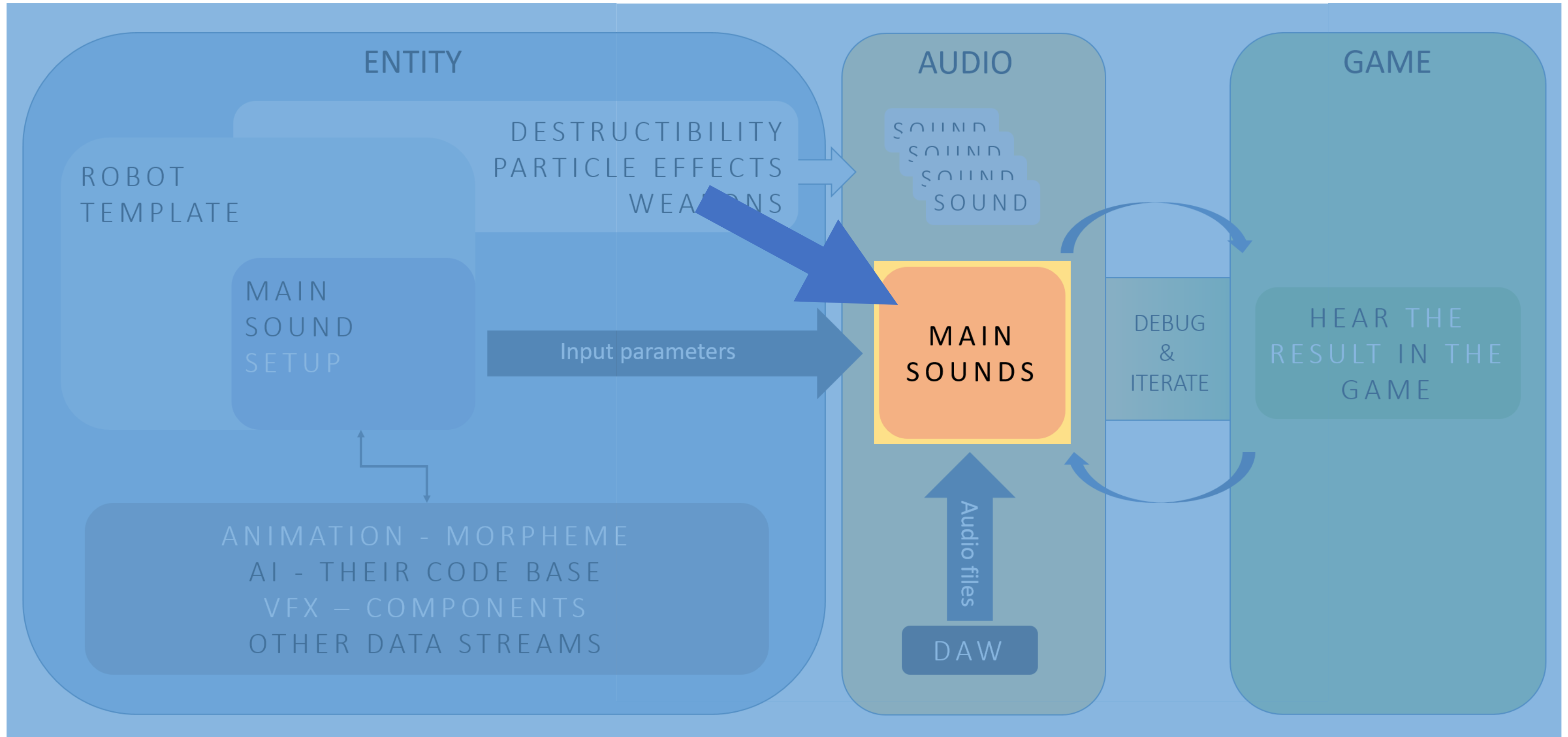
inStart
inStop
inWave (sample data)
Other Voice Parameters:
Dry Gain,
Wet Gain,
LFE Gain, etc.



The Robot SETUP



The Robot SETUP



MAIN Robot Sounds



NECK

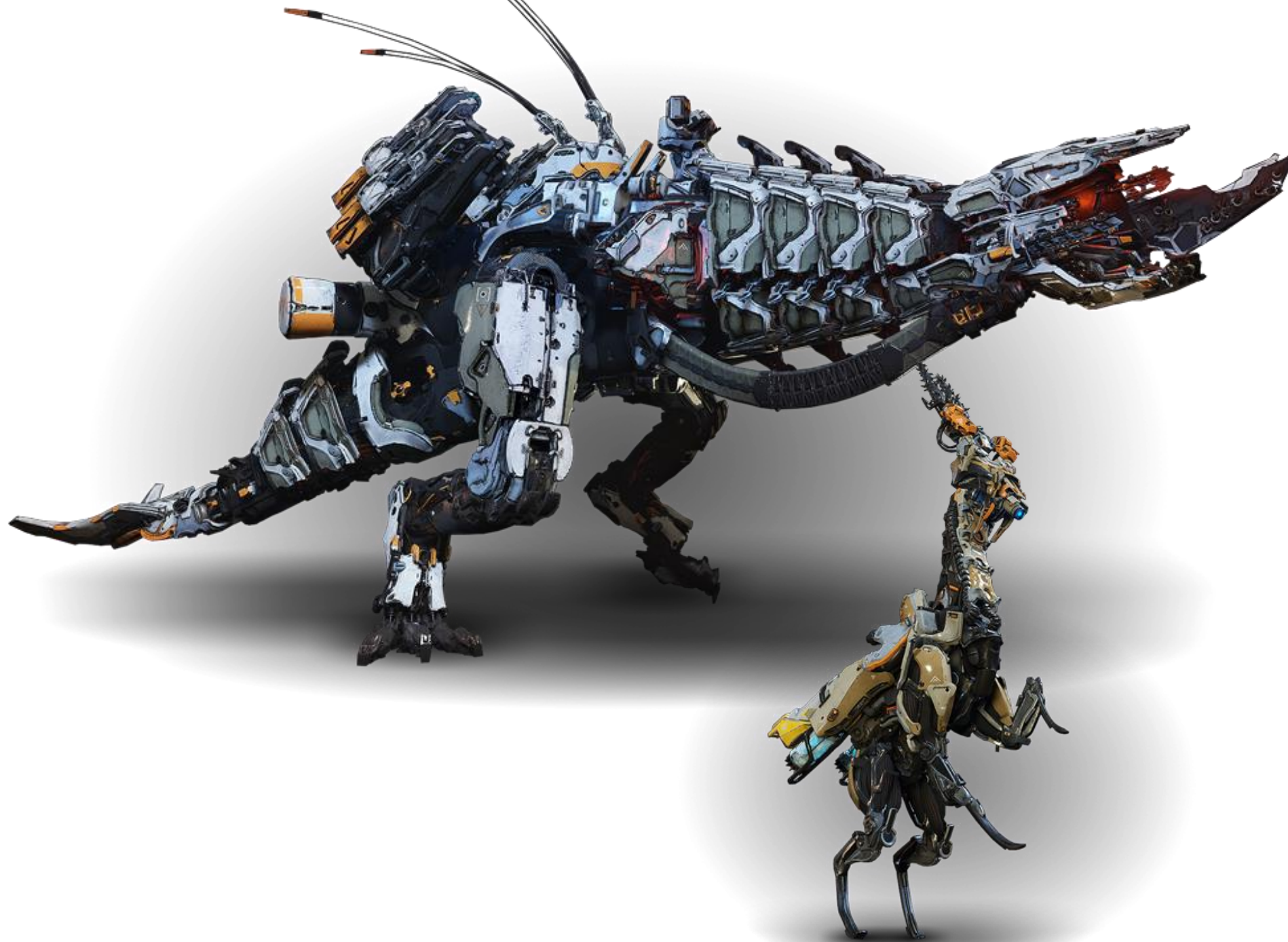
WING

TAIL

What's INSIDE a sound?



