

INDEPENDENT GAMES
SUMMIT

Making Your Own Tools & Hidden Benefits

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Past games

Soul Bubbles



Pixeljunk Shooter



Tearaway

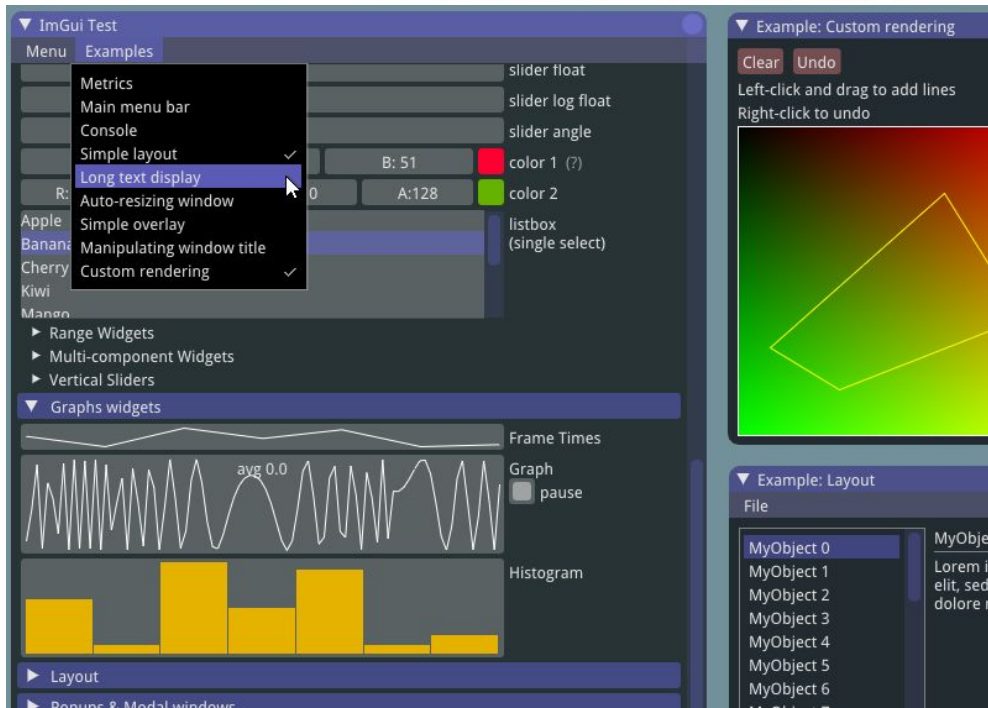


- Bottom-up game designs, building everything as we go
- Custom tools, always evolving specs



“dear imgui”

- Free software C++ library
- UI toolkit aimed at games developers
- Self-contained (9 files!)
- Portable



Sources at <http://www.github.com/ocornut/imgui>



Why do we need our own tools?

- Most ready-made engines are focused on authoring “startup conditions”, rather than authoring and understanding running systems
- Too much focus on level-design!
 - We need more tools for game-design! (PuzzleScript <3)
 - We need more tools for debugging



Tools to make sense of the mess

- Games = “interactive haystacks”
- Nobody in the team understands everything about how the game works
- Make it easier to visualize your game logic and game data! Share that knowledge!
Solve problems faster



dear imgui: goals

- Easy to use: turn making UI/tools into an habit rather than an afterthought
- Low friction for quick use/hacking
- Create tools that are always available



Always Available tools

- Embed tools inside engine/game
- Have access to all engine/game state
- Understand problems as they happens
- You can ship tools to everyone
 - Programmers, Designers, Artists, QA, etc.
 - Players, modders?



in-games tools →

Brigador © Stellar Jockeys

▼ Debug (F1 to toggle panels)

