

Fall 2018 Workshop Series
Unity Workshop 2
2D Physics

About This Talk

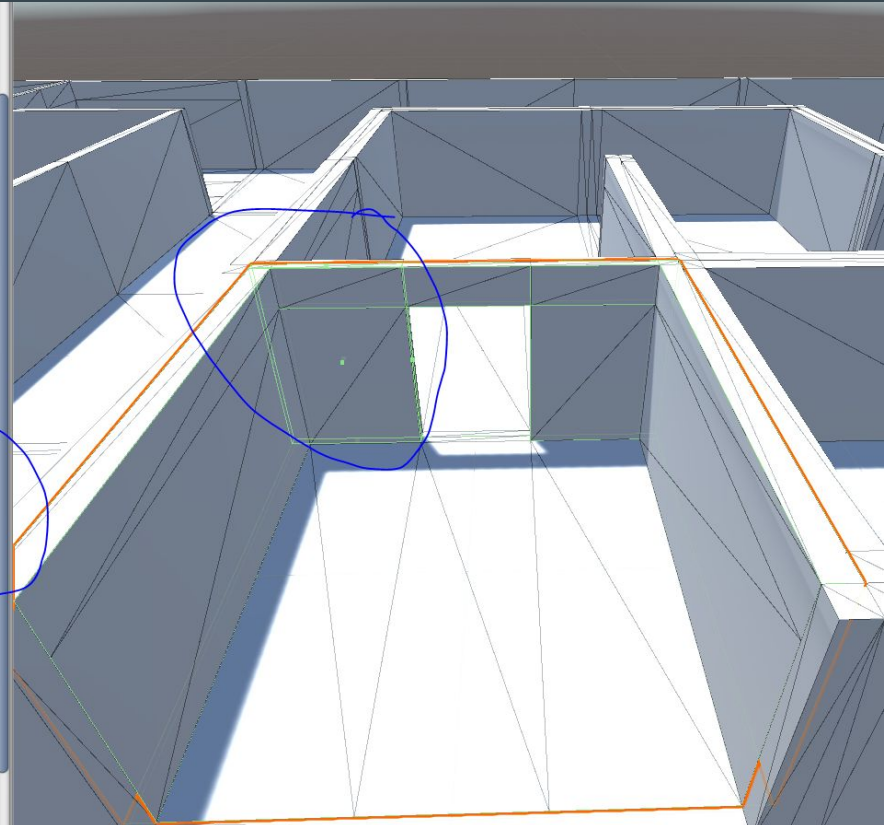
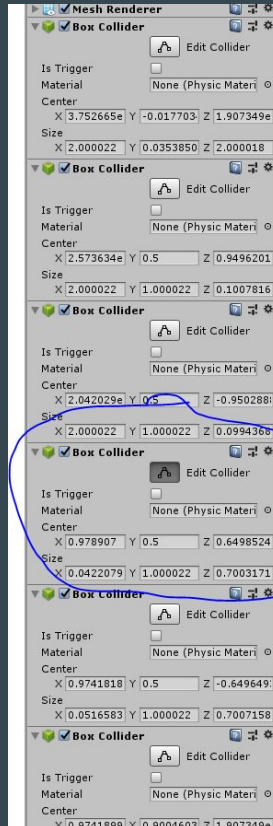
This talk was originally presented as a live presentation at the MUN Computer Science Lab in 2018.

The talk was delivered as part of that year's Global Game Jam St. John's site event activities.

Review: Workshop 1 - Colliders

Notes:

- 3D Physics
- Box Colliders
- Multiple Colliders per mesh
- Doors break up both the mesh and the colliders



Review: Workshop 1 - Scripts

Note:

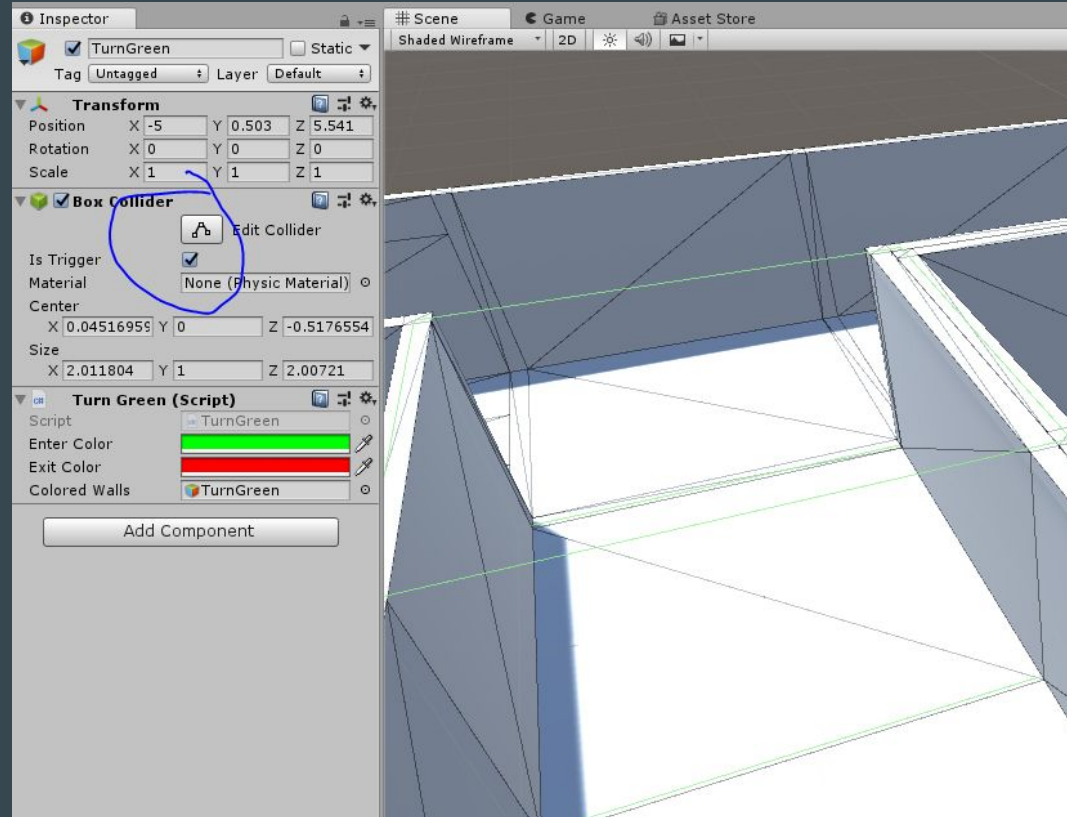
- SerializeField - ensures that the field can be seen by the editor
- OnTriggerEnter/Exit - *message* functions
- GetComponent - retrieves *Components* from *GameObjects*

```
public class TurnGreen : MonoBehaviour {  
  
    [SerializeField]  
    Color enterColor = Color.green;  
  
    [SerializeField]  
    Color exitColor = Color.red;  
  
    [SerializeField]  
    GameObject coloredWalls;  
  
    Color oldWallColor;  
  
    private void OnTriggerEnter(Collider other)  
    {  
        other.GetComponent<Renderer>().material.color = enterColor;  
        oldWallColor = coloredWalls.GetComponent<Renderer>().material.color;  
        coloredWalls.GetComponent<Renderer>().material.color = enterColor;  
    }  
  
    private void OnTriggerExit(Collider other)  
    {  
        other.GetComponent<Renderer>().material.color = exitColor;  
        coloredWalls.GetComponent<Renderer>().material.color = oldWallColor;  
    }  
}
```

Review: Workshop 1 - Triggers

Note:

- Trigger flag
- Subscribes to Trigger *messages*
- Turns off the physical collision for the collider



2D Physics

Why 2D?