I.E. Head Sound:



VOCALIZATIONS

I
N
P
U
T
S

EVEN
MORE
COOL
LOGIC
STUFF

Idle

Suspicious

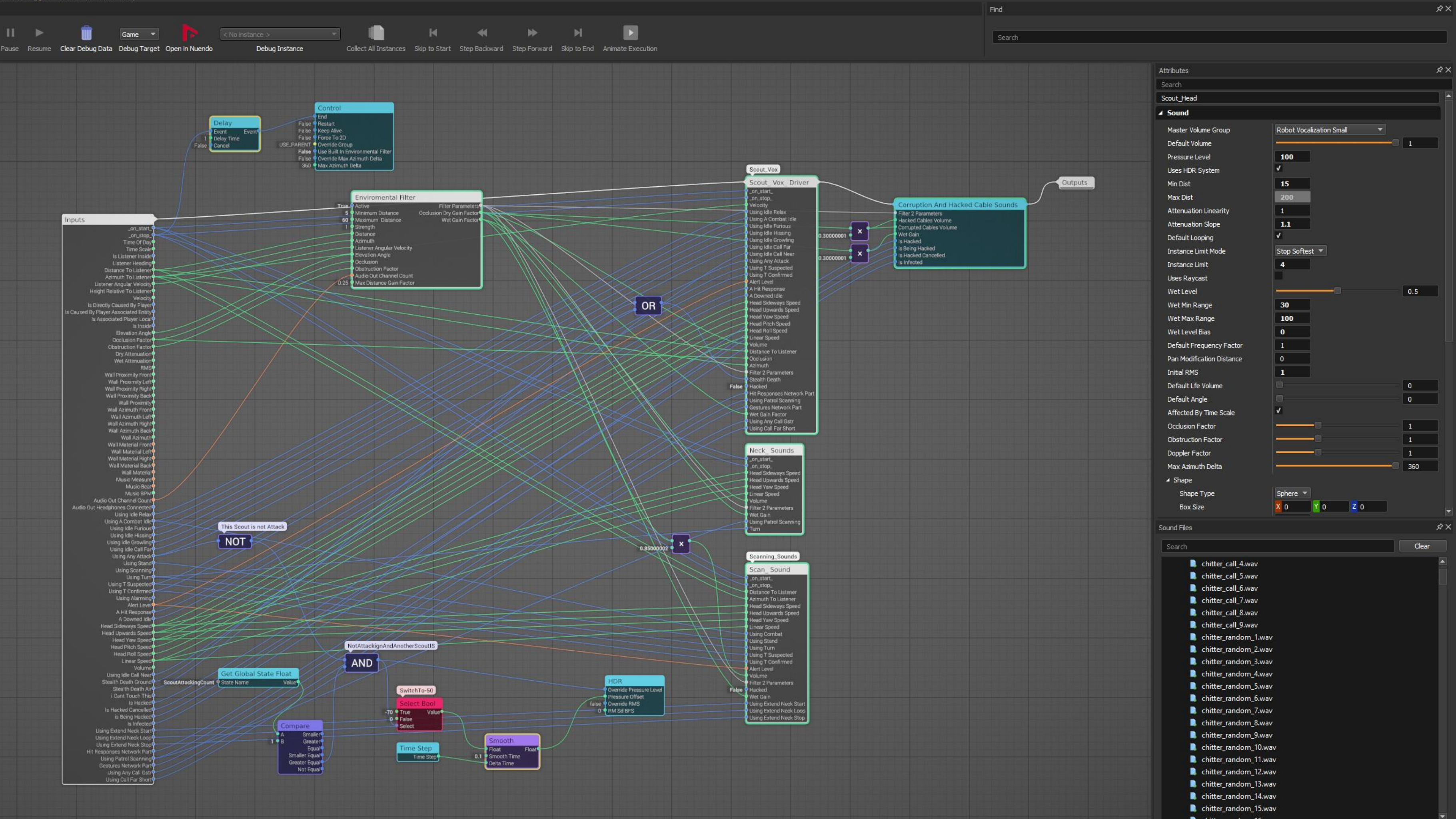
Alerted

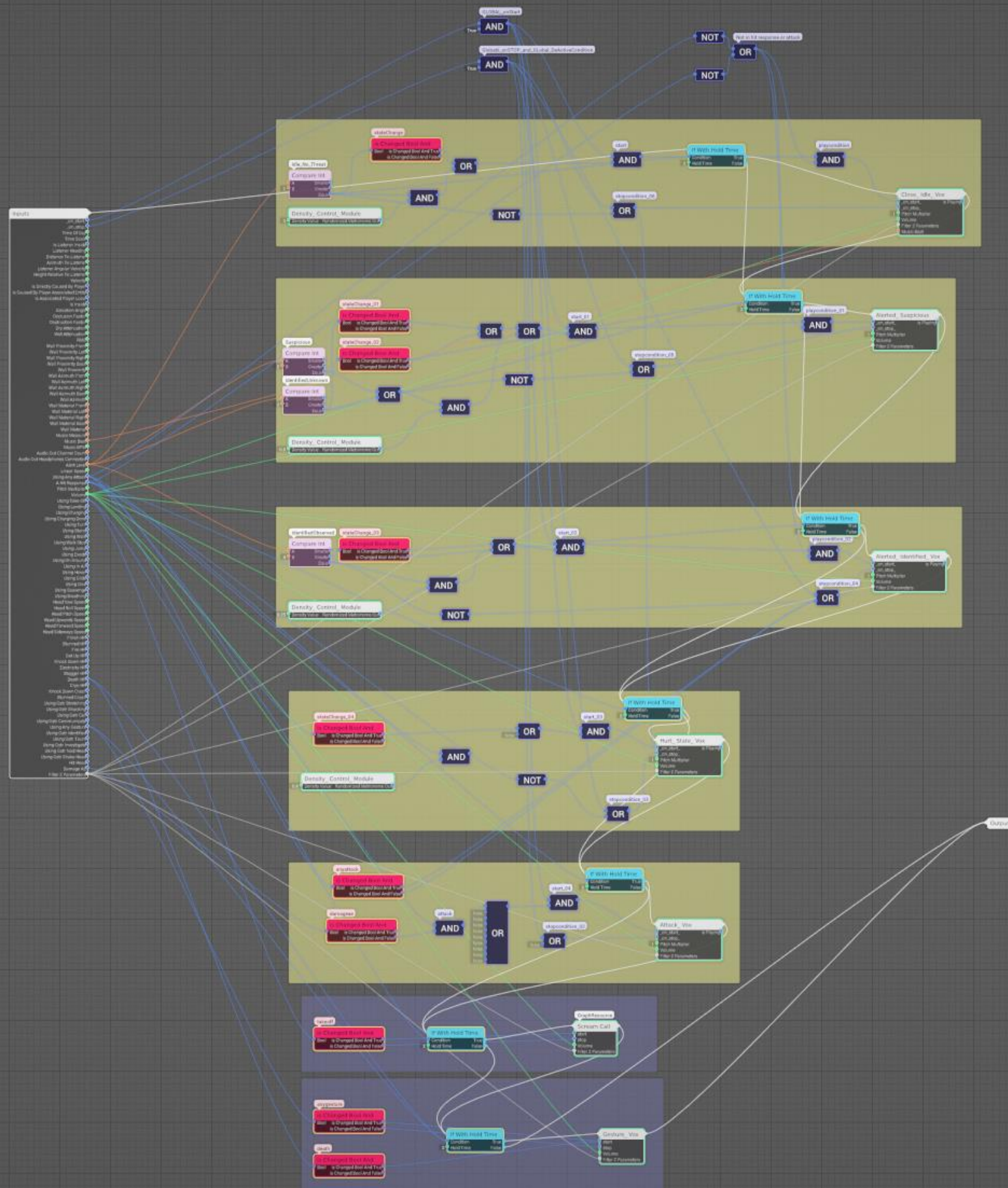
Hurt

Gestures

Attacks







Attributes

Search

Vocalizations

Node Graph

Color of Node

Body Text Label

Help Text

Used Palettes

Connectors

Template Constraints

Always Execute

Sound Files

Search

wav

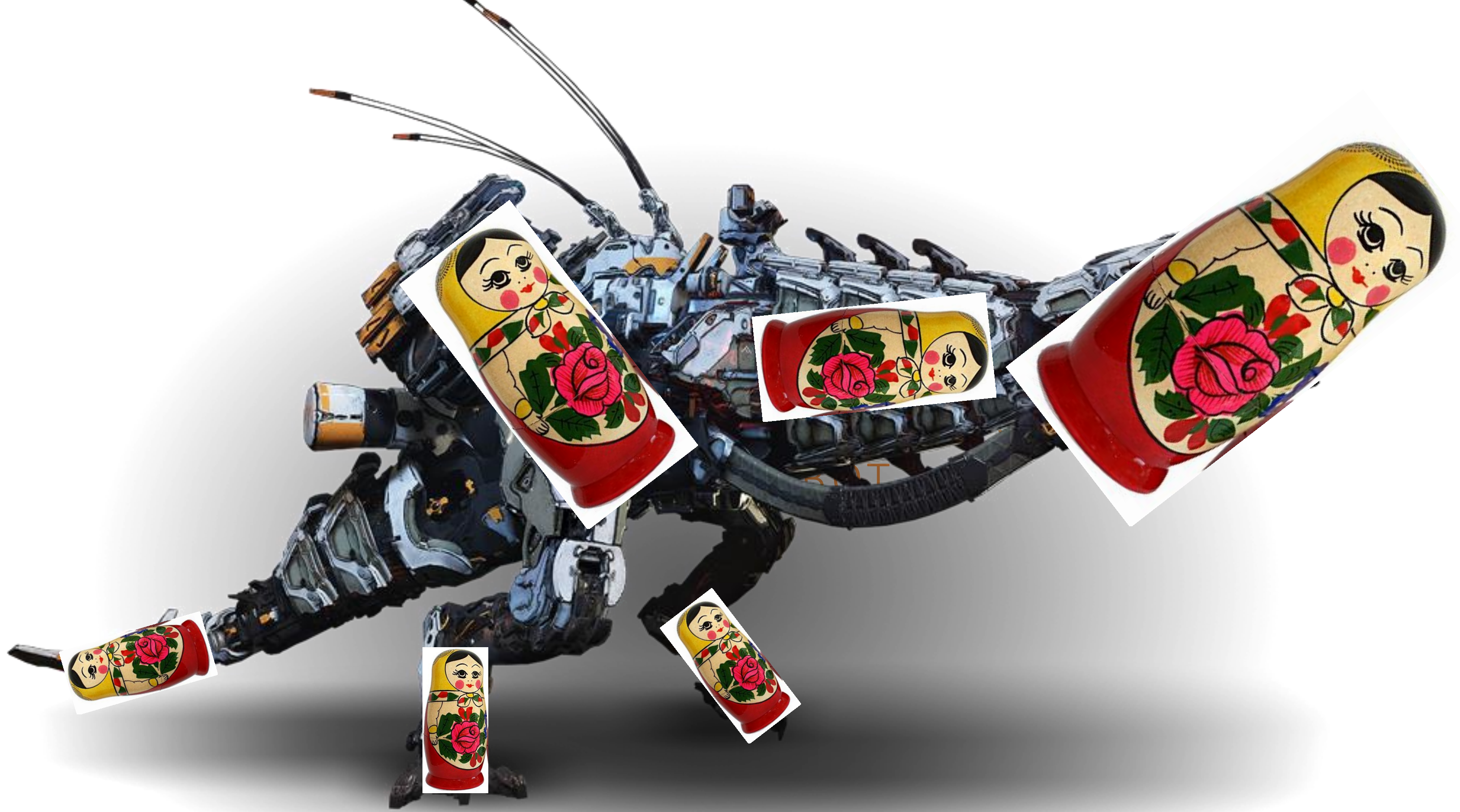
- aggressive_2.wav
- aggressive_3.wav
- aggressive_4.wav
- aggressive_5.wav
- alerted_1.wav
- alerted_2.wav
- alerted_3.wav
- alerted_4.wav
- arc_engine_a_1.wav
- arc_engine_a_2.wav
- attack_mech_a_1.wav
- attack_mech_a_2.wav
- attack_mech_a_3.wav
- attack_mech_a_4.wav
- attack_mech_a_5.wav
- battle_cry_1.wav
- bite_attack_short_1.wav
- bite_attack_snap_1.wav
- breath_1.wav
- breath_2.wav

WHERE DO YOU PLAY THESE
SOUNDS IN THE WORLD?



SPATIAL DISTRIBUTION OF SOUNDS ON A ROBOT





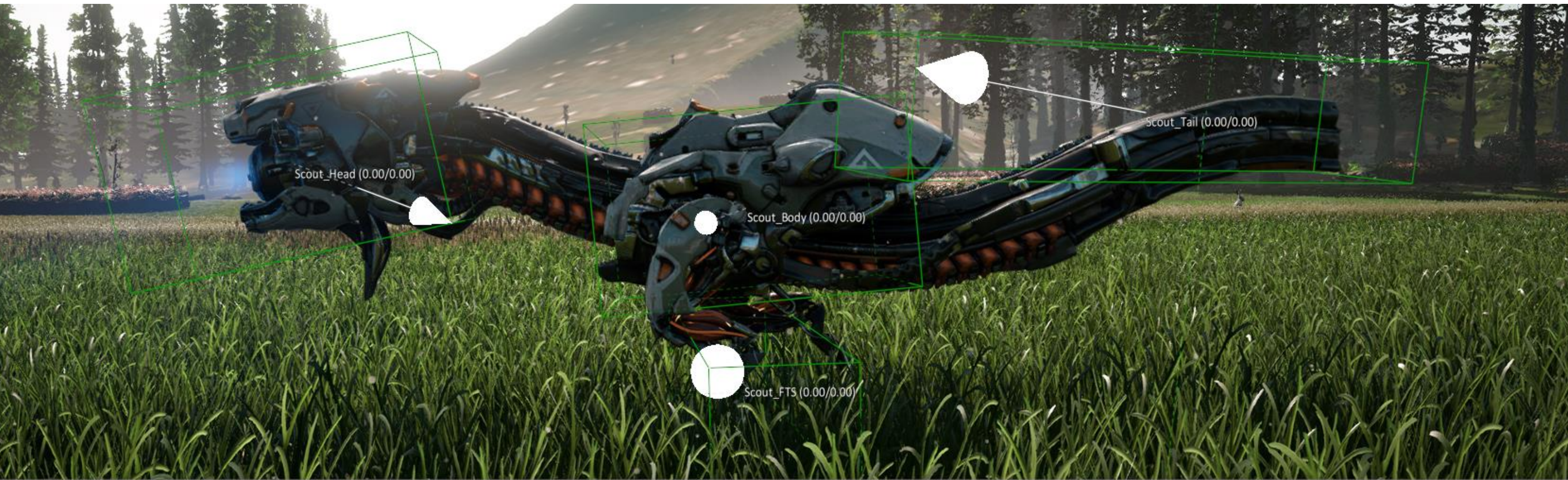