Main | Mech debug | Pack file | Data editor | Message debug | Range

6.000 sound_radius
0.950 size
2.538 height
0.000 hover_height

▼ Guns

Laser, 12MW Discharge, "Boiler"
Cooldown remaining: 1.451185
Adj. accuracy cone: 0.104720 (6.000000 degrees)
BPS: 8.571429
DPS: 17.142859
Shots per burst: 30

assets/data/weapons/corv_laser_tur_01.json

Show fire prediction

▼ AI state

Leg FSM: LegMove
Chassis FSM: ChassisShootAt
AI index: 66

BEHAVIOR_NORMAL behavior

NORMAL_GOTO_FIRING_POSITION state

► transition table

Current target

Handle:	Custom target
type = 0	type = -1
h = 4	h = -1
count = 1	count = -1
ptr = 28F3DAB8	ptr = 00000000
Last known position: vec2: (193.431830, 253.716141) timestamp: 28.217361 Valid	Last known position: vec2: (0.000000, 0.000000) timestamp: 0.000000 Invalid
Last known velocity: vec2: (0.000000, 0.000000) timestamp: 28.217361 Valid	Last known velocity: vec2: (0.000000, 0.000000) timestamp: 0.000000 Invalid
Last known orientation: vec2: (-0.912526, -0.409019) timestamp: 28.217361 Valid	Last known orientation: vec2: (0.000000, 0.000000) timestamp: 0.000000 Invalid
Last known height: 2.963000	Last known height: 0.00
Last known radius: 0.900000	Last known radius: 0.00
Priority: 1 (AGGRO_MECH)	Priority: AGGRO_LOWEST
Have LoS	Have LoS
Clear Set as custom	Clear Set as current Conti

▼ Player Mech

Select player Respawn

Mech: assets/data/units/player/corv_tank_07.json

Special: assets/data/abilities/special_silentrun.json



dear imgui: usage

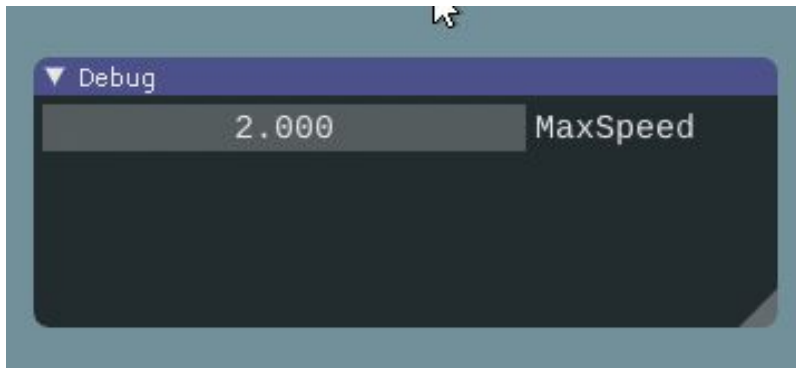
- Your code creates live UI every frame
- Pull, display or edit data straight from your engine/game
- Perfect for creating real-time interactive visualization/debugging tools



Code example

```
ImGui::DragFloat("MaxSpeed", &MaxSpeed);
```

A wild interactive widget appears!



- Interact/process immediately
- It works from anywhere in your code



140master hue

H:140S:180V:161main

H:140S:124V:100area

H:140S: 59V: 40back

▼ Example: Property editor

(?)

▶ Object_0my sailor is rich

▼ Object_1my sailor is rich

▶ Child_3700257420my sailor is rich

▶ Child_2063235384my sailor is rich

Field_21.000

Field_33.142

Field_4100.000

Field_5999.000000- +

Field_60.000000- +

Field_70.000000- +

▶ Object_2my sailor is rich

R:255G: 0B: 51color 1 (?)

R:102G:178B: 0A:128color 2

Apple

Banana

Cherry

Kiwi

Manon

▶ Range Widgets

▶ Multi-component Widgets

▶ Vertical Sliders

▼ Graphs widgets

Frame Times

Lines

avg 0.0

pause

Histogram

Sinfunc70

Sample count

Lines

Histogram

0.000float

R:114G:144B:154clear color

Test Window

Another Window

Application average 2.486 ms/frame (402.2)