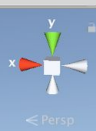
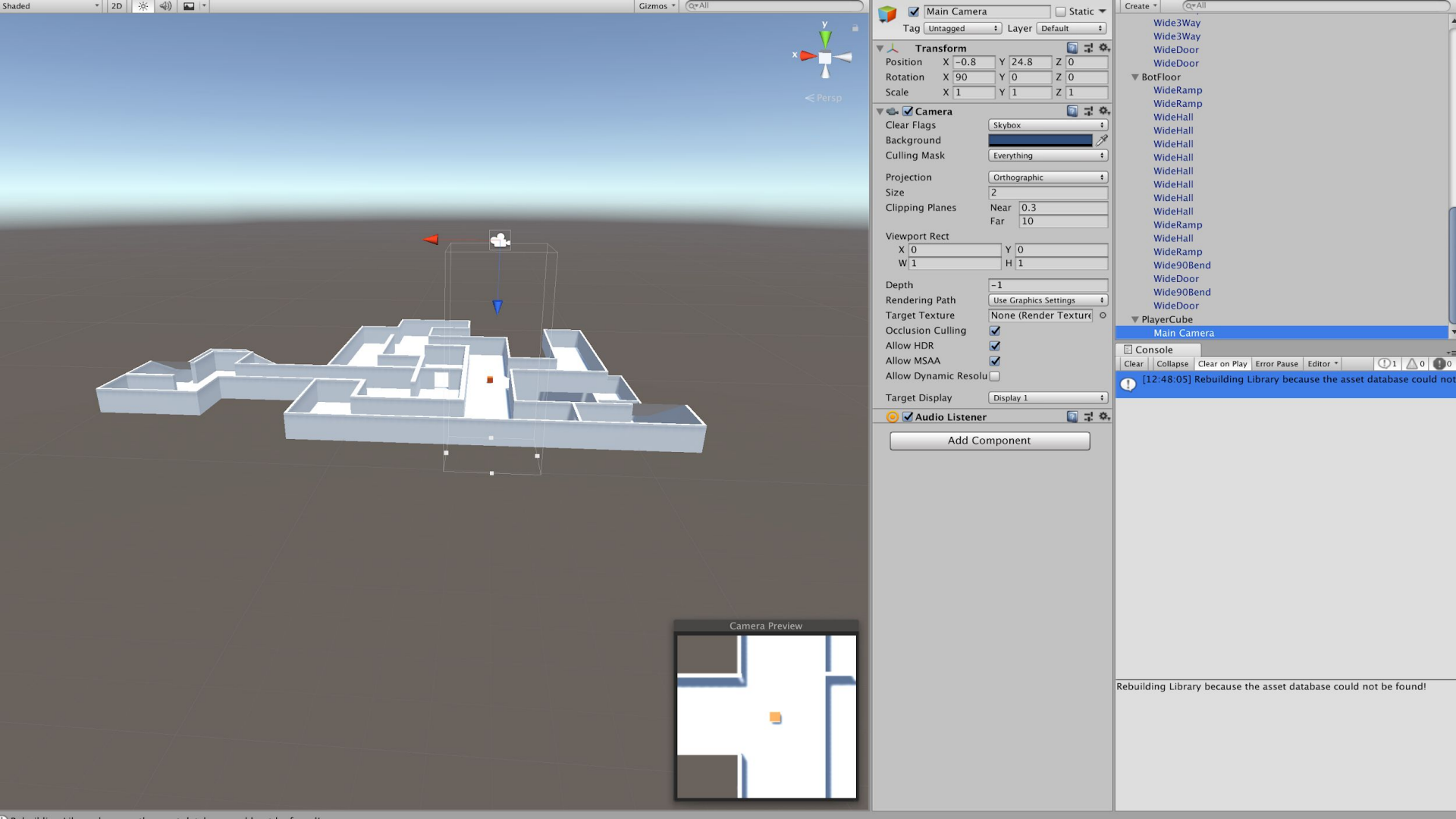
- Teaches most of the same concepts as 3D with a simpler frame of reference
- Commonly used for smaller games in the indie world

Learning Objectives

- How to construct a GameObject with physics behaviours
- How to adjust those behaviours
- How to trigger non-physical gameplay via the physics system

Project Setup

1. Open the Assets/Workshop_2 folder
2. Control+D or Command+D to duplicate the Workshop 1 scene
3. Rename the duplicate file to “Working Copy”
4. Double-click the Working Copy file to open it in the editor



Tag Untagged Layer Default

Transform

Position	X	-0.8	Y	24.8	Z	0
Rotation	X	90	Y	0	Z	0
Scale	X	1	Y	1	Z	1

Camera

Clear Flags Skybox

Background [Color Picker]

Culling Mask Everything

Projection Orthographic

Size 2

Clipping Planes Near 0.3 Far 10

Viewport Rect X 0 Y 0 W 1 H 1

Depth -1

Rendering Path Use Graphics Settings

Target Texture None (Render Texture)

Occlusion Culling

Allow HDR

Allow MSAA

Allow Dynamic Resolu

Target Display Display 1

Audio Listener

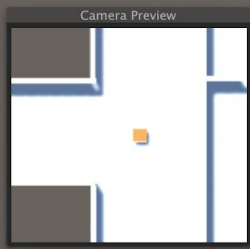
Add Component

- Wide3Way
- Wide3Way
- WideDoor
- WideDoor
- BotFloor
- WideRamp
- WideRamp
- WideHall
- WideHall
- WideHall
- WideHall
- WideHall
- WideHall
- WideHall
- WideRamp
- WideHall
- WideRamp
- Wide90Bend
- WideDoor
- Wide90Bend
- WideDoor
- PlayerCube
- Main Camera

Console

Clear Collapse Clear on Play Error Pause Editor

[12:48:05] Rebuilding Library because the asset database could not be found



Rebuilding Library because the asset database could not be found!