STORMBIRD (Thunderhawk)





WATCHER (Scout)



Sound Instances

89 suspended, 42 audible, limit = 96

Stopped Audible Suspended due to priority/range Suspended due to instance limit

max: 3.48ms | Update 1.33ms (avg: 1.47ms, max: 56.92ms) | Graph Programs 0.38ms (avg: 0.16ms, max: 4.99ms) [Reset](#)

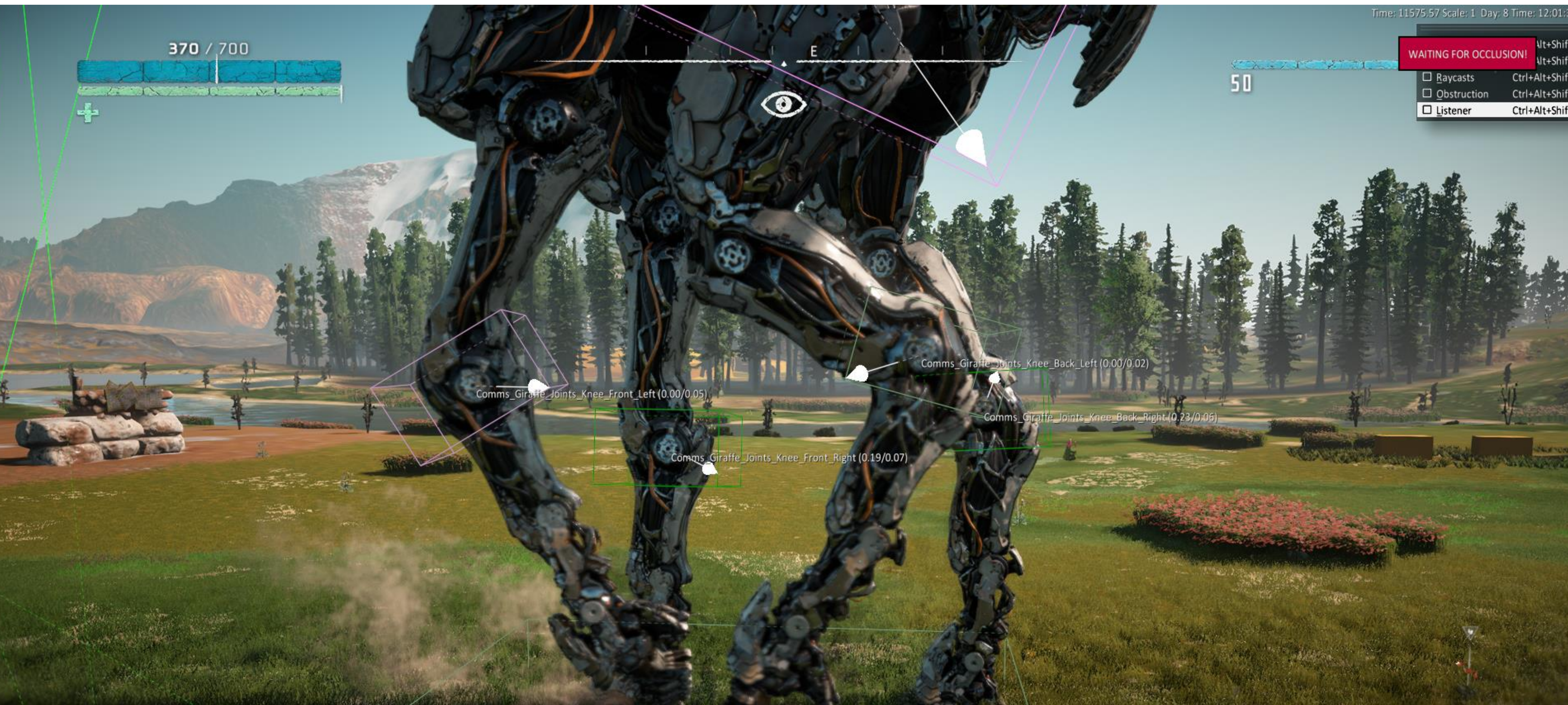
scout

	Graph	Type	Voices	Level	State	Mode	Loop	Shape	SPL	SPLrms	Gain	Pitch	Azim	Elev	Focus	Dist	Reverb	Group	Occlusion	Obstruct...	Priority	Age	Update (μ...	MaxUpdate (μ...
	27236	GRAPH	0		playing	3D	yes	box	100	7	1.00	1.00	349	0	0	4.49	0.03	Robot Vocalization Small	0.00	0.00	8,474	58.79	41	124
	27238	GRAPH	0		playing	3D	yes	box	100	7	1.00	1.00	360	0	0	4.52	0.03	Movement Robot Small	0.00	0.00	9,475	58.79	47	134
	27239	GRAPH	0		playing	3D	yes	box	80	0	1.00	1.00	0	0	0	4.42	0.03	Movement Robot Small	0.00	0.00	9,544	58.79	15	109
	27237	GRAPH	0		playing	3D	yes	box	83	0	1.00	1.00	9	1	0	4.33	0.02	Movement Robot Small	0.00	0.00	9,543	58.79	12	64