▼ Example: Layout

File

MyObject 0

MyObject 1

MyObject 2

MyObject 3

MyObject 4

MyObject 5

MyObject 6

MyObject 7

MyObject 8

MyObject 9

MyObject 10

MyObject 11

MyObject 12

MyObject: 0

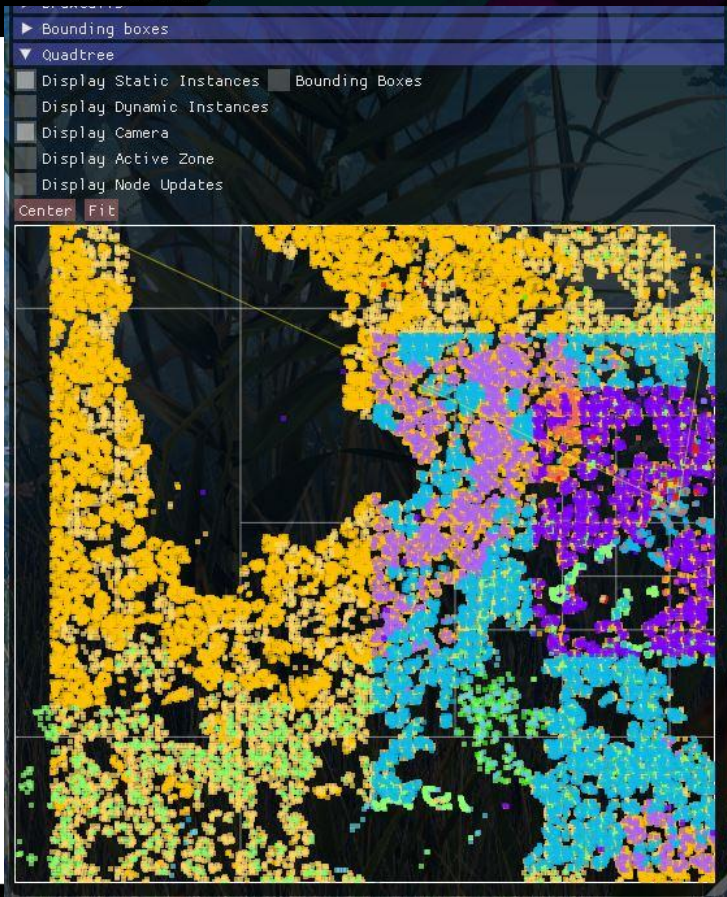
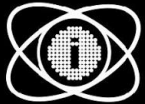
Lorem ipsum dolor
consectetur adipisc
eiusmod tempor in
labore et dolore m

RevertSave



Hidden Benefit: Tools = Communication

- Exposing data/algorithms is de-facto communication within team
- Avoid game being a black box to designers, artists, QA
- Tame complexity, understand what's going on!



← Plot spatial data

```
// Draw LOD mini-map  
// (also: abstract painting)  
draw a rectangle  
for all objects  
{  
    transform coordinates  
    choose a color  
    draw a circle  
}
```



Memory Gauge [BUDGET MODE LARGE]

<div><div></div></div>	System	2170.44 MB / 2816 MB
<div><div></div></div>	Garlic	1457.40 MB / 2432 MB
<div><div></div></div>	Onion	42.84 MB / 128 MB

Budget viewer

Red only

Filter

DrawDatabase

Draw calls	574/frame (max 1500)	38 %
StaticObj	41371 (max 30000)	137 %
StaticObj instances	41371 (max 50000)	82 %
StaticGrp	309 (max 500)	61 %
StaticGrp instances	26439 (max 30000)	88 %
DynObj	476 (max 400)	119 %
DynObj instances	1007 (max 400)	271 %

CPU - LODTransition::Process (1000 frames)



← Monitor stats, budgets



Hidden Benefit: Tools = Documentation

- Interactive tool = Self-documenting software.
 - Always up to date.
 - Write new code & matching tool together!
 - Easier to debug, now and later.
- Helps to communicate terminology.
 - Everybody can speak the same language.



Kiss it simple

- Tools don't have to be amazing, they just need to serve a purpose:
 - Make your life easier / happier
 - Make your game better
- They don't have to last a life-time
- They don't have to be pretty



Common Excuses

- “We don’t have time to make tools”
 - Implies that tools are a luxury or a productivity loss. They aren’t!
- “I am terrible at it / I hate UI stuff”
 - Try different ways of doing it (“dear imgui” is one way but there are many others)
 - The more you’ll do it, the better you’ll get!



