

Nicole Lazzaro

Hear Me Feel Me Let Me Play: Lessons from Unscramble  
the Oracle a BOSE AR Audio-First AR Game

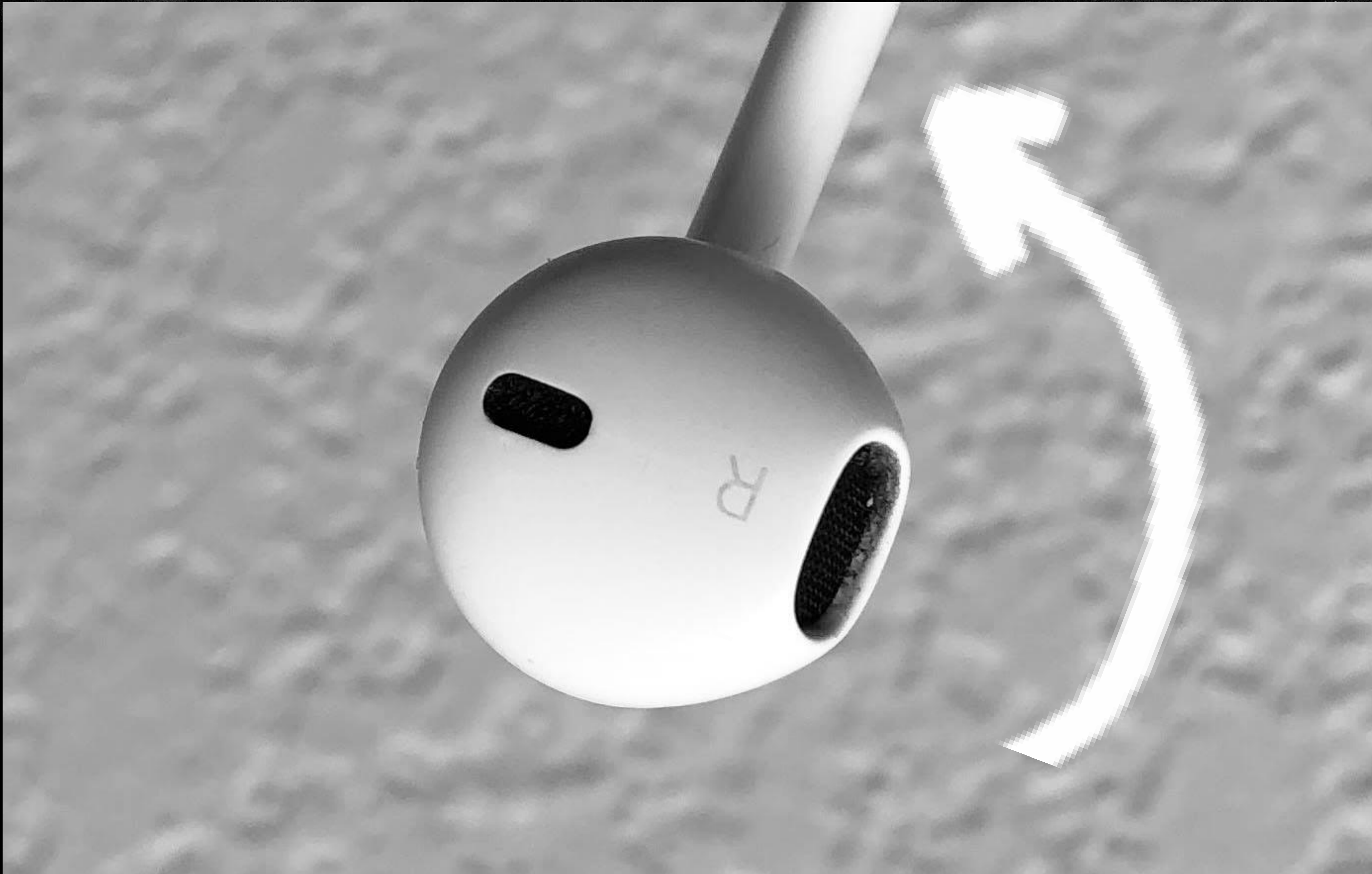
GDC Summer SF/Online

August 4, 2020



@NicoleLazzaro

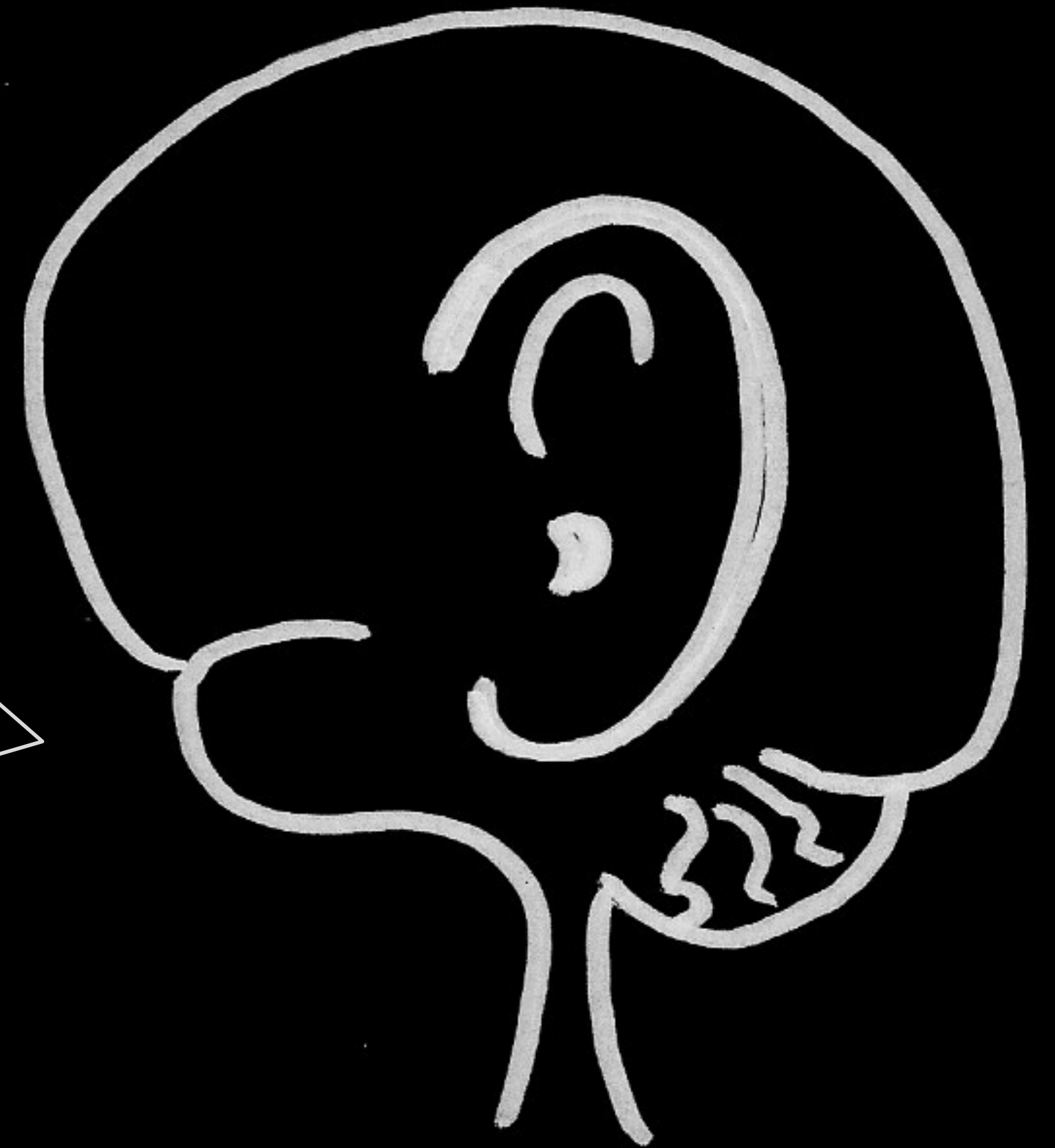




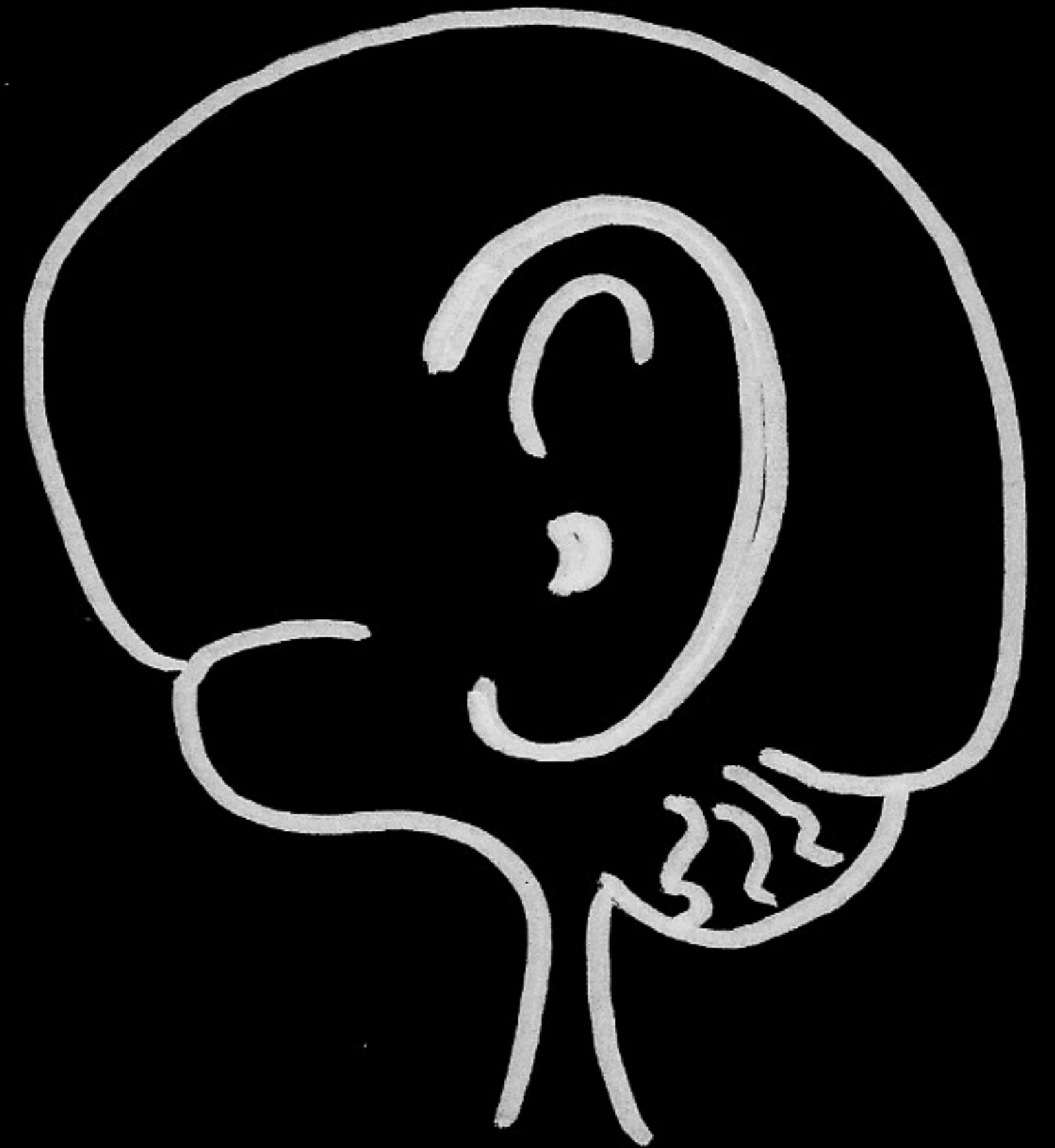
rt the  
Sound?



**Hear Me Feel Me  
Let Me Play:  
Lessons from  
Unscramble the  
Oracle a BOSE AR  
Audio-First AR  
Game**



# Best with Headph ones



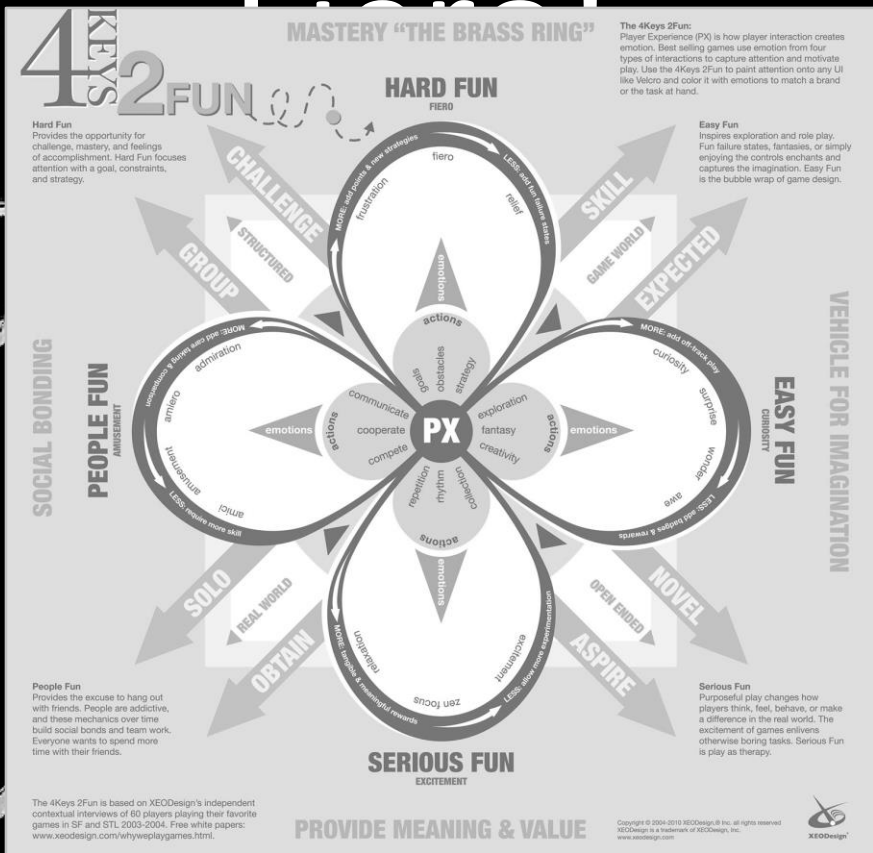


Stanford Psych  
Degree

4 Keys to Fun

\o/

Final



Tilt World  
the first iPhone  
game

Tilt World  
Plant 16K trees in  
Madagascar

Unscramble the  
Oracle – audio  
first choose your  
own adventure  
play walking  
around the block

Follow the White  
Rabbit

@NicoleLazzaro

UNSCRAMBLE  
THE  
[ ] RACLE



xeoplay racle Audio First

Choose Your Own Adventure You Play  
Walking Around the Block





UNSCRAMBLE  
THE  
ORACLE

Less



tonehenge, and  
day Night Fever

to Make Unscramble the Oracle an  
Audio First Game





- David B Fox
- Patrick O'Shaughnessey
- Wonkubus Wonk (Michael Crabbs)
- Nicole Lazzaro

Thank You! Unscramble the  
Oracle TEAM!



