Masterclass

BOND UNIVERSITY

Bachelor of Interactive Multimedia and Design

Beginner Game Dev
Masterclass

Mobile Games Starter with Unity

Table of Contents

A Crash Course in Unity

T o begin, download Unity by visiting *http://www.unity3d.com/*. Unity provides a full version as a 30-day trial with all features unlocked, after which it will revert to the free version. The free version includes the majority of Unity's functionality and the Android or iOS tools. You can use the free tool to create and release games. The main difference between the paid and free versions is that the free version includes a watermarked loading screen. If you can live with that, you're free to develop as many games as you like with it. When the download is complete install Unity and run the software. On opening you will notice the Unity Editor is comprised of several tabbed windows as shown and explained in Figure 1.
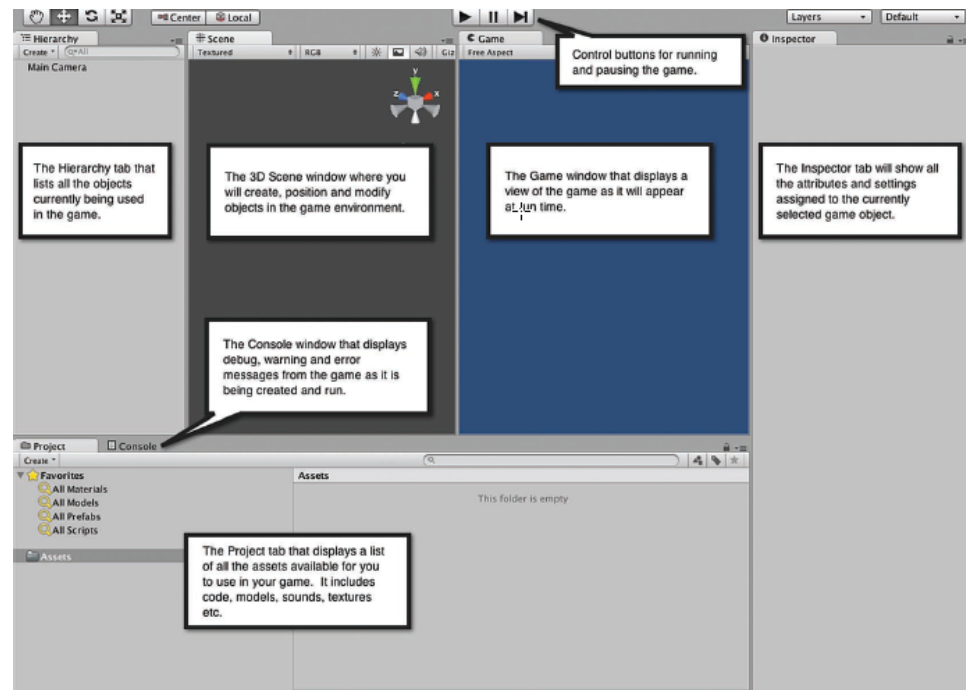

Figure 1. The Unity Interface

STEP 1

If you didn't create a new project when Unity started create one now by selecting **File > New Project** from the main menu. The name you give the project will be the same as the folder Unity creates to store the game assets. Unity does not use a single file to save the project as you find in other software such as *Word* or *Photoshop* but rather the top-level folder. Unity also likes to have everything in its project folders in the correct order, so best not to mess with the structure or add anything manually.

K E Y S	
W	Move
E	Rotate
R	Resize
Q + Mouse Pan View	
ALT + Mouse Rotate View	

Moving in Unity

To move, rotate or scale an object use the W, E and R keys to change the gizmo. Then drag the axis to put the object in the desired position.

To change the view you can use Q to pan the camera (move it vertically or horizontally) or ALT with the right mouse button to orientate.

STEP 2

We will now create a simple game scene with a sphere. From the main menu select GameObject > 3D Object > Sphere. A new game object called *Sphere* will be created and you'll see it in the Hierarchy tab and Scene and Game windows as shown in Figure 2. When selected the properties of the *Sphere* are shown in the Inspector tab.
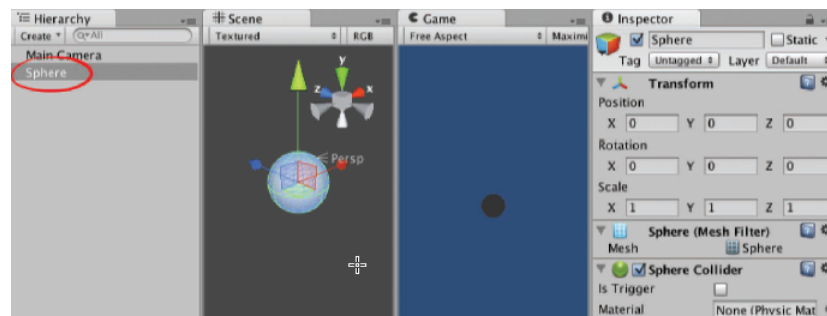

Figure 2. Adding a Sphere to the Scene

STEP 3

If the Sphere appears small in the Scene, place the mouse inside the window and scroll to zoom in. Notice the Sphere in the Game is not affected. The Game is the view of the game from the camera in the scene. The camera is essentially the player's eyes into the game world. You can find the Main Camera as a game object in the Hierarchy. Double-click on it.