1/17



TALLNECK (Comms Giraffe)





THUNDERJAW (Raptor)



Instances (180 playing, 142 suspended, 38 audible, limit = 96)

Audibility: 0.00

Latency: 0.44ms (avg: 0.50ms, max: 2.38ms) | Update 1.52ms (avg: 1.36ms, max: 56.92ms) | Graph Programs 0.09ms (avg: 0.15ms, max: 4.05ms)

Reset

Live viewCtrl-P

raptor

Name	Graph	Type	Voices	Level	State	Mode	Loop	Shape	SPL	SPLrms	Gain	Pitch	Azim	Elev	Focus	Dist	Reverb	Group	Occlusion	Obstruct...	Priority	Age	Update (μs)	MaxUpdate (μs)
Raptor_Body	11864	GRAPH	3		paused	3D	yes	box	100	7	1.00	1.00	355	0	0	27.07	0.20	Movement Robot Large	0.00	0.12	8,700	102.27	44	100
Raptor_FTS_Right	11866	GRAPH	1		paused	3D	yes	box	97	4	0.90	1.00	359	0	0	28.80	0.45	Movement Robot Large	0.00	0.00	8,748	102.27	36	86
Raptor_Tail	11863	GRAPH	0		paused	3D	yes	box	73	0	1.00	1.00	14	0	0	24.80	0.28	Movement Robot Large	0.00	0.17	8,747	102.27	17	45
Raptor_FTS_Left	11865	GRAPH	5		paused	3D	yes	box	100	53	0.90	1.00	346	-1	0	24.20	0.45	Movement Robot Large	0.00	0.00	8,212	102.27	116	153
Raptor_Head	11861	GRAPH	7		paused	3D	yes	box	99	79	1.00	1.00	336	0	0	28.21	0.35	Robot Vocalization Large	0.00	0.16	7,992	102.27	71	135
Raptor_Neck	11862	GRAPH	0		paused	3D	yes	box	73	0	0.80	1.00	346	1	0	27.57	0.18	Movement Robot Large	0.00	0.14	8,775	102.27	18	50



Sound instances

318 sound instances (265 playing, 218 suspended, 47 audible, limit = 96)

Listener insideness: 0.00

PreUpdate: 0.76ms (avg: 0.73ms, max: 3.35ms) | Update: 1.56ms (avg: 1.46ms, max: 10.12ms) | Graph Programs 0.53ms (avg: 0.12ms, max: 4.96ms)

Reset

Live view Ctrl-P

raptor

M	S	Name	Graph	Type	Voices	Level	State	Mode	Loop	Shape	SPL	SPLrms	Gain	Pitch	Azim	Elev	Focus	Dist	Reverb	Group	Occlusion	Obstruct...	Priority	Age	Update (μs)	MaxUpdate (μs)
☐	☒	Raptor_MachineGun_ChargeUp	5469	GRAPH	0		stopped	3D	yes	sphere	0	0	0.00	0.99	5	1	0	15.03	0.00	Robot Fire	0.00	0.08	65,535	109.10	0	134
☐	☒	Raptor_MachineGun_Fire_loop	6512	GRAPH	0		stopped	3D	yes	sphere	0	0	0.00	1.00	3	1	0	16.48	0.00	Robot Fire	0.53	0.01	65,535	111.64	0	145
☐	☒	Raptor_FTS_Right	4568	GRAPH	6		playing	3D	yes	box	100	70	0.90	0.99	314	0	0	21.37	0.44	Movement Robot Large	0.00	0.07	8,013	1059.88	37	221
☐	☒	Raptor_FTS_Left	4567	GRAPH	5		playing	3D	yes	box	100	54	0.90	1.02	292	0	0	14.24	0.36	Movement Robot Large	0.00	0.07	8,102	1059.88	42	170
☐	☒	Raptor_MachineGun_Fire_loop	6513	GRAPH	0		stopped	3D	yes	sphere	0	0	0.00	1.00	352	0	0	20.26	0.00	Robot Fire	0.07	0.03	65,535	145.72	0	221
☐	☒	Raptor_Head	4563	GRAPH	3		playing	3D	yes	box	100	81	1.00	1.01	280	1	0	15.63	0.21	Robot Vocalization Large	0.00	0.06	7,846	1059.88	58	218
☐	☒	Raptor_Neck	4564	GRAPH	0		playing	3D	yes	box	92	0	0.80	1.02	287	2	0	16.85	0.22	Movement Robot Large	0.15	0.11	8,668	113.84	21	106

sounds/effects/weapons/robot/raptor/machinegun/raptor_machinegun.soundbank | played: 9 times | audible instances: 0/32 (limit mode: Off)

Mute all instances of this sound Ctrl-M

Min: 30.00, Max: 160.00, SPL: 130.00, AttenuationLinearity: 1.00, Slope: 1.00, Pan Modification Distance: 10.000, WetMin: 30.00, WetMax: 150.00, WetBias: 0.50, Reverb Wet Level: 0.600, Looping: yes

Build: HRZ 14375/472 Solo all instances of this sound Ctrl-S

Cam: (-2451.39 -2224.36 220.95), fwd: (0.38 -0.92 -0.07), [fov: 70.0 [p: 50.0 z: 1.0] [r: 22.57m] [n: 0.200 f: 16000.000] [sd: 0.750 fp: 0.000] [gfxmode: None] [hdr: Off] [ldm: 0.83] 1.0] f: 0.8] [name: ThirdPersonPlayerCamera] [TVcap: 1920x1080 HDR: No]

[AI Nodes, Sound]

Tools & Engine

WORKFLOW
ENABLING
SOUND
DESIGNER

Sound Design

FUNCTIONAL

EVOCATIVE

Ultimate Goal

MEMORABLE &
CONVINCING



EXAMPLES FOR
Sound “Behavior” Design

IDLE CHATTER

Communicating Sentience



“A LIFE OF THEIR OWN”