Design is

on its air



BOSE AR Game Jam

PlayCrafting

July 26, 2019



AUDIO FIRST AR HEAD POSE

Robust





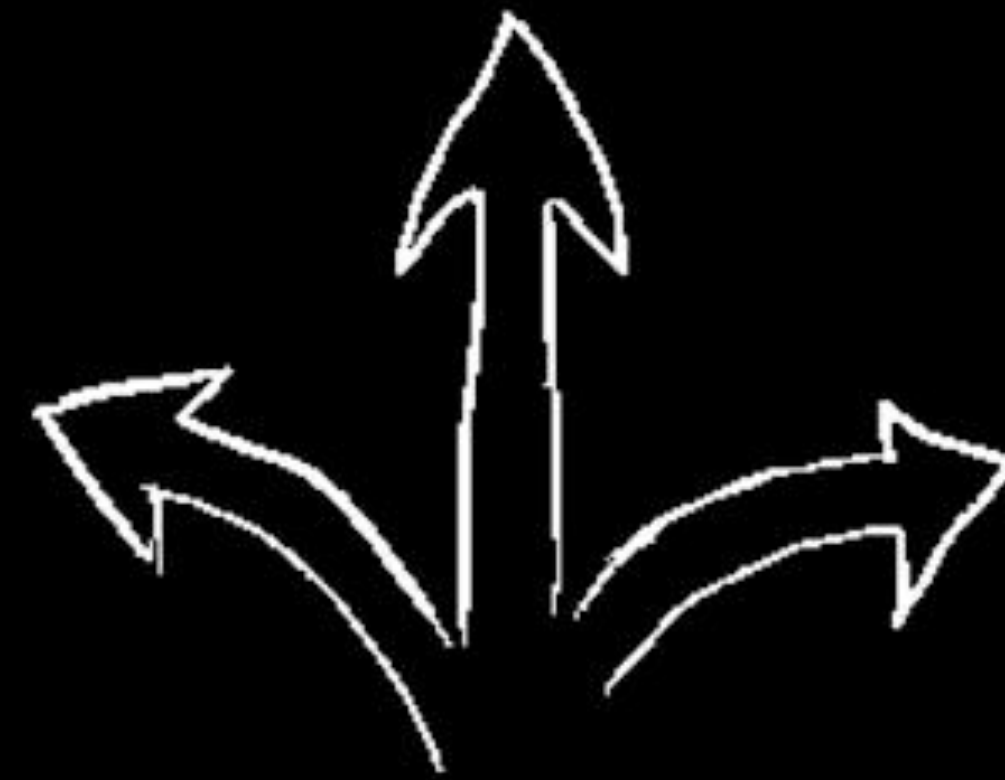
811



INSIDE  
CASTLE



WALK



Look Around  
Tap to Choose

2254



1589

Spatial >> Stand

3 Challenges Choose-First

Games



1

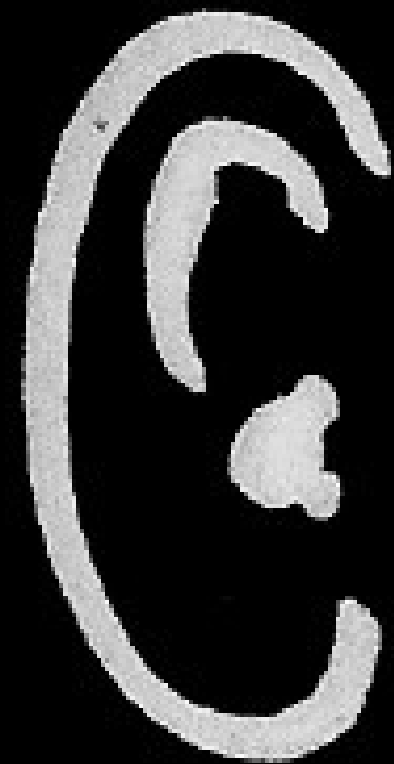
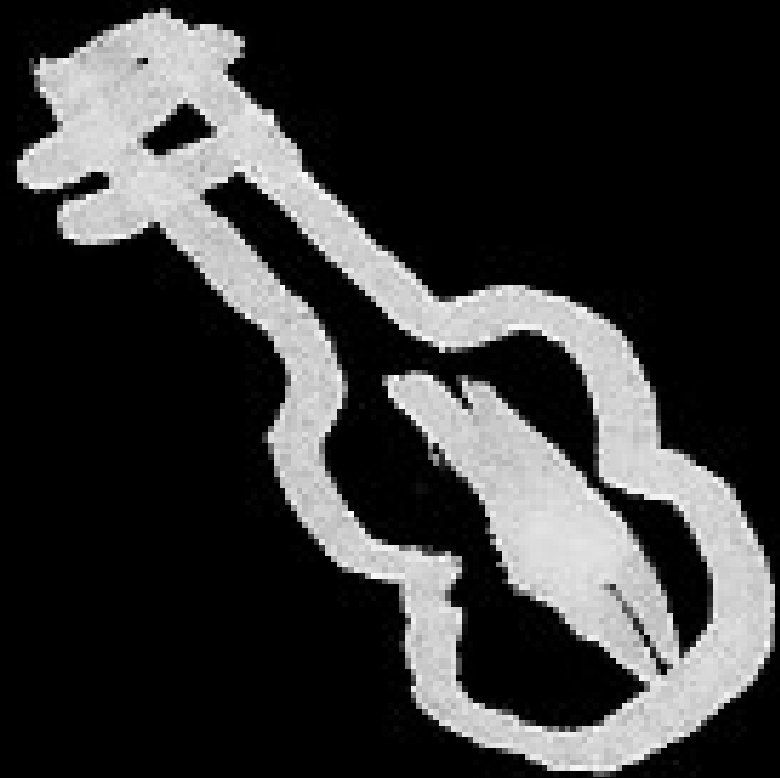


INSIDE  
CASTLE

2254

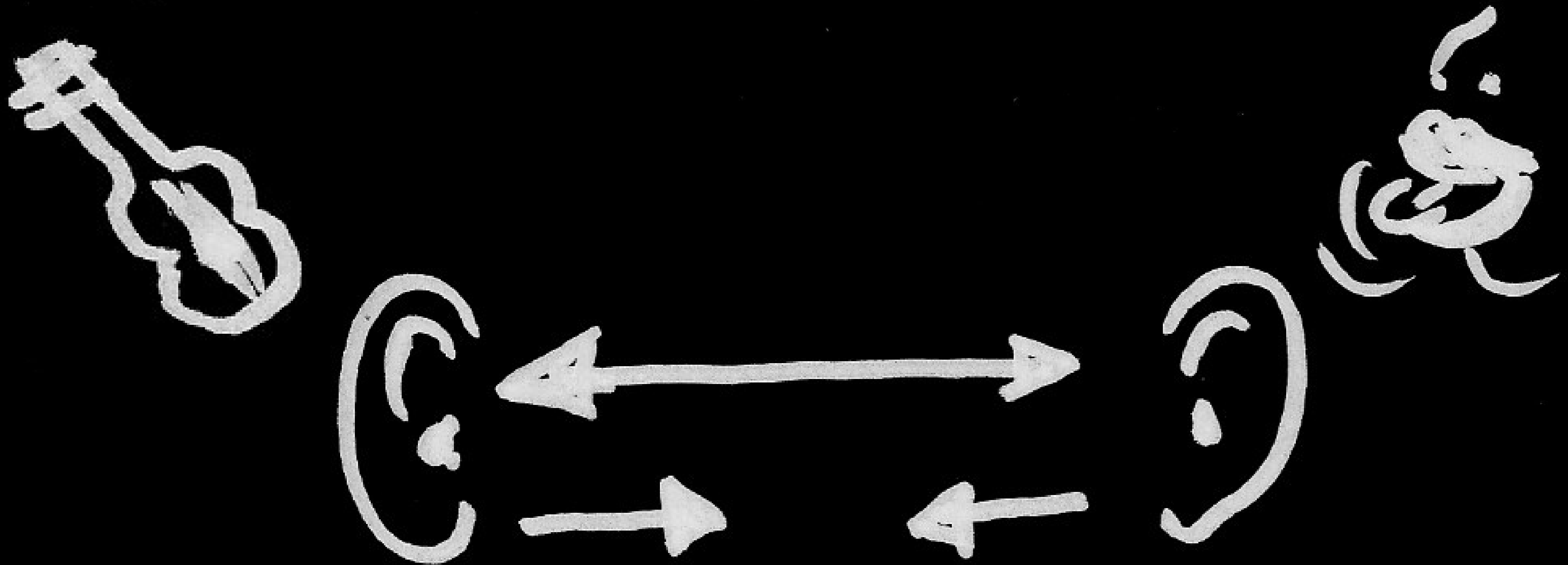
Stand  
Spatial





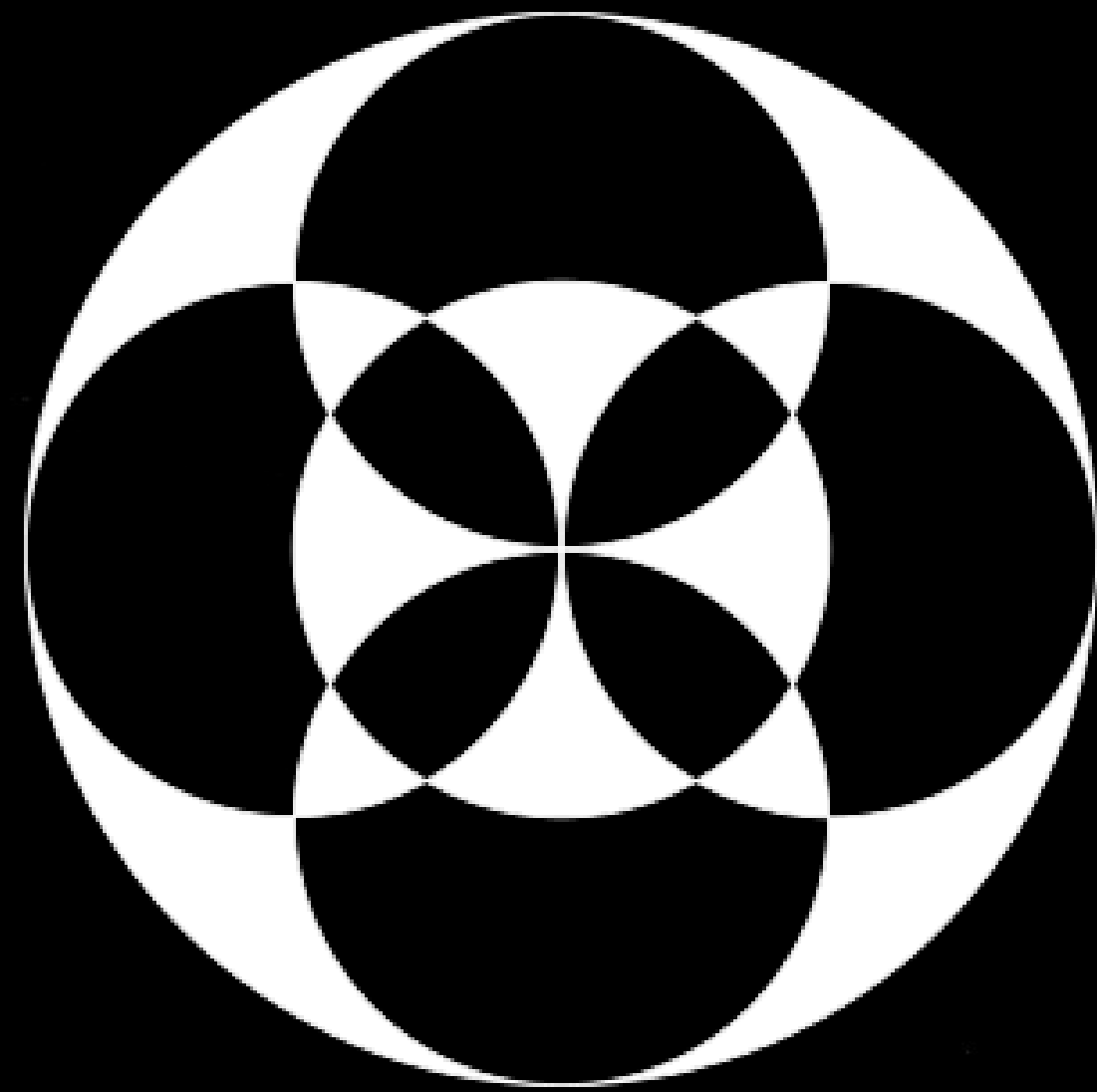
# Beatles Abbey Road 1<sup>st</sup> to Record in Stereo and Synthesizer





Powerful Yet Stereo = Zero Degrees of  
Freedom for Movement





Ø Stereo

Ø Ambisonic

Ø Binaural

Ø ASMR

Spatial Audio ≠ Surround  
Sound





INSIDE  
CASTLE

2254



While Standing -Spatial  
Audio Field

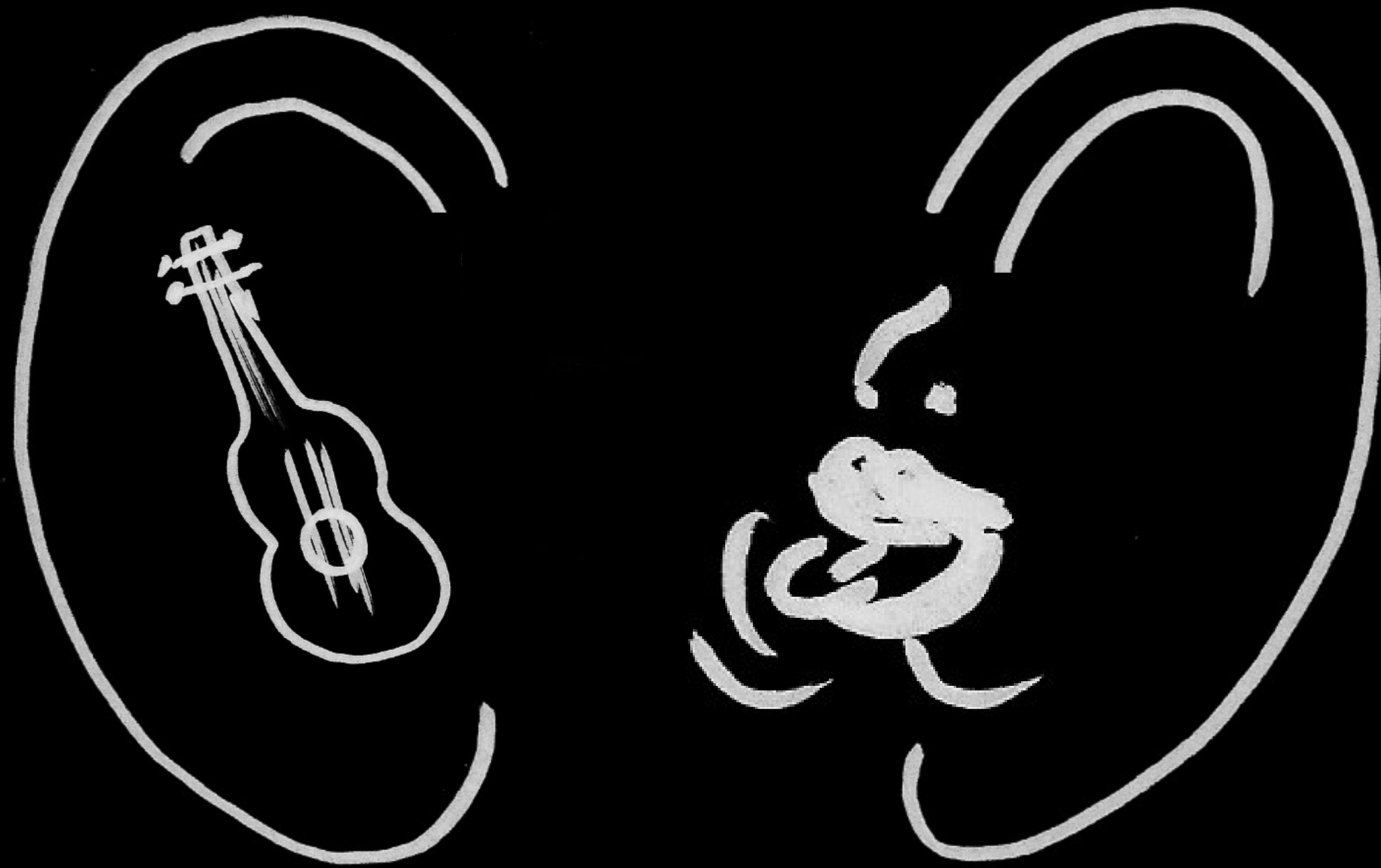


TAP TO  
BEGIN!

