SEVEN YEARS IN ALPHA: THUMPER POSTMORTEM

Marc Flury

Co-Founder, Drool

Brian Gibson

Marc Flury

THUMPER

RELEASE TRAILER

PLATFORMS

OCTOBER 2016

DECEMBER 2016

BRIAN'S EXPERIENCE

- Years of experience as effects artist
- No art direction experience
- Never composed game music/audio

MARC'S EXPERIENCE

- 6 years C/C++ game programming
- Mostly menus/UI
- Limited 3D math/graphics ability

GOALS (2009)

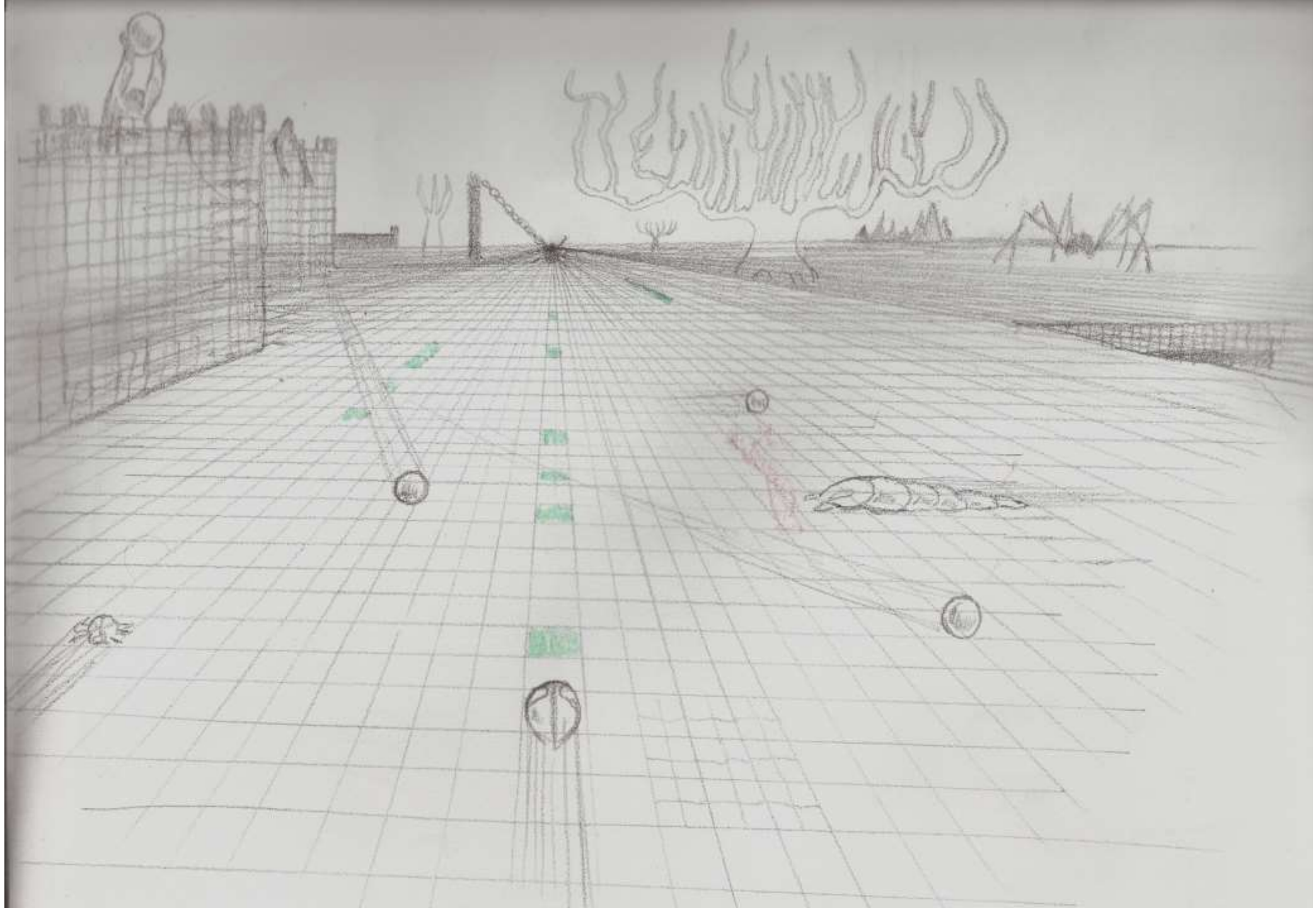
- Make an engine
- Design a game
- Release within “a year or two” on Xbox 360

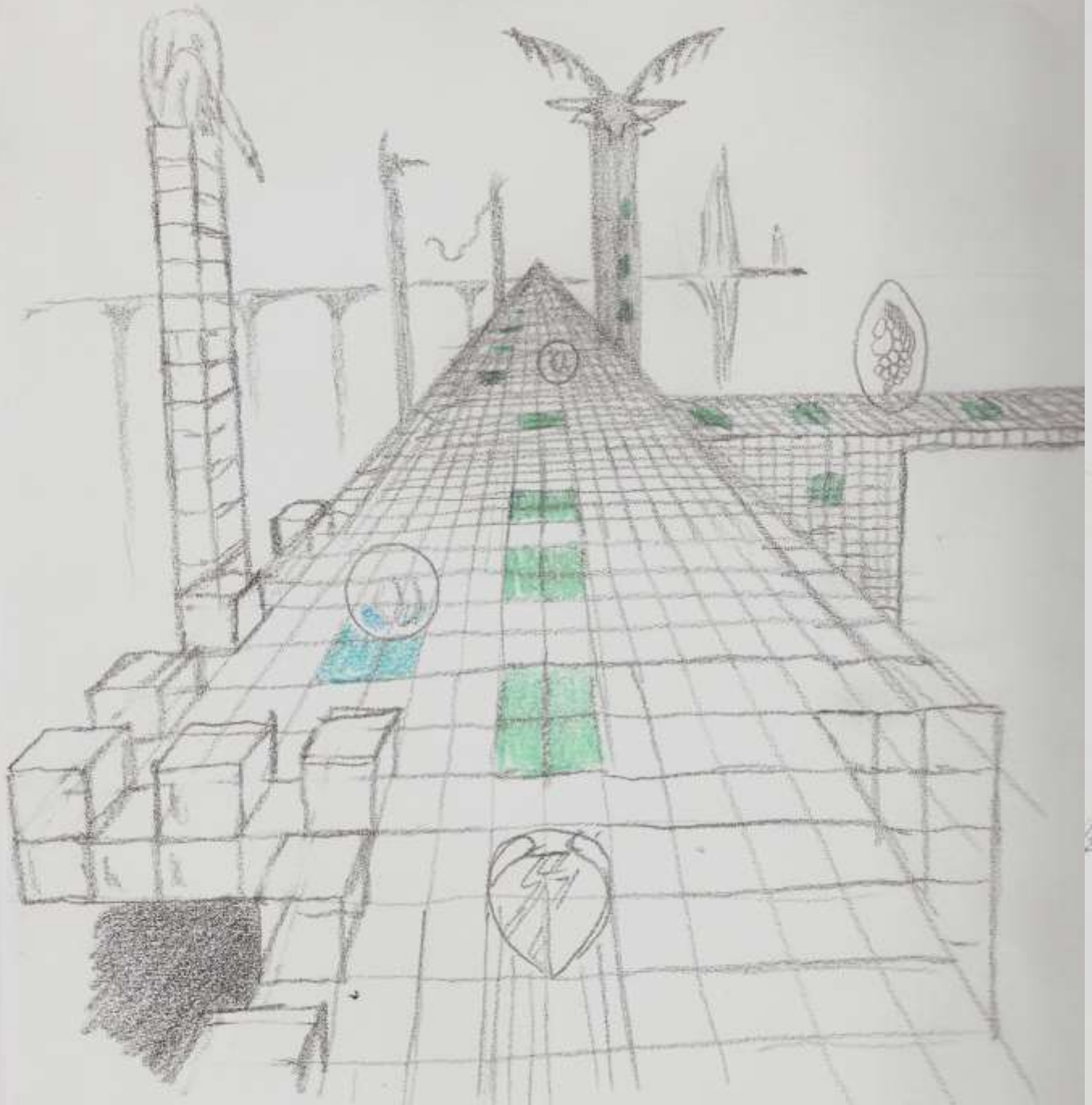
SCOPE

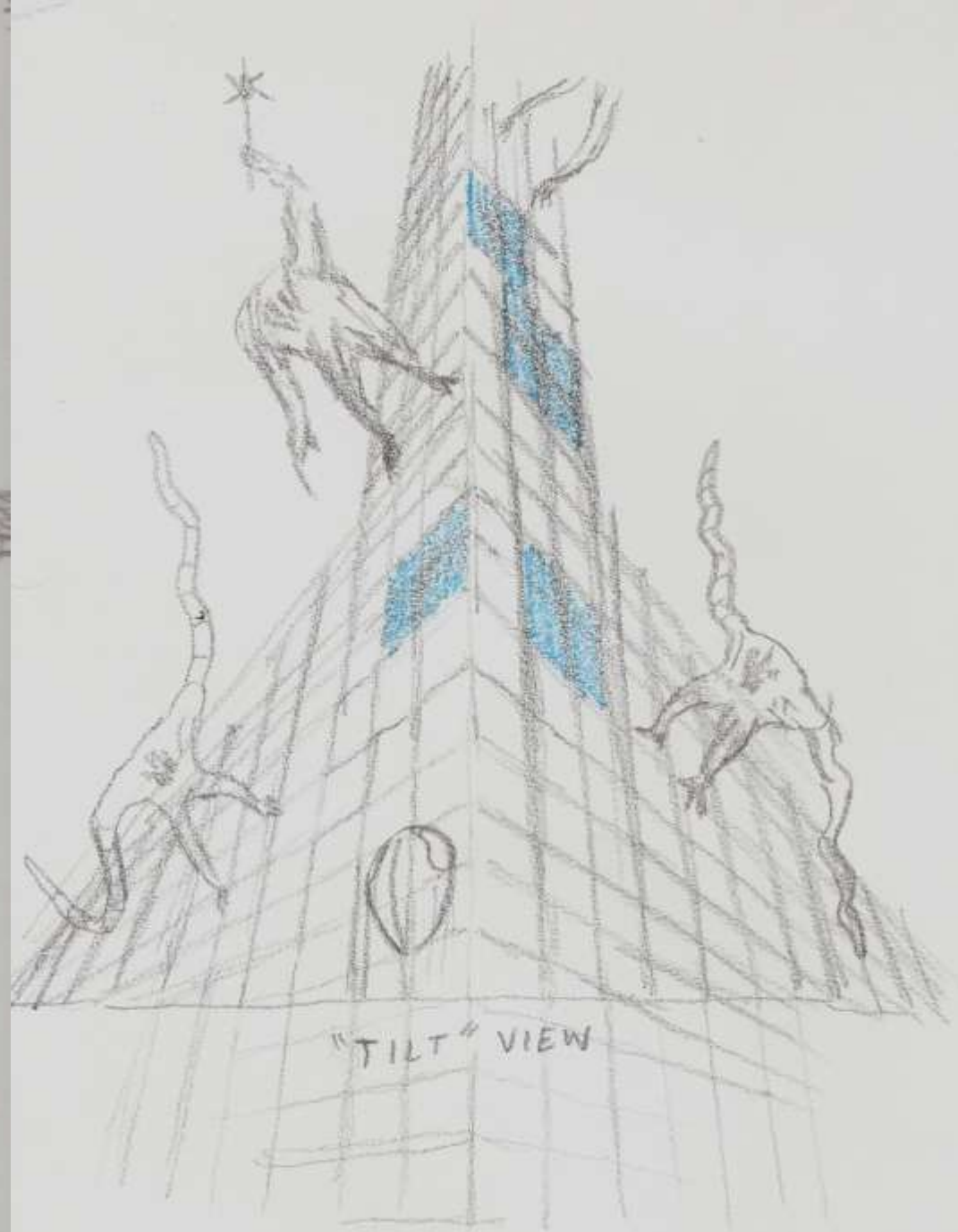
- 7+ years
- Custom engine
- 100,000+ lines of code
- 2D + VR support
- Steam/PS4
- No external QA

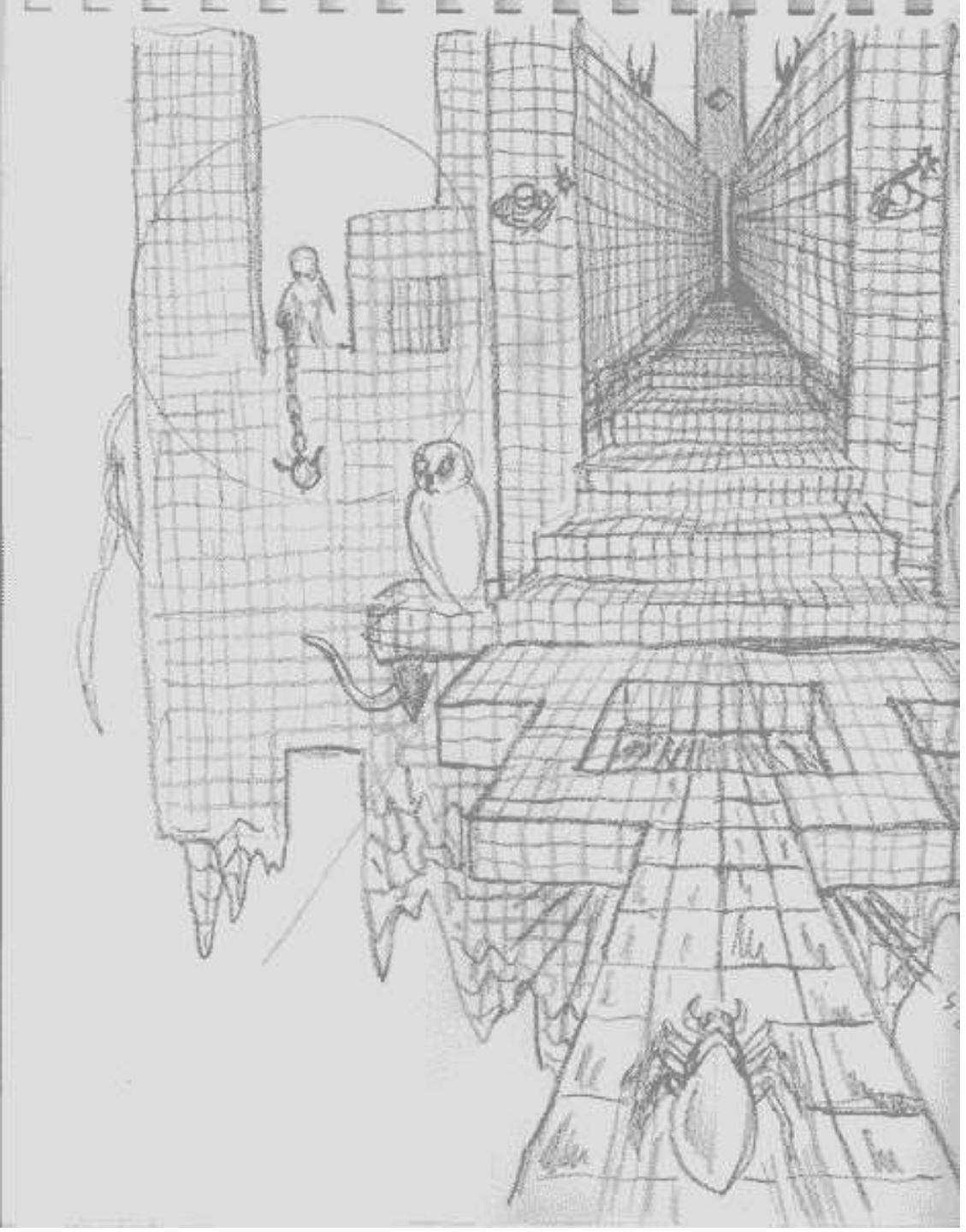
CONCEPT ART

2008 - 2009






"TILT" VIEW



GLIDE + OTHER MOVES / ATTACKS / OPTIONS...

IF FALLING (FALLS FAST!) CAN HIT JUMP TO GLIDE-PA RETURN TO SURFACE (IF POSSIBLE)

CANNOT FALL UNLESS KNOCKED BY ENEMY INTO SPIN MODE

↑ JUMP/GLIDE

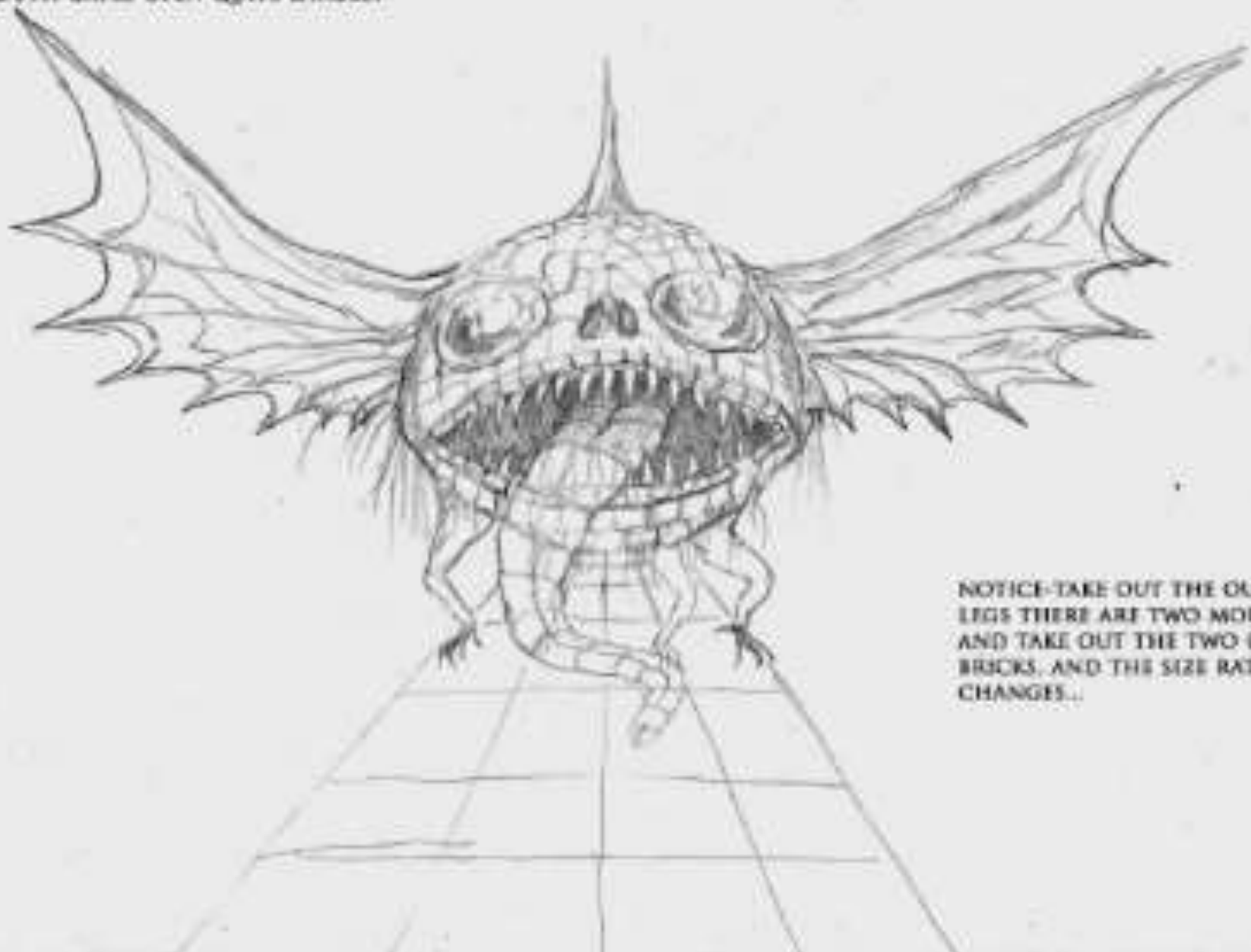
DOUBLE SPEED <RAM OPPONENT FROM SIDE OR LEGS?>
AS RAM?