STEP 4

To change what you see in the Game the Main Camera needs to be moved. To do this, select the Main Camera in the Hierarchy and press W. A set of green, red and blue axes will appear in the Scene on the Main Camera. To move the camera select the tip one of the axes with the mouse and drag it. Notice how the Game view changes with the camera's view.
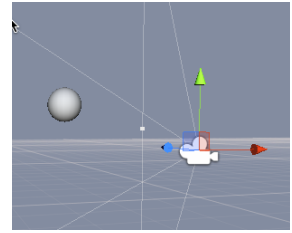
To change the camera's orientation, with the Main Camera still selected in the Scene, press E. Green, red and blue orbital handles will appear around the camera in the Scene. Dragging the mouse over any of these will orient the camera.

The final manipulation you can make to an object in the Scene is to scale it. In this case, scaling the camera won't do anything, so instead, click on the Sphere either in the Hierarchy or the Scene. Press R. Again green, red and blue axes will appear. This time the axes will have small cubes on the end. There will be a large yellow cube in the centre. Dragging the large yellow cube will evenly resize the Sphere. Dragging the individual cubes at the end of each axis will resize in the same direction. Try this out and observe how the sphere's size changes in the Game.

STEP 5

Try pressing the play button at the top centre of the editor. This runs your game. At this time nothing will happen as there's nothing actually going on in your scene. Press the play button again to stop playing.

NOTE: Do not make changes to your game in Play mode. Otherwise when you stop playing the changes will be lost.

STEP 6

You may have noticed the sphere looks very flat in the Game. This is because there aren't any lights. When lights are added to a scene 3D objects become shaded and the scene gains depth. To add a light select GameObject > Light > Directional Light. The sphere will now be shaded.

STEP 7

To add physics, with the Sphere selected, choose Add Component > Physics > Rigidbody. The result will be a Rigidbody component added to the Inspector for the sphere. For the Sphere, having a rigidbody simply means it becomes part of the engine's physics system and now will behave as such.

Press play. The Sphere will fall under the influence of gravity.
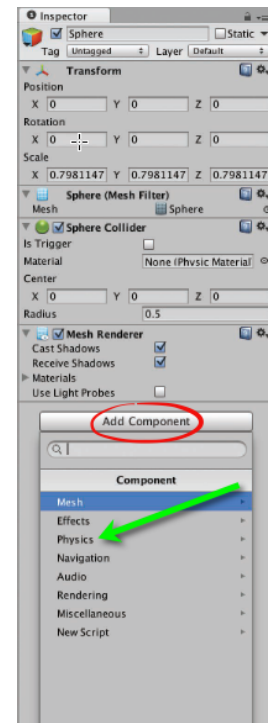
STEP 8

Add a cube to the scene with GameObject > 3D Object > Cube. Select the Cube in the Hierarchy and use the W key to set it to move mode and use the mouse to drag the cube beneath the sphere. Add a rigidbody to the cube. Without changing any rigidbody settings, press Play. Both the sphere and the cube will fall at the same rate. If you understand basic Newtonian physics there will be no surprises there. For the Cube, in the Inspector, untick the rigidbody's Use Gravity tickbox. The cube will still be influenced by physics events just not gravity.

Play. The Cube will remain stationary until the sphere collides with it, causing it to move under the sphere's influence.

Add more Cubes and place them beneath the Sphere. To add an exact replica of the Cube you've already created, with it selected in the Hierarchy press CMD+D (Mac OS) or CTRL+D (Win) to duplicate it. Right-clicking on the object in the Hierarchy will also give you the option to duplicate. You can then move the new Cube into position. Because it was duplicated it will already have a rigidbody. Depending on how you have the cubes positioned, the Sphere will now collide with them and cause them to spin. The Sphere will continue falling under the influence of gravity, but the Cubes will only have the Sphere's momentum on collision to carry them and therefore they will not fall in the same way.

NOTE: If you want to set the Main Camera to look at the game world in the same way you are viewing it in the Scene, select the Main Camera and then GameObject > Align with View.

STEP 9

Another property you can manipulate on a game object is its colour. The colour is defined by a material component. It must be created differently to the physics component. To create a material, go to the Project, select the drop down menu under Create and choose Material.
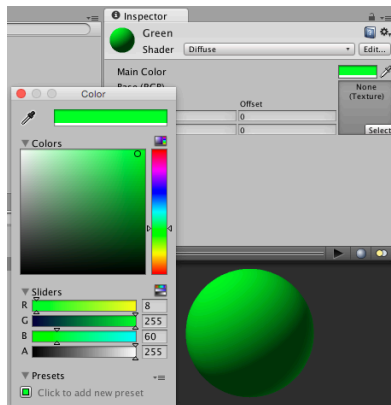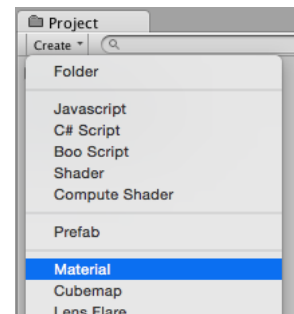
When the material is first created it will be called *New Material*. Click on its name to change it to *Green*. When it is selected in the Project, the properties of the material will be visible in the Inspector. Click on the Main Color colour box to bring up the colour selection dialogue. Set the colour of the material to green.

4

STEP 10

To apply the material to one of the game objects in the Scene simply drag and drop the material from the Project onto the object in the Scene. Alternatively you can drag and drop it onto the game object's name in the Hierarchy or with the game object selected in the Hierarchy, drag and drop the material onto the Inspector.

You can apply this material to any object in the Scene. To change the colour or other properties of the material, select it again in Project and change it in the Inspector. All objects with this material applied will change in response. For example, if you changed the colour of the material to orange, all objects that were green will now appear orange.