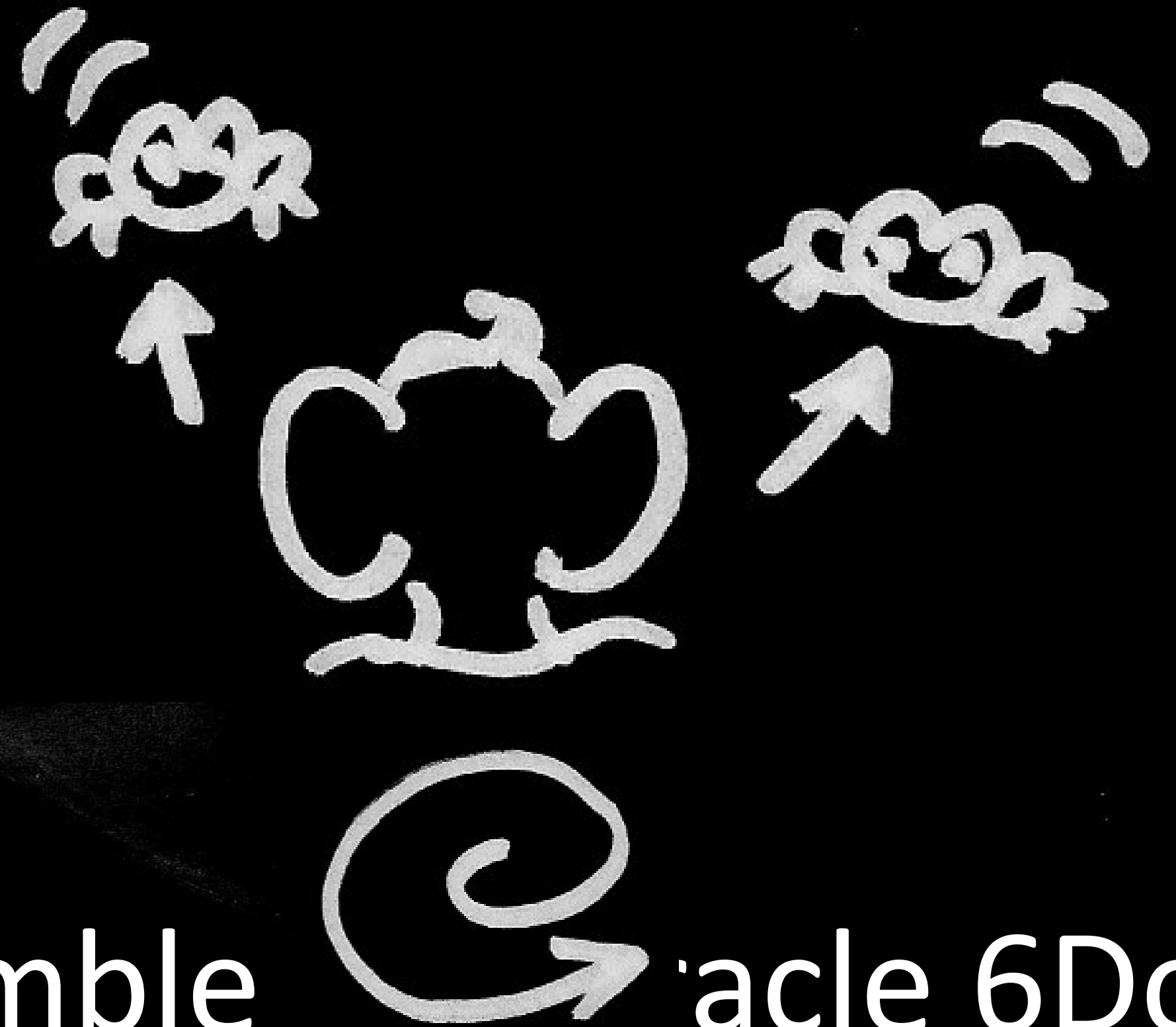




Stereo Inside the Head  
Zero Degrees of Freedom



“Find the Frog”  
Walk Around Rotate Look Up & Down



Unscramble → Scale 6DoF  
(Degrees of Freedom for  
Movement)

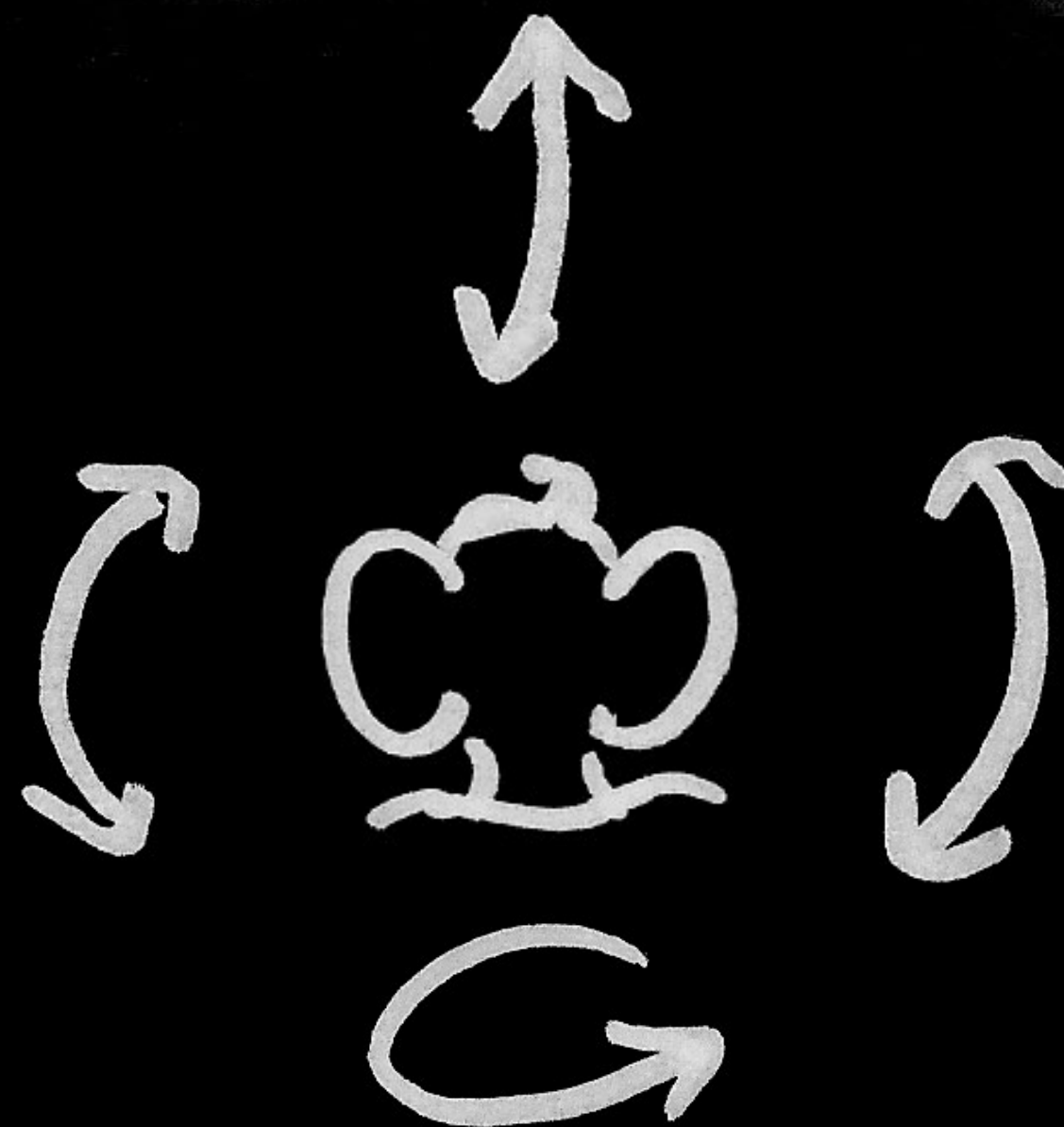




No DoF

Headphones

No Motion

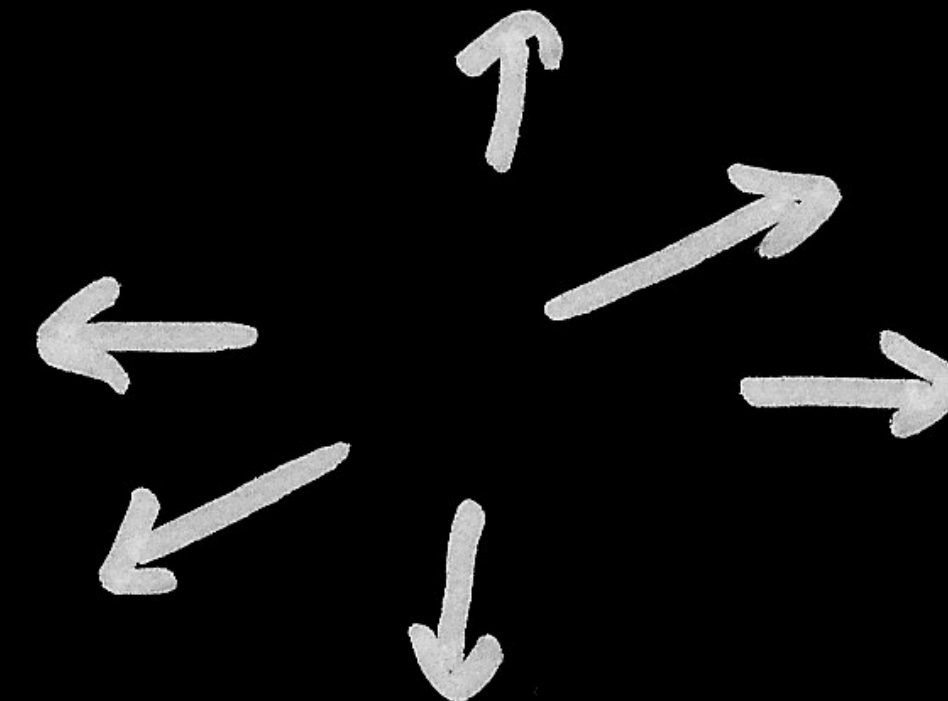


3 DoF

Look up/down

Left/right

Tilt Left/Right



6 DoF

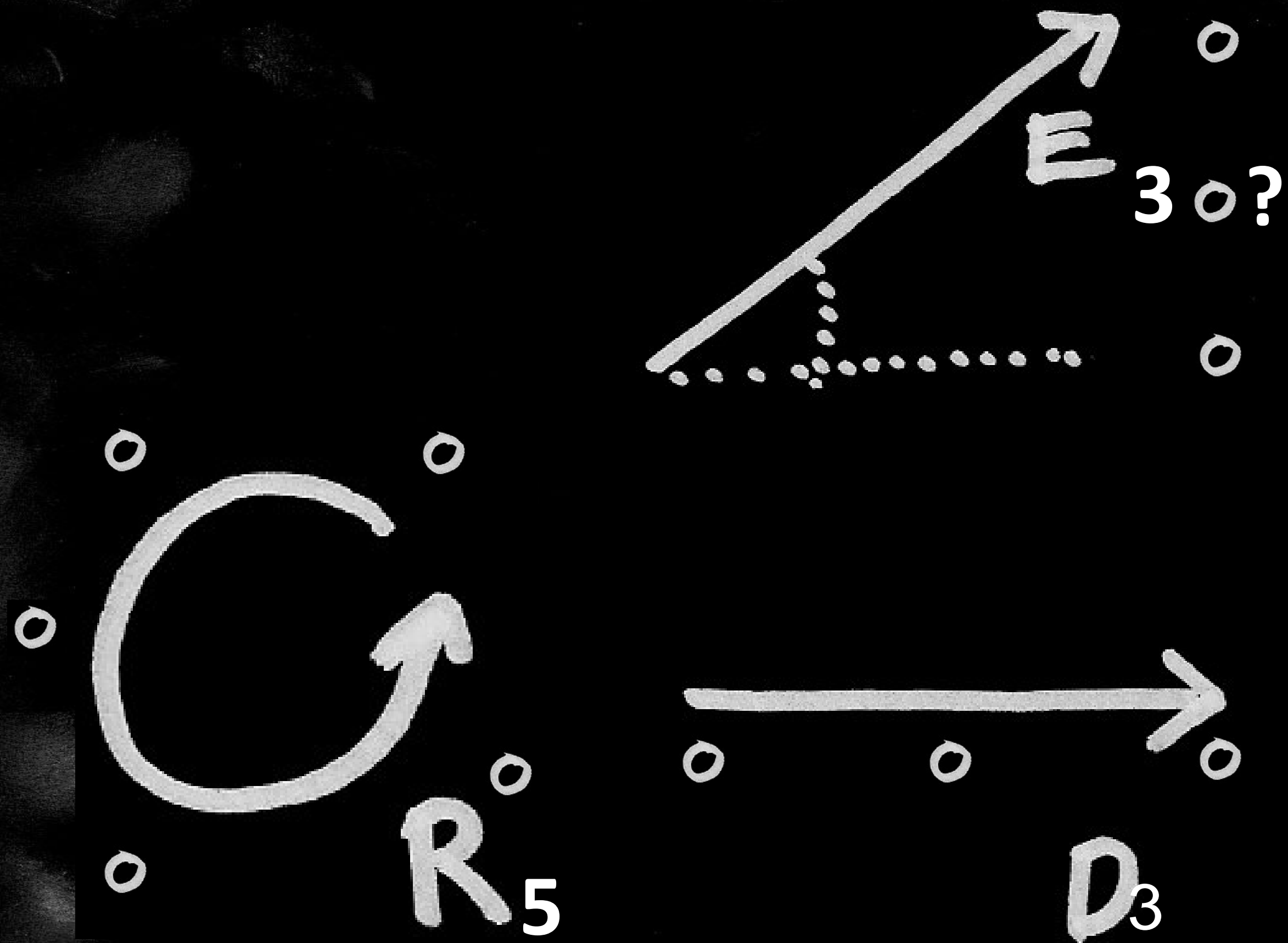
Walk forward/backward

Sideways left/right

pose and degrees of

Freedom (DoF)





$$\text{Auxel} = R_5 E_3$$

“Audio-Pixel”

Auxel = RED for Audio  
Position

How many audio position information can the player hear?



# Sharp Attack



# Repeating Pattern



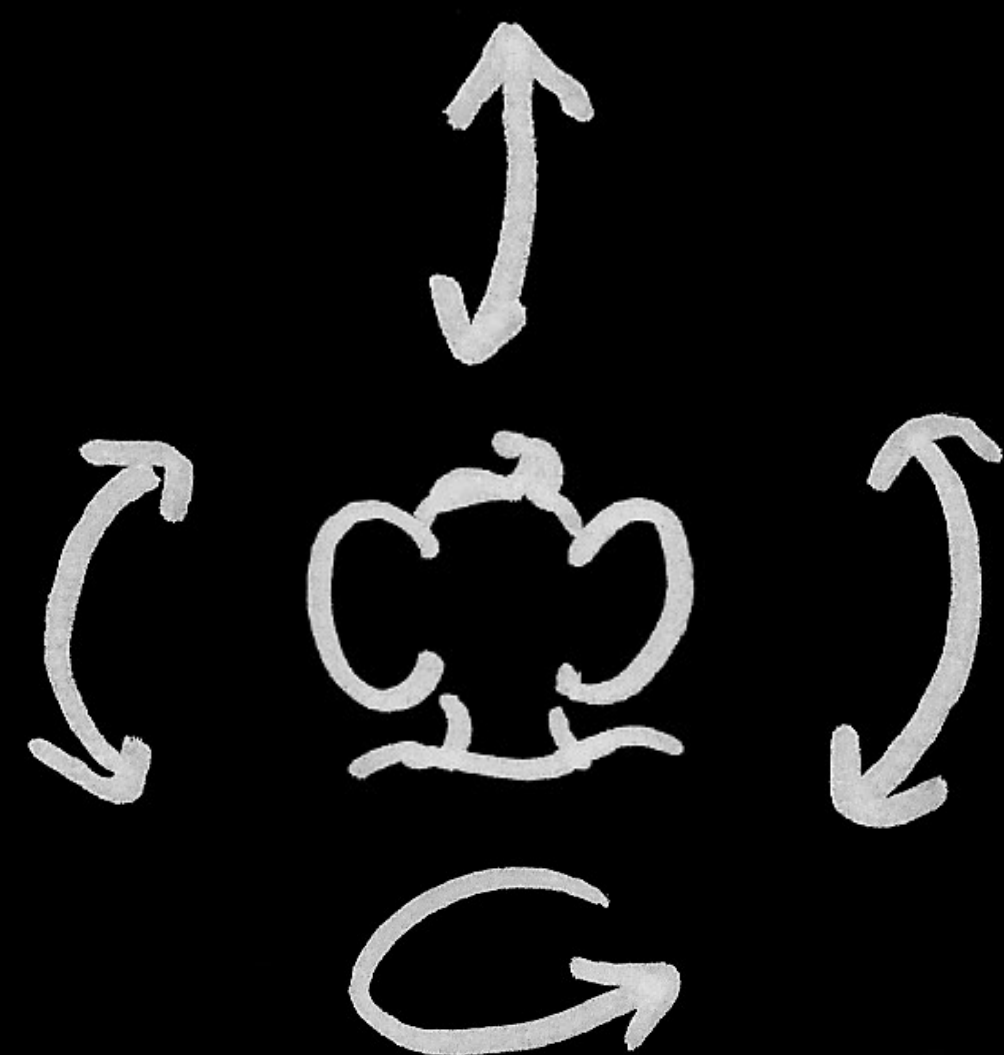
Easier to Localize Hear  
Spatial Distortion





INSIDE  
CASTLE

2254

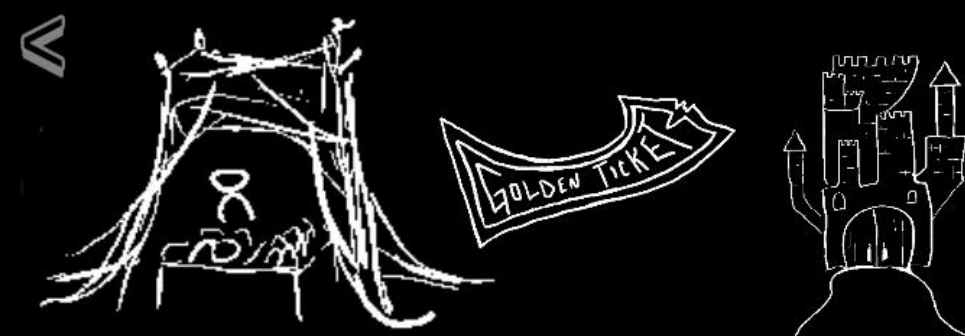


1. Sharp Attack
2. Long Enough  
Loops
3. Pitch Above and  
Below

Audio-First Stand / Spatial Tips  
for All Games



2



Walk

WALK



1589





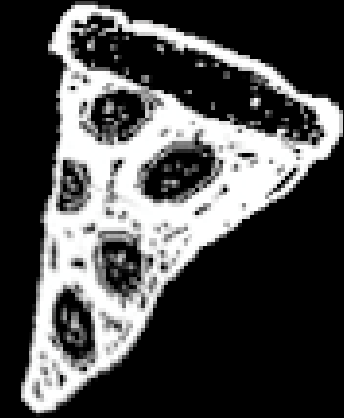
through the  
Soundscape



Saturday  
Night  
Fever



X



WALK



33

How Get

the  
Road?