- DOUBLE SPEED BURST (ONLY WAY TO JUMP?)*
- SHOCK <SELECT SHOCK>(WEAPONS/ATTACKS)
- ABSORB/(THUMP)

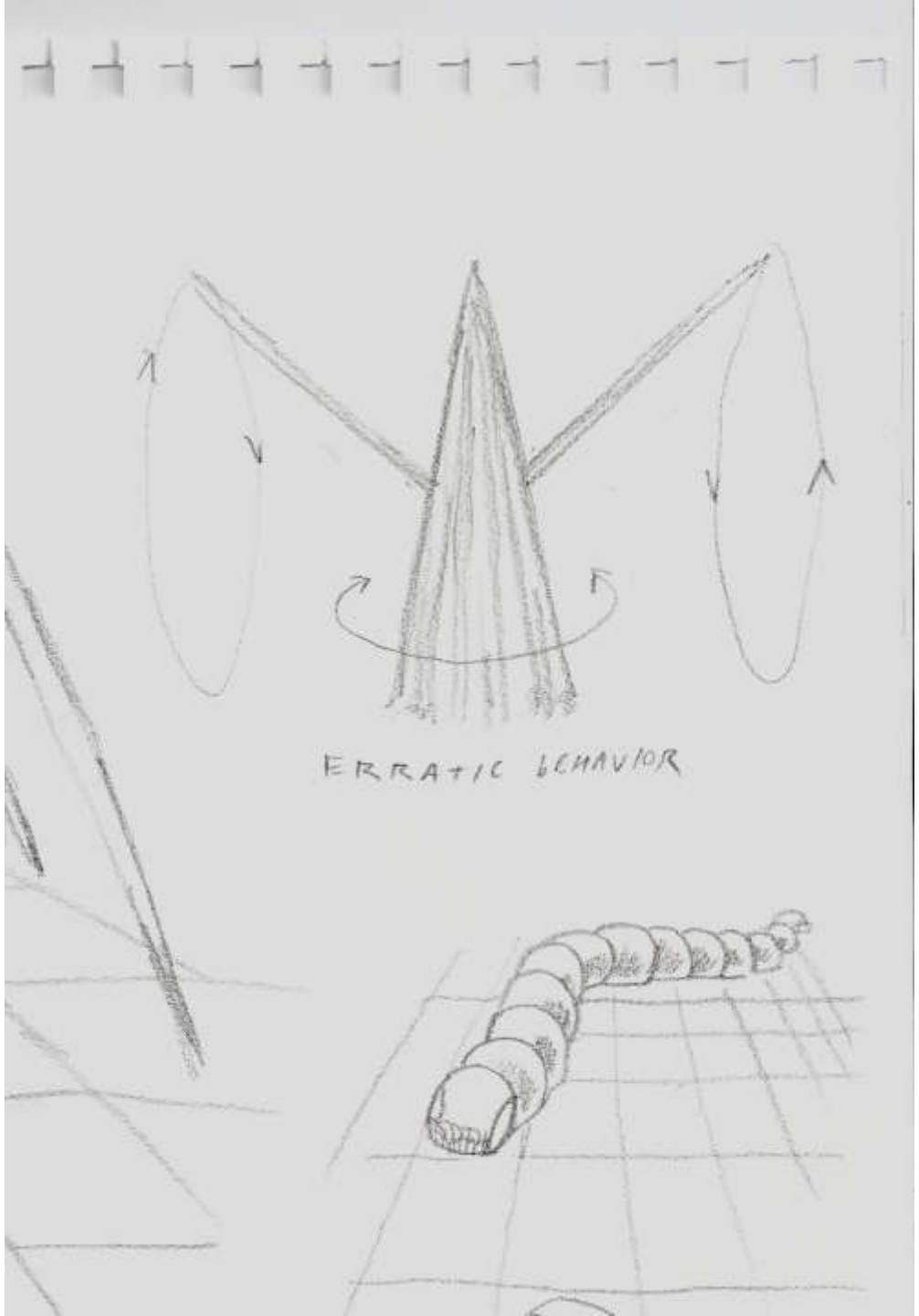
*(AND ONLY ON SPECIALLY LIT SQUARE?)
(OR SPECIAL WEAPON?)

A WHIPPING TYPE CREATURE
(HARD/SHINY ARMored TENTACLES?)
WEBBED UNDERARM... GLIDE? (CAN BE HIT?)

HERES A HEADD IN NA BLOCK STYLE. EARS FLAP.
LEGS WERE ADDED TO MAKE LESS FISH LIKE -ITS NOT A FISH.IT IS JUST A HEAD.
LEGS SKITTER &DANCE ALONG JUST TO GUIDE THE FEYING . EYES REFLECTIVE GLOB-ORBLIGHTINSIDE SKIN LIKE BLOCKS
EARS ARE PINK-ORANGE TRANSPARENT LIKE BATS WITH VEINS SHOWING THRU. SOME WISPY HAIRS. LEGS SLIGHT LY HAIRY
MOUTH GAPES OPEN QUITE LARGELY



NOTICE-TAKE OUT THE OUTSIDE LEGS THERE ARE TWO MORE THERE. AND TAKE OUT THE TWO OUTSIDE BRICKS. AND THE SIZE RATIO CHANGES..

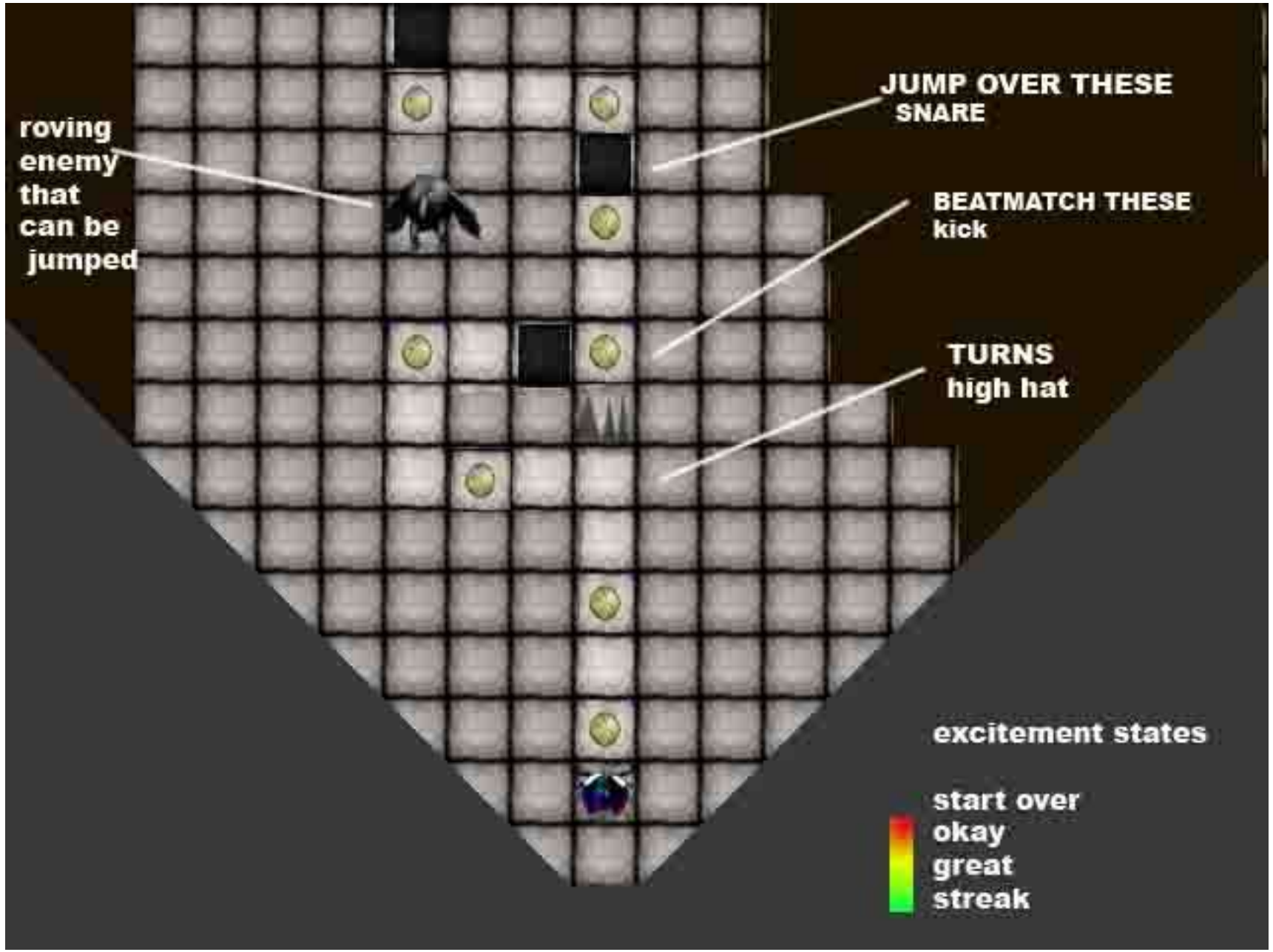

ERRATIC BEHAVIOR

TIMED BOUNCE

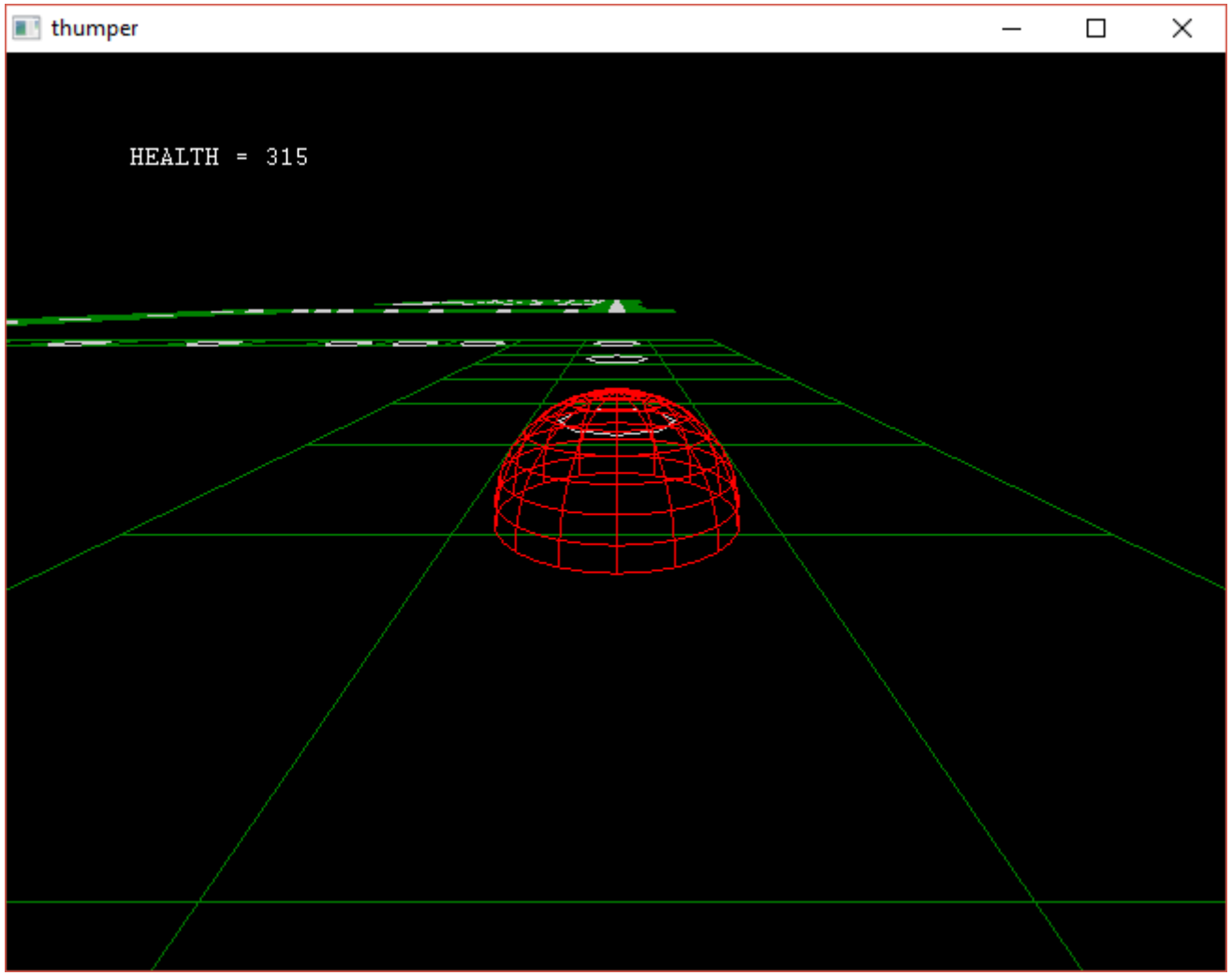
1c
(2)
(3)
1D
1A
CRACKED
GLOW
AND MELT
1b

TECH PROTOTYPES

2009

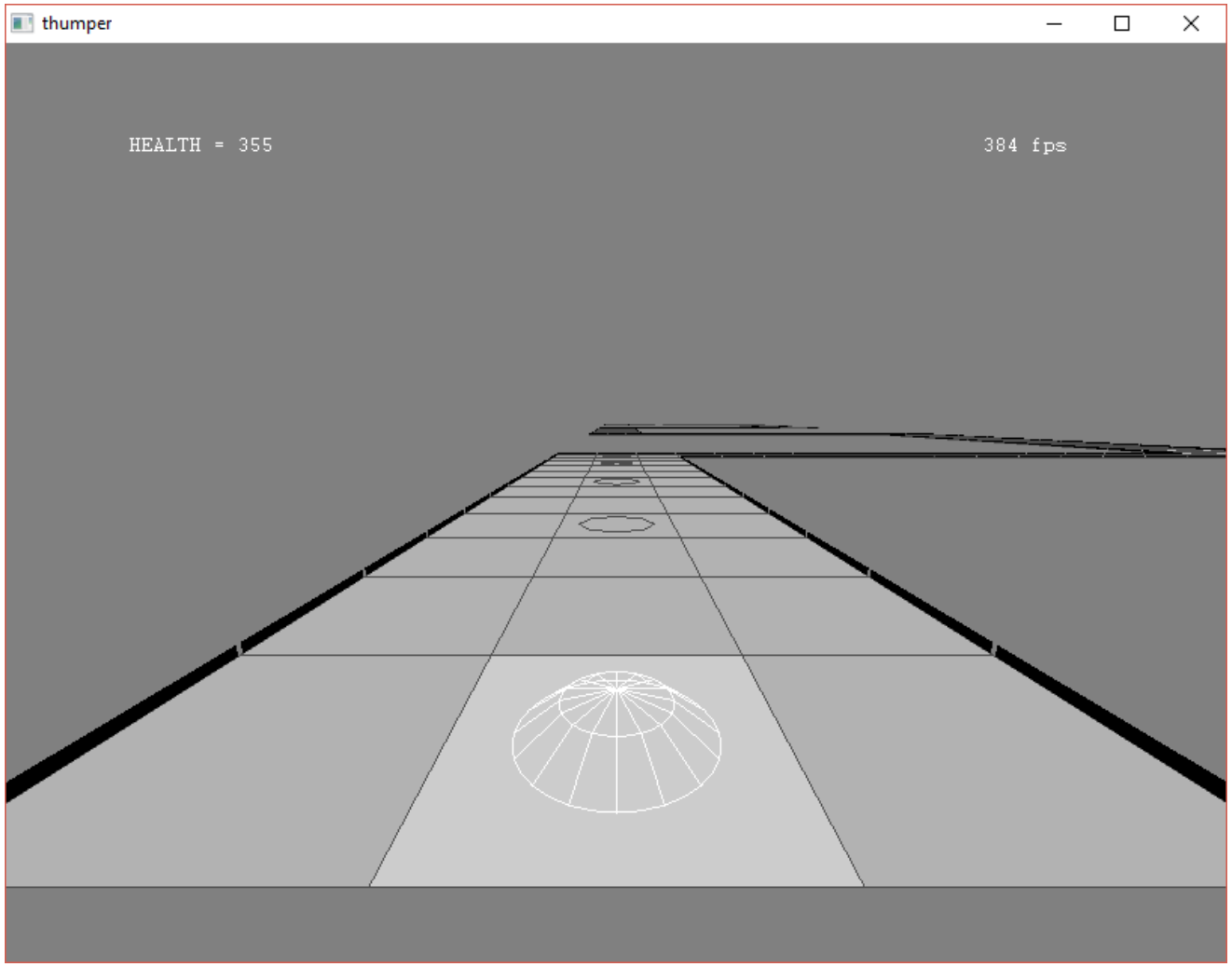

roving
enemy
that
can be
jumped
JUMP OVER THESE
SNARE
BEATMATCH THESE
kick
TURNS
high hat
excitement states
start over
okay
great
streak