STEP 11

Code can be attached to any game object to control it's behaviour. Simple JavaScript commands can access and modify any properties. For example, you can change the colour of the object, move it around, change it's animation state and much more.

To create a script, in the Project select Create > Javascript. The file will initially be called NewBehaviourScript. Click on it and rename to **revolve**. Double-click the new file in the Project to open it in an editor.

Add the line of code in bold to the script and then save.

```
#pragma strict
function Start () {
}

function Update ()
{
    this.transform.Rotate(Vector3.up, 5);
}
```
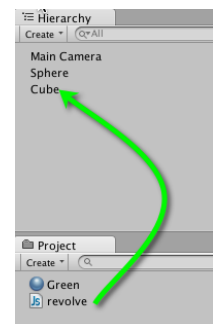
STEP 12

Switch back to Unity.

Drag and drop the script file onto one of the cubes in the Inspector. This will attach the script to that particular game object and cause it to follow the instructions of the code.

Play. Watch the cube spin.

Attach this code to any object in the scene that you want to spin.

Slender Granny

Making an avoid and collect game for a mobile device.

I n this tutorial we are going to make a game in which the player must run from one side of a map to the other, avoiding zombies, picking up chests to stay alive and reaching a tower before their health runs out.

To begin, download the starter files from the website at http://www.holistic3d.com/Tutorials/SlenderGranny.pdf and open the *gamplay.unity* file in the Unity project folder SlenderGranny by double-clicking on it.

STEP 1
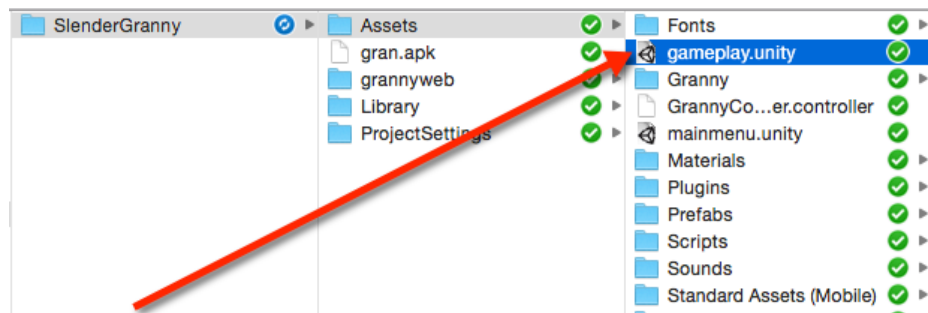
Unity will open and you'll see a large blank ground plane and a simple graphical user interface (GUI) as shown here.
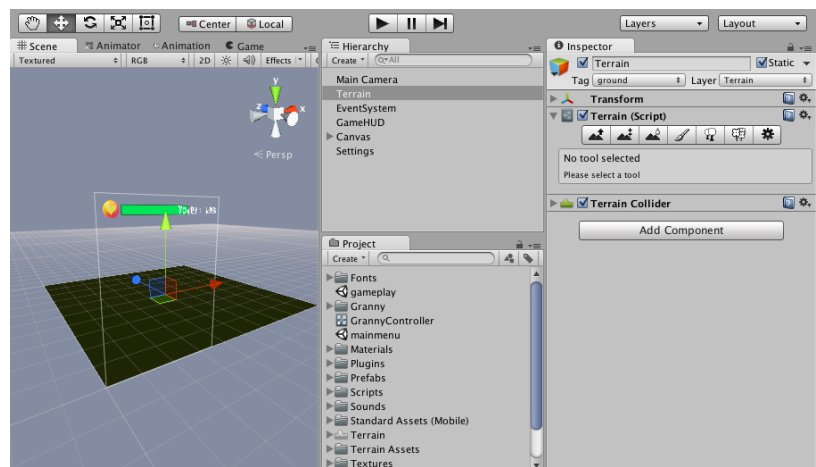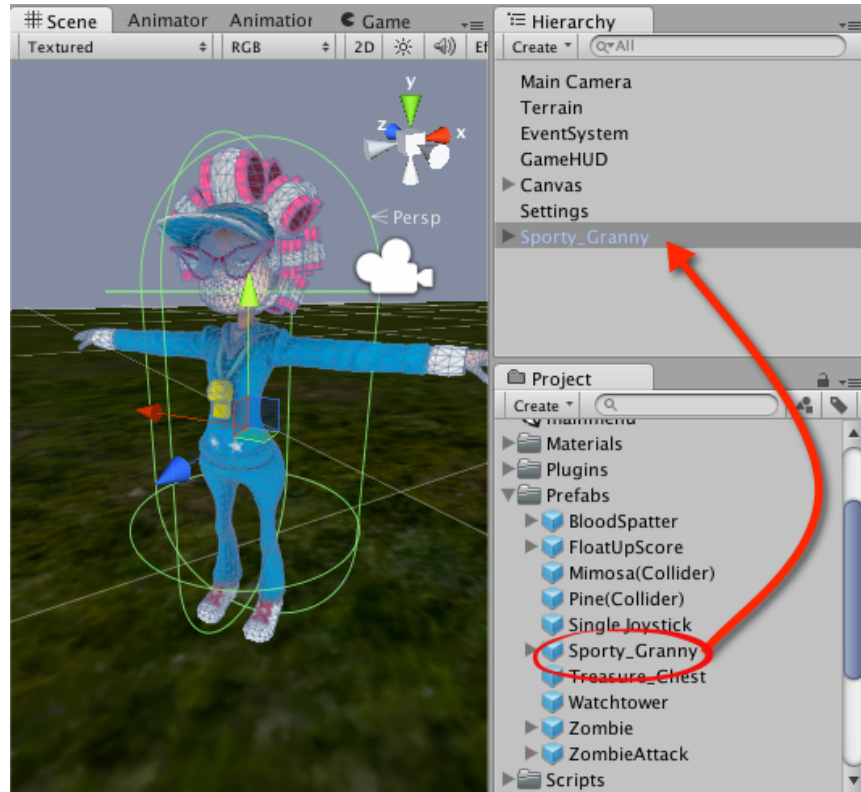
STEP 2