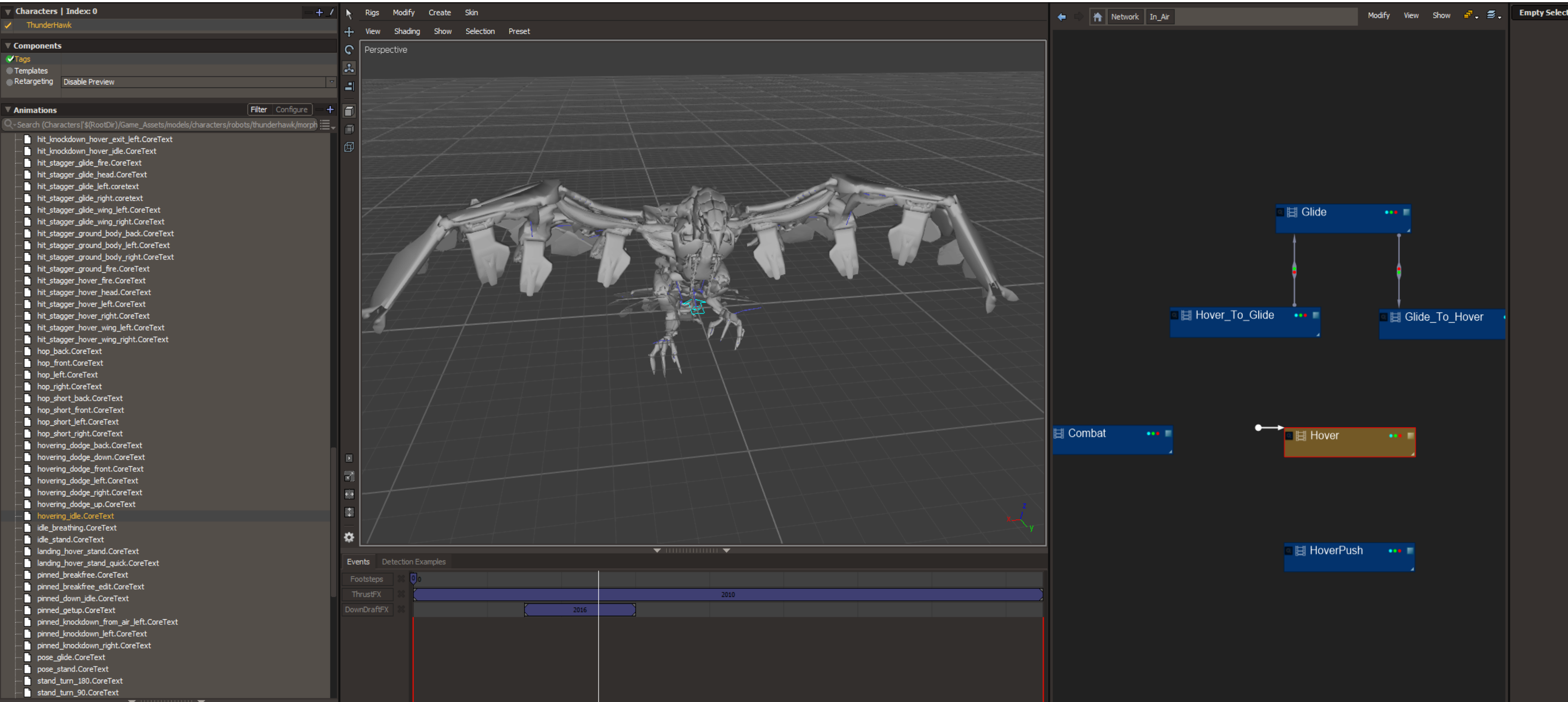


DATA-DRIVEN SOUND TRIGGERS

Being Lazy The Smart Way



“BYE BYE ANIMATION EVENTS”



EMBRACE THE FLOW

Asset Manager

thunderhawk_L_Wing

File Edit View Game Tools Debugger Sound Window Help

Save Undo Redo Sync Pause Resume Clear Debug Data Debug Target Open in Hierarchy

GraphProgramResource (1441)

Debug Instance Collect All Instances Skip to Start Step Backward Step Forward Skip to End Animate Execution

Find

Search

LeftWing_Sounds » Wing_Sounds_Master » JointMovementLogic_withStats » StandardDev_A

Standard Deviation Calc - double check triggers and reset condition!!!

Based on this weird formula

$$\sigma = \sqrt{\frac{\sum(x^2)}{n} - (\frac{\sum(x)}{n})^2}$$

triggers to push values_03

count check 0 for division problem

ResetCondition_04

SUM(x^2)/n - squared data average

(SUM(x)/n)^2

to avoid Nan

StandardDev_A

Attributes

Search

StandardDev_A

Node Graph

Color of P

Body Tex

Help Text

Used Pale

Connects

Template

Always B

Sound Files

Search

thunderhawk

Live view

Ctrl-P

11 sound instances (11 playing, 0 suspended, 11 audible, limit = 96)

Listener insideness: 0.00

PreUpdate: 0.10ms (avg: 0.10ms, max: 0.31ms) | Update: 0.67ms (avg: 0.67ms, max: 3.61ms) | Graph Programs 0.05ms (avg: 0.15ms, max: 3.44ms)

Reset

M	S	Name	Graph	Type	Voices	Level	State	Mode	Loop	Shape	SPL	SPLrms	Gain	Pitch	Azim	Elev	Focus	Dist	Reverb	Group	Occlusion	Obstruct...	Priority	Age	Update (μs)	MaxUpdate (μs)
☒	☐	Electrified_Particles_and_Sparks_thunderhawk	1482	GRAPH	4		playing	3D	yes	sphere	80	52	1.00	0.99	346	1	0	21.35	0.21	Destructible Small	0.00	0.00	11,193	137.00	11	58
☒	☐	ThunderHawk_Head	1485	GRAPH	0		playing	3D	yes	box	100	7	1.00	1.00	1	1	0	18.02	0.25	Robot Vocalization Large	0.00	0.00	8,610	137.00	36	84
☒	☐	ThunderHawk_FTS	1484	GRAPH	0		playing	3D	yes	box	100	7	1.00	1.00	360	0	0	21.14	0.24	Movement Robot Large	0.00	0.06	8,641	137.00	30	111
☒	☐	ThunderHawk_Tail	1489	GRAPH	0		playing	3D	yes	box	95	2	1.00	1.00	3	0	0	25.78	0.20	Movement Robot Large	0.44	0.23	8,737	137.00	8	119
☐	☒	ThunderHawk_R_Wing	1488	GRAPH	3		playing	3D	yes	box	100	67	0.75	0.99	334	2	0	21.45	0.16	Movement Robot Large	0.00	0.12	8,044	137.00	29	88
☐	☒	ThunderHawk_L_Wing	1487	GRAPH	3		playing	3D	yes	box	100	70	0.75	0.99	17	2	0	20.55	0.16	Movement Robot Large	0.00	0.02	8,005	137.00	32	97



Time: 253.91 Scale: 1 Day: 1 Time: 12:00:00

thunderhawk

Live view

Ctrl-P

thunderhawk

Live view

Ctrl-P

thunderhawk

Live view

Ctrl-P

thunderhawk

Live view

Ctrl-P

thunderhawk

Live view

Ctrl-P

thunderhawk

Live view

Ctrl-P

thunderhawk

Live view

Ctrl-P

thunderhawk

Live view

Ctrl-P

thunderhawk

Live view

Ctrl-P

thunderhawk

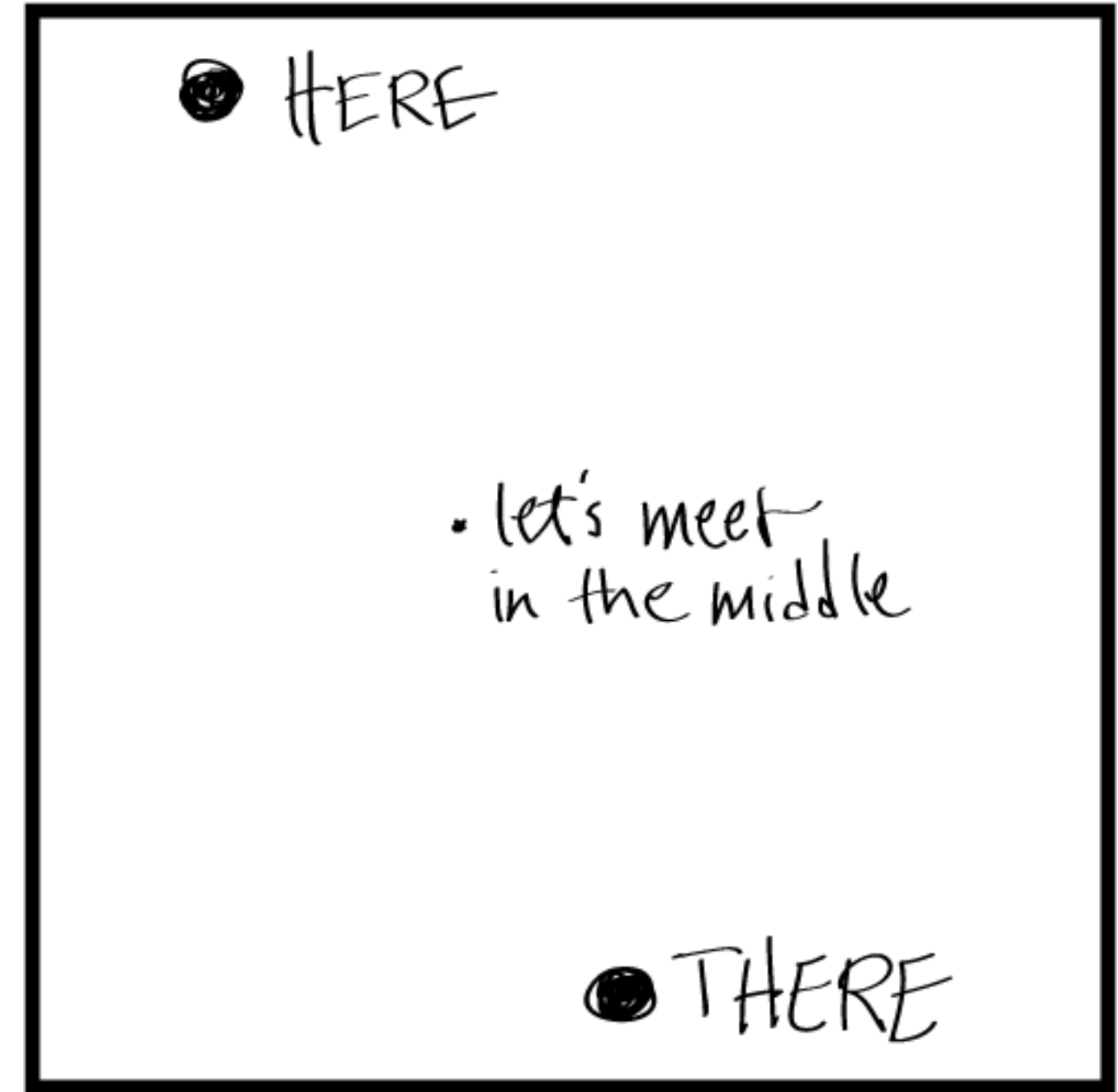
Live view

Ctrl-P



TACKLING A DESIGN PROBLEM

Finding The Middle Ground



“I DID NOT SEE THAT COMING”



“Can I get a beep for this?”