JULY 2009



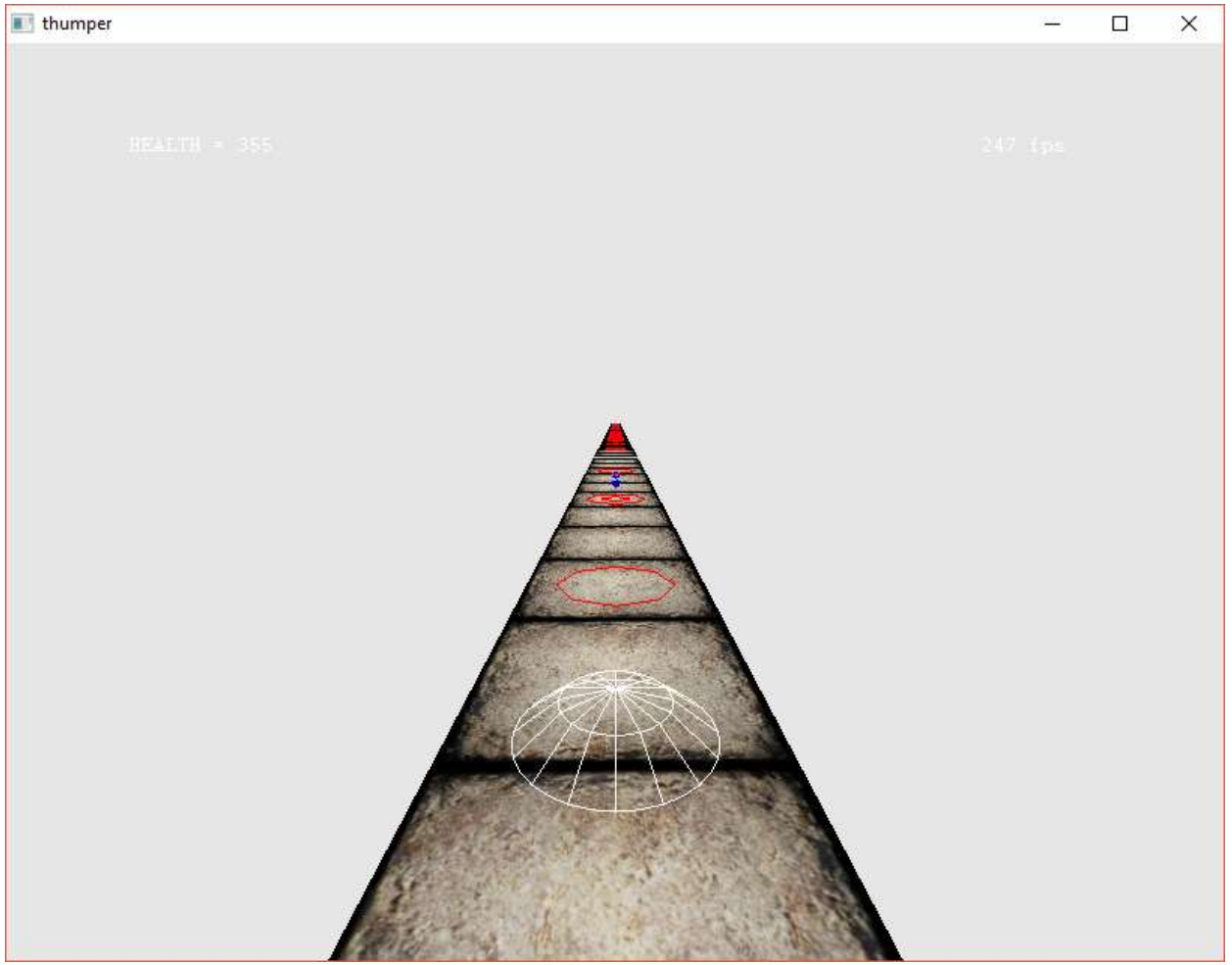
“Sweeeeet! perfectly done!” - Brian

AUGUST 2009



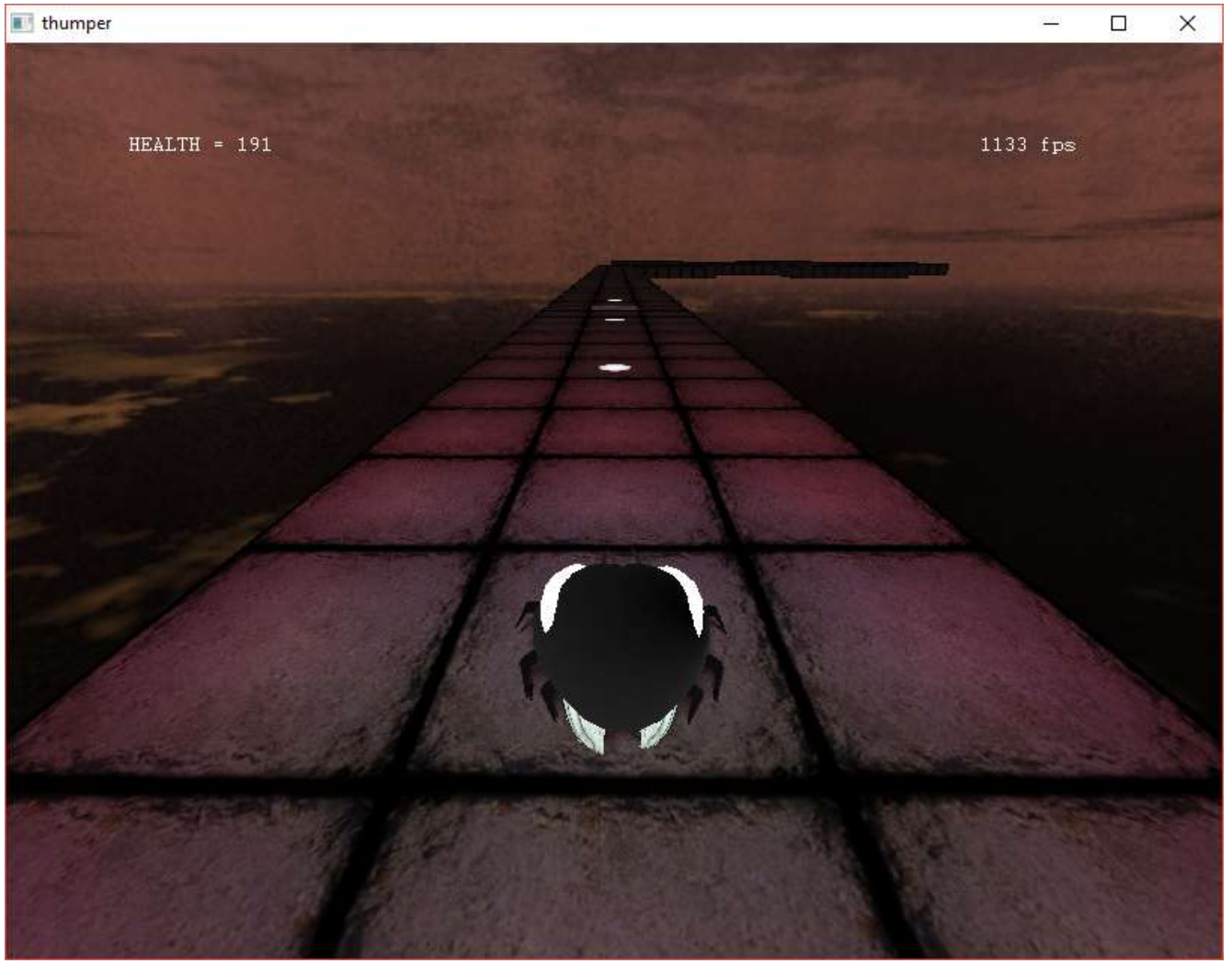
“like 10 christmas' in a row.” - Brian

SEPTEMBER 2009



“Textures!!!” - Brian

OCTOBER 2009



“HOLY NUTTTS!!!” - Brian

Is it interesting?

Will it be interesting for hours?

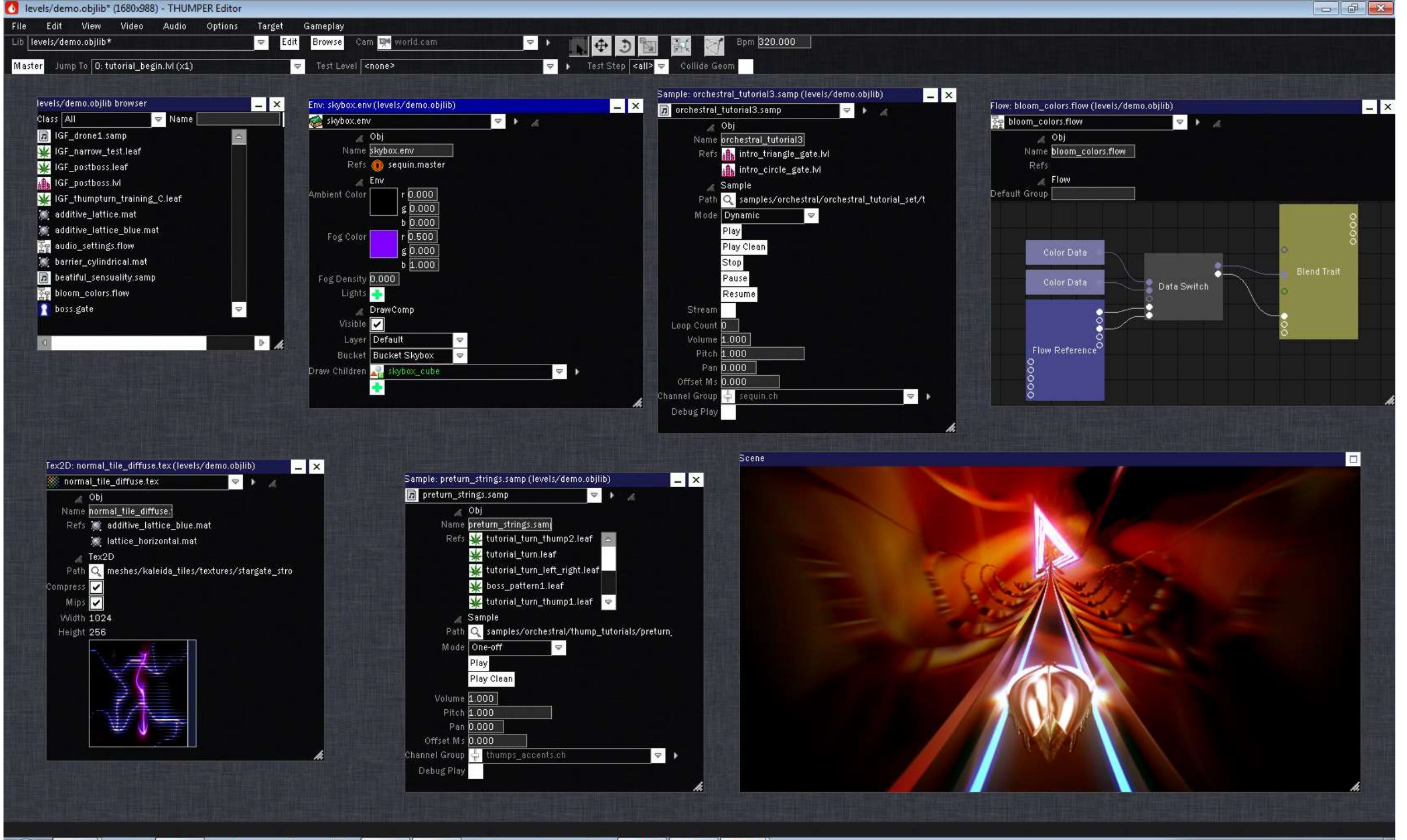
GAMEPLAY PROTOTYPES

2009 - 2011

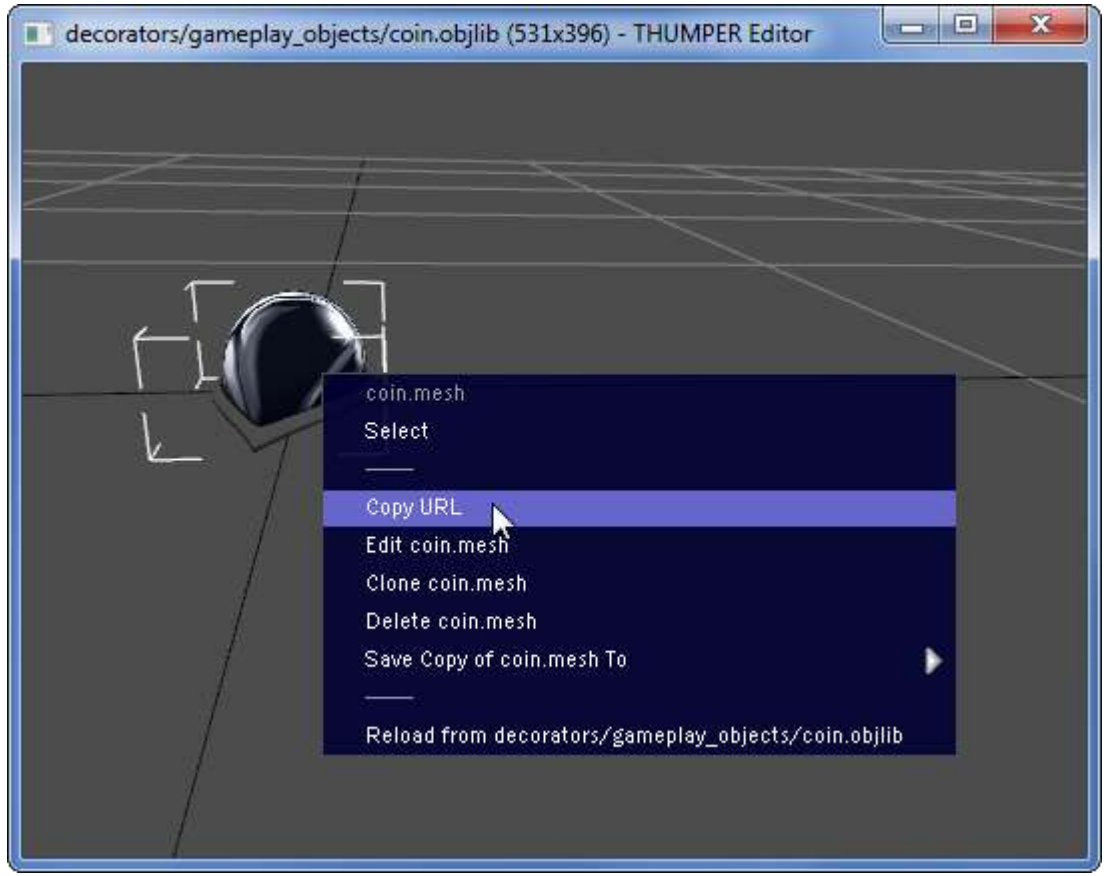
THE WILDERNESS

SEOUL

2011


levels/demo.objlib* (1680x988) - THUMPER Editor
File Edit View Video Audio Options Target Gameplay
Lib levels/demo.objlib* Edit Browse Cam world.cam Bpm 320.000
Master Jump To 0: tutorial_begin.lvl (x1) Test Level <none> Test Step <all> Collide Geom
levels/demo.objlib browser
Class All Name
IGF_drone1.samp
IGF_narrow_test.leaf
IGF_postboss.leaf
IGF_postboss.lvl
IGF_thumpturn_training_C.leaf
additive_lattice.mat
additive_lattice_blue.mat
audio_settings.flow
barrier_cylindrical.mat
beatiful_sensuality.samp
bloom_colors.flow
boss.gate
Env: skybox.env (levels/demo.objlib)
skybox.env
Obj
Name skybox.env
Refs sequin.master
Env
Ambient Color r 0.000 g 0.000 b 0.000
Fog Color r 0.500 g 0.000 b 1.000
Fog Density 0.000
Lights
DrawComp
Visible
Layer Default
Bucket Bucket Skybox
Draw Children skybox_cube
Sample: orchestral_tutorial3.samp (levels/demo.objlib)
orchestral_tutorial3.samp
Obj
Name orchestral_tutorial3
Refs intro_triangle_gate.lvl
intro_circle_gate.lvl
Sample
Path samples/orchestral/orchestral_tutorial_set/t
Mode Dynamic
Play
Play Clean
Stop
Pause
Resume
Stream
Loop Count 0
Volume 1.000
Pitch 1.000
Pan 0.000
Offset Ms 0.000
Channel Group sequin.ch
Debug Play
Flow: bloom_colors.flow (levels/demo.objlib)
bloom_colors.flow
Obj
Name bloom_colors.flow
Refs
Flow
Default Group
Color Data
Color Data
Data Switch
Blend Trait
Flow Reference
Tex2D: normal_tile_diffuse.tex (levels/demo.objlib)
normal_tile_diffuse.tex
Obj
Name normal_tile_diffuse.
Refs additive_lattice_blue.mat
lattice_horizontal.mat
Tex2D
Path meshes/kaleida_tiles/textures/stargate_stro
Compress
Mips
Width 1024
Height 256
Sample: preturn_strings.samp (levels/demo.objlib)
preturn_strings.samp
Obj
Name preturn_strings.sam
Refs tutorial_turn_thump2.leaf
tutorial_turn.leaf
tutorial_turn_left_right.leaf
boss_pattern1.leaf
tutorial_turn_thump1.leaf
Sample
Path samples/orchestral/thump_tutorials/preturn_
Mode One-off
Play
Play Clean
Volume 1.000
Pitch 1.000
Pan 0.000
Offset Ms 0.000
Channel Group thumps_accents.ch
Debug Play
Scene

EDITOR URLS


decorators/gameplay_objects/coin.objlib (531x396) - THUMPER Editor
coin.mesh
Select
Copy URL
Edit coin.mesh
Clone coin.mesh
Delete coin.mesh
Save Copy of coin.mesh To
Reload from decorators/gameplay_objects/coin.objlib

EDITOR URLS

```
drl://path_to_file?obj=object_name
```

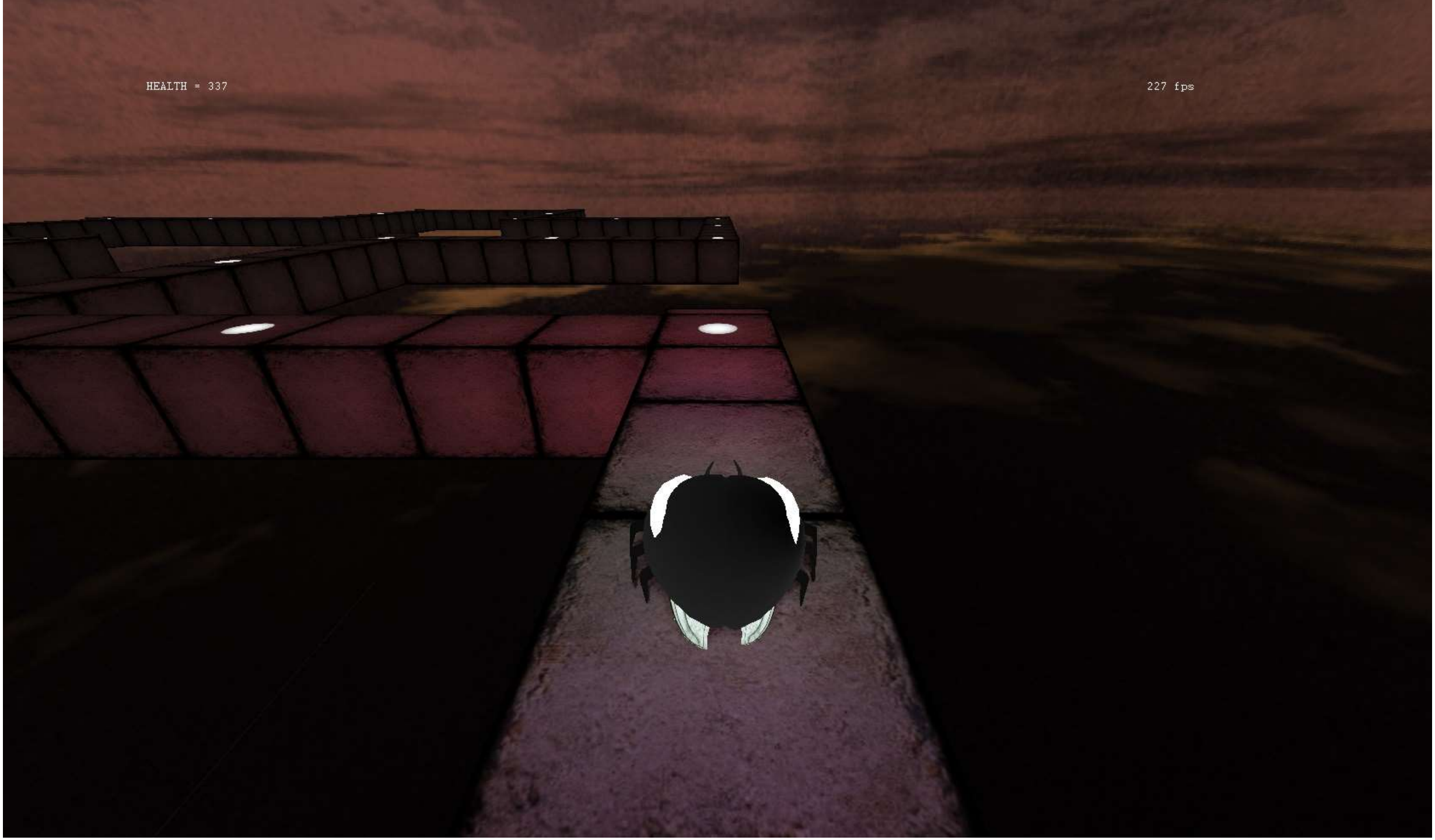
IMPLEMENTATION DETAILS: https://goo.gl/h2wUKE