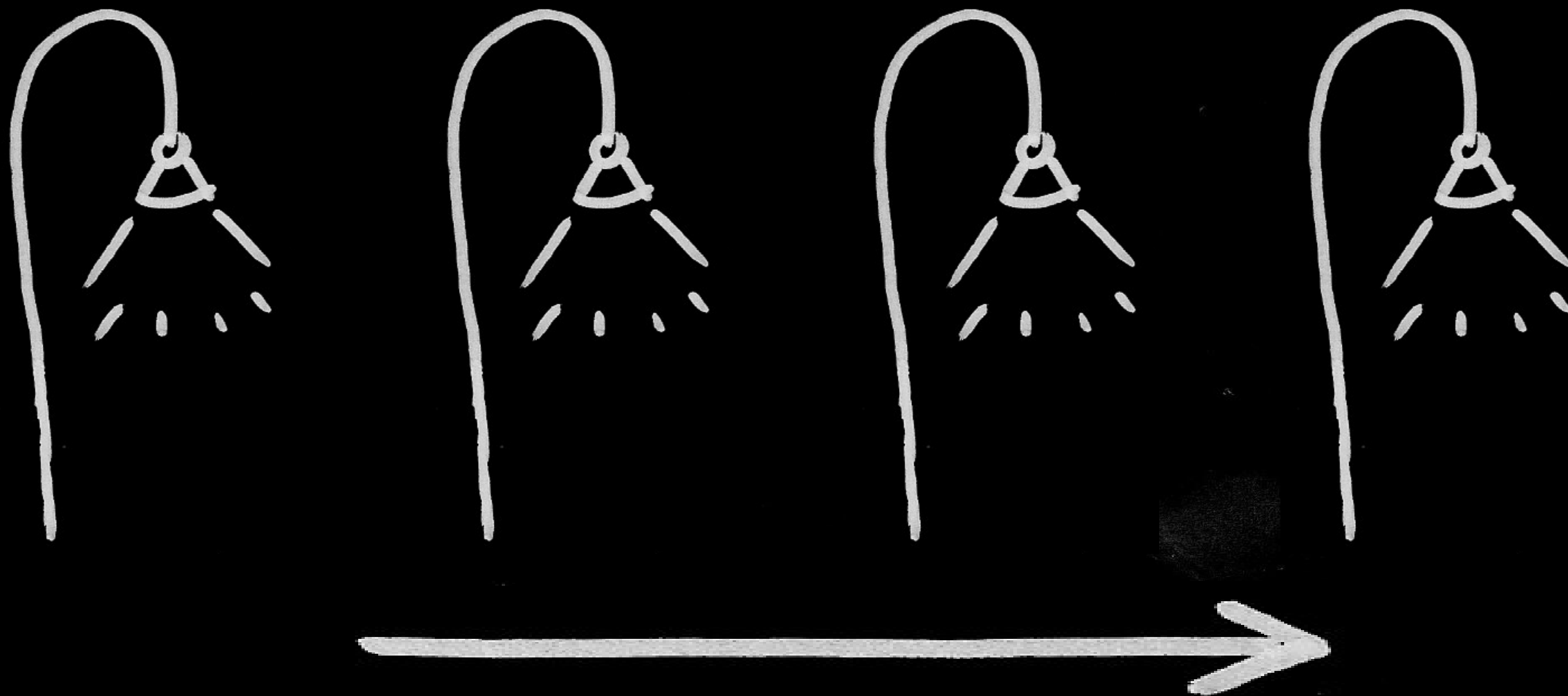


WALK



nable the Oracle

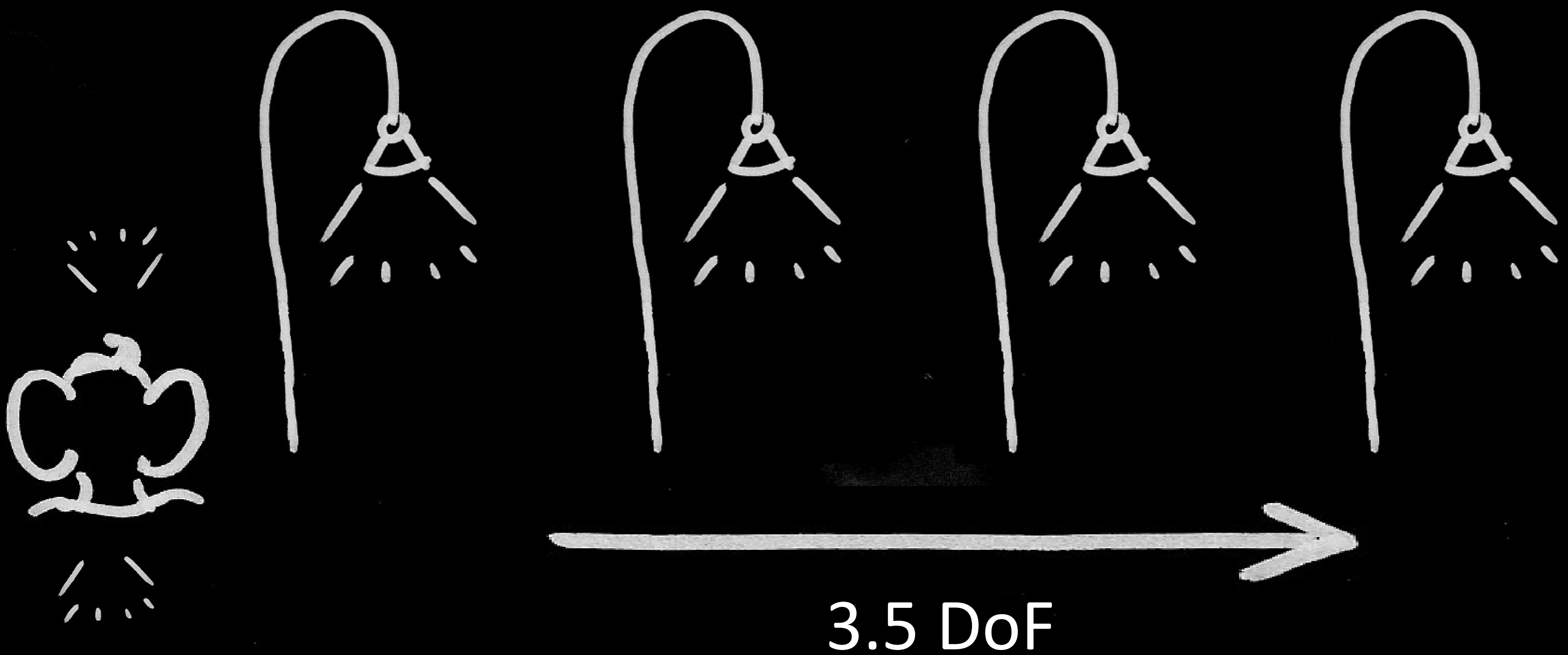




3.5 DoF

Walk Audio First Lampposts





Detect Walking from Head Pose





3.5 DoF  
“on rails”

Audio Lampposts  
for More Depth

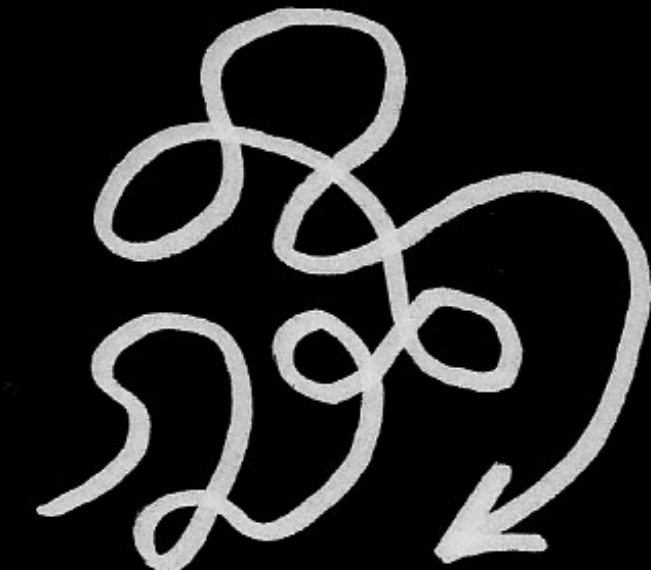
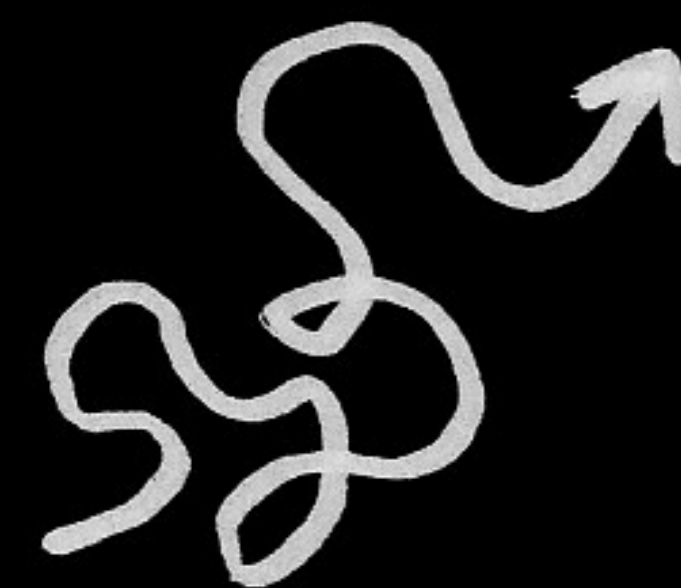
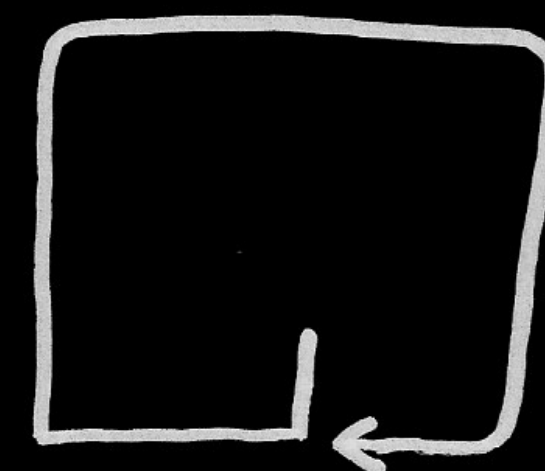
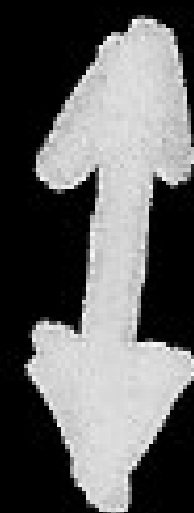


As Designed

As Used



3.5 DoF



Seat

Walk

Walk

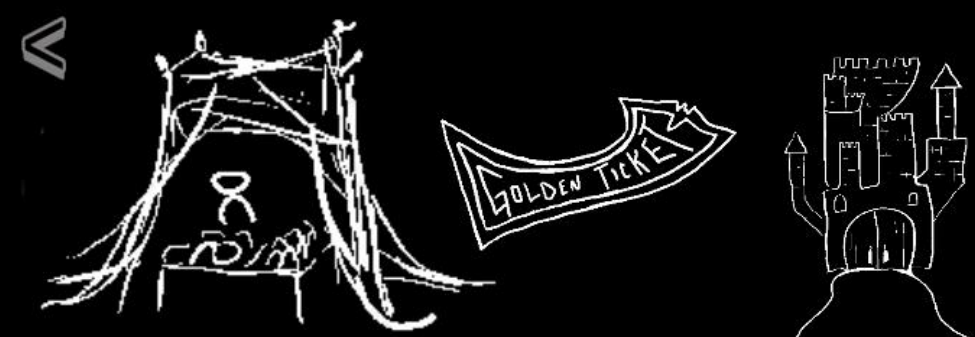
Wander

Spatial Audio Walk - Believable Real

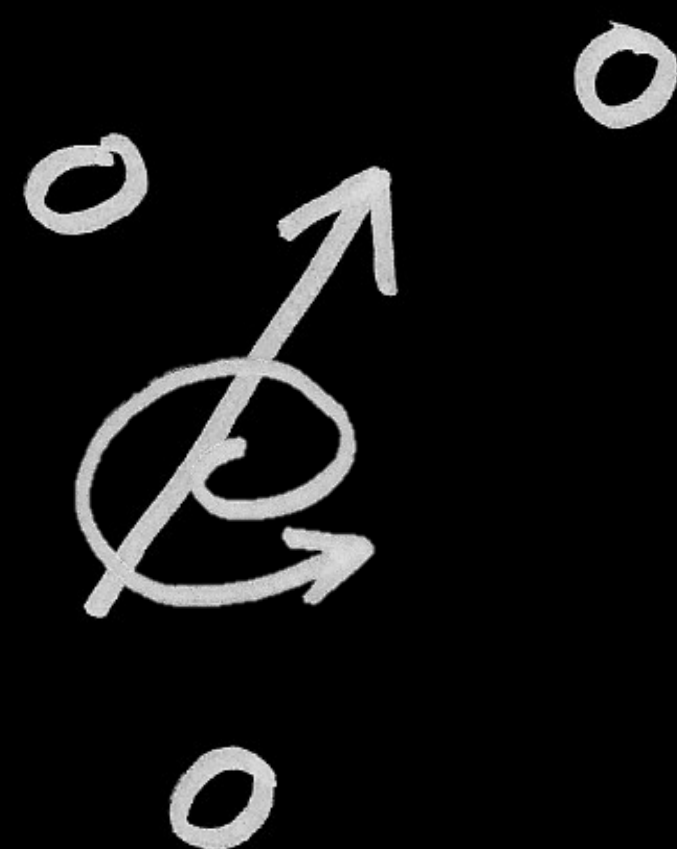
the Block

World Overlay





WALK



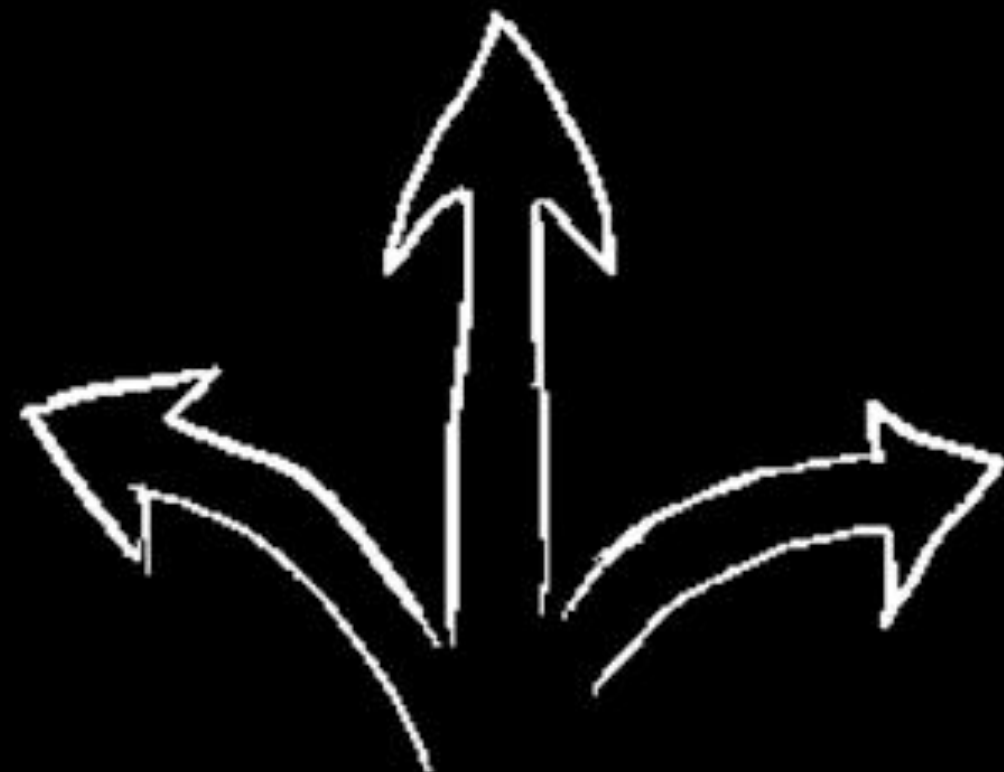
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# 1. Position > Reflection 2. Discrete Audio Sources 3. Narrative Audio Sources Audio-First Walk Tips for All Games