Add Granny

In the Project > Prefabs folder locate the Sporty_Granny prefab. Drag and drop it into the Hierarchy. The Sporty_Granny character will be added to the scene.
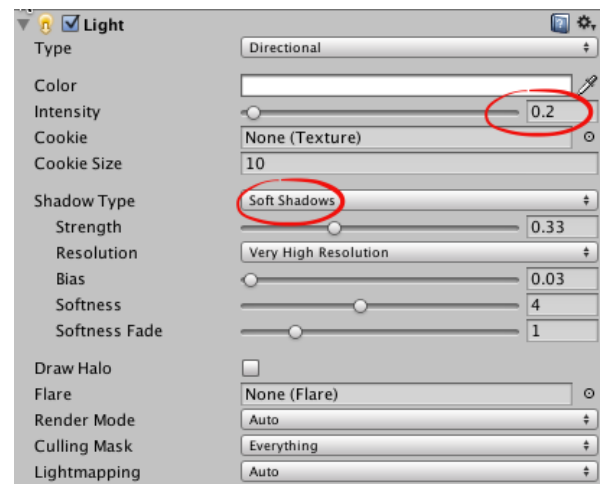

Press the play button and use the arrow keys to move Granny around.

STEP 3

Turn on the Lights

So granny can see where she is going we should add a light to the scene.   From the main menu select GameObject > Light > Directional Light. There will now appear a Directional Light game object in the Hierarchy. Selecting it will reveal its properties in the Inspector.

We want the game to be dark and scary so set the light's intensity to 0.2 and turn on soft shadows.

STEP 4

Attach Camera to Granny

In the current game state Granny is able to walk out of view of the camera. In third-person games, such as this, the camera sticks to the character and follows it around. To achieve this in our game, the camera is childed to the character.

Select the Main Camera in the Hierarchy and drag and drop it onto Sporty_Granny.
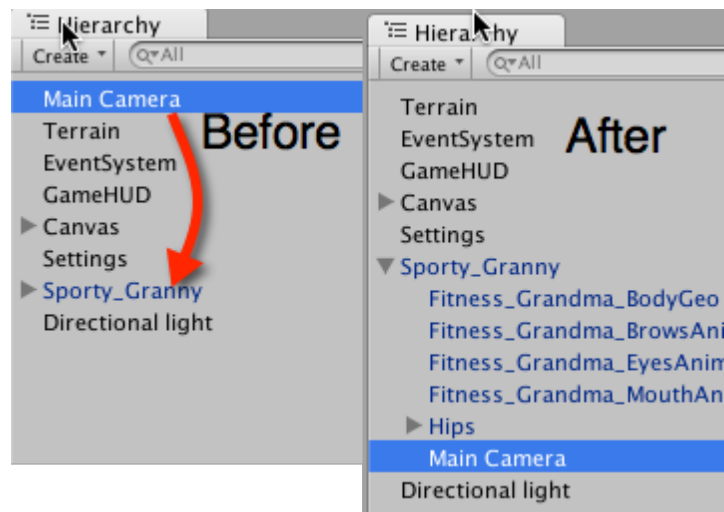
Click on the little triangle next to Sporty_Granny in the Hierarchy to see the other children of that object. After dropping the camera onto the character it will now be one of these children.

This means that wherever Sporty_Granny goes, so will the camera.

STEP 5

Align the Camera with Granny

Press play and walk Granny around. Does the camera follow and stay fixated on the character? If it is a little askew, you may want to adjust the camera's position and rotation with respect to Granny. To do this, select the Main Camera in the Hierarchy and set its position to (0, 2, -4) and rotation to (5, 0, 0).
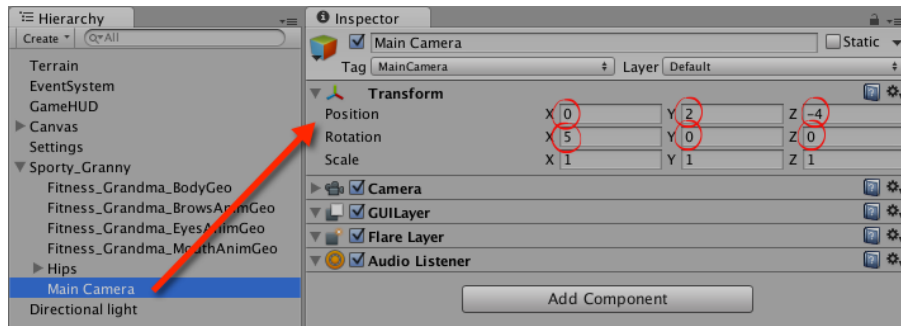
Feel free to modify these values as you like until the camera is the position you want it.
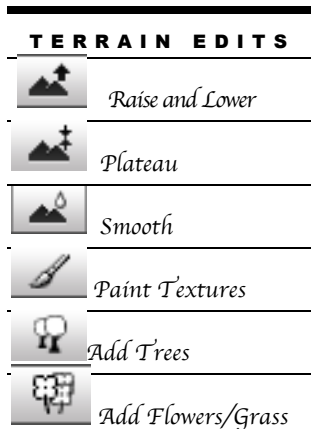
STEP 6

Sculpting the Environment

For this game we are using a Unity terrain. This is a 3D model that can be edited within Unity. But pulling and prodding at the surface you can create hills and valleys to your hearts content. There's also the ability to add trees, grass and paint the landscape.