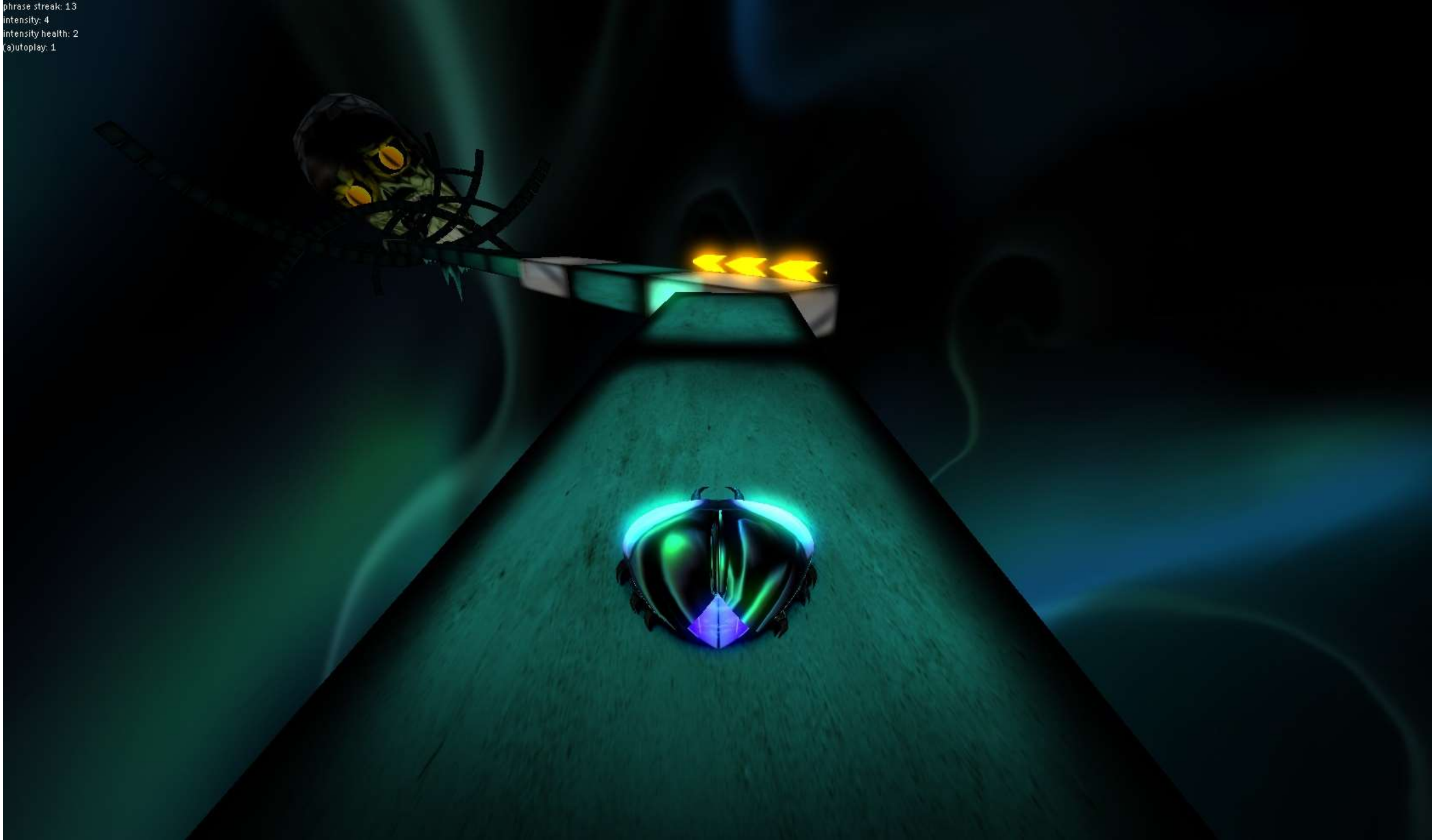
EDITOR URLS

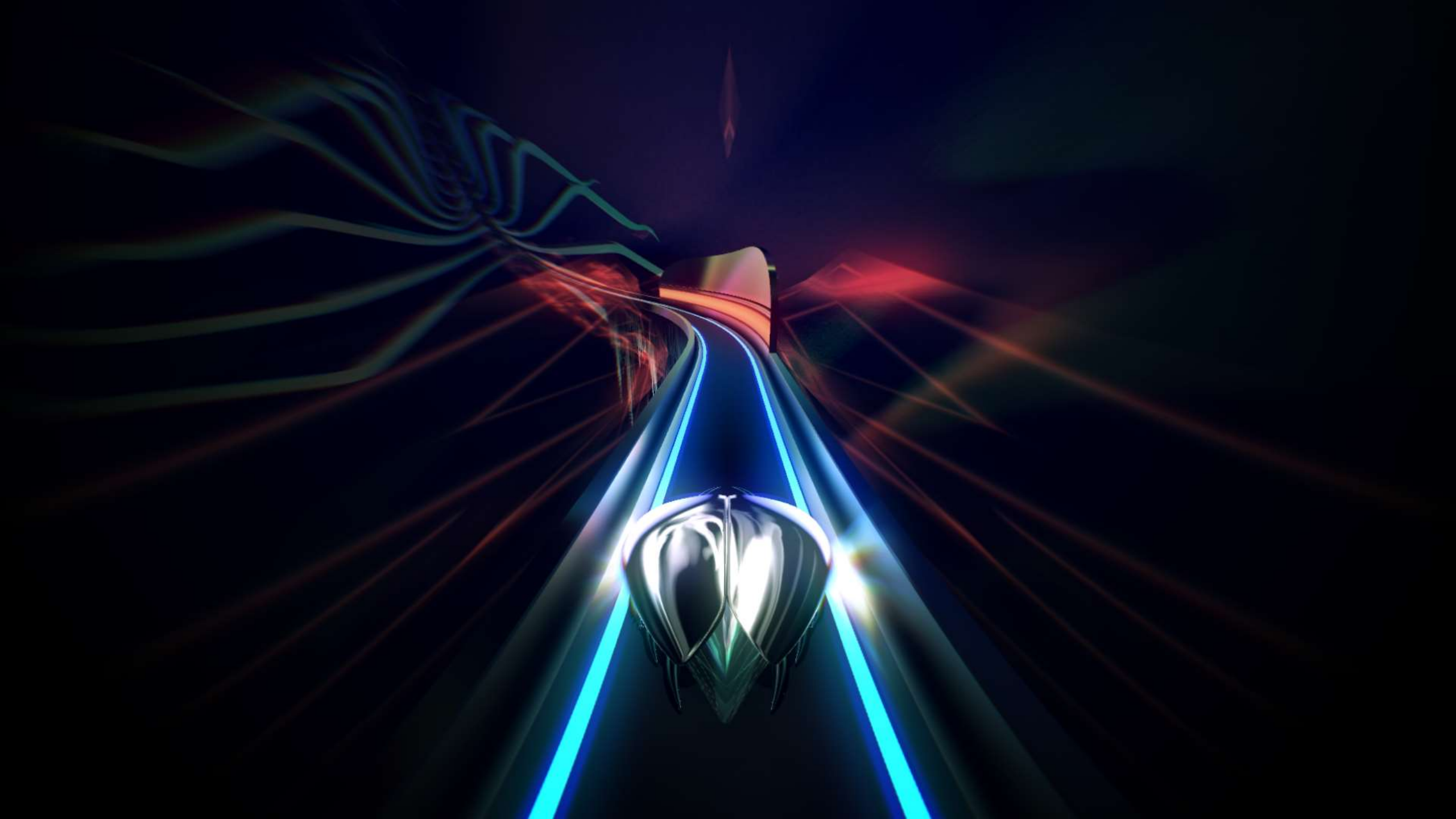
```
drl://path=?obj=level_name&section=section_name
```