# 3

811



Look Around  
Tap to Choose

# CHOICE

Putting the *Choose* in Choose  
Your Own Adventure



Plan B



Peck 1 for Adventure











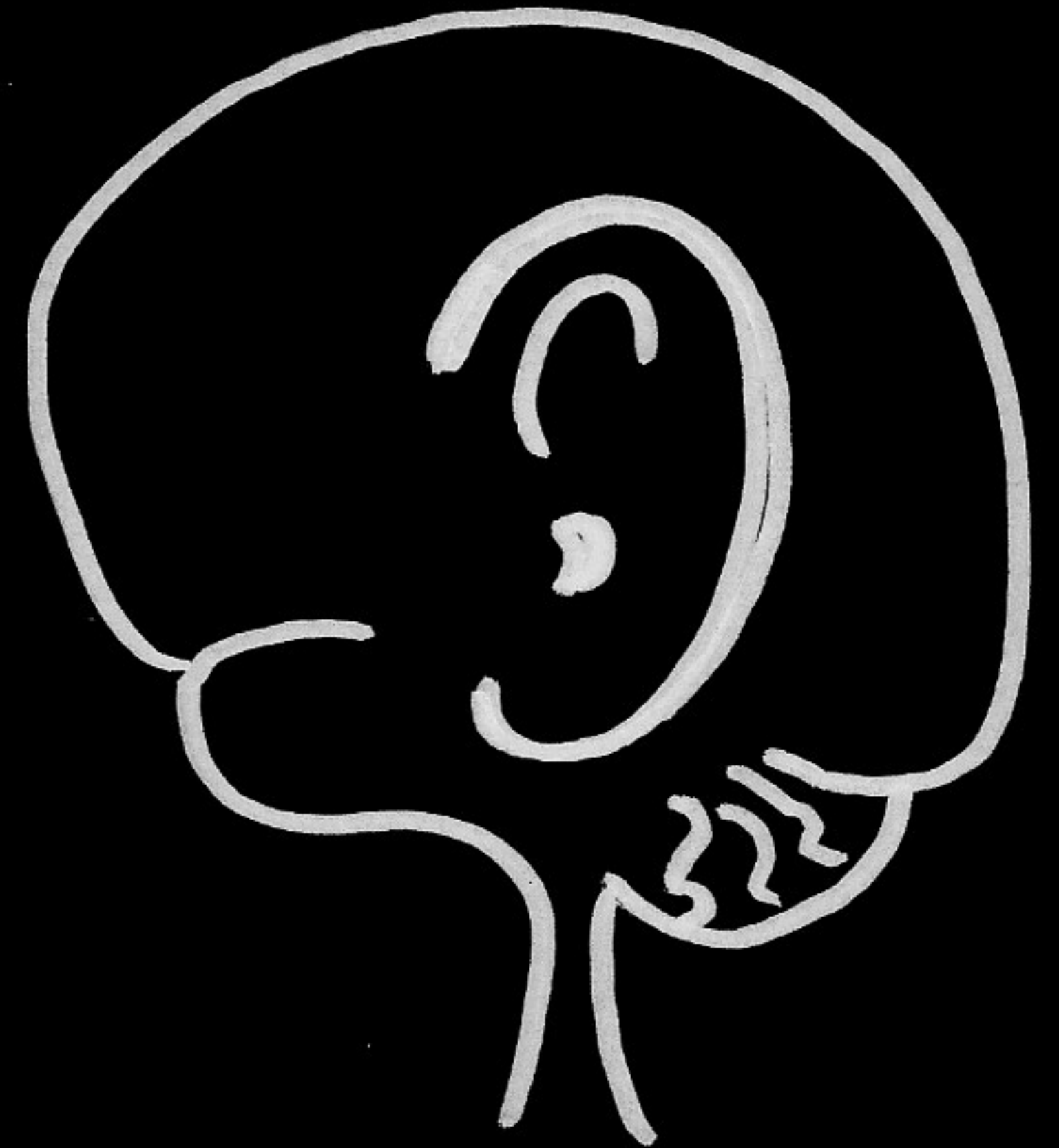
# THE THREE PATHS



**Audio menus required more  
resolution than walk paths**

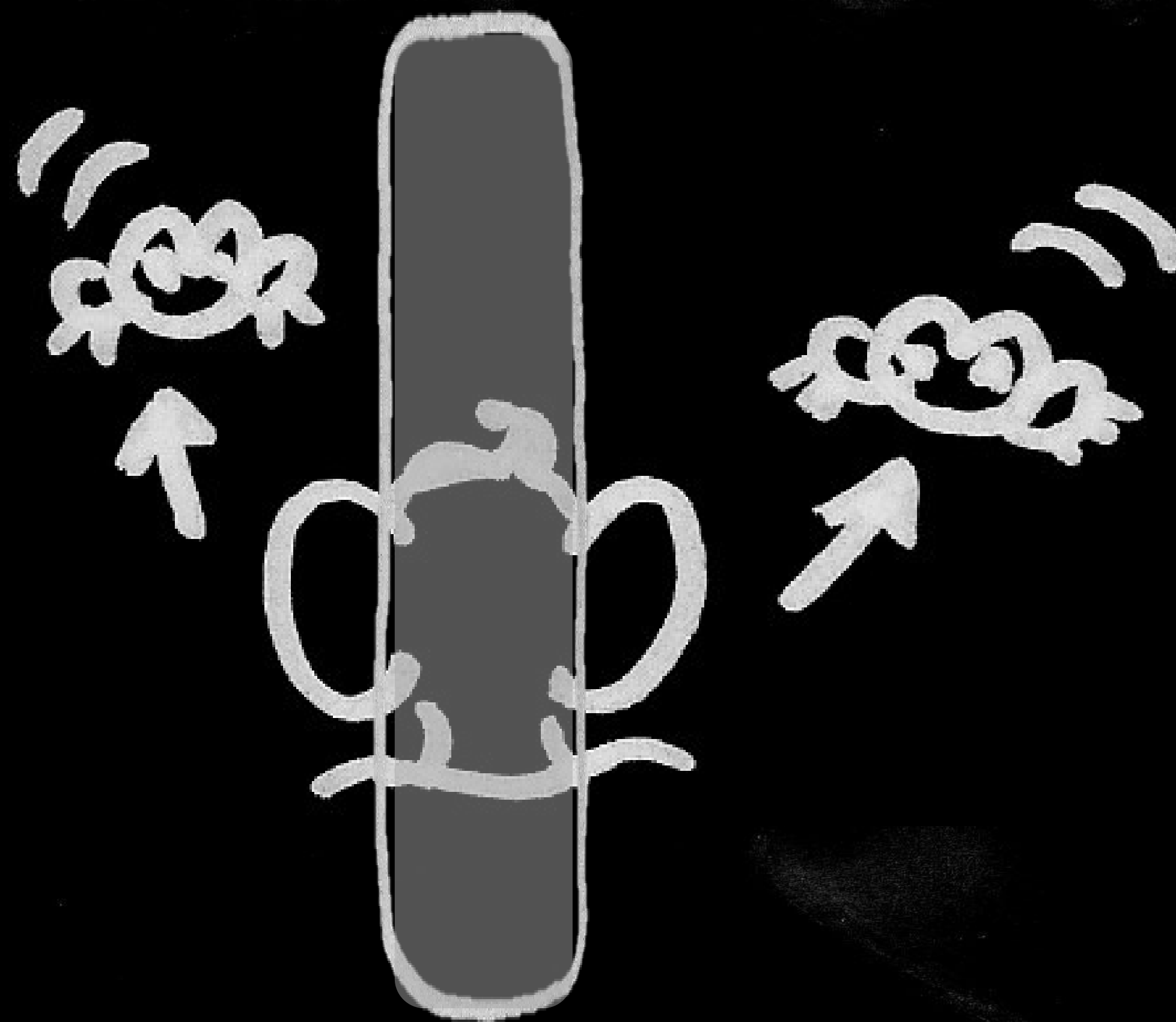
**compared to visual menus**

1. Low resolution
2. Brain's short term memory buffers.
3. Hard to refresh audio information.
4. Experience 1 audio source at a time
5. Mentally map audio source with an  
object, event, or interaction  
opportunity



**Psychology Constraints of  
the Ear**





“Find the Frog”

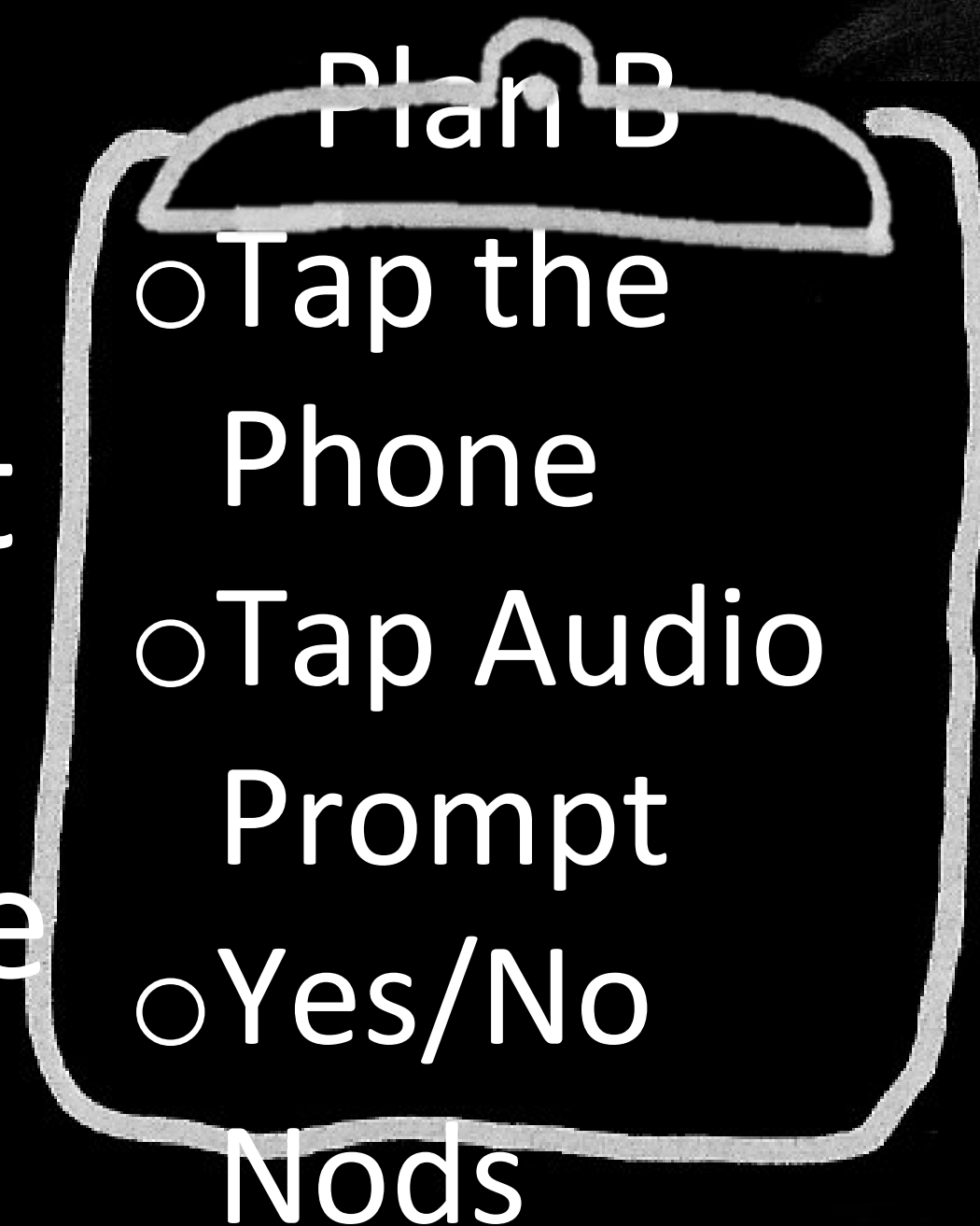
Spatial Audio Dead Zone



# 4 State Audio Buttons

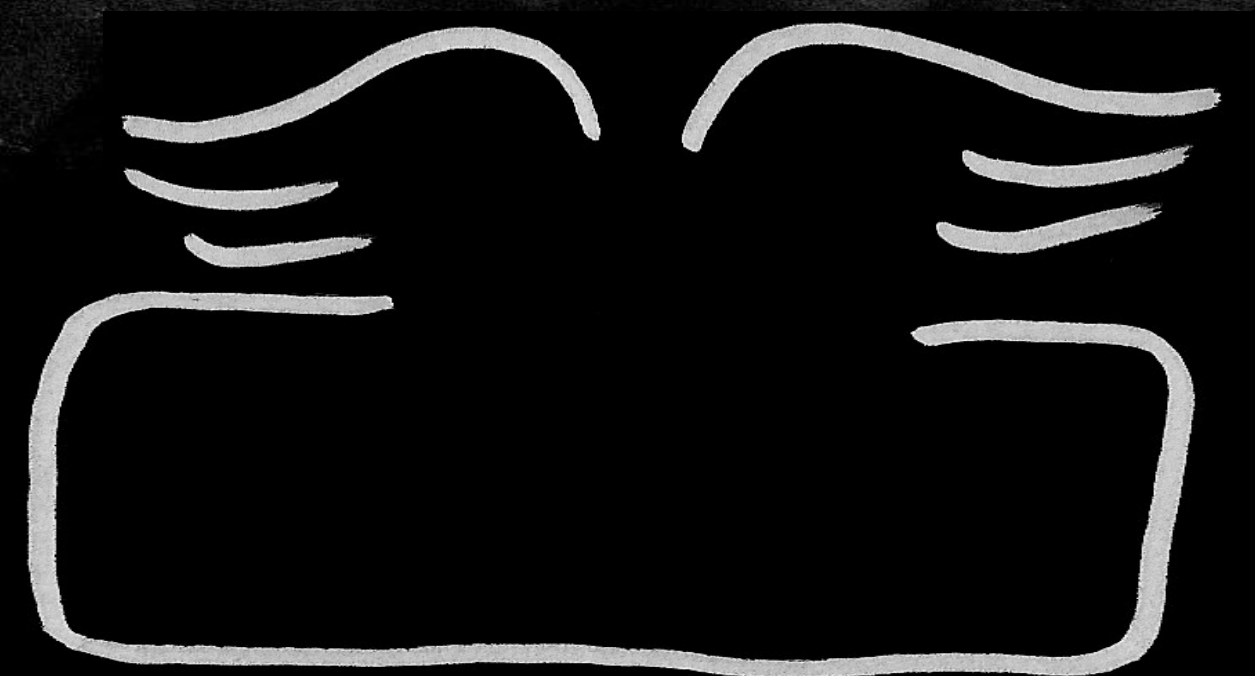


Gaze “beak cursor” to interact  
Heard what you looked at  
Double Tap Headset To Choose