The terrain in this game is called (funnily enough) Terrain. Locate it in the Hierarchy and select it. It's currently flat and green as you can see in the Scene view.

TERRAIN EDITS

 Raise and Lower

 Plateau

 Smooth

 Paint Textures

 Add Trees

 Add Flowers/Grass

The terrain editor has a number of options for creating a landscape. Play around with them as you like to see how they work.

Select an option and then drag the mouse over the terrain in the Scene view to change it. SHIFT+RightMouse Drag will undo any changes. Use the shift to remove trees or lower the height.

For the painting textures, adding trees and adding grass options images and models are already preloaded. You will NOT need to use the Edit Textures button. Just stick with the ones already loaded.

Under the tree adding option, you will find a button that will perform a mass planting of trees. This works well to add a large crop of random trees over the terrain. Keep in mind you are creating a game that will eventually be pushed out for mobile and
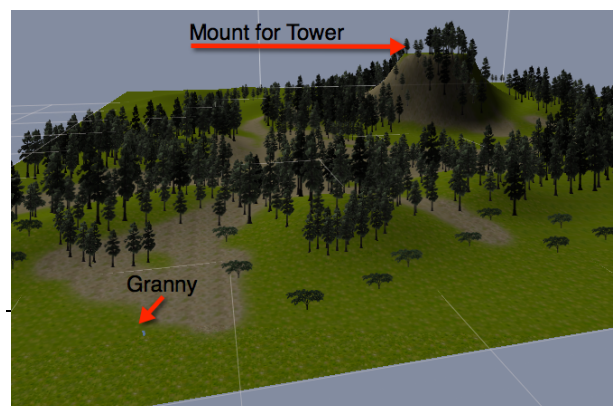
therefore you should limit the number of trees This game will have Granny running across it from one side to the other to reach a tower. Create a landscape with a mount for the tower on the other side of the terrain from Granny's starting

position. Give the landscape some interesting features and vegetation.

At anytime you can press play and have Granny run around the map. You may like to do this to ensure the terrain isn't too steep for her to navigate. Some steep parts are okay, but it can't be impossible to get the character to safety.

If you run the game and Granny walls through the ground and into the abyss chances are the capsule collider that determines Granny's physics and keeps her planted to the ground has gone through or below the terrain.

To fix this, with Granny selected in the Hierarchy, press the W key to get the movement axes to come up in the Scene and use the up pointing arrow to drag Granny above the ground.

Press play to check you've lifted the model up far enough. Even if it is slightly in the air above the terrain when you press play, gravity will ensure Granny drifts to the ground.
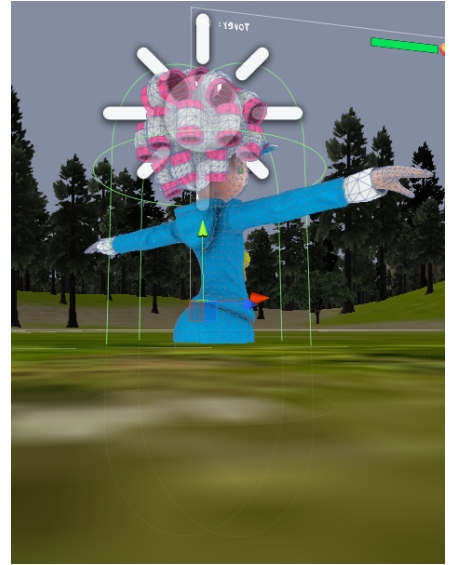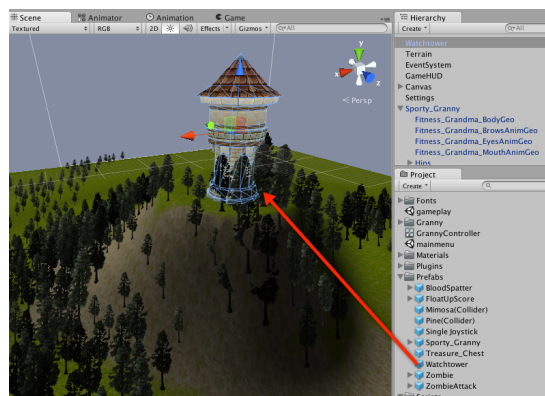
STEP 7

Add the Tower

Granny's safe haven and the checkpoint that ends the game is the tower. The tower will be placed on the other side of the map. For the tower we need a 3D model. This Locate the Watchtower prefab in the Project > Prefabs folder and drag and top it onto your terrain.

It doesn't matter if you don't get it in the exact position as you can move it around in the same way we adjusted Granny's position in the previous section.

After the tower is in the Scene, select it and then press the W key. Drag the tower around by the blue, green and red axes that appear.

STEP 8

Land of the Living Dead

To give Granny that little bit of incentive to make it to the tower we will now add a horde of attacking zombies.