IMPLEMENTATION DETAILS: https://goo.gl/h2wUKE

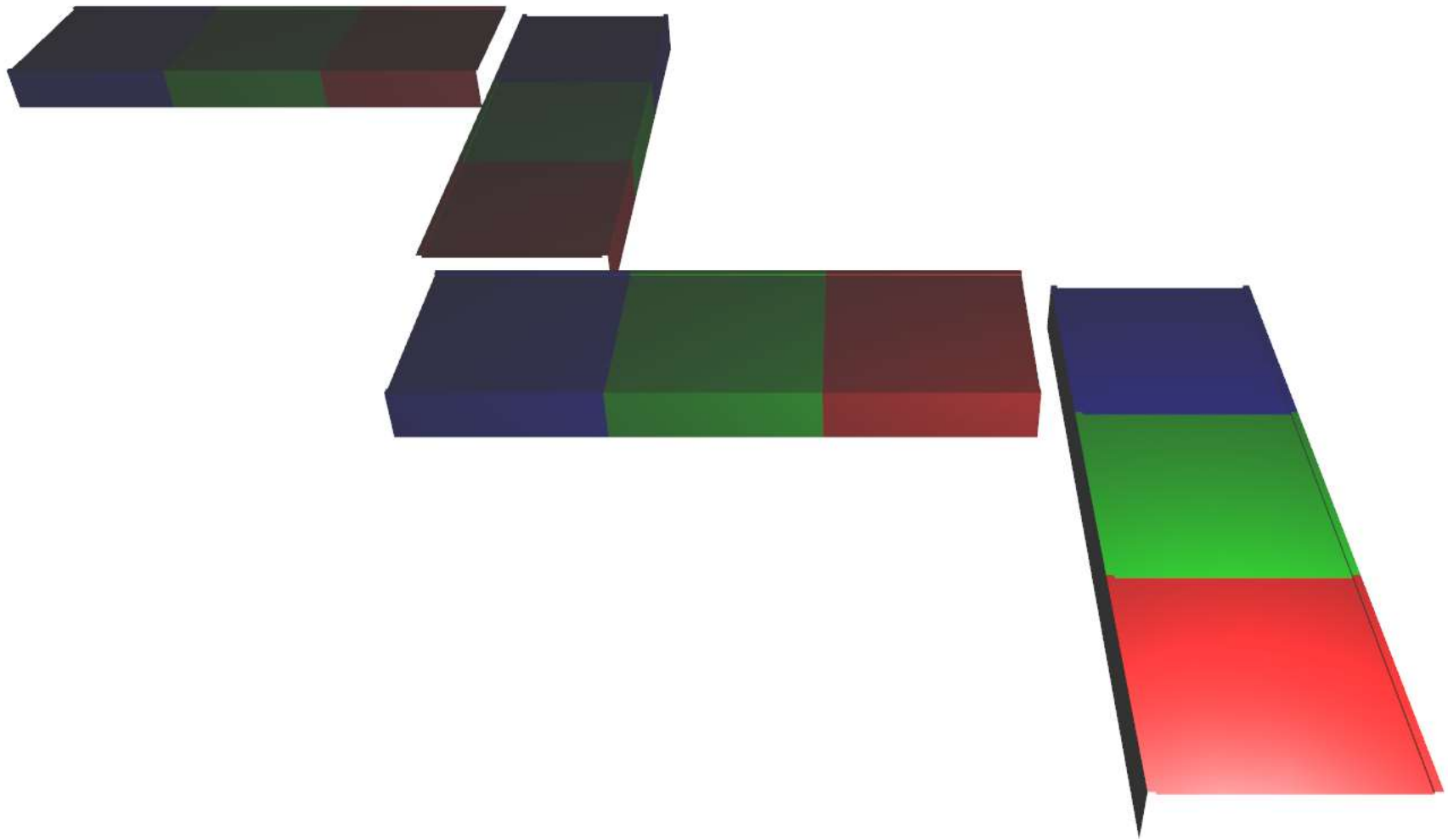
TURNS

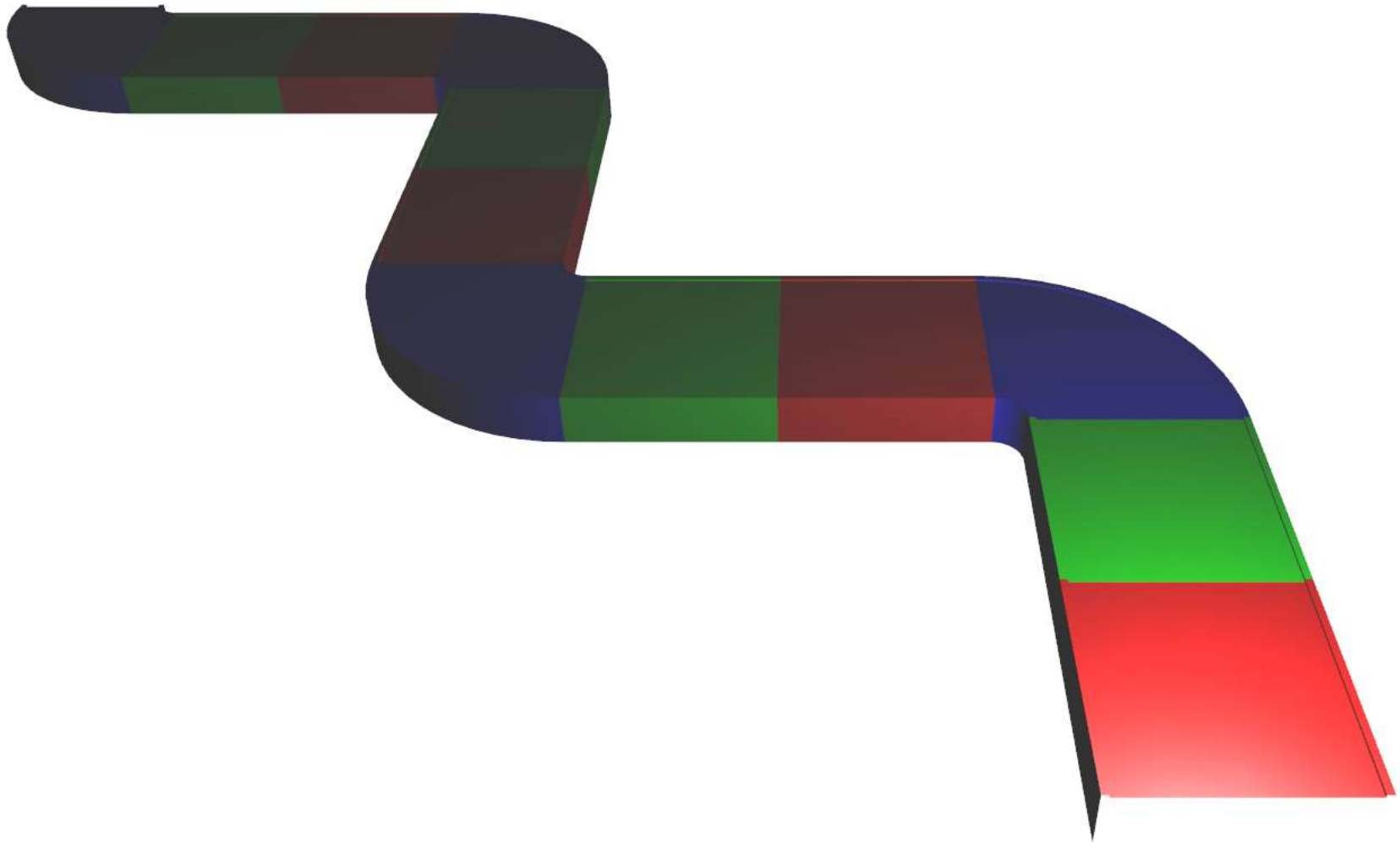

HEALTH = 337
227 fps

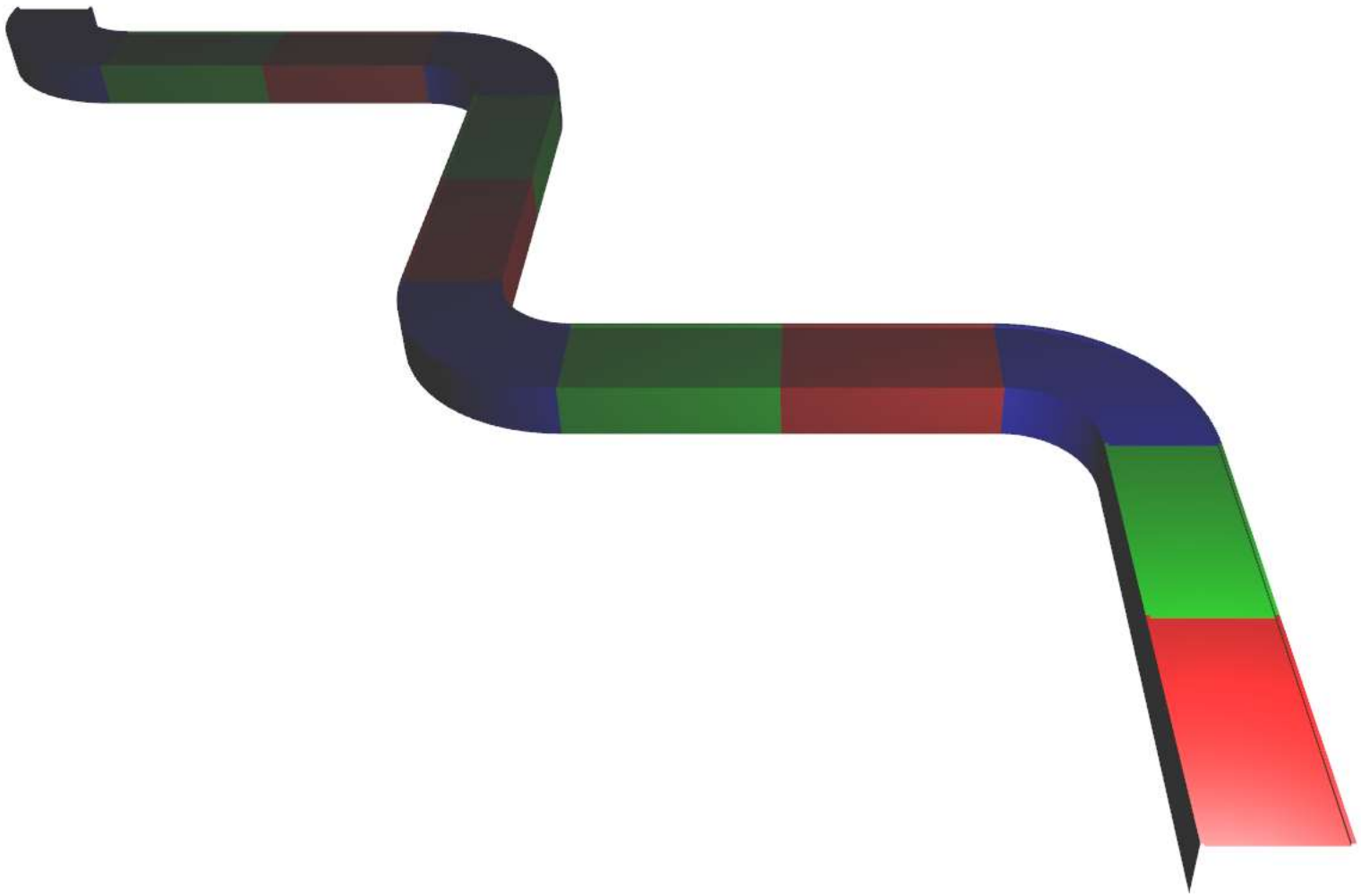

phrase streak: 13
intensity: 4
intensity health: 2
(a)utoplay: 1

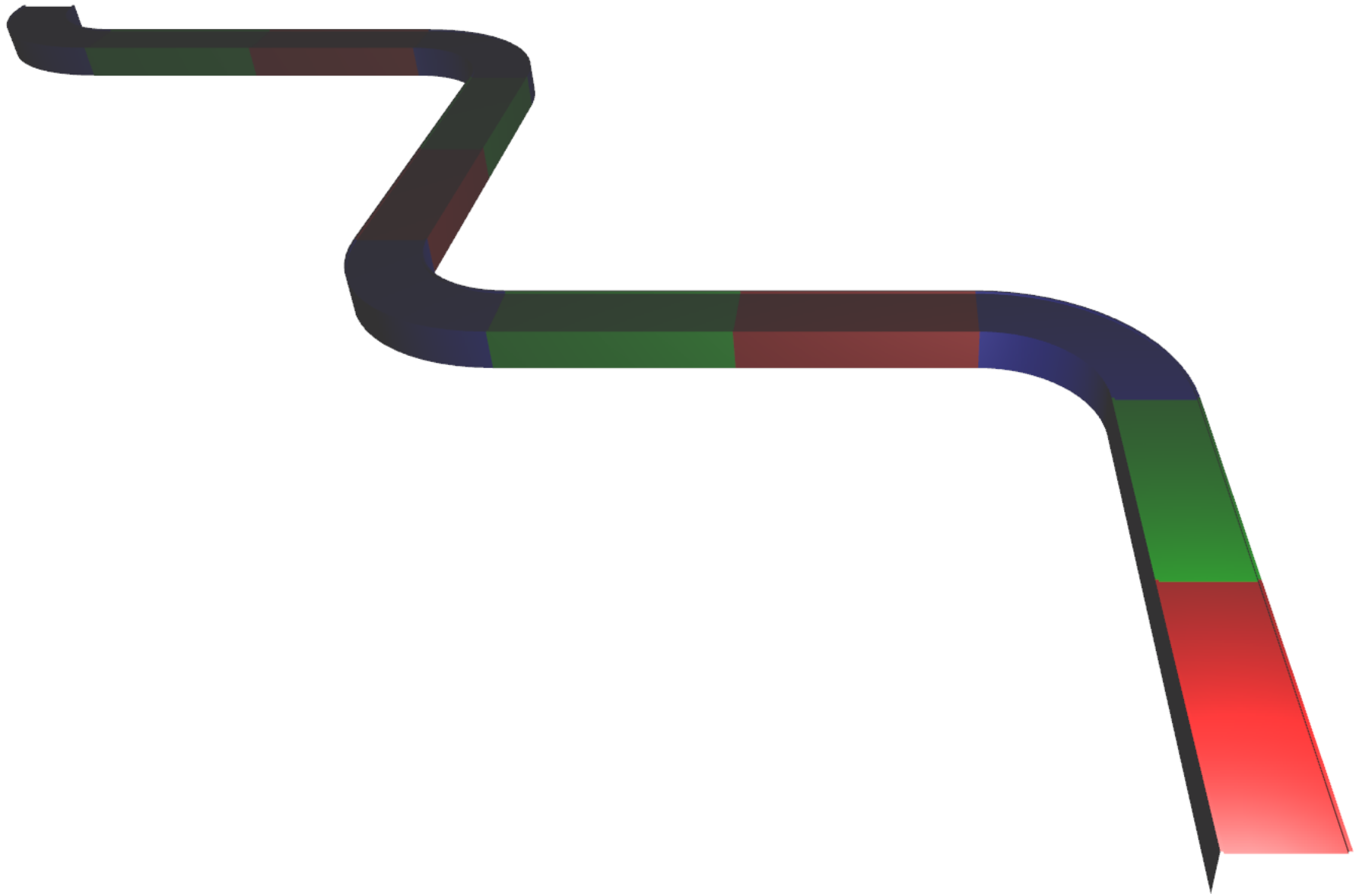


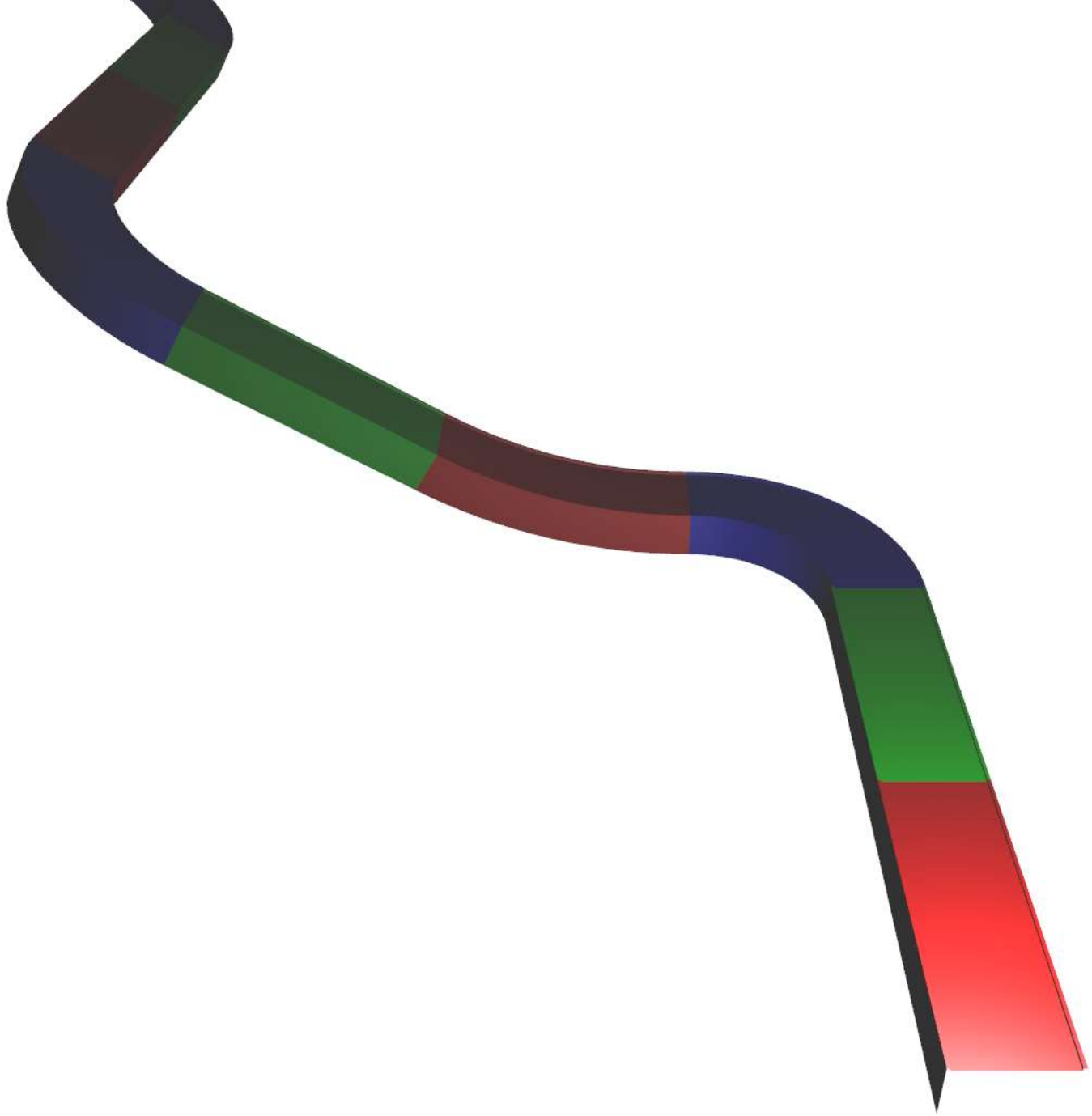
HANOI, JANUARY 2012

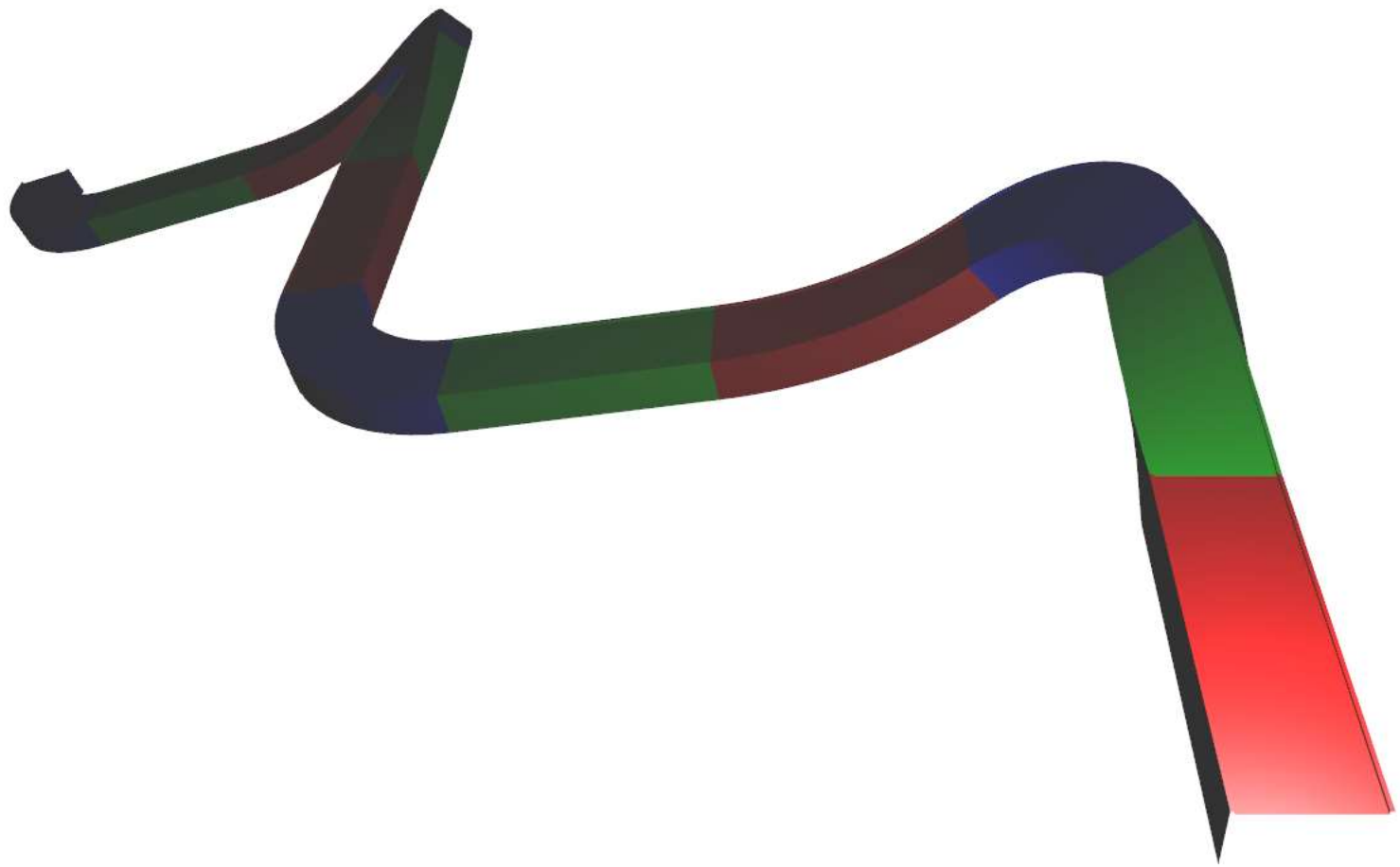


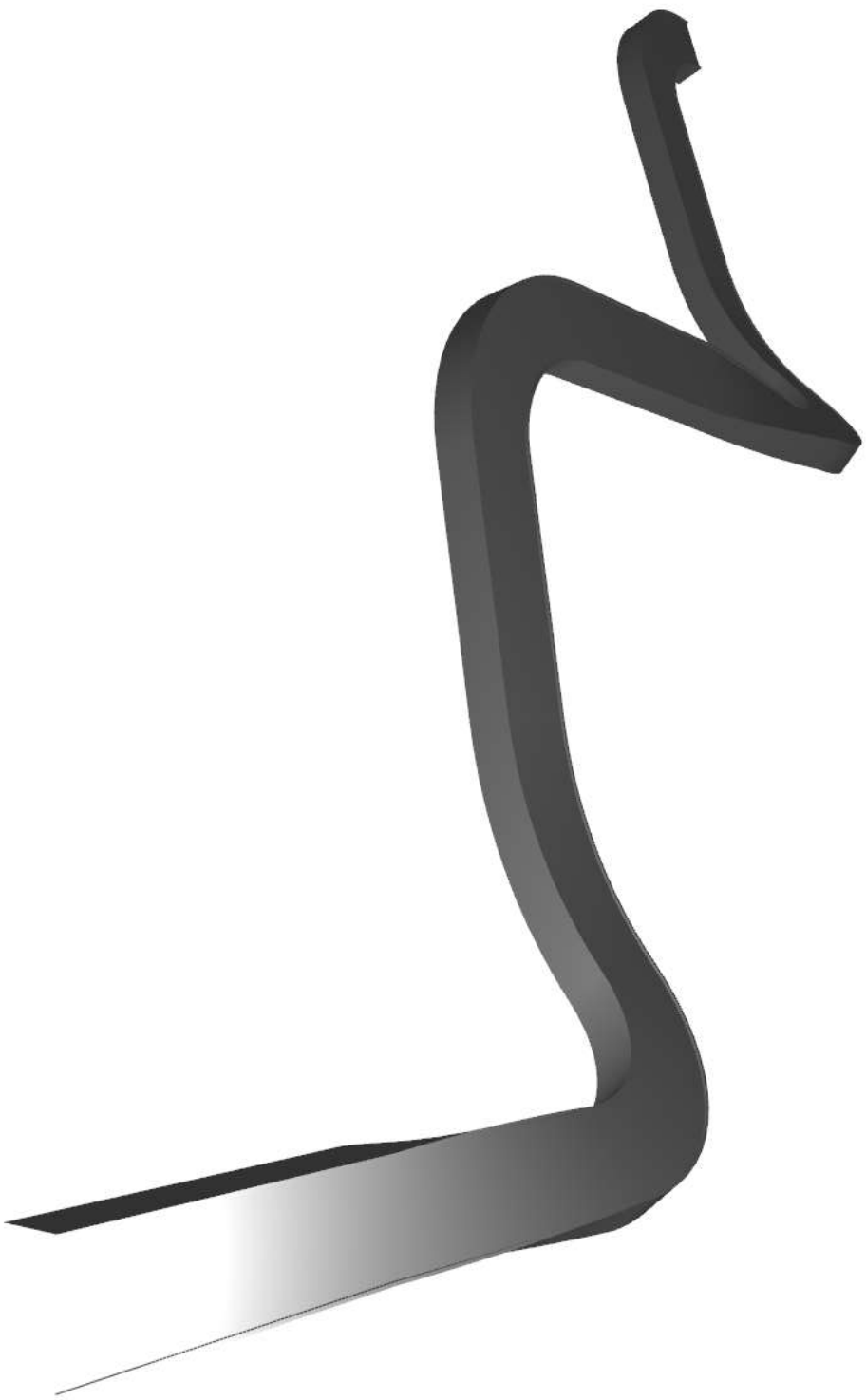


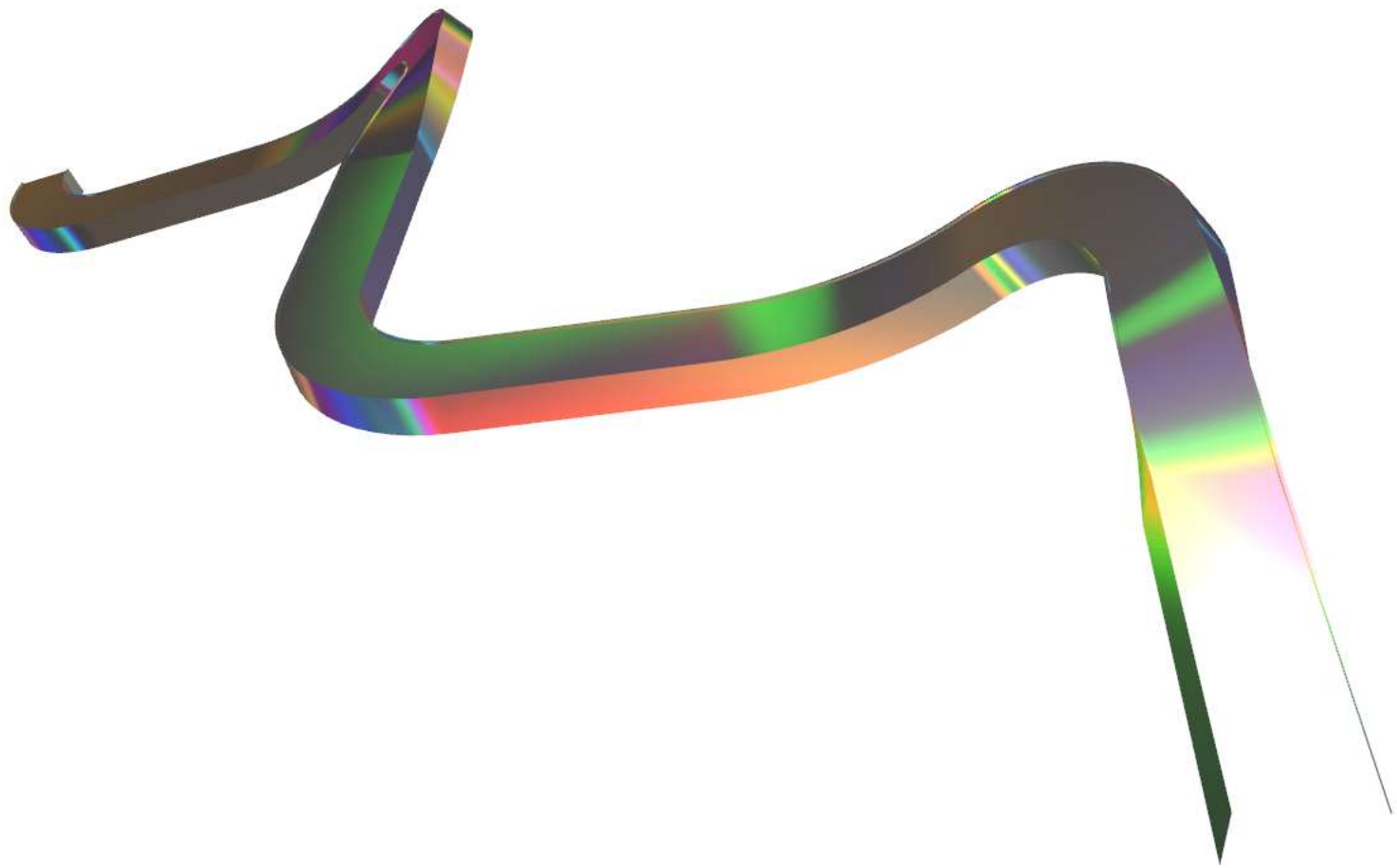


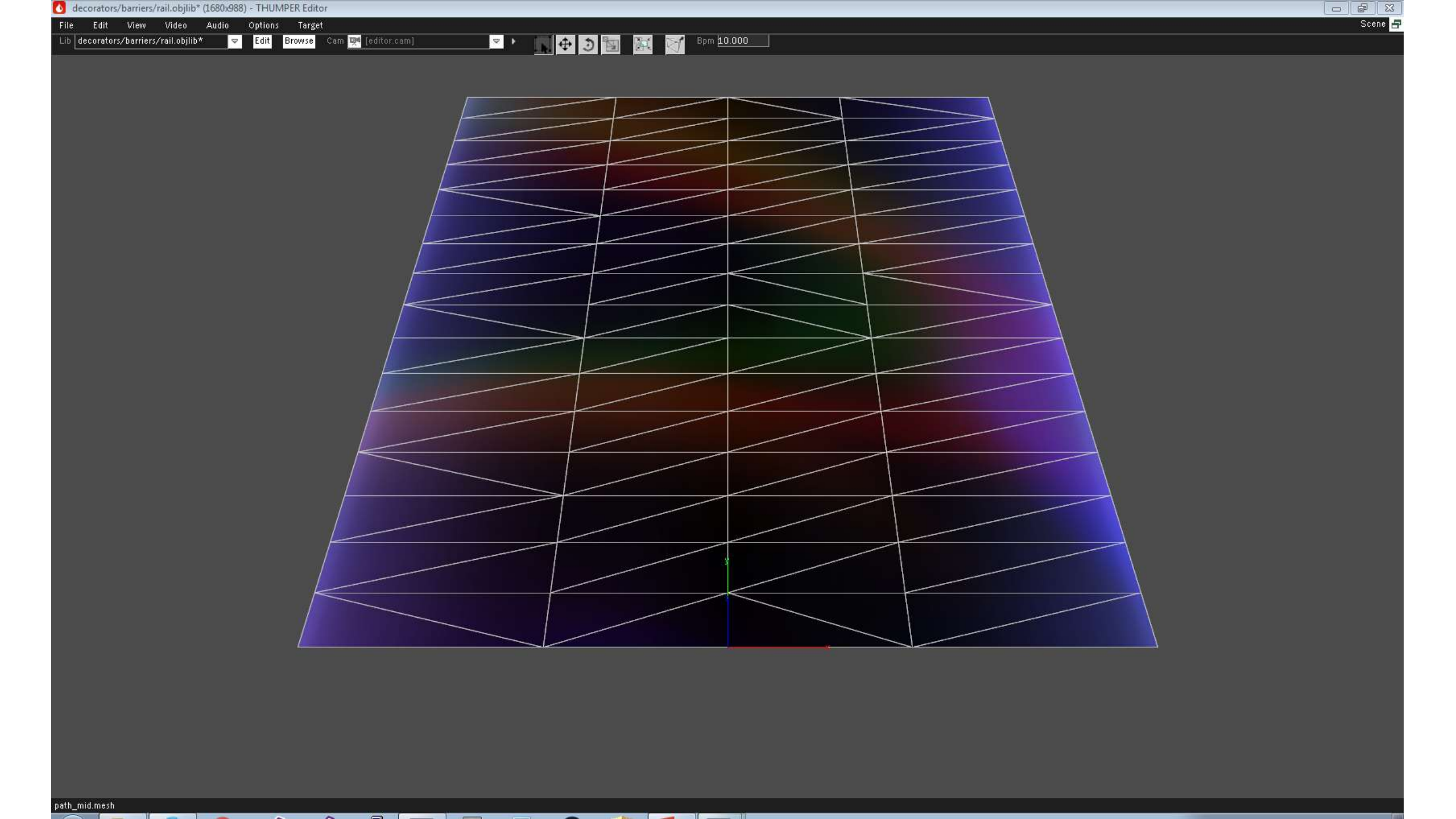


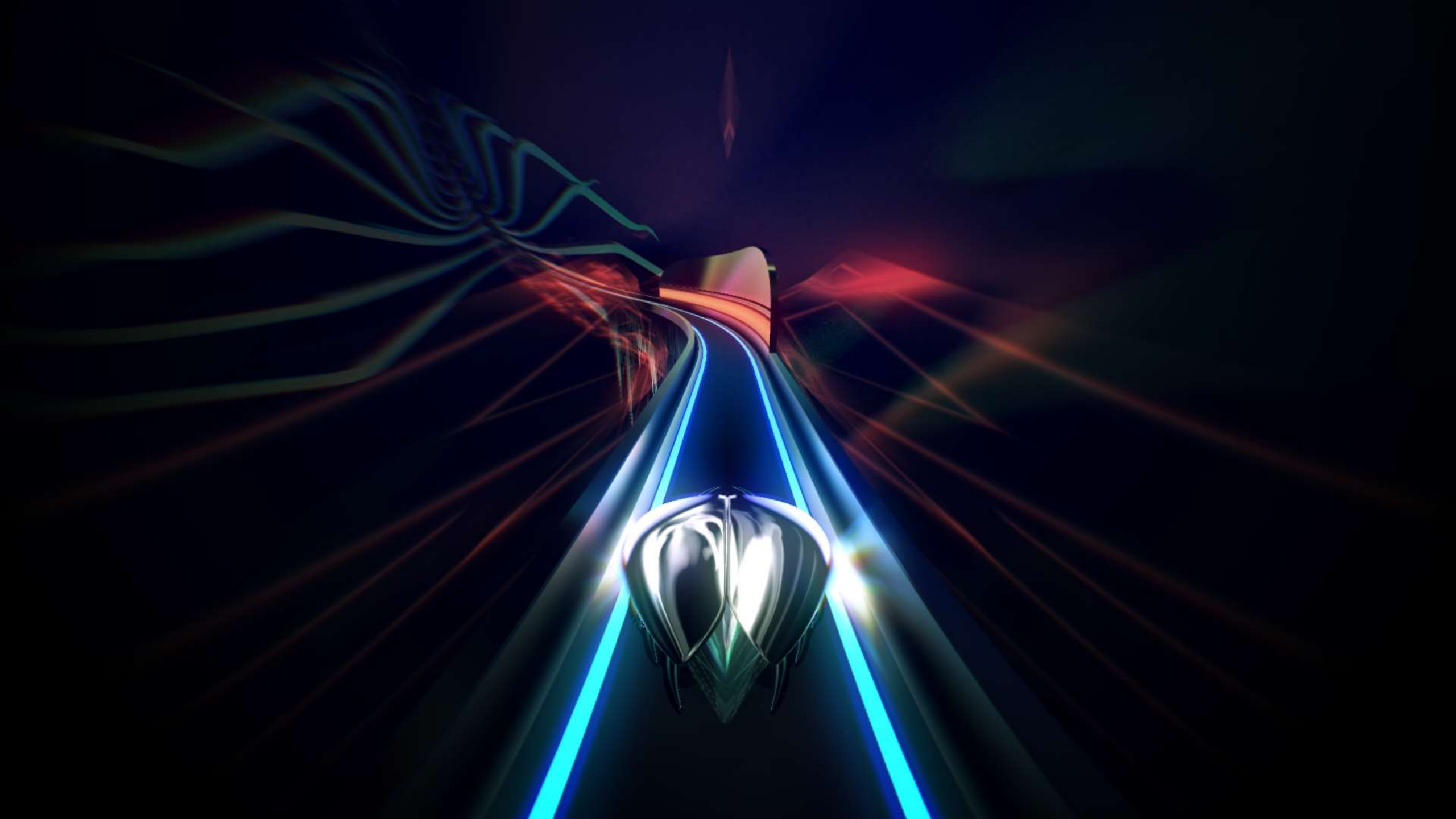


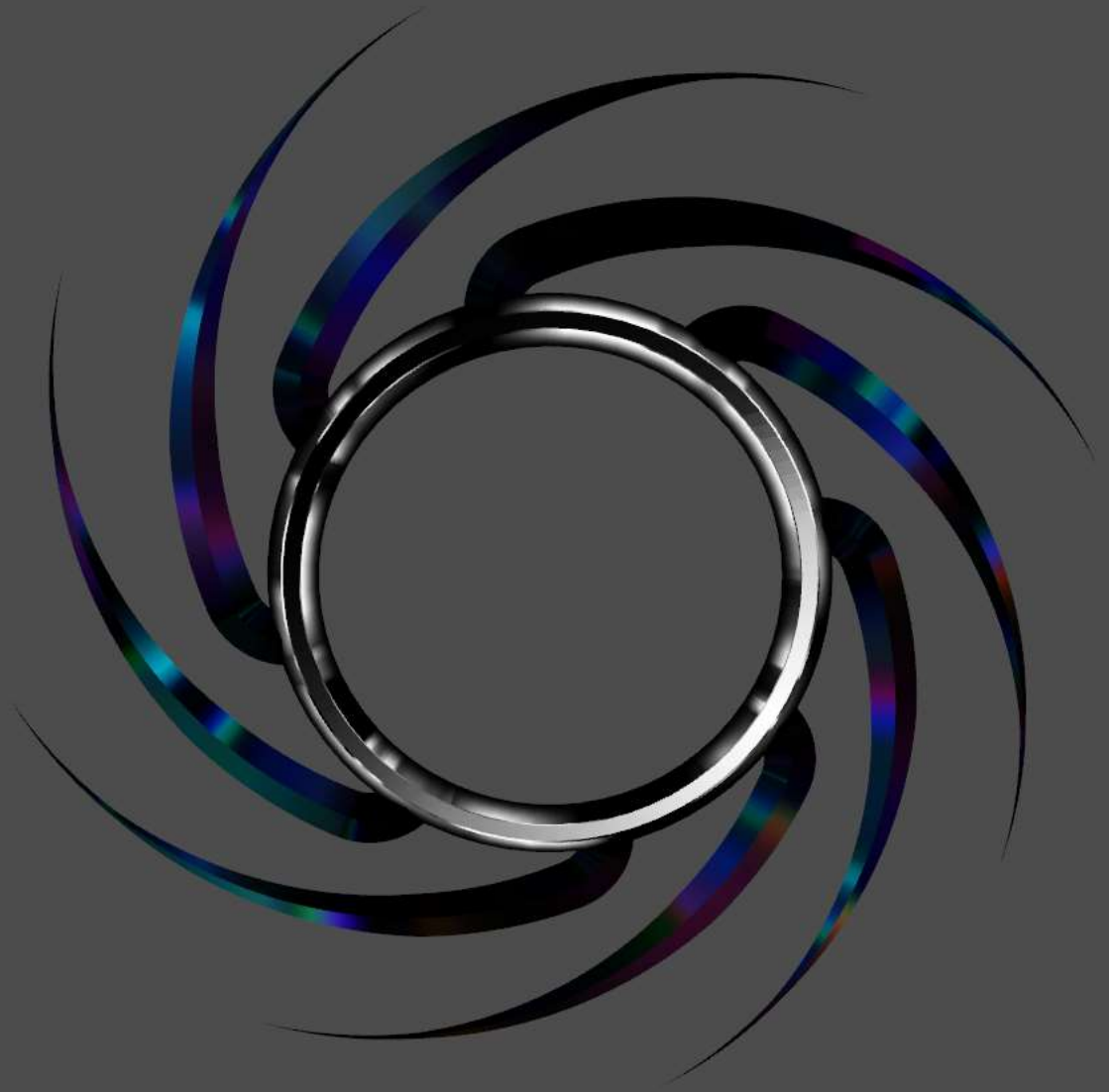


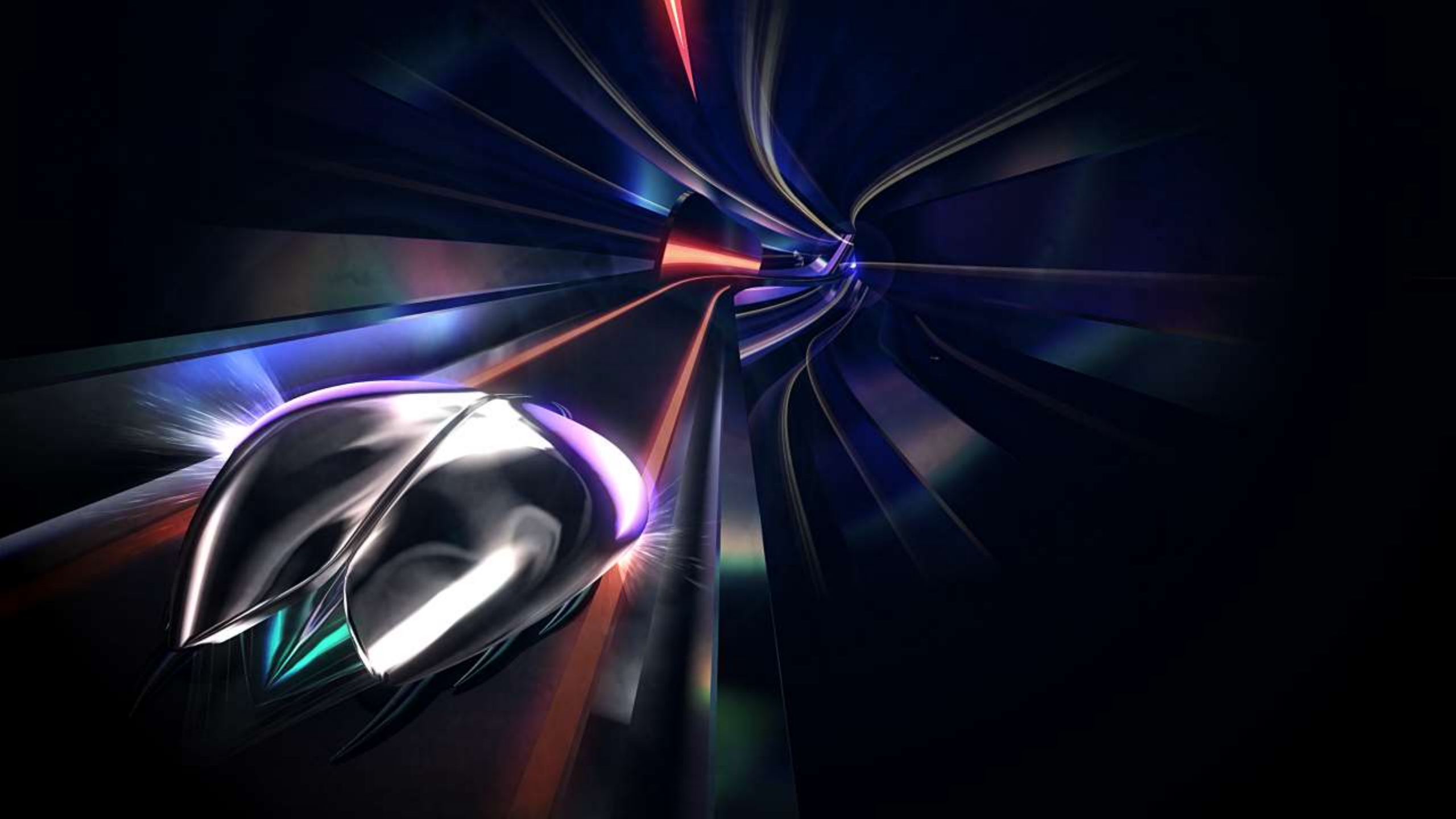




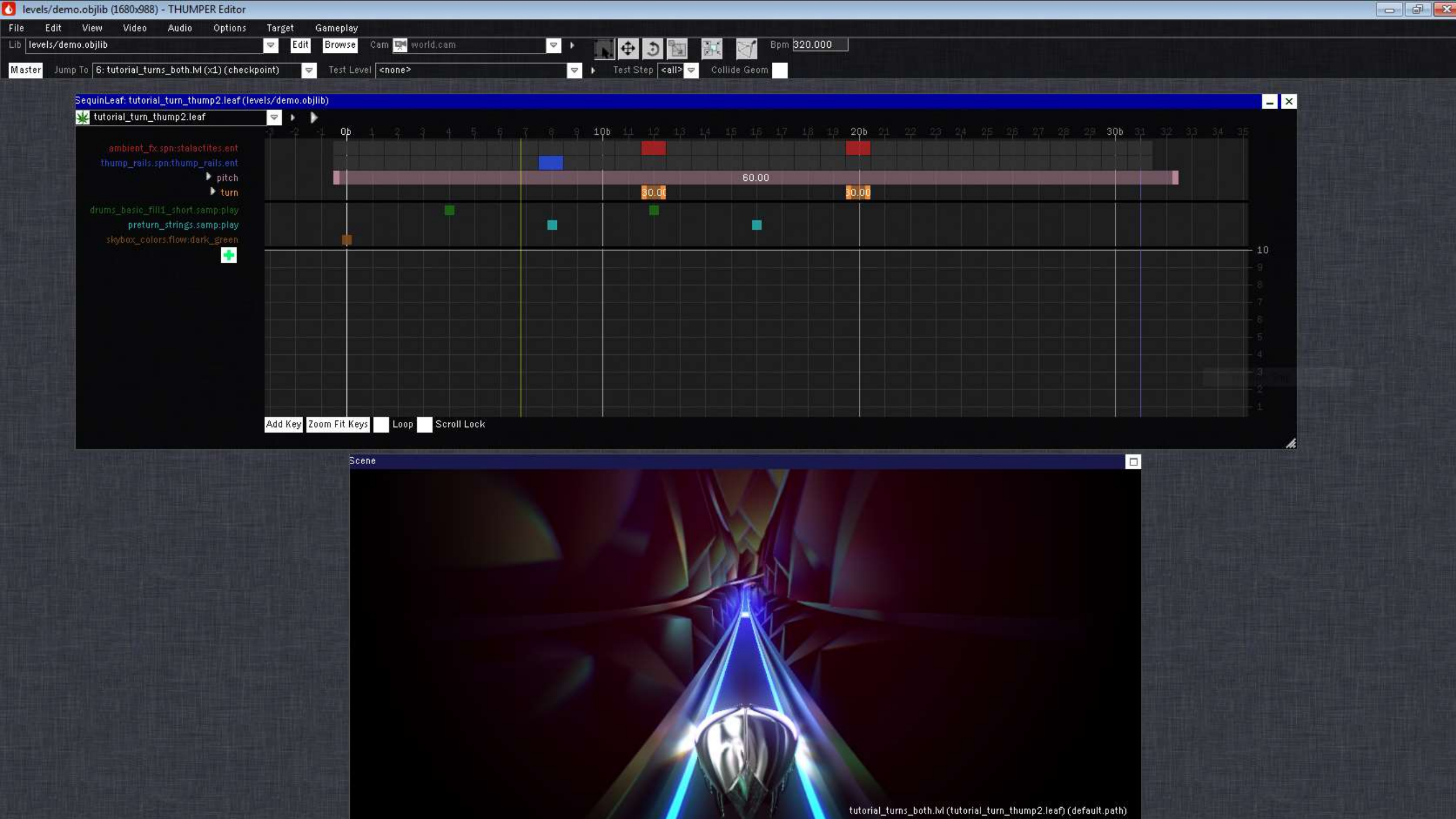

decorators/barriers/rail.objlib* (1680x988) - THUMPER Editor
File
Edit
View
Video
Audio
Options
Target
Scene
Lib
decorators/barriers/rail.objlib*
Edit
Browse
Cam
[editor.cam]
Bpm
10.000
path_mid.mesh







AUDIO


levels/demo.objlib (1680x988) - THUMPER Editor
File
Edit
View
Video
Audio
Options
Target
Gameplay
Lib
levels/demo.objlib
Edit
Browse
Cam
world.cam
Bpm
320.000
Master
Jump To
6: tutorial_turns_both.lvl (x1) (checkpoint)
Test Level
<none>
Test Step
<all>
Collide Geom
SequinLeaf: tutorial_turn_thump2.leaf (levels/demo.objlib)
tutorial_turn_thump2.leaf
ambient_fx.spn:stalactites.ent
thump_rails.spn:thump_rails.ent
pitch
turn
drums_basic_fill1_short.samp:play
preturn_strings.samp:play
skybox_colors.flow:dark_green
60.00
30.00
30.00
Add Key
Zoom Fit Keys
Loop
Scroll Lock
Scene
tutorial_turns_both.lvl (tutorial_turn_thump2.leaf) (default.path)