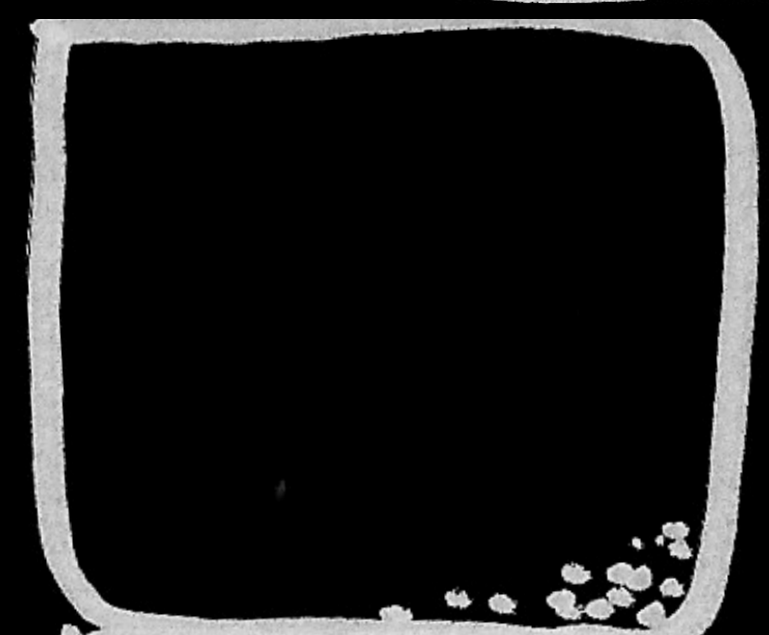


# 4 State Audio Buttons

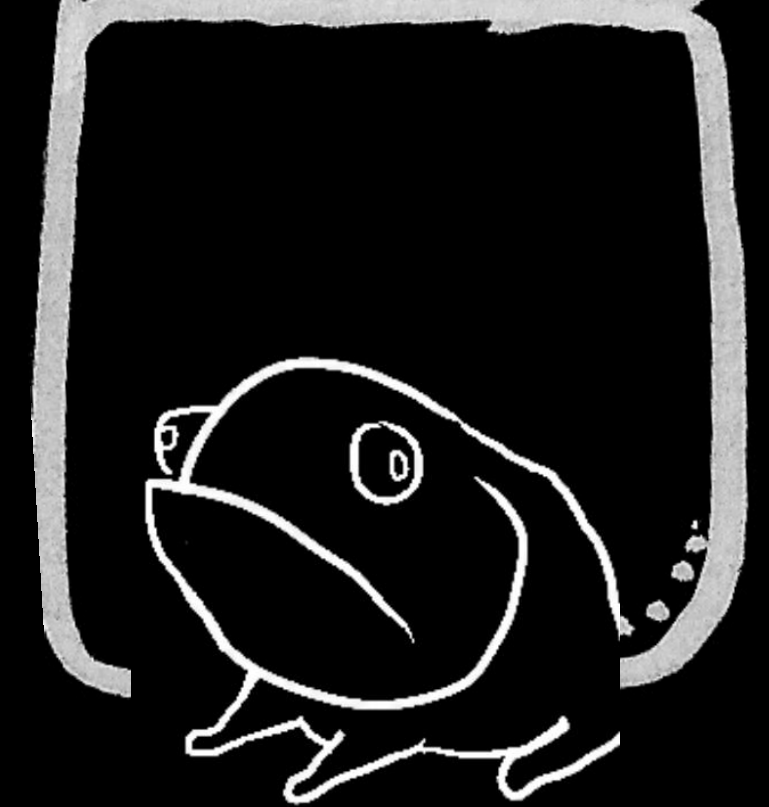




Pitch Wing Flap Loop  
Fairy Chicken Godmother



[Empty Audio Position]



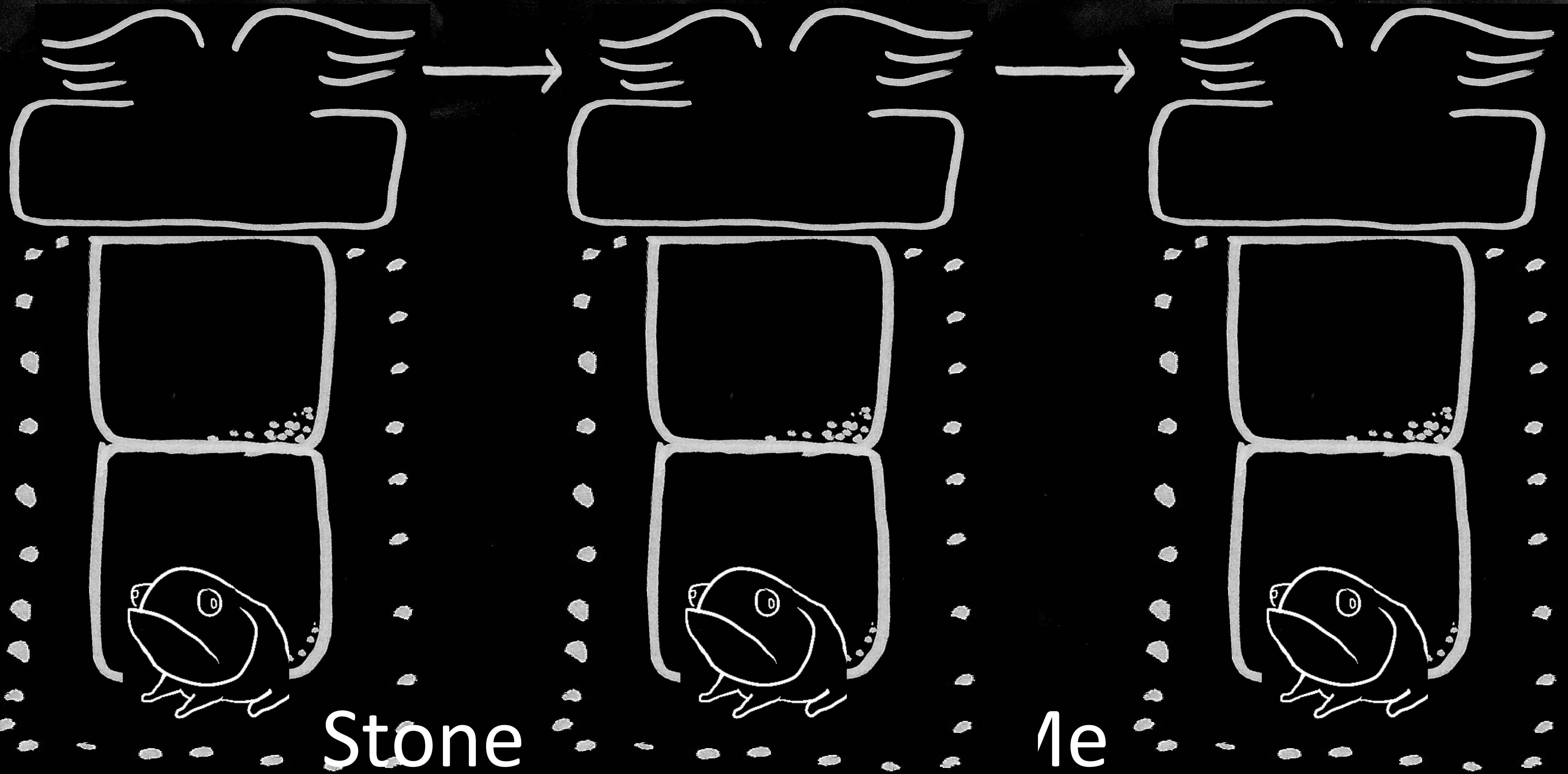
Button  
Pitch Frog Croak Loop



Double Tap Headset  
To Choose

Audio Highlight Audio Find Menu  
Option (Find The Frog)



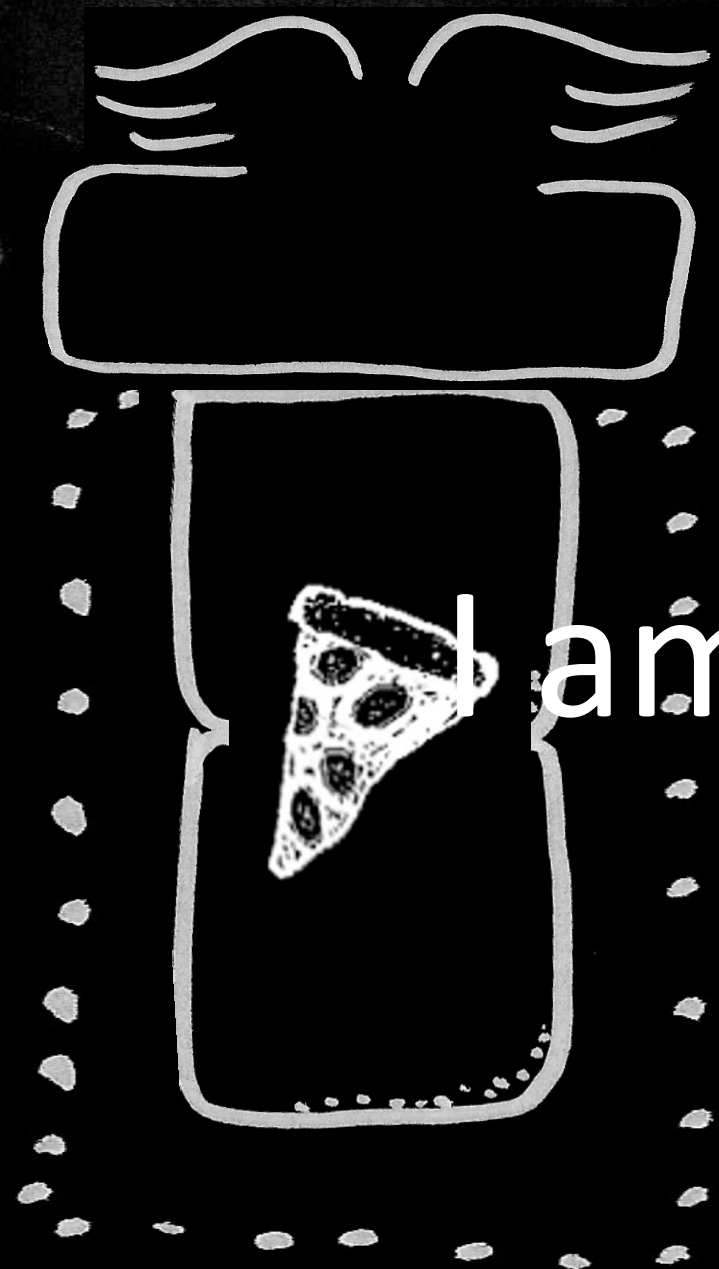


Stone

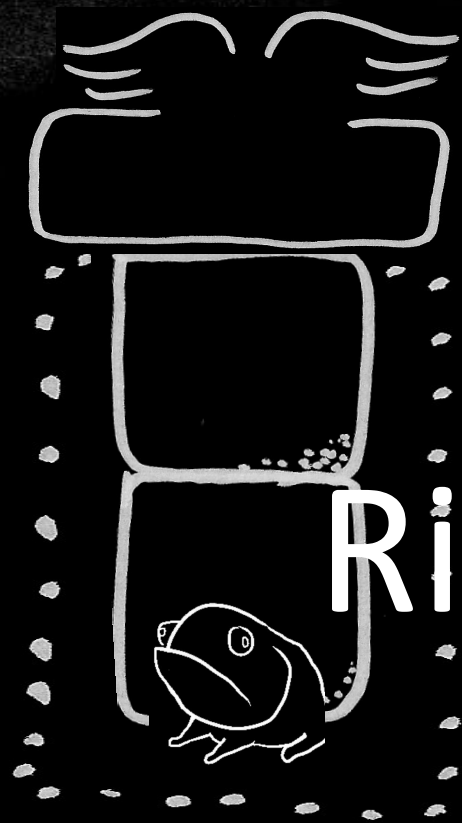
1e

Flap Audio Cue Moves





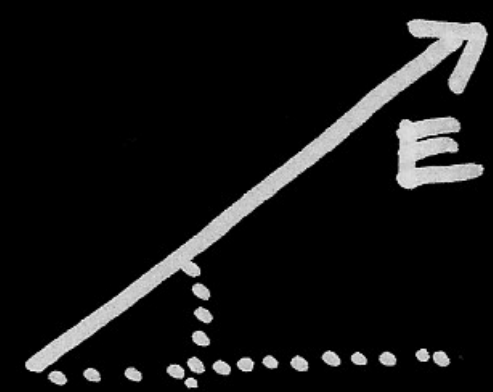
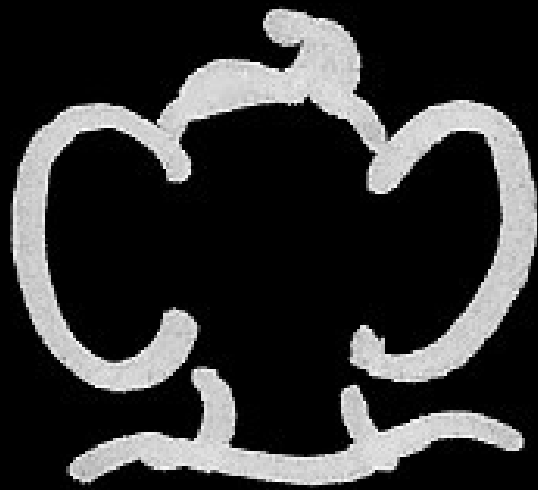
I am The Pizza Door



Ribbit Ribbit



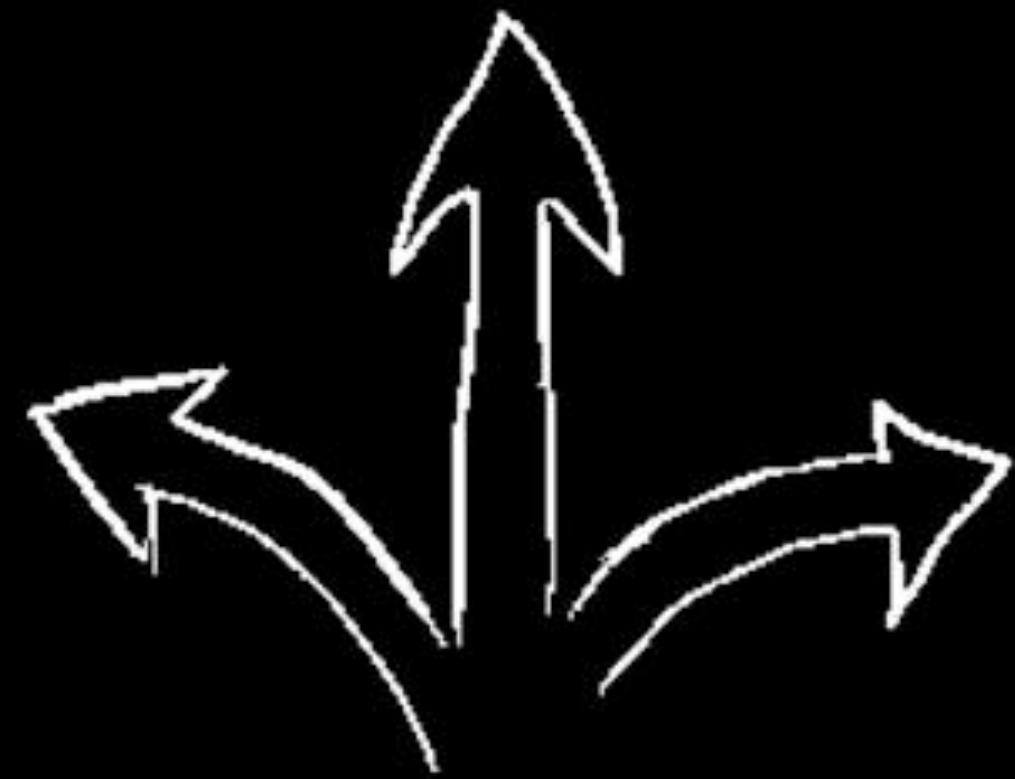
Do You  
Want to  
Wade  
Across?