Geometry Setup

Turn on 2D scene mode - note that the level isn't set up for 2D

Turn off 2D mode

Rotate Top Floor and BotFloor by 90 around X Axis

Turn on 2D mode again - scene looks good BUT lighting is wrong!

Lighting setup

Window->Rendering->Lighting Settings

Environment Lighting:

- Skybox - intensity
- Gradient - not much effect (2D is hard!)
- Color - Mid-yellow

Sun Source - Directional Light

Directional Light - Point light - Range, Color, Position

Modify WideDoor

Remove BoxCollider components

Add BoxCollider2D component, show how it doesn't work

Create Empty Gameobject at top level (Colliders)

Add BoxCollider2D - Show it works

Parent to WideDoor - editor automatically transforms as necessary

Add rest of colliders

Hit Apply on WideDoor - note prefab applies to all objects in scene

Modify PlayerCube

Remove BoxCollider

Remove CharacterController - breaks PlayerController

Remove PlayerController

Add BoxCollider2D

Add Rigidbody2D, set Gravity Scale to 0

Open Controller2D.cs, show the new code

Open Edit->Project Settings->Player, explain the .NET settings

Reimplement TurnGreen

Copy the TurnGreen script into Workshop 2

Rename it TurnGreen2D

Add it to the TurnGreen object in the working copy scene and assign a GameObject

Run the scene - doesn't work - anyone know why?

Add BoxCollider2D - still doesn't work

Open TurnGreen2D in the code editor & change trigger message function names

Recompile & retest

Bottom Floor Collisions

Try to go down to the first visible wall

The bottom floor colliders block movement - difference between 2d/3d

Remove BotFloor->WideHall(5)

Now we can go all the way down down to the visible wall

Remove BotFloor->WideHall(4),(6),(7),(9)

Now we have access to the whole level

Mass, Linear and Angular Drag, and Gravity

Start the level and hold W for a bit to get moving quickly. Release w, note you keep moving

Play with linear drag setting to show how it affects things

Change Mass to 0.1 to show how the force and linear drag interact

Go around a corner while pressing to one side - note the spin

Change Gravity to 30, Linear Drag to .4, Mass to .1

Hit play - player falls right through the thin collider - change the Wide90Bend Collider to 2 thickness & try again - shouldn't fall anymore

Friction and Bounce

Reset gravity to 3 & hit Play, try to move to the right - we barely move

Select Wide90Bend(8)->Colliders & expand Info on one of the BoxCollider2Ds - friction is .4 and can't be edited

Right click->Create->Physics Material 2D

Set Friction to 0 and Bounce to .3 & add the material to the BoxCollider2D

Hit Run - note the bounce, plus now we can move right...until we hit the hall

Add the material to WideHall (7) as well

Joints

Add an empty GameObject, call it Pendulum

Add a child empty GameObject, call it Anchor, add a Rigidbody2D, set to Static

Add a child cube, call it Chain, remove BoxCollider, add BoxCollider2D

Add a Hinge Joint 2D, set Connected to Anchor, move hinge point to top of cube

Duplicate Chain, set Connected to first Chain

Add a Sphere, remove SphereCollider, add Circle Collider 2D, add Hinge Joint 2D, move hinge point to top of sphere.

Hit play and move towards the pendulum - it should swing. Be careful of position!

Effectors

Add a third `BoxCollider2D` to `WideHall(7)`, change size to `2x2`

Add an `AreaEffector2D` - note the warning - turn on “used by effector” and “used by trigger” on the box collider

Play with angle and magnitude to show different effects, end at 150/1.3

Add a `PlatformEffector2D` to `WideEnd5`, demonstrate the mechanism, changing the rotational offset and the surface arc, setting one way

Mention the side friction, suggest people try it out.