IGF 2015

EXCELLENCE IN AUDIO NOMINATION

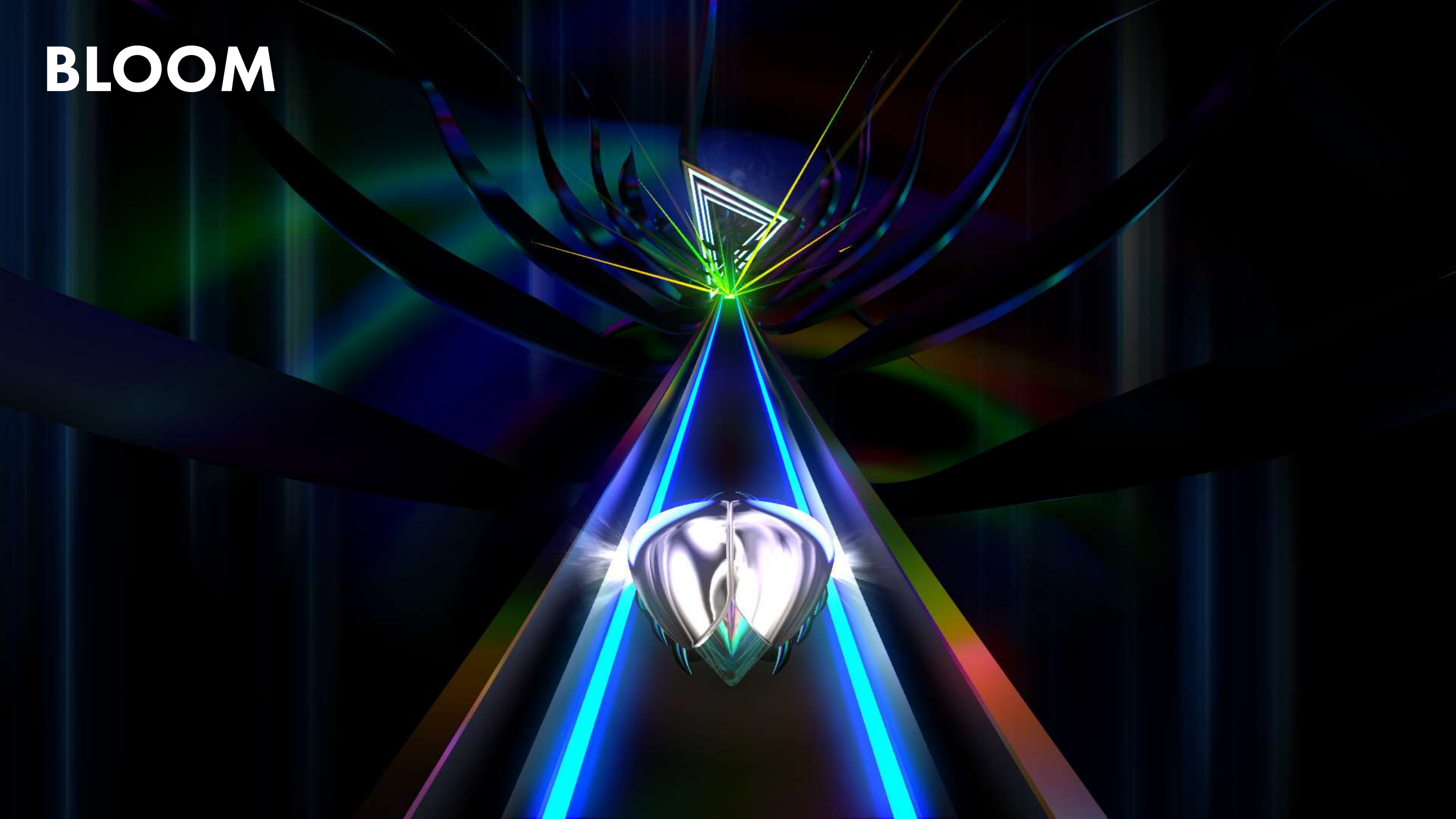
SAN FRANCISCO, MARCH 2015

POST-PROCESSING

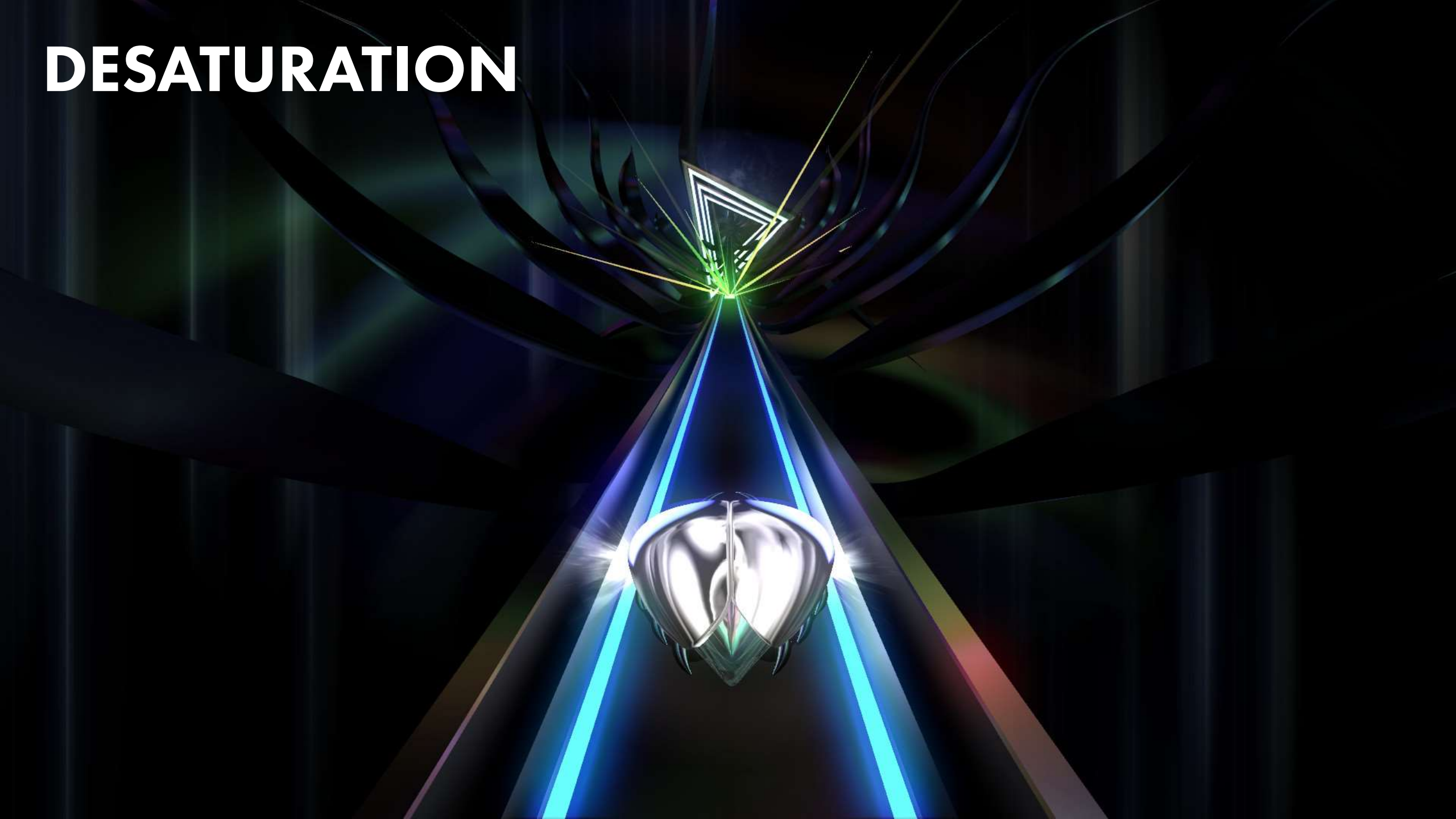
POST-PROCS

NO POST-PROCS

BLOOM



DESATURATION

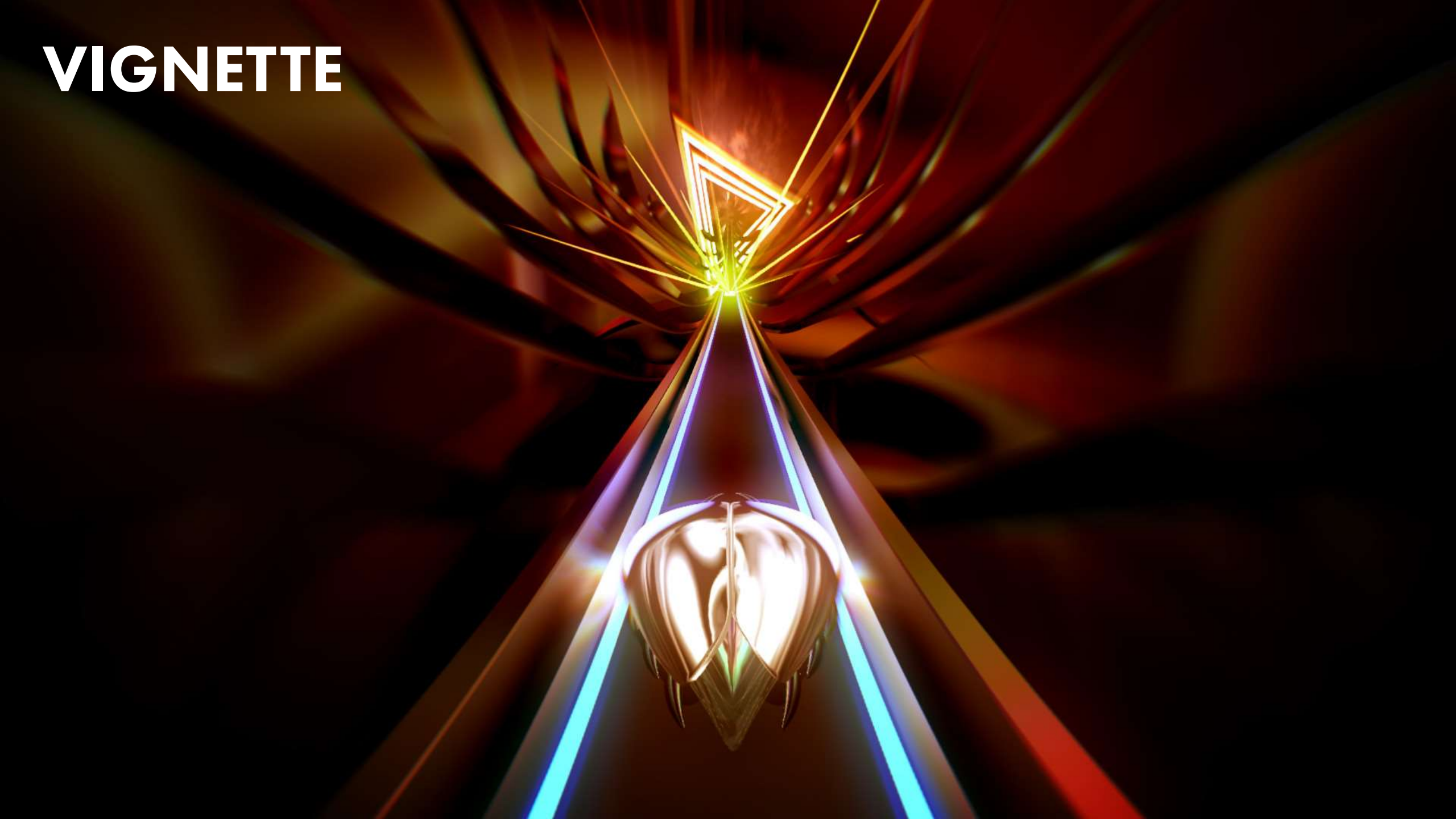


CUBIC DISTORTION

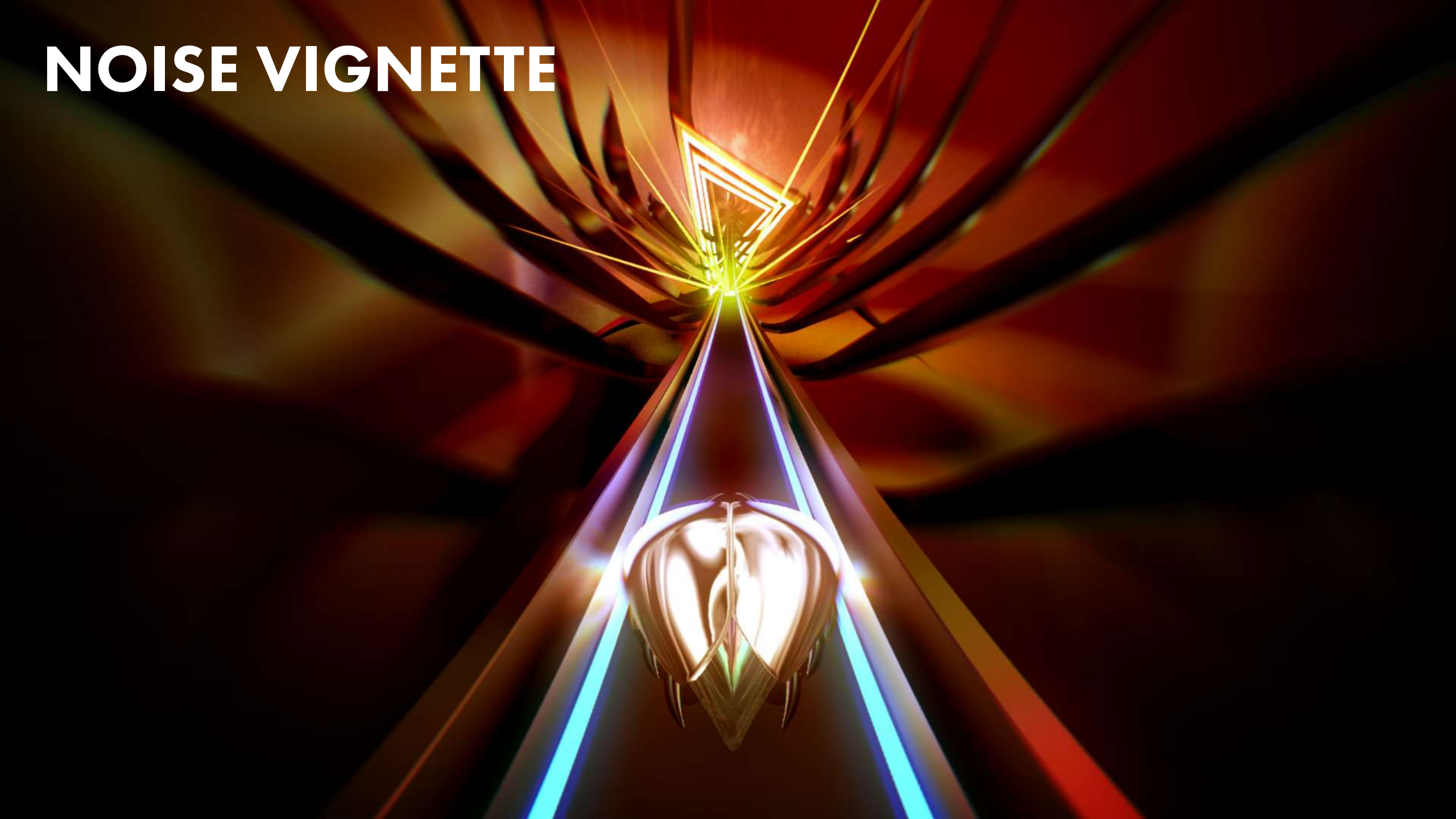
LEVELS

RADIAL BLUR

VIGNETTE



NOISE VIGNETTE



ESSENTIAL VISUAL EFFECTS

- Vertex bend shader
- Reflection maps
- Post-processing

THUMPER DOESN’T USE

- Complex lighting
- Normal maps
- Particle systems

CONFIDENCE

OOP

object-oriented
programming is bad
@brianwill
This work is licensed under a Creative Commons Attribution-ShareAlike 3.0 Unported License.
0:01 / 44:34

Avatar.cpp

- 5000 lines of code
- 90% of gameplay input-handling and logic

Renderer.cpp

- 6000 lines of code
- DX9, DX11, PS4, Oculus, OpenVR, ...
- 90% of graphics code

VR

2016

Designing to Minimize Simulation Sickness in VR Games

Ben Lewis-Evans

Researcher, Player Research

GDC China 2015

SEOUL, FEBRUARY 2016

2D: 150° FOV

VR: 100° FOV

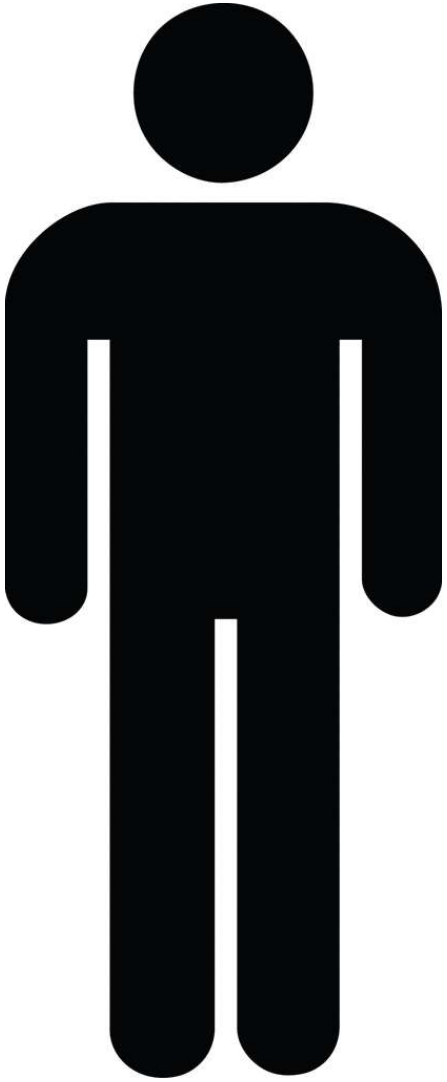
VR: 100° FOV + 2x PATH SCALE

VR: SCALE

ORIGINAL SCALE (TOO SMALL)

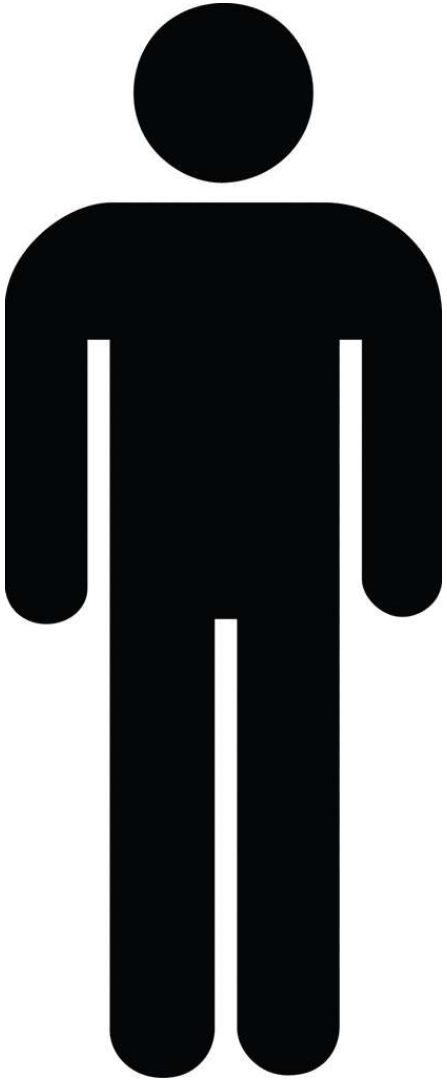
15m

ADJUSTED SCALE (TOO BIG)