Locate the *globalFlock* script in the Project > Scripts folder. Drag and drop it onto the GameHUD object in the Hierarchy.

Select the GameHUD object in the Hierarchy and you will now see the script attached to it in the bottom of the Inspector.

With GameHUD selected in the Hierarchy, drag and drop Sporty_Granny *from the Hierarchy* onto the Granny variable box of Global Flock in the Inspector and drag and drop the Zombie prefab *from the Project > Prefab folder* onto the Zombie variable.
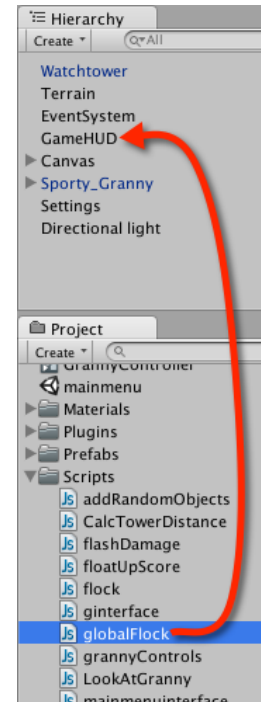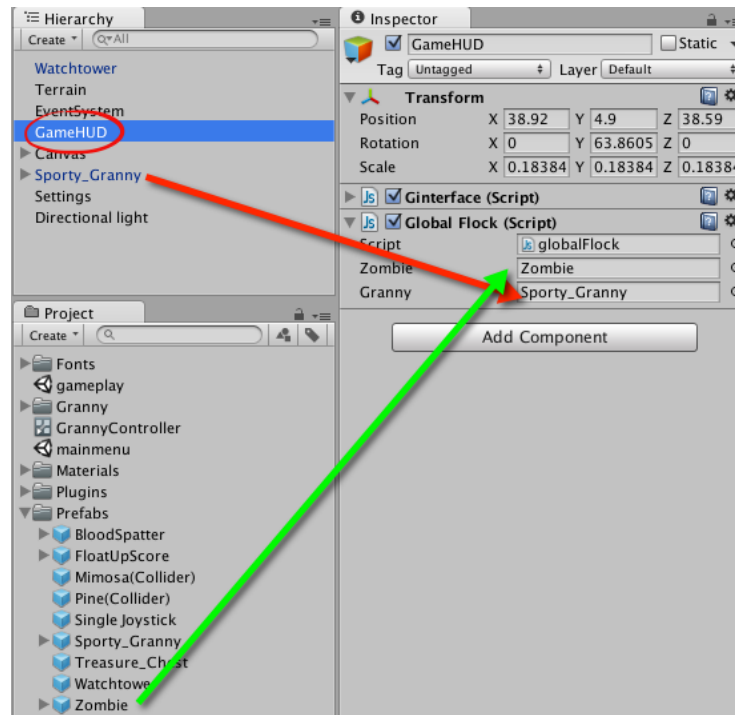
It's very important you get the right Granny and the right Zombie dropped onto the Global Flock script.

Once you've completed this step Play the game and take Granny for a walk. Watch out for the zombies.

They will follow you around unrelentlessly until you are dead.

STEP 9

The Cries of Death

When Granny finally succumbs to the zombie attack there's a spectacularly over acted death animation that plays. This is great visual feedback for the player. But lets make it even better by adding a little sound.

With Sporty_Granny selected in the Hierarchy, click on the Add Component button in the Inspector. From the list choose Audio > Audio Source.

An Audio Source component will be added to Sporty_Granny.

The Audio Clip of this Audio Source should be set to the death.mp3 file that can be found in the Project > Sounds folder.
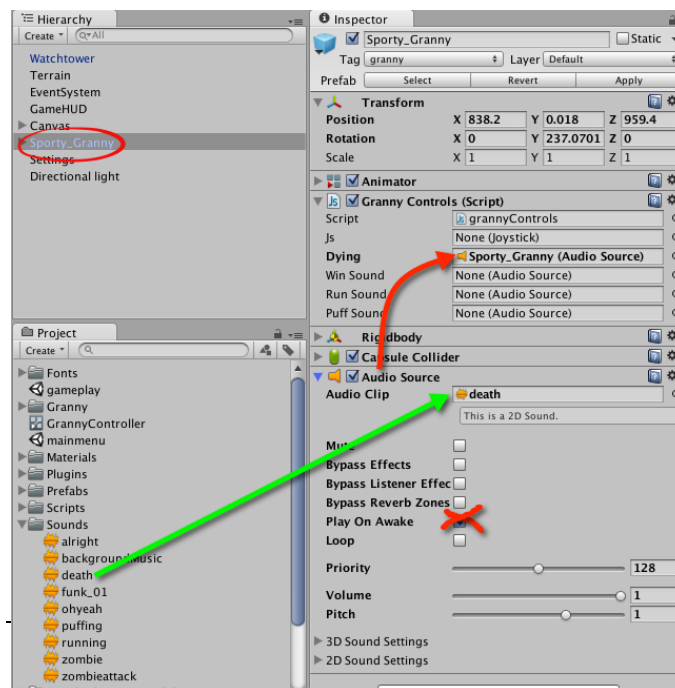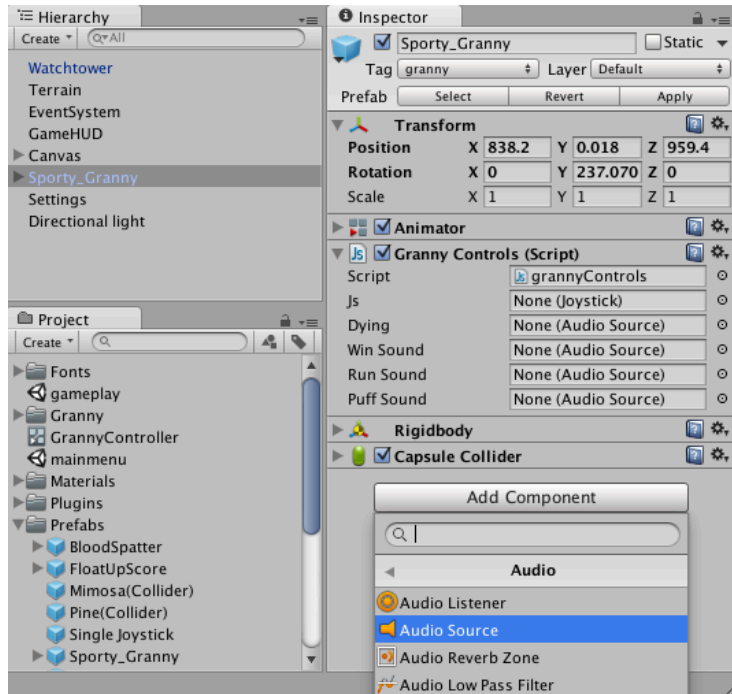
After the Audio Clip is set, untick the *Play On Awake* check box. If you don't the sound will play immediately the game runs.