A few examples of simple, custom tools using *dear imgui*



▼ My First Tool!! v3.1 (c) Indie Inc.

Search object: tree



tex/bg_4_tree3.png

tex/bg_4_tree3.png

tex/bg_4_tree2.png

tex/bg_4_tree2.png

tex/bg_4_tree2.png

tex/bg_4_tree2.png

tex/bg_4_tree2.png

tex/bg_4_tree2.png

← **Mini
Searching Tool**
(20 lines
of code)

(live search for
objects, display
results in a list,
display preview in
mini-map)



▼ Texture

Options

2,000

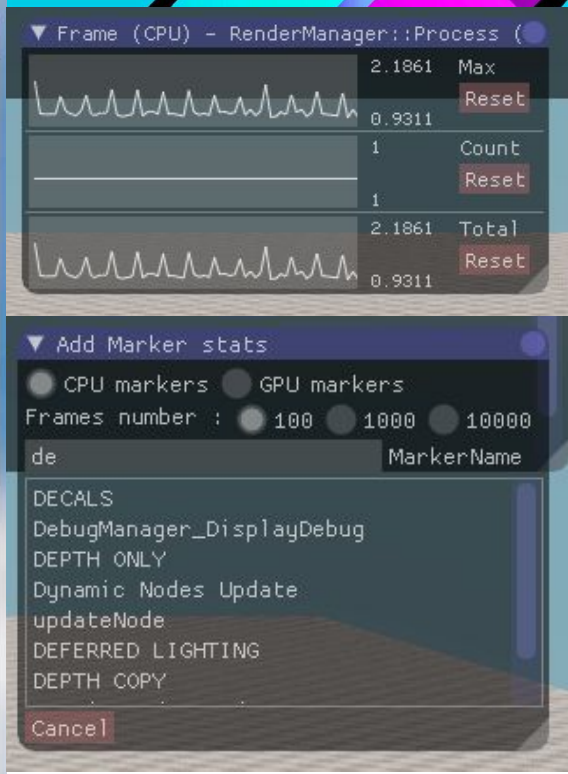
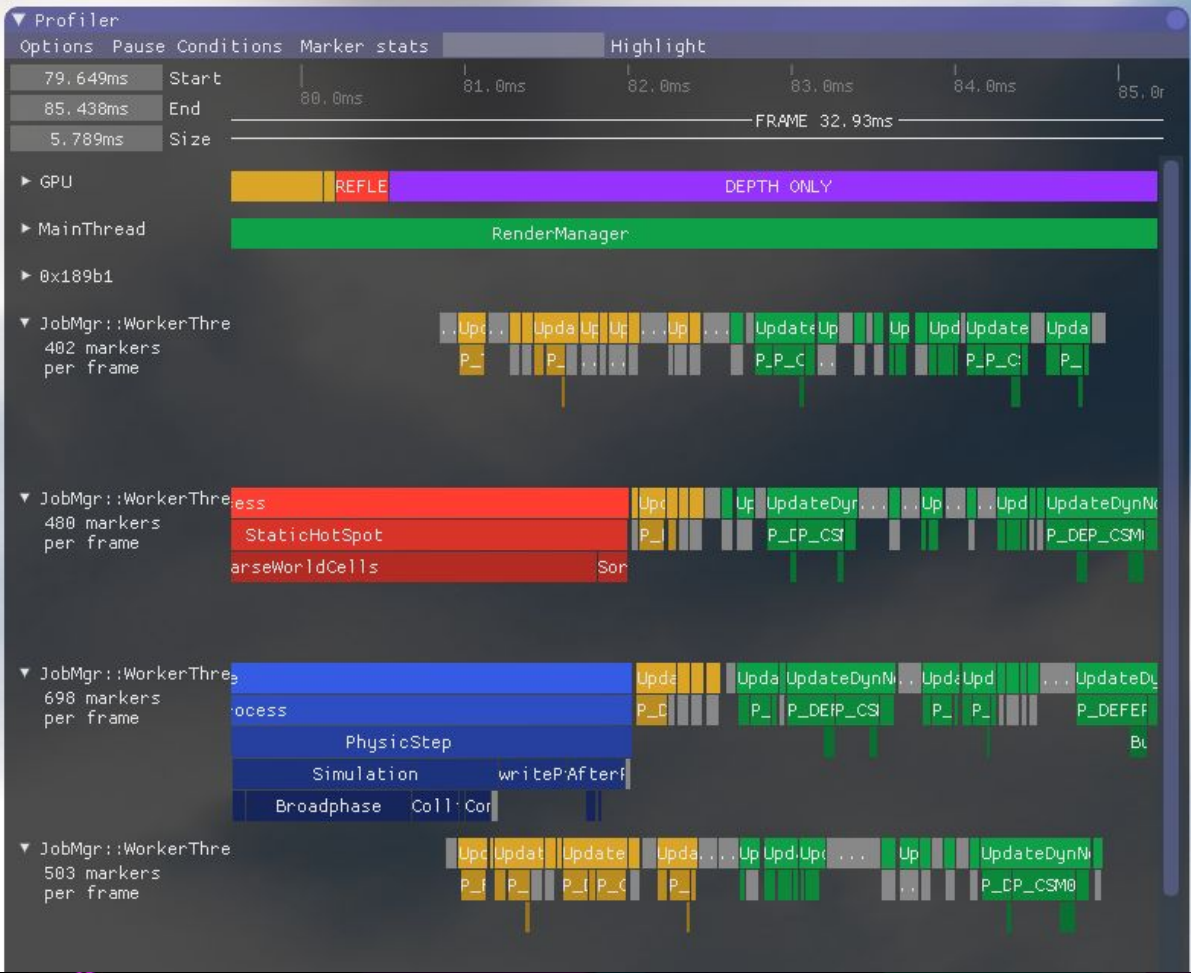
MaxSpeed