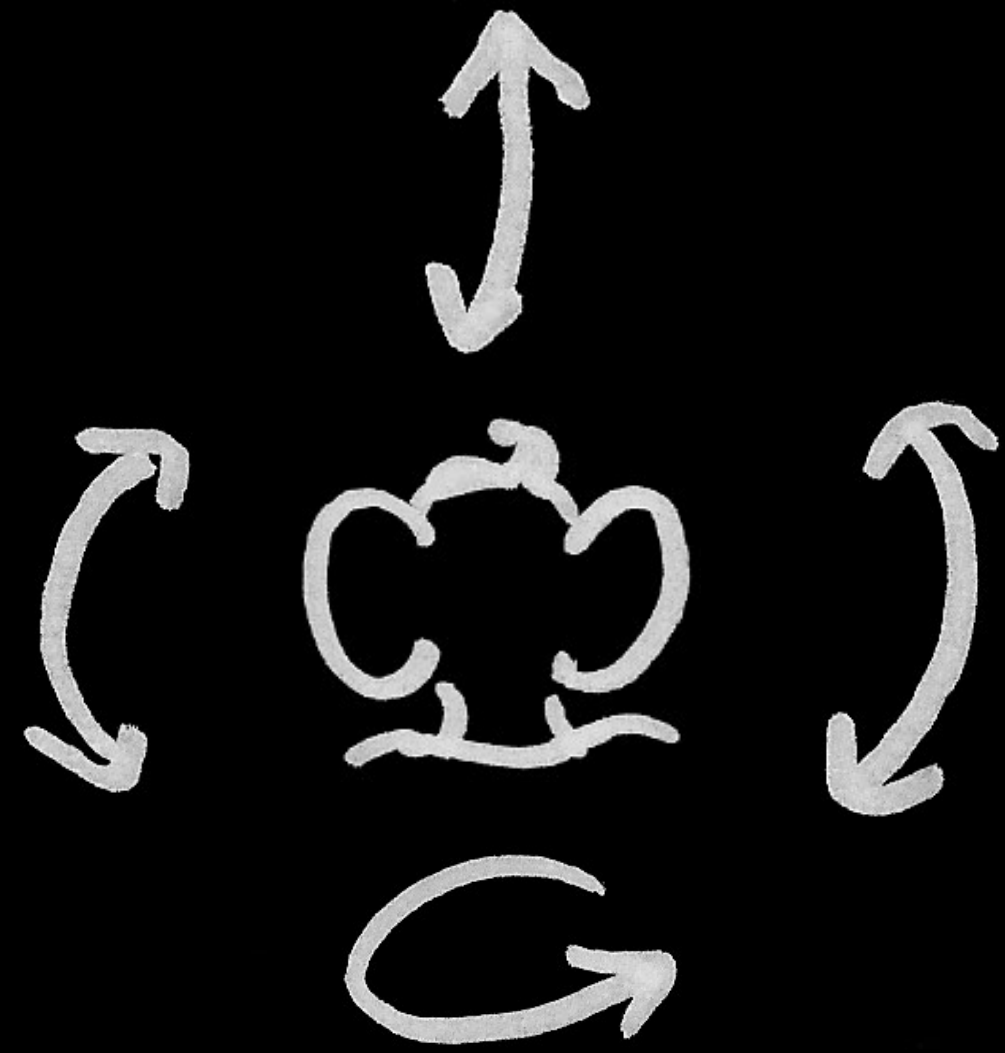
Menus 3DoF  
No Distatnce



811



Look Around  
Tap to Choose

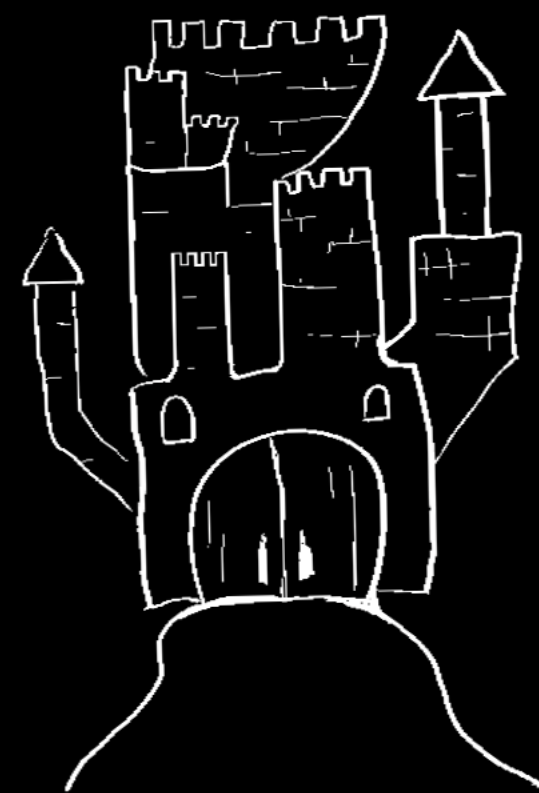


1. Pattern
2. Narrative (Frogs > Turnips)
3. Latency: Bluetooth, WiFi, HRTFs

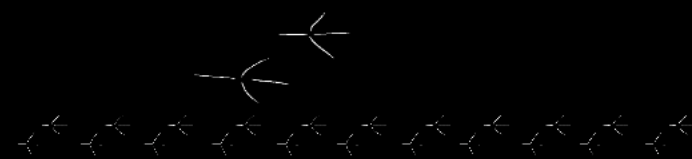
Audio-First Choose Tips for All  
Games



4



CASTLE DOOR



1935

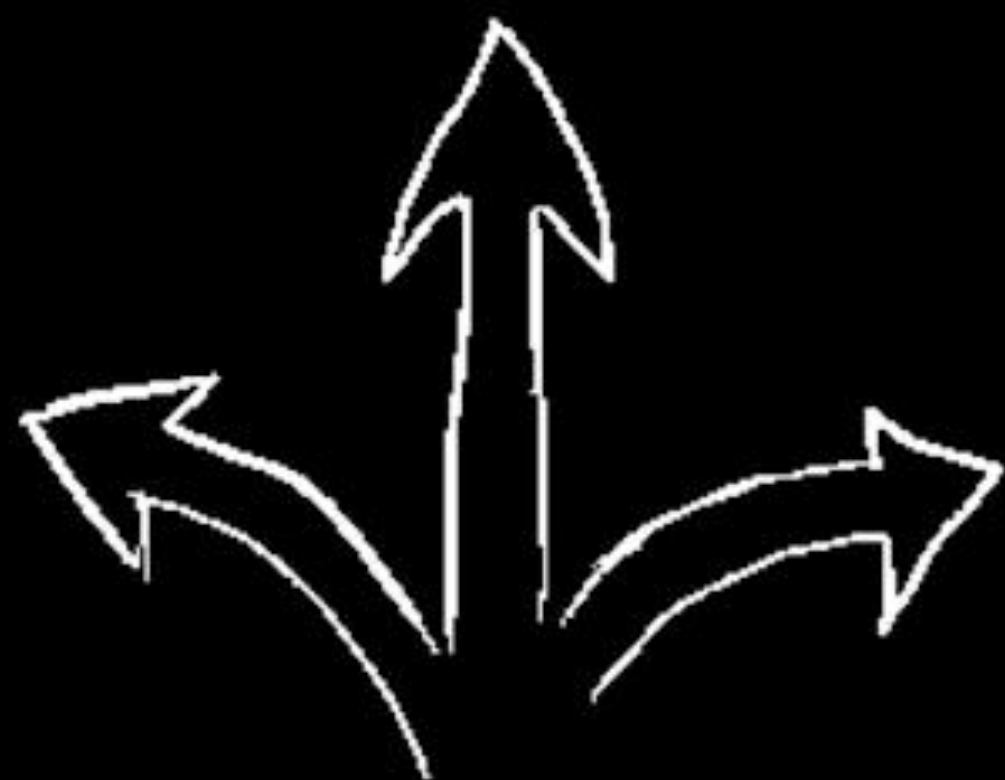
Opportunity

y

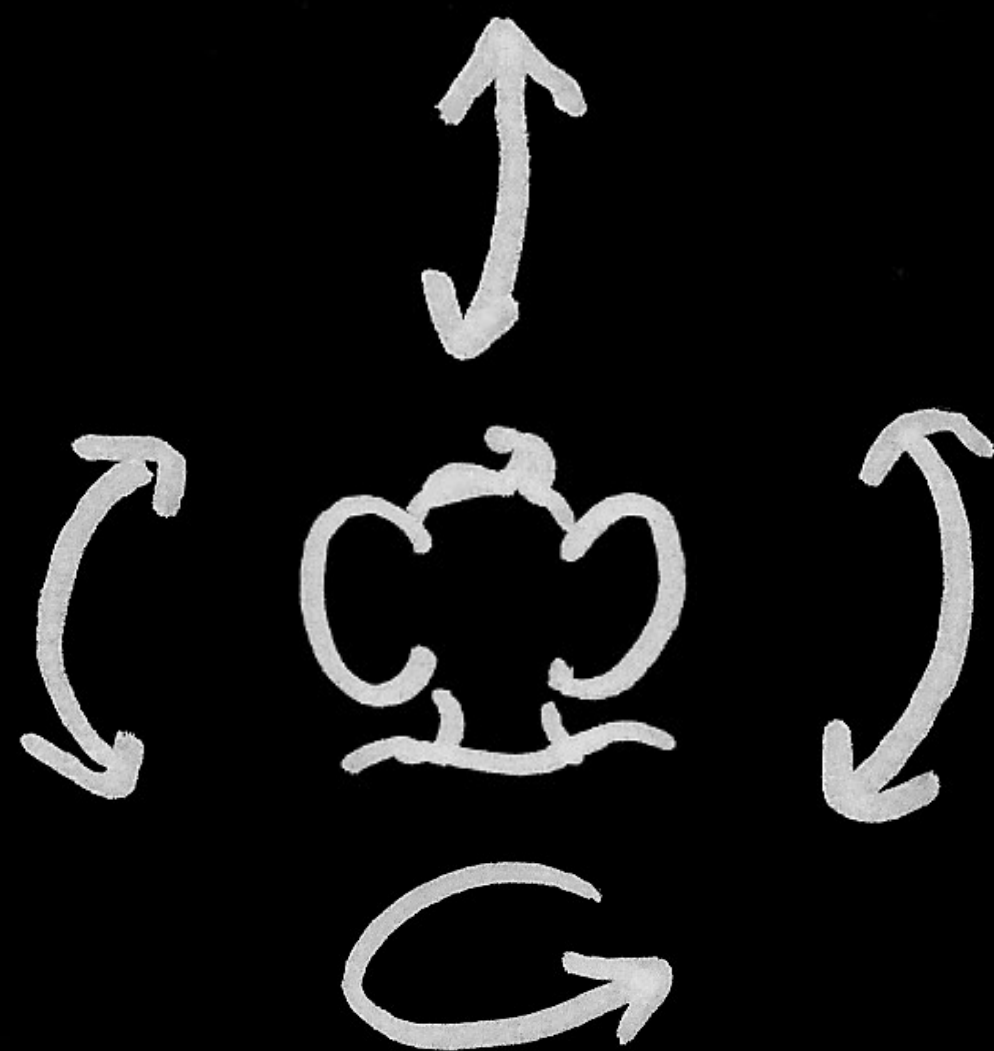
Knocks



811

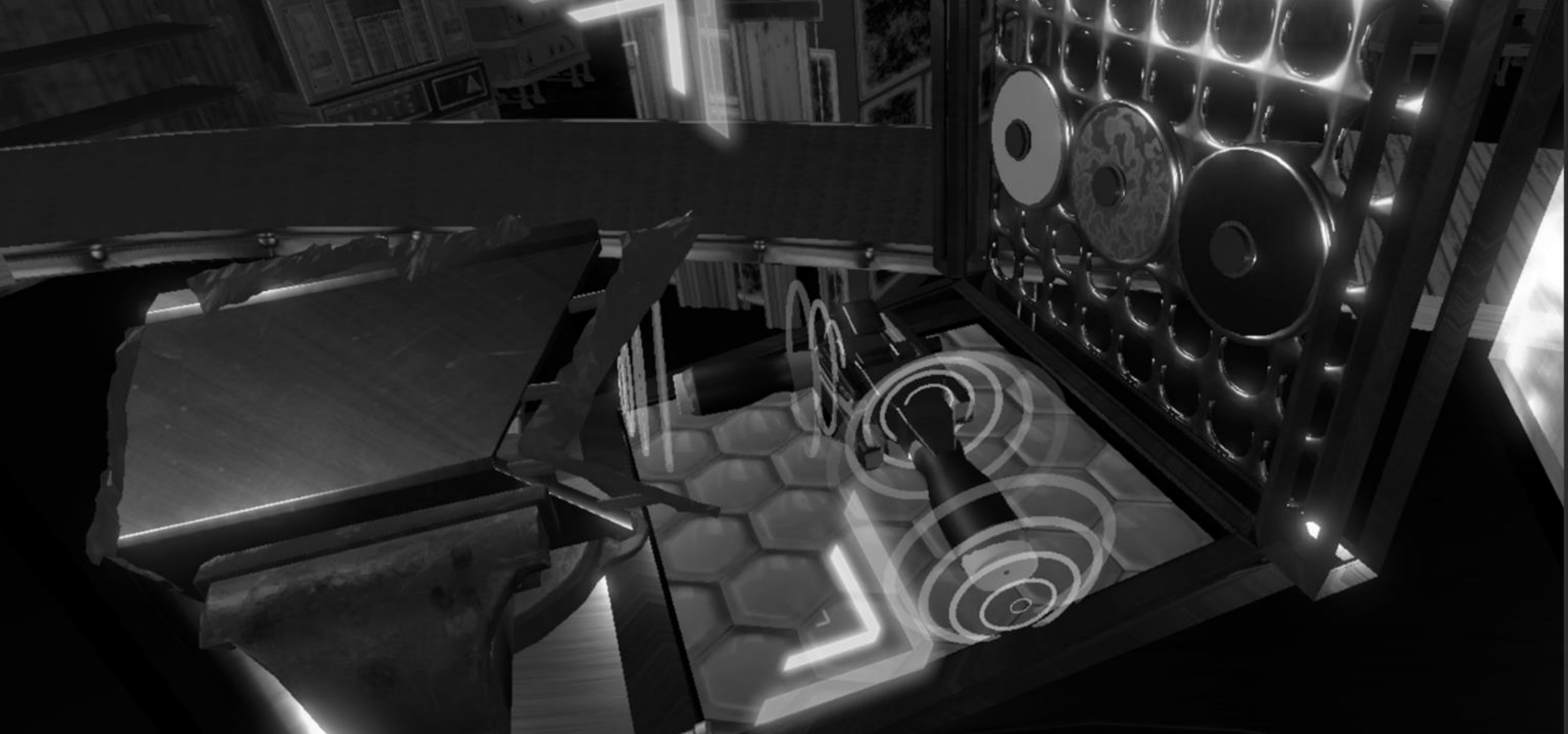


Look Around  
Tap to Choose

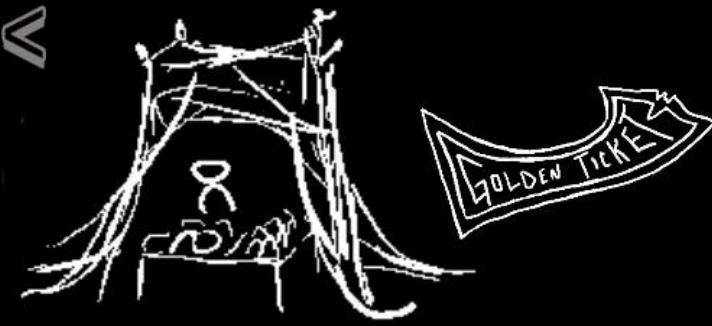


# Port Motion to Smart Phone









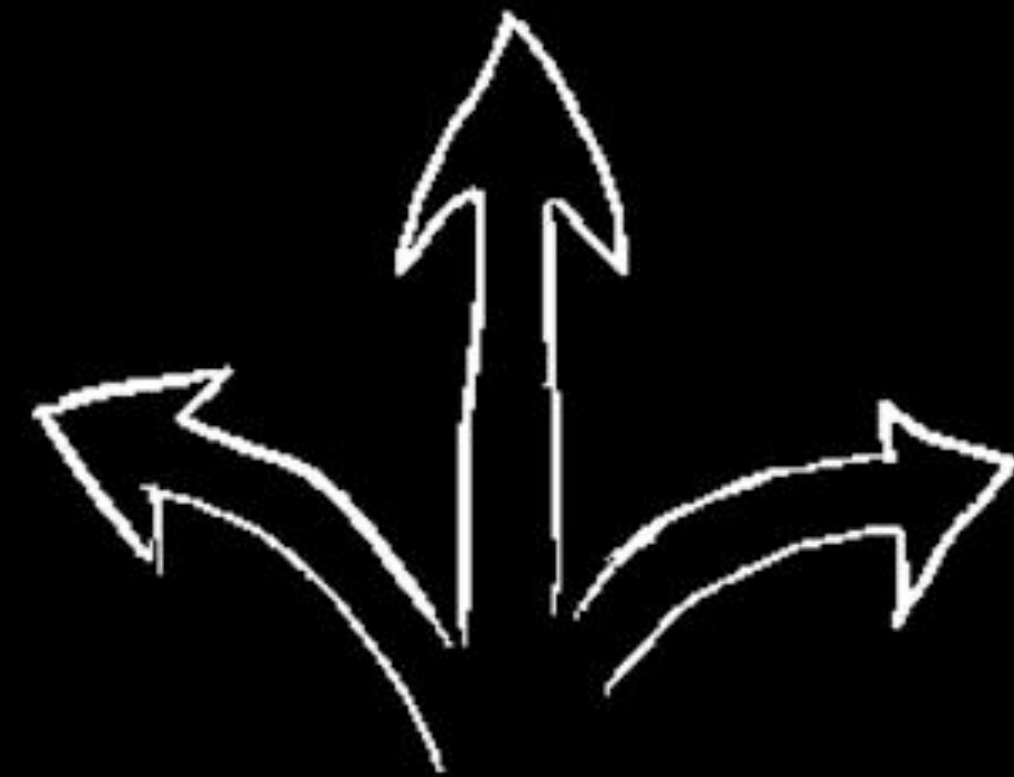
811



INSIDE  
CASTLE



WALK



Look Around  
Tap to Choose

2254



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Stand/Spati 3 Challenges Choose-First  
al Games





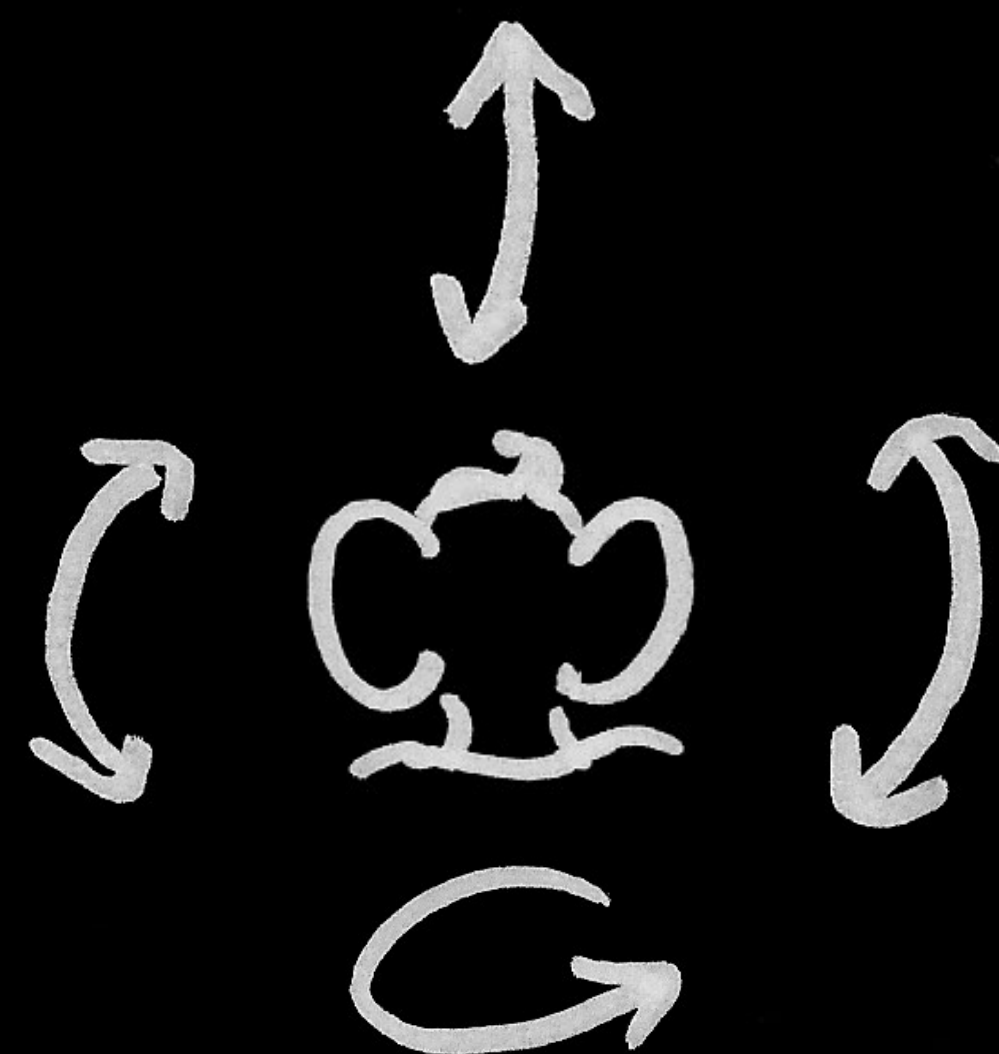
- David B Fox  
[ElectricEggplant.com](http://ElectricEggplant.com)
  - Patrick  
O'Shaughnessey  
[PatchedReality.com](http://PatchedReality.com)