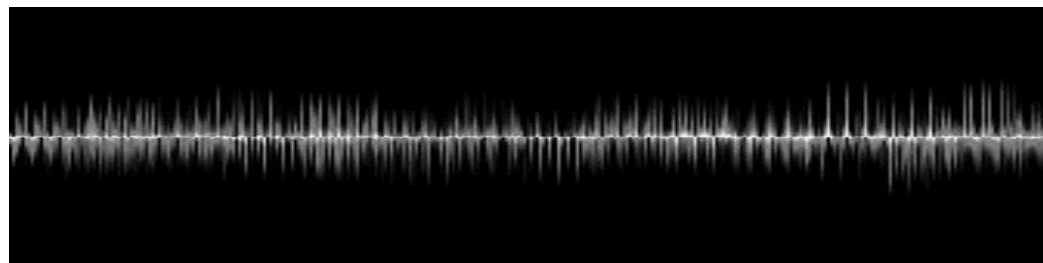
- A GAME DESIGNER



ANTON SOUND ALERT!



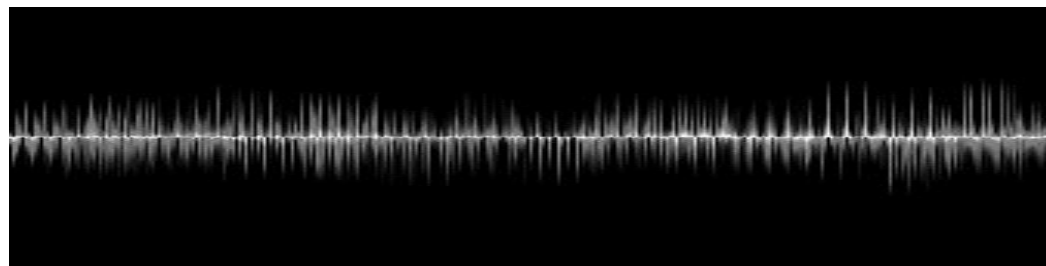
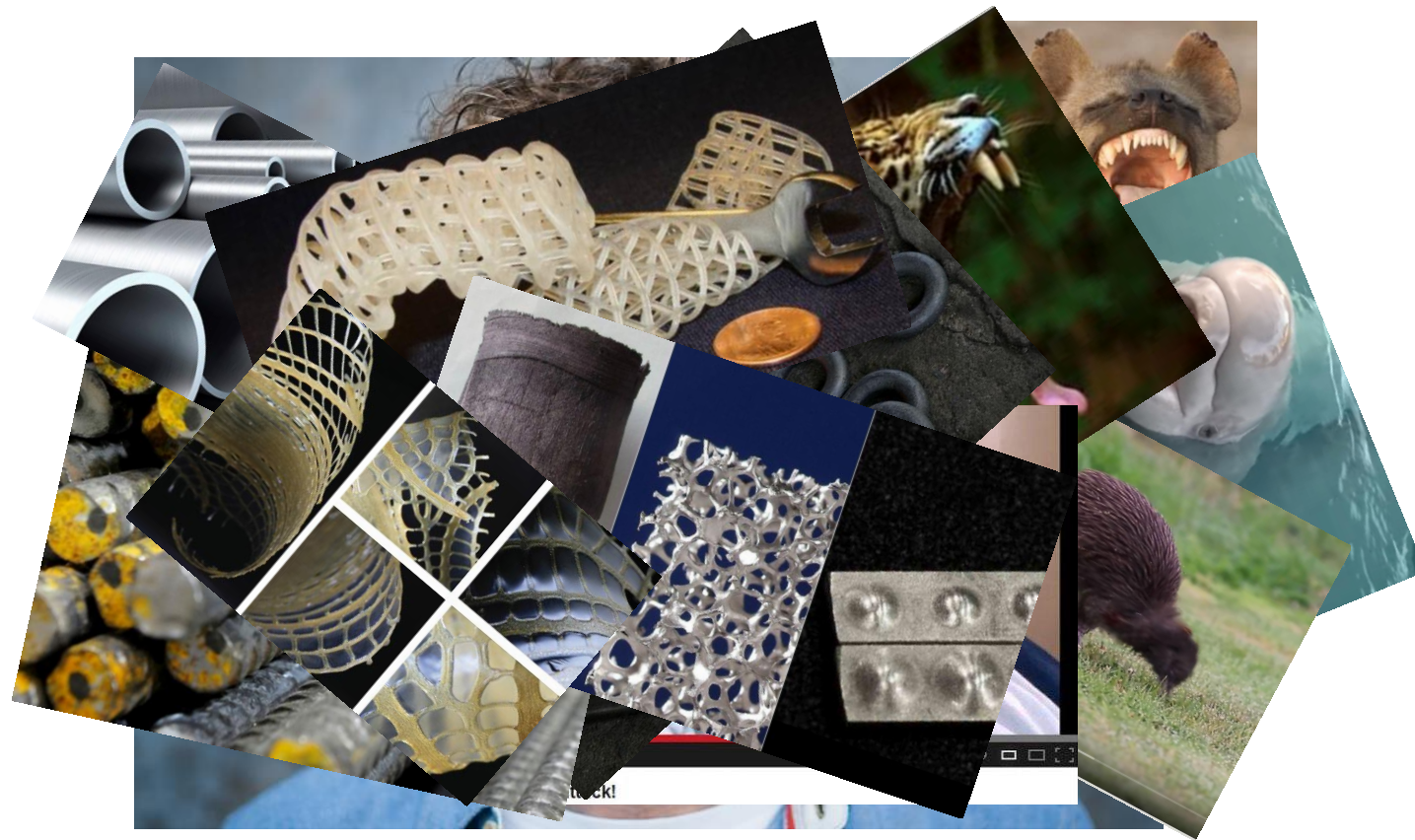
Beeeeeeep!!!



ITERATE



BACK TO COOKING...



ITERATE



EXAMPLES OF FINAL SOUNDS



Tools & Engine

WORKFLOW
ENABLING
SOUND
DESIGNER

Sound Design

FUNCTIONAL

EVOCATIVE

Ultimate Goal

MEMORABLE &
CONVINCING





WHAT MADE THEM WORK?

Character Sound Design



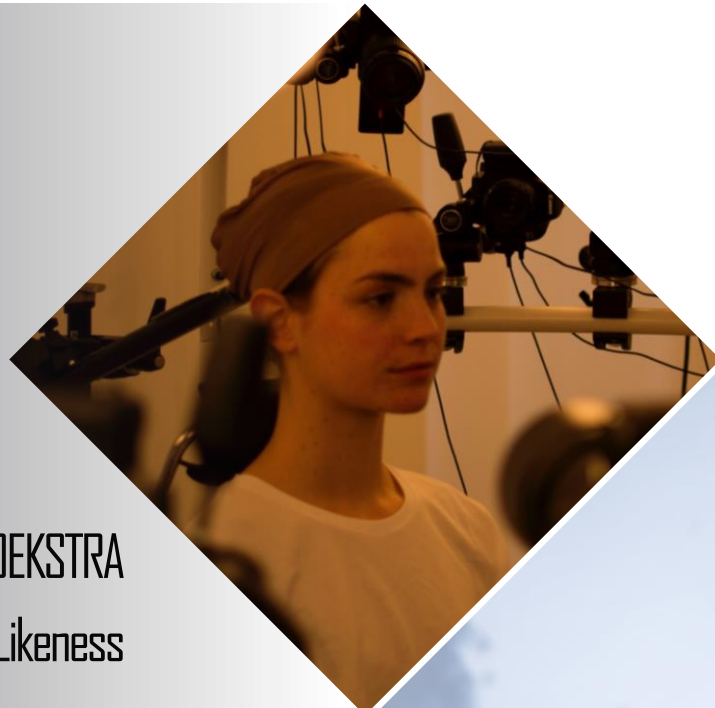
WHAT HAVE WE LEARNED?