Filter by Name or ResourceId

Statu	ResourceI	Name	Uses	Loads	Weight	Size
OK	0x1dc8488	Texture 0x004B22A0	1	1	8640.0 KB	1920x1152
OK	0xe51b1d8	Texture 0x004B24D0	1	1	8640.0 KB	1920x1152
OK	0x7dea0fa	tex/LocDesert/sky.png	1	1	8100.0 KB	1920x1080
OK	0xc73c597	tex/LocDesert/clouds03.png	2	2	7500.0 KB	1920x1000
OK	0xebee332	tex/LocDesert/pyramid01.png	1	1	6130.0 KB	1920x866
OK	0x61b120e	tex/LocDesert/smoke01.png	1	1	4000.0 KB	1920x53
OK	0x631ecff	tex/LocDesert/ground03.png	1	1	4000.0 KB	1920x1080
OK	0xbb7c880	tex/LocDesert/buildings.png	1	1	4000.0 KB	1920x1080
OK	0x630cb77	tex/LocDesert/ground02.png	1	1	4000.0 KB	1920x1080
OK	0xec004ba	tex/LocDesert/pyramid02.png	1	1	4000.0 KB	1920x1080
OK	0x268142c	tex/LocDesert/door_desert.png	1	1	4000.0 KB	1920x1080
OK	0xc72a40f	tex/LocDesert/clouds02.png	1	1	4000.0 KB	1920x1080
OK	0x8bc80bf	tex/blocks.png	1	1	4000.0 KB	1920x1080
OK	0x2048468	tex/UI/UI_01.png	1	1	4000.0 KB	1920x1080

30 Resources total. Total Memory: 57.75 MB





Tearaway

▼ Debug Object

Log To TTY Log To File Log To Clipboard 2 Depth

▼ Options

DrawDebug 0.0 Tint 0.7 LayoutAlpha

SelectSensors AnimDetails GroundDebug Paper Level OBB

0x100 Debug object ID

▼ Events

On selected event: Break Pause Once

None AddToWorld RemoveFromWorld
StartPlaying DeleteRequest Delete
Sleep WakeUp Update
UpdateAI UpdateGnd Render
LogicOutput LogicInput OnDamaged
OnContact OnTrajChange Custom