15cm

FINAL SCALE



40cm

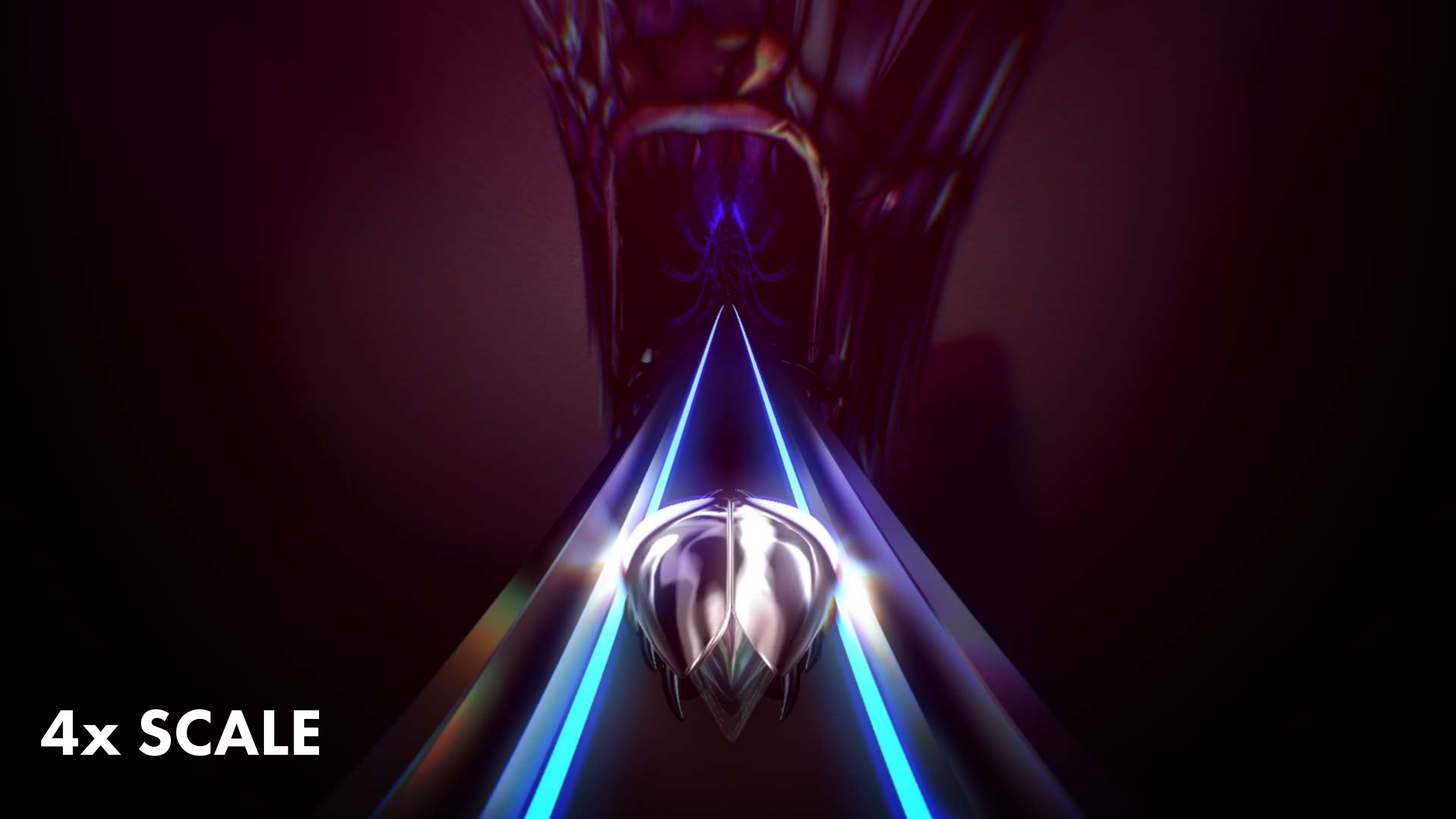
Jeff Minter
@llamasoft_ox

Follow

Played a game where I'm a beetle running down a Hotwheels track snapping pencils whilst under the influence of a hallucinogen.

VR: BOSS SCALE

NO SCALE


4x SCALE

ENDGAME

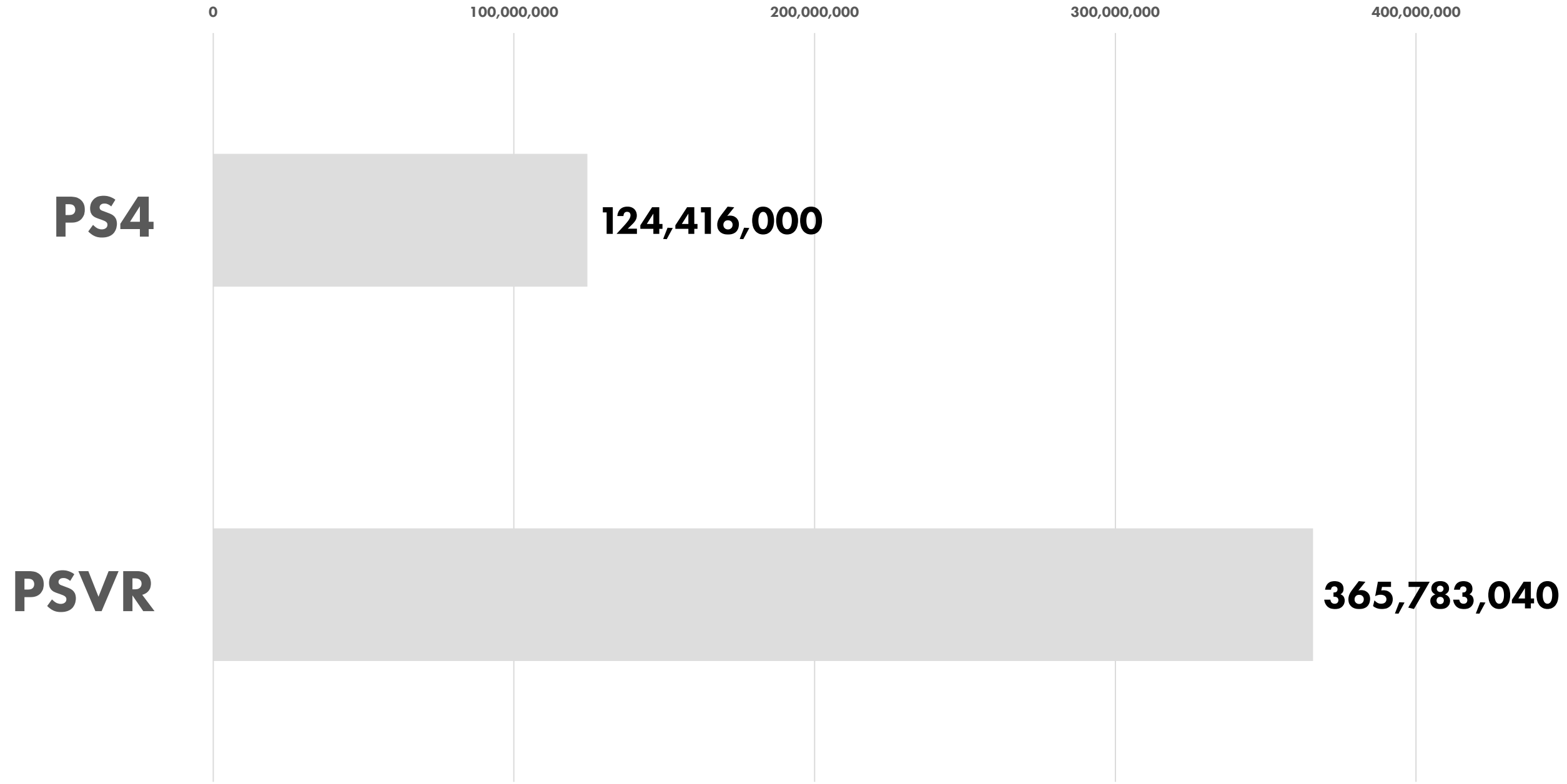
MAY – OCTOBER 2016

OPTIMIZATION

PS4: 1920x1080 @ 60Hz = 124,416,000 pixels/second

PSVR: 1344x1512x2 @ 90Hz = 365,783,040 pixels/second

PIXELS PER SECOND



OPTIMIZATION: GPU

- Multi-slice rendering
- Hardware instancing
- A few platform-specific tricks

MEMORY

Custom Memory Allocation in C++

Niklas Gray

Engine Architect, Autodesk Stingray

http://bitsquid.blogspot.com/2010/09/custom-memory-allocation-in-c.html

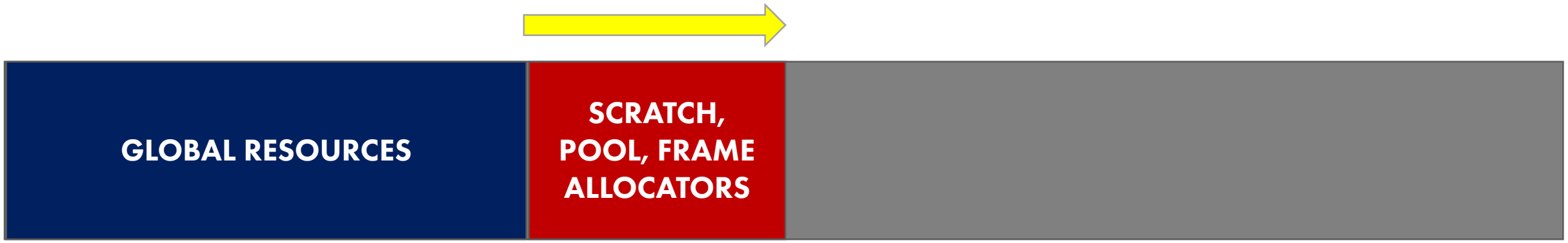
```
void* operator new (size_t size)
{
    ASSERT(false);
    return 0;
}
```

```
~Allocator()
{
    ASSERT(total_allocated == 0);
}
```

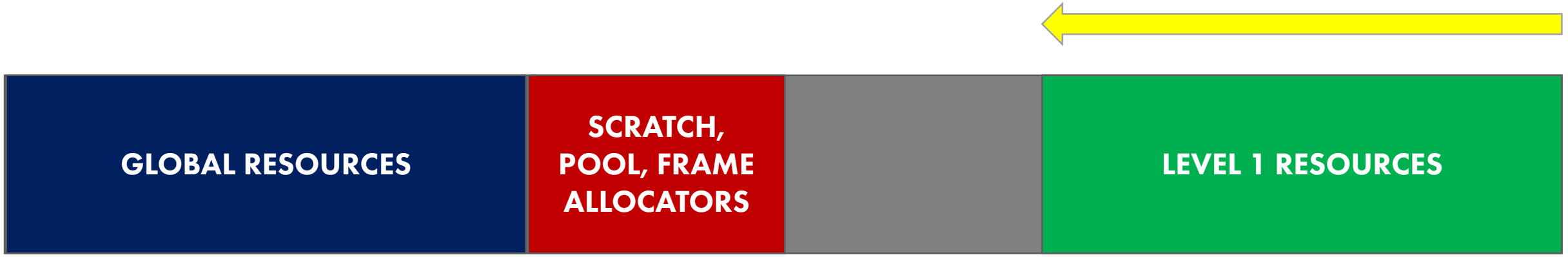
STARTUP ALLOCATION (malloc)

GLOBAL RESOURCES (Stack Allocator)

RUNTIME ALLOCATORS

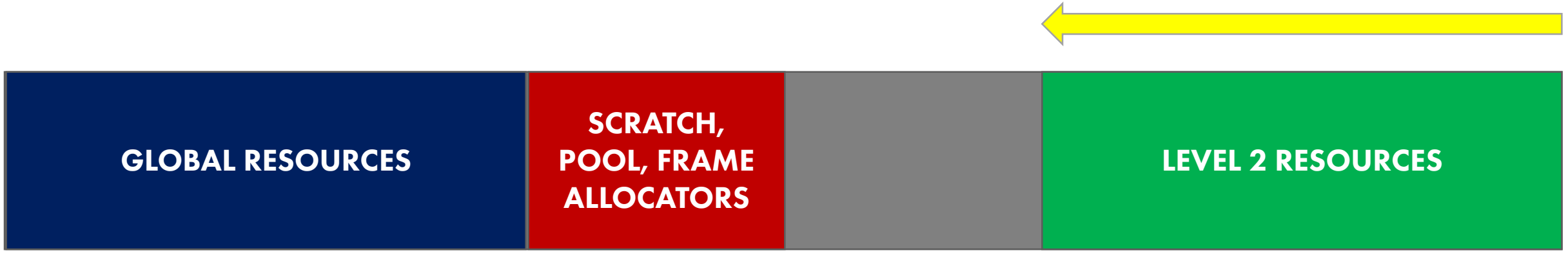


LEVEL LOADING



LEVEL UNLOADING

LEVEL LOADING



CUSTOM ALLOCATORS

- **Stack**
- **Pool**
- **Scratch**
- **Frame**

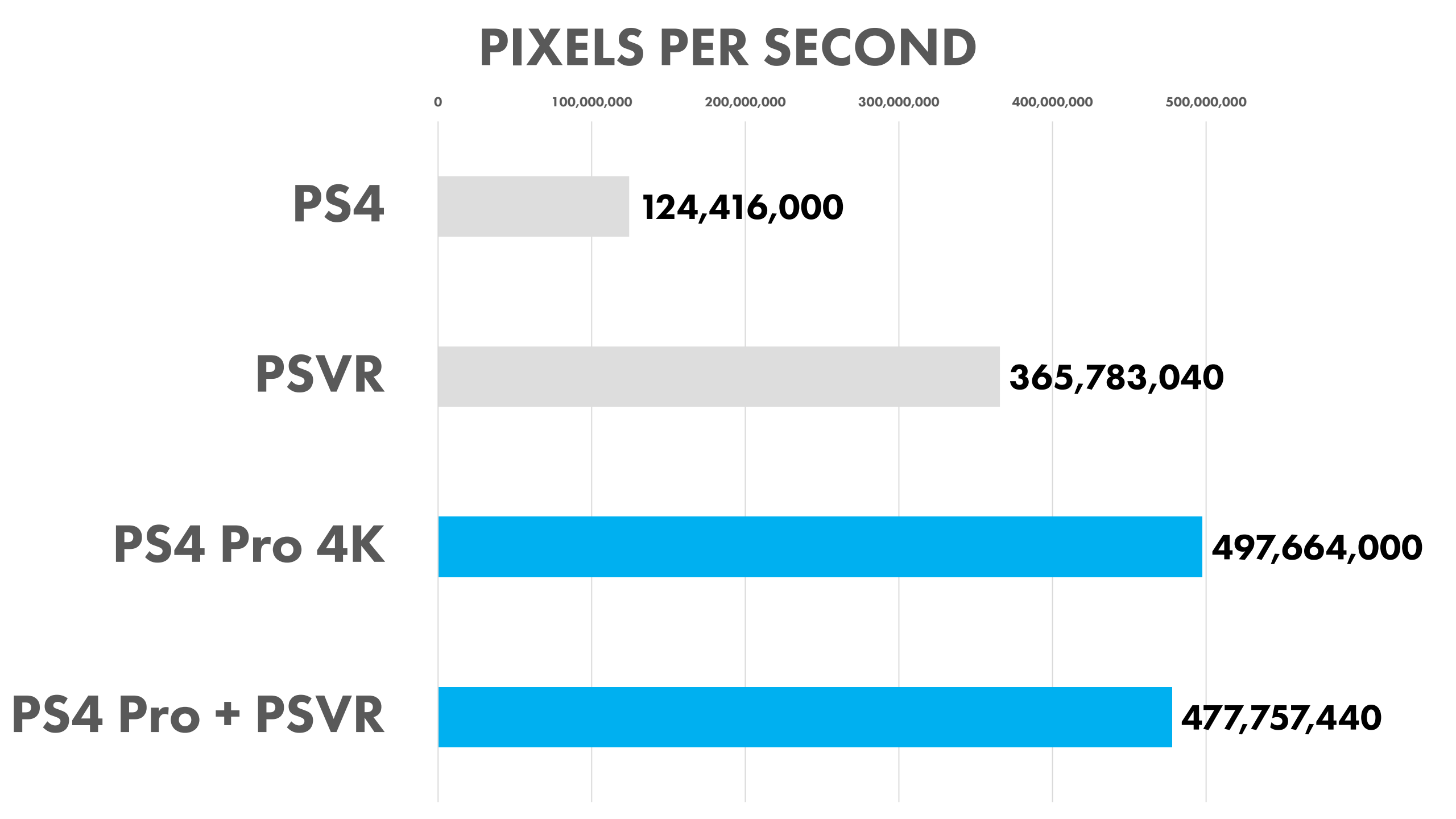
OPTIMIZATION: ART DIRECTION

- **Minimal aesthetic**
- **One or two key visual elements**
- **Defend what is critical, cut the fat**

PS4 PRO

Native 4K (PS4 Pro)
3840x2160 @ 60Hz = 497,664,000 pixels/second
(4x MSAA)

PSVR (PS4 Pro)
1536x1728x2 @ 90Hz = 477,757,440 pixels/second
(1.6x supersampling + 8x MSAA)


PIXELS PER SECOND
0
100,000,000
200,000,000
300,000,000
400,000,000
500,000,000
PS4
124,416,000
PSVR
365,783,040
PS4 Pro 4K
497,664,000
PS4 Pro + PSVR
477,757,440

PLAY TESTING

PLAY TEST HEROES

Orion Rigel Dommisse
Matt Perlot
Arnaud Vannier
Bennett Foddy
Chris Hartelius
Daniel Chace
Dare Matheson
Jeff Tangsoc
Joey Godard
Jon Carter
Jonathan Beilin
Kevin Regamey
Kevin Roverud
Robert Ashley
Ryan Lesser
Sanatana Mishra
Sun Park
Youngmin Park

NO QA, BUT...

- Lots of game shows (20+)
- 3 PS4 Kiosk demos
- PSVR demo disc
- Multiple Sony VR consultations

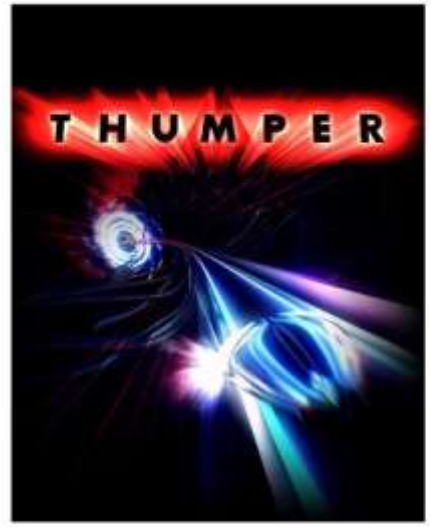
Zach Huntley

架け橋

kakehashi
games

Chris Dwyer
@junklatch

RELEASE

WHAT I PLAYED	WHAT I EXPECTED
	

WHAT I MOTHERFUCKING GOT

NOT DONE YET

- Pressure to sustain and maximize
- VIVE + Oculus support
- Support / bugs / customer service
- ???

Q&A
marc@drool.ws