Character Sound Design









HANNAH HDEKSTRA
The Likeness



HAIR MODEL
The Hair



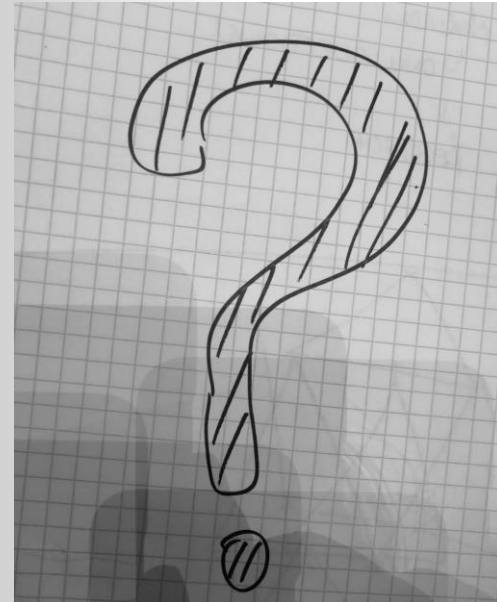
AMANDA FAIREY
The Moves



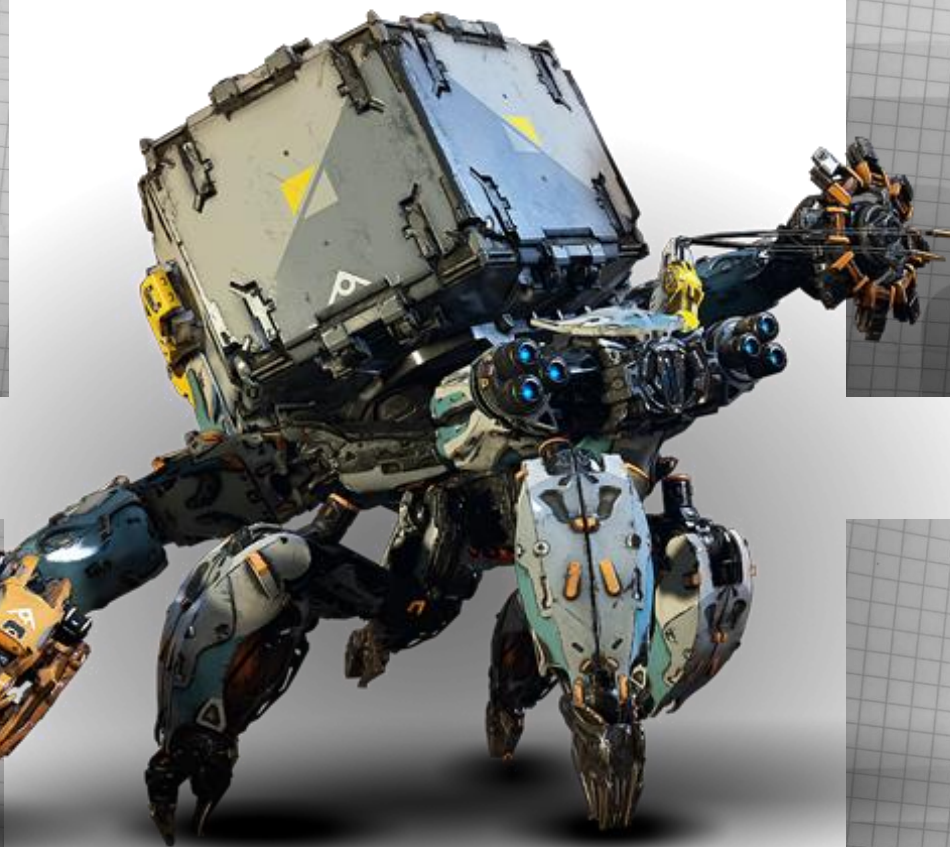
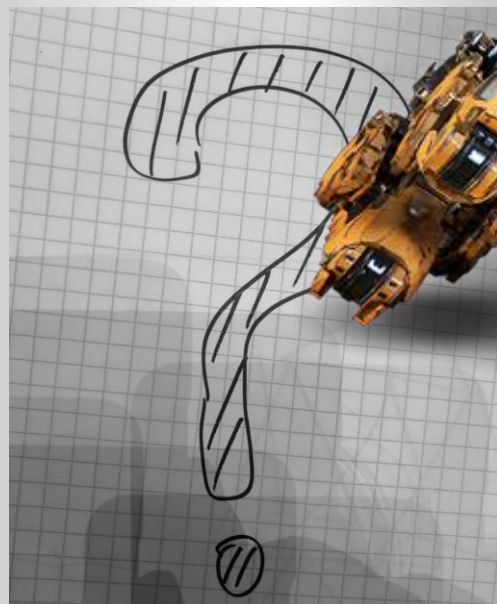
ASHLY BURCH
The Voice