▼ Tools

WakeUp() Sleep() ActivateRigidBody() Kill CheckWorldSleepBuddies Delete

Offset from player: (0.00,0.00,0.00) Distance: 0.00

Locate Print Print ID Delete

► RigidBody: 0x20a6a12a0
► FoldingProp (folding_prop.prop) at (-25.01,21.65,237.52) 'Ramp'
► GroundSheet: 0x2059d0c50 Default
► AIHint at (-21.00,23.39,236.19) 'AI_iota'
► AnimLibrary (131)

Id: 0x100, Ptr: 218d98060
Data: papercraft_player.mon ('Atoi')
Name: ThePlayer
Pos: (-21.03,23.39,236.21), Com: (-21.03,23.39,236.21), Upness: 1.00
Aabb: (-21.05,24.58,236.22) hw (1.09,1.26,1.07)
StreamingPlaceId: 42
AngularVel: (0.00,-0.00,0.00) (= 0.00)
CollisionFilter Group 0008, Mask FFFDF7F
Ground: Default (Obj: 21bd3d1b0, Sht: 2059d0c50)
GroundContactNormal: (-0.03,1.00,0.01) (= 1.00) (dot.up=0.999)
GroundSurfaceNormal: (-0.03,1.00,0.01) (= 1.00) (dot.up=0.999)
GroundPos: (-21.02,23.39,236.21), length(GroundPos-Com): 0.006
NextGroundPhy: Default (Obj: 21bd3d1b0, Sht: 2059d0c50)
NextGroundPos: (-21.03,23.39,236.21), length(NextGroundPos-Com): 0.006
IdleBehaviour: Wander, FleeBehaviour: Flee
InvincibleForCutsceneAny: true
IsPlayerInputsEnabled: false

Model: iota_atoi_mesh.GR2
Anim Controls: 1
- #0: 1.00 Wave 'iota_idle_wave_at_player_anim.GR2' [time:1.914/2.667, sp:1.00 ev
(user_w:1.00, io_w:1.00, out_speed:0.00, in_time:0.25s, loopidx: 0->0, pri:113,

AIHintState
TheHint: 206e34c70 (30c9e35850e20900) 'AI_iota'
SubState: Animate
TaskMove: State:Stop, Finished:1, Success:1

▼ World Contents

Log To TTY Log To File Log To Clipboard 2

Filter (inc,-exc)

► Objects (3525)
► ObjectsCharacters (69)
► ObjectsToRender (711)
▼ AwakeObjectsList (718)
► 2 AIHint
► 1 BabyWendigo
► 8 CameraHint
► 1 Crow
► 1 CustomTarget
► 10 DigitalButtonDetector
► 1 Elephant
► 44 FixedProp
► 270 FoldingProp
► 2 GodRaySource
► 15 Gopher
► 6 InstanceObject
▼ 1 LevelCheckpoint
► LevelCheckpoint (level_check_point.prop) a
► Select Locate Print Print ID Delete
► PaperLevel: level_start_point.lv1 0x211'
► FixedProp (fixed.prop) at (55.70,0.00,21
Id: 0xab0b005c09ba21e3, Ptr: 225f811c0
Data: level_check_point.prop
Pos: (19.94,2.08,206.16), Com: (19.94,2.08
Aabb: (19.93,2.11,206.14) hw (0.82,0.11,0.
StreamingPlaceId: 45
FAILED to stick to : 0x89e5d4a119ff1b7c
CollisionFilter Group 0002, Mask FFFFFFFF
► 1 LevelStartPoint
► 12 LightProp
► 86 LogicBlock
► 1 Monkey
► 6 MovingBlock
► 1 NPC
► 1 PaperCraftPlayer
► 168 ParticleEmitter
► 1 Prop
► 25 RumbleController
► 11 SpecialEffect
► 5 ThemeBlendController
► 6 VitaButtonBlock
► 28 WindDetector
► 4 YellowFinger
► AwakeObjectsList (By Update Order) (718)
► NeverSleepObjectsList (9)
► AsleepObjectsLists (30)