Then click and drag the entire Audio Source by its text at the top near the little orange speaker symbol and drop it onto the Dying slot of the Granny Controls script just above.

To test this worked. Play and take Granny for a walk

in the forest to meet her doom.

Add Scary Background Adding a Backing Track

To add another level of scary ambience to the game lets play some scary backing music.

Select the GameHUD in the Hierarchy. In the Inspector, use the Add Component button to add an Audio Source onto the GameHUD. Set the clip for this Audio to the backgroundMusic file in the Project > Sounds folder and tick its PlayOnAwake and Loop checkboxes.
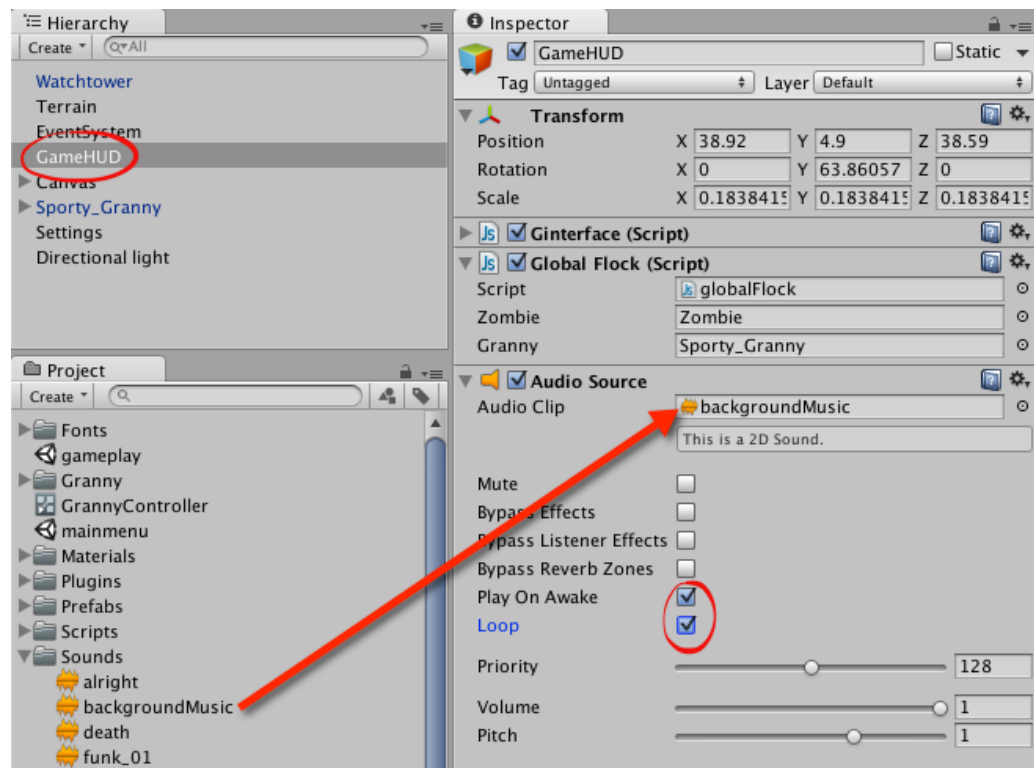

Play. There's now scary music.

Health Pickups

By now you'll have figured out that Granny has no hope in this zombie ridden landscape with rapidly declining health to make it to the tower alive. We therefore need to provide her with some pick-me-ups – health boosts – to provide her with a fighting chance.

Double-click on Sporty_Granny in the Hierarchy to locate your in the Scene. Drag a Treasure_Chest prefab from the prefabs folder onto the terrain close to Granny.

Play. Have Granny walk over the chest. Once it is picked up a sound will play, a score will float up and Granny's health bar will increase.