INTERACTIONS
The Feel



ANIMATION
The Moves



VISUAL EFFECTS
The Look

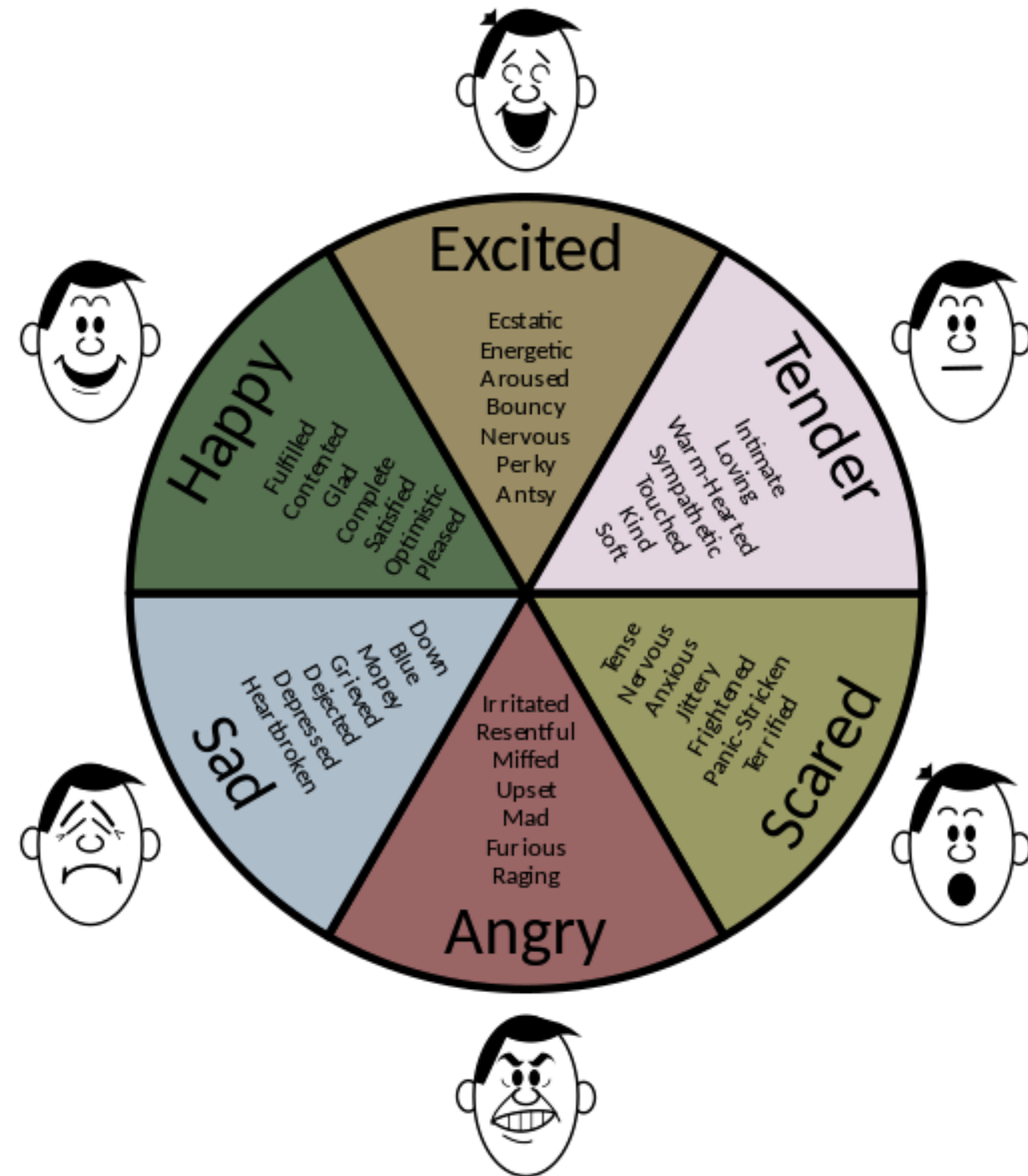


SOUND DESIGN
The Voice



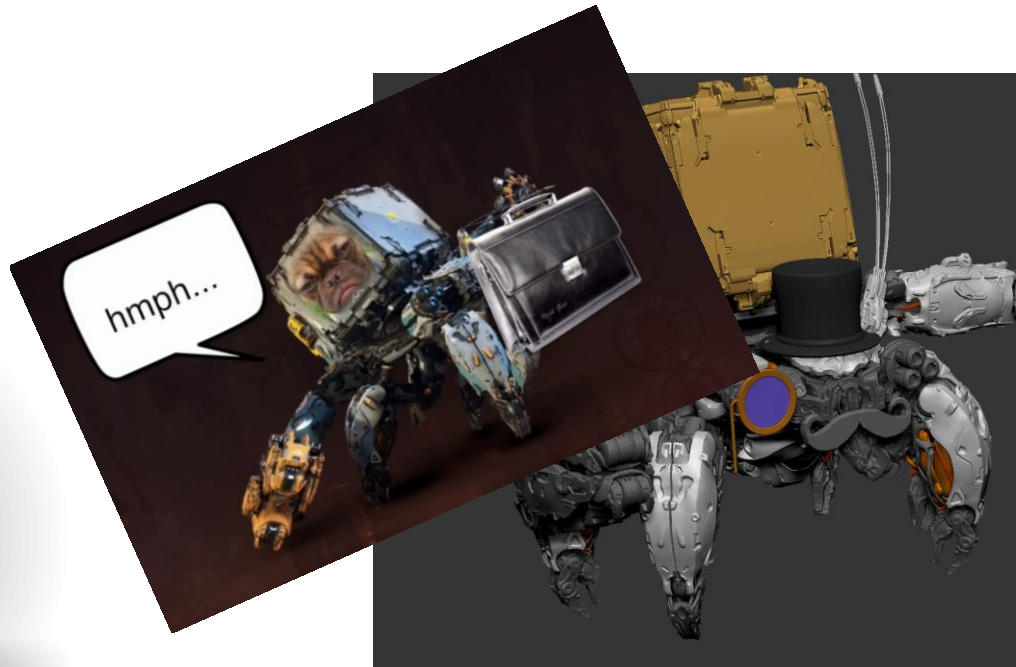
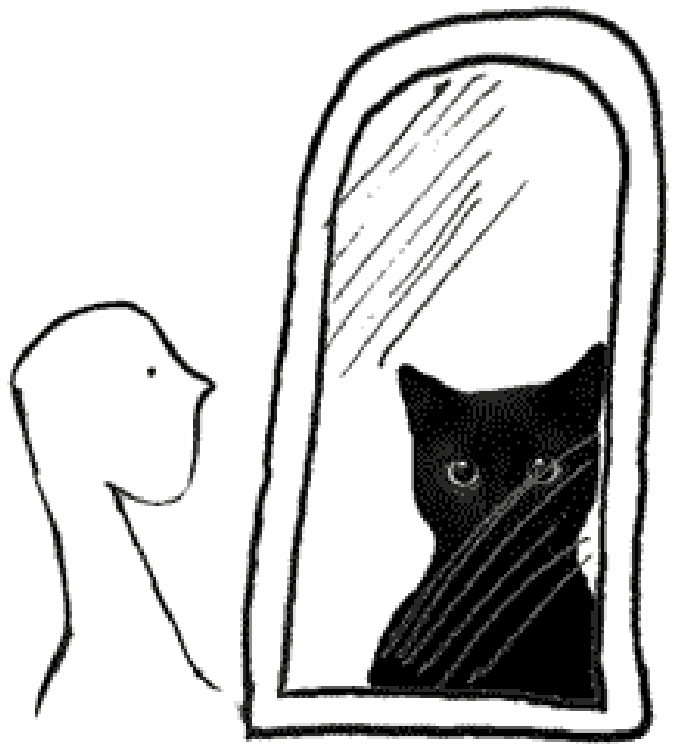
Emotional Spectrum

What is beyond anger or fear?



Anthropomorphize

WE POLISH AN ANIMAL MIRROR
TO LOOK FOR OURSELVES
Harraway (1991:12)



Just-Noticeable Difference

Finding what makes it recognizable.



Use Human Voice

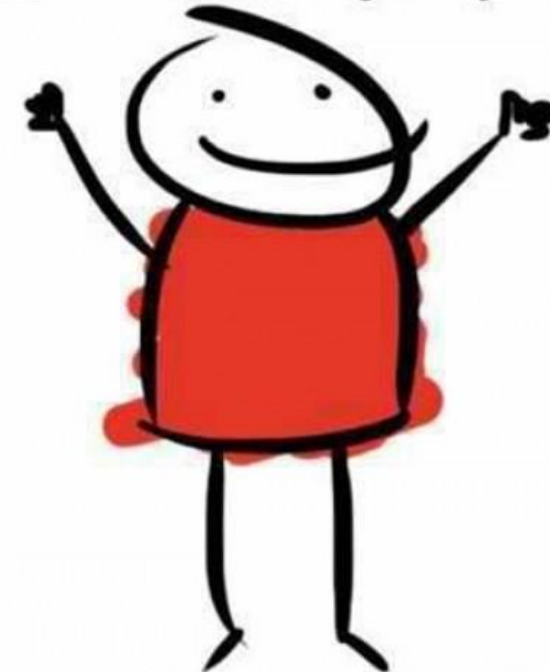
Sketch and perform.



Let Go...

...of the need to control everything.

I HAVE NO IDEA
WHAT'S GOING
TO HAPPEN.



AND I LOVE IT.



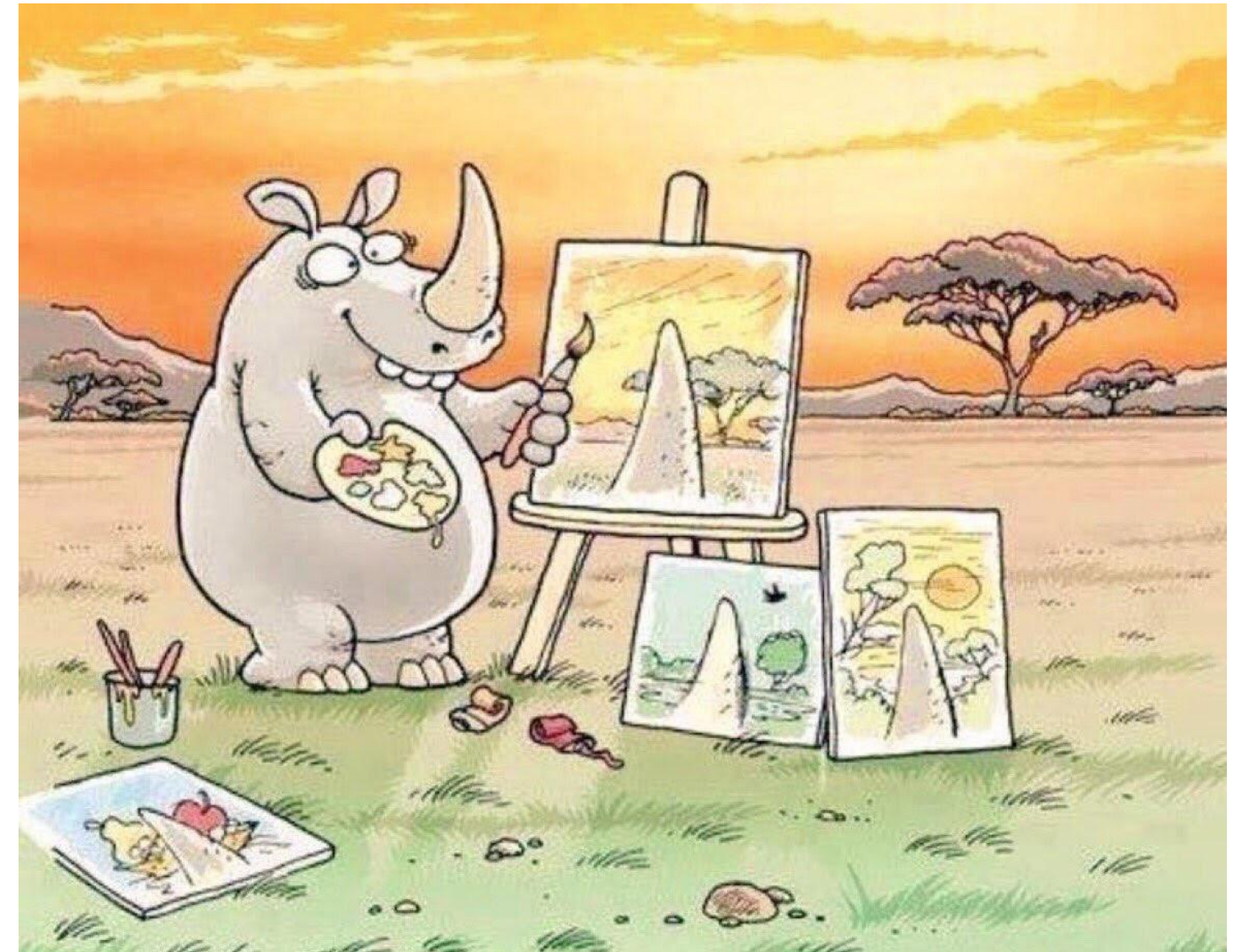
Make Up Some Rules...

...and (tentatively) break them.



Whatever Works

It's subjective.



Tasting Future Metals

Owning it.



In the Ear Of The Beholder

Do your thing.

Enjoy the process.

Hope for the best.



Thanks For Listening!

Extra thanks to Anton, Lucas, Bastian, Andreas and Angie for their support, patience and trust!

Any
Questions?

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Byeeee! =)