► Memory

Properties x

▼ Mesh

Remove component

models/creatures/deer/deer1.msh ... View Source

▼ Materials

models/creatures/deer/eye.mat ... View Material

models/creatures/deer/antlers.mat ... View Material

models/creatures/deer/head.mat ... View Material

models/creatures/deer/body.mat ... View Material

▼ Lua script

Remove component

Add script

▼ player

Remove script

scripts/player.lua ... View Source

1.000 MOUSE_SENSITIVITY

0.100 PLAYER_SPEED

-1 ... camera_entity

dest ... dest_entity

navmesh

☒ Debug

Navigate

▼ Asset Browser Entity List x

New group name

Create group

▼ default (14)

editor: camera

1 - cube

global light

deer - deer1

6 - cube

dest

4 - cube

3 - cube

5 - cube

9 - cube

10 - cube

11 - cube

12 - cube

13 - cube

Can not delete - at least one group must exists

Select all entities in group

Assign selected entities to group

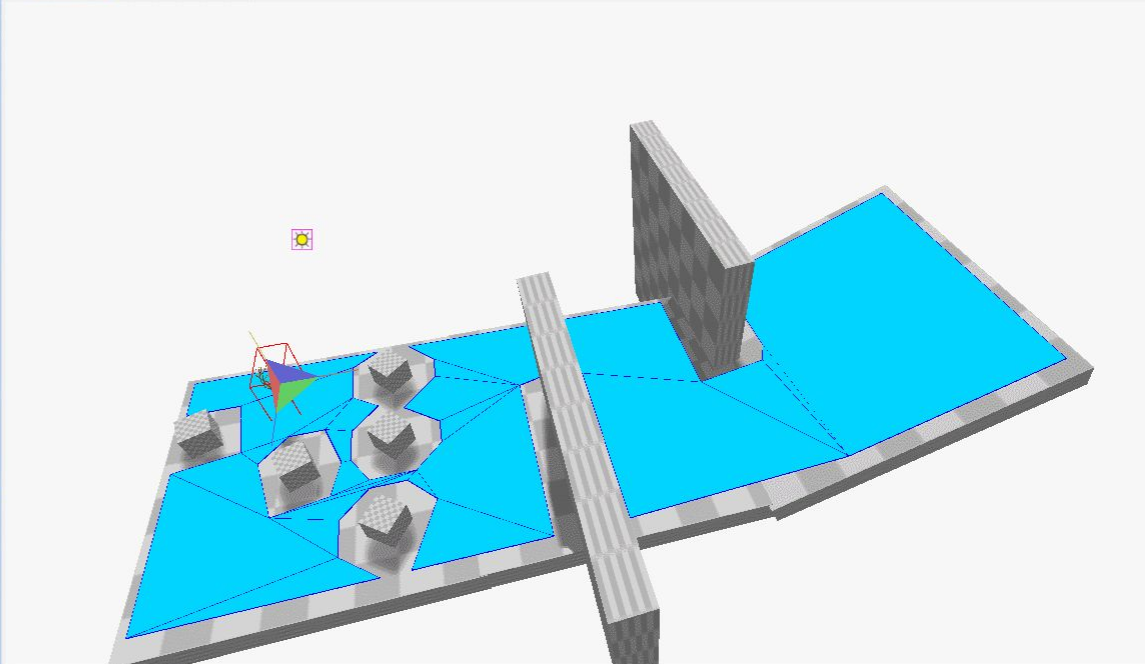
Hide all

Show all

Freeze

Entities

Scene View Settings Game View



0.01 Camera speed 10 Gizmo step Stats

Log x

Info(4) Warning(0) Error(0)

Clear

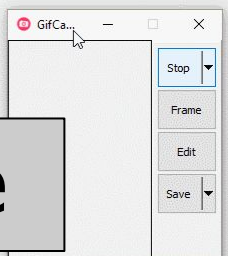
Could not load metadata

Loading universe universes/player.unv...

Parsing universe...

Universe parsed in 0.0084615984 seconds

LumixEngine





That's all folks

- Don't shy away from creating your own
 - Standalone tools
 - In-game "always available" tools
 - Unity editor extensions, etc.
- Beware letting your design/dev process be too enslaved by what's readily available.
- Productivity or innovation often requires off-the-road work.



Contact, Links



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Dear ImGui <http://www.github.com/ocornut/ImGui>

Become my patron on



<http://www.patreon.com/ImGui>