  - Wonkubus Wonk  
(Michael Crabbs)  
[MichaelCrabbs.com](http://MichaelCrabbs.com)
- Thank You! Unscramble the  
XEQ Design TEAM!





INSIDE  
CASTLE

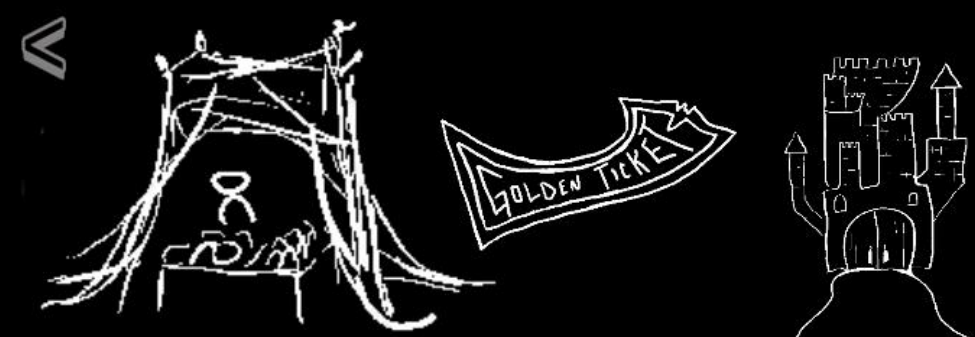
2254



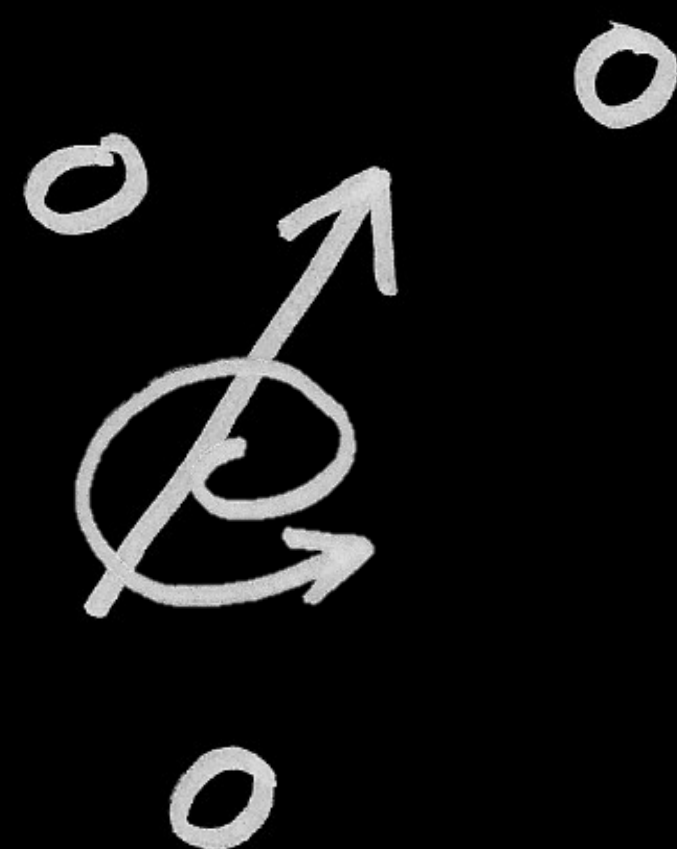
1. Sharp Attack
2. Long Enough  
Loops
3. Pitch Above and  
Below

Audio-First Stand / Spatial Tips  
for All Games





WALK

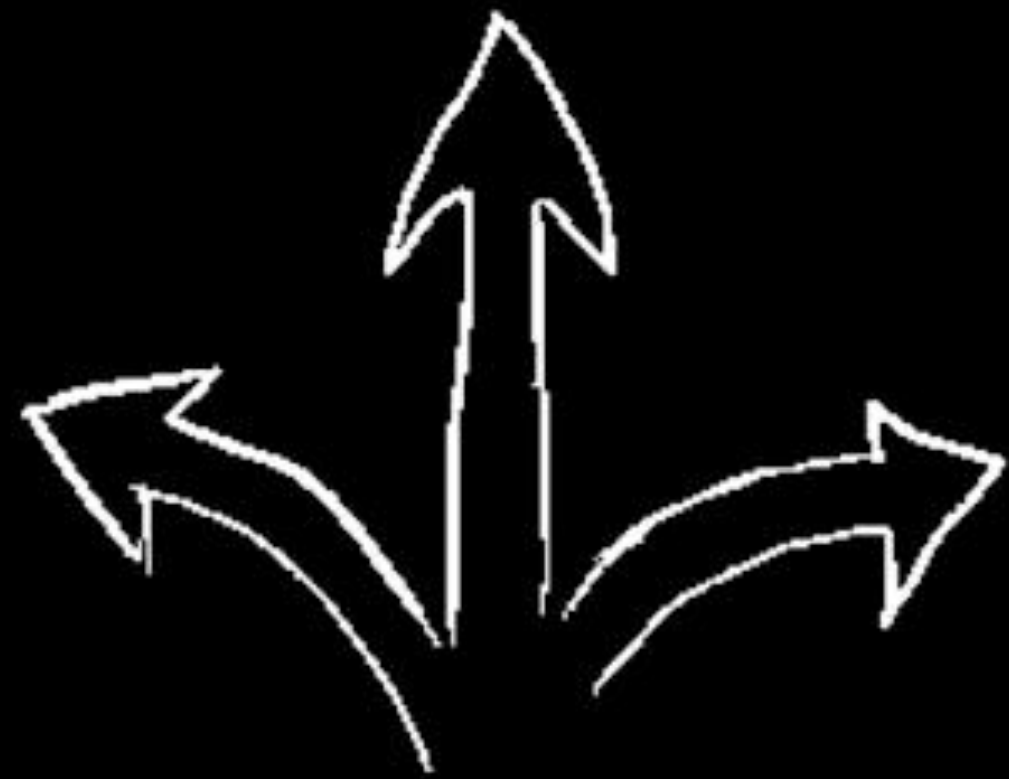


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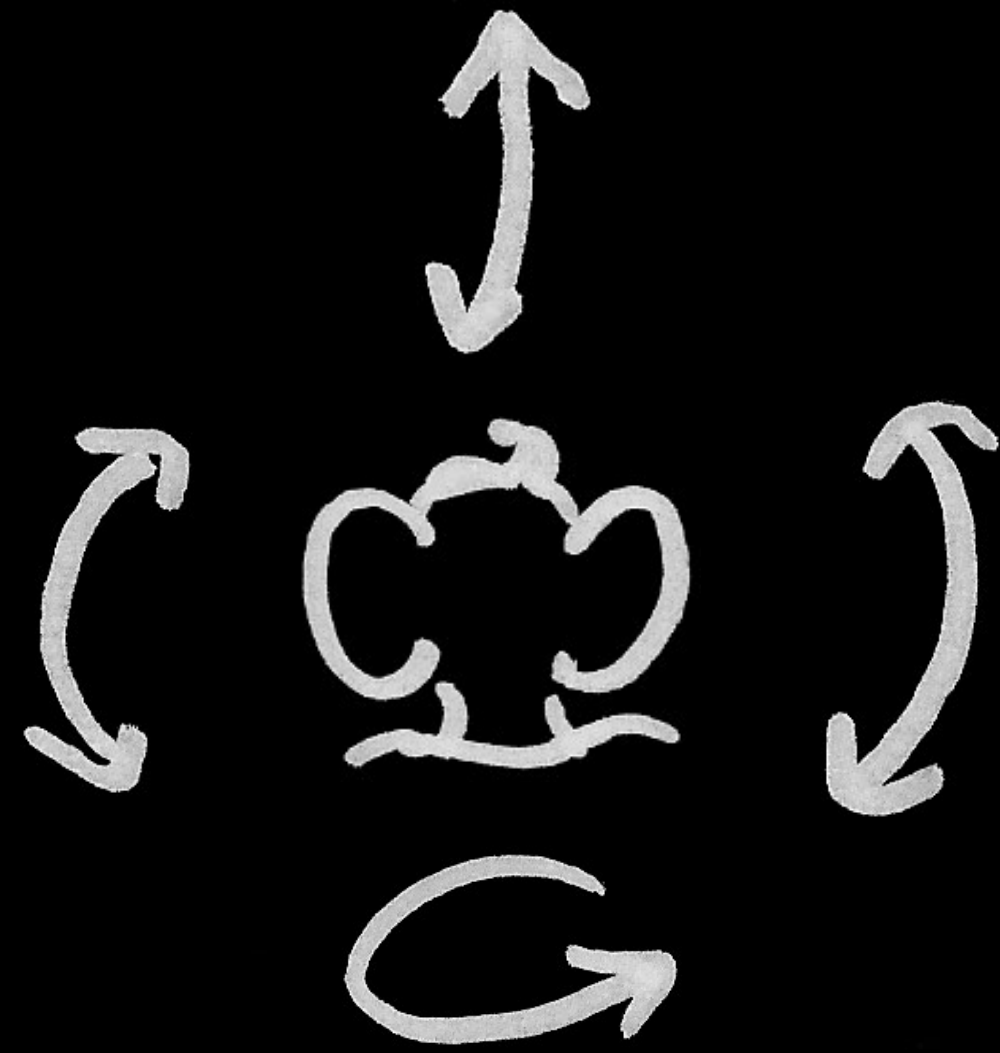
# 1. Position > Reflection 2. Discrete Audio Sources 3. Narrative Audio Sources Audio-First Walk Tips for All Games



811



Look Around  
Tap to Choose



1. Pattern
2. Narrative (Frogs > Turnips)
3. Latency: Bluetooth, WiFi, HRTFs

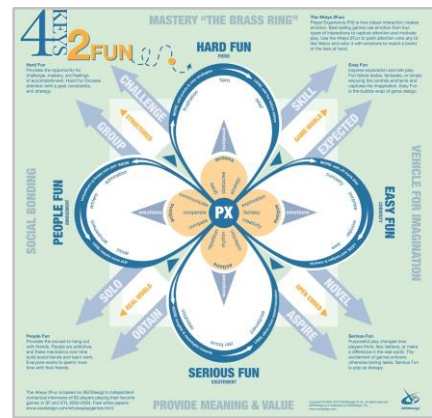
Audio-First Choose Tips for All  
Games



# Thank you!



Follow the  
White Rabbit



Free Download  
4K2F.com



TiltWorld.com



Unscramble the  
Oracle

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