If you inspect the Treasure_Chest you'll find it is more than a 3D model. It also has script attached and an Audio Source among other things.
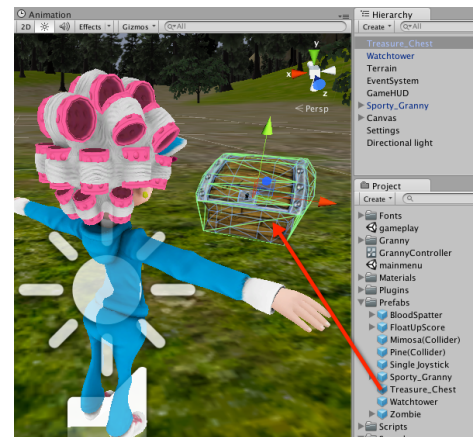
Now, you could place chests by hand all over the map. But this is a laborious task. Instead, a simple script can be employed to create and drop chests at random across the landscape.

Locate the *addRandomObjects* script in the Projects > Scripts file. Drag and drop this script onto the Terrain.
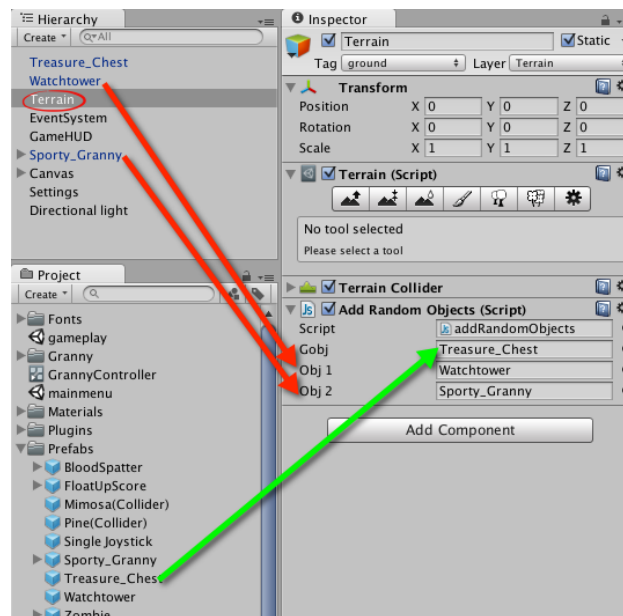
Select the Terrain in the Hierarchy. Drag and drop the Watchtower and Sporty_Granny objects *from the Hierarchy* onto Obj1 and Obj2 of the script respectively.

Drag and drop the Treasure_Chest prefab *from the Project* onto Gobj of the script.

This script will drop chests at random locations within a circle between the tower and Granny.

Sometimes a prefab is dropped onto a script. You do this when you want to create copies of the prefab and add them to the scene. To manipulate or work with objects already in the scene (such as Granny and the tower) the script needs to reference them directly from the Hierarchy.

Play. You'll find a whole cache of chests have been dropped on the map to give Granny a little boost every time she walks over one.

STEP 12

'See?' said the blind Granny

With all the zombies and chests scattered across the terrain it would be nice to give Granny a little heads-up as to their location. We will therefore add a radar system to the game.

Locate the *radar* script in Project > Scripts and drag and drop it onto the GameHUD object in the Hierarchy. This script performs some clever mathematics and places coloured dots on a radar view on the game heads-up display (HUD).

However, to perform its task it requires some images; ones to display locations of chests and zombies, one to show where the tower is and others.

Expand the view of the Project > Textures folder so you can see all the images contained within. Next select the GameHUD object in the Hierarchy. You will now see the radar script in the Inspector. One by one drag the corresponding images onto the script from the Textures folder as shown here.

You'll also need to drag Sporty_Granny from the Hierarchy onto this script so the radar can figure out the position of objects relative to her position in the world.
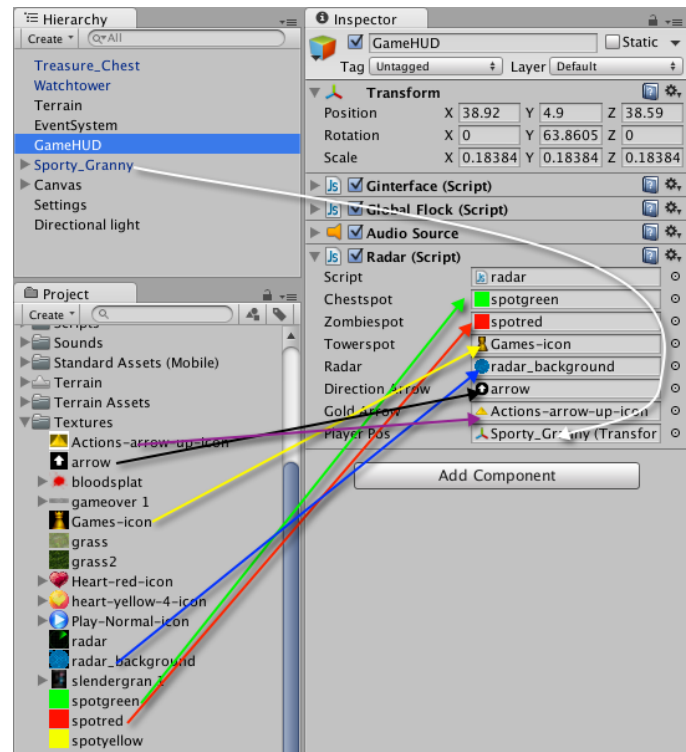
Play. You will now have a radar system. The green dots are the chests, the red dots are the zombies and the gold arrow points to the tower.

STEP 13

Are we there yet?

the tower. If this number is going down, we know the player can assume they are heading in the right direction.

There's already some text on the screen in the upper right ready to display this value. All we need to do is program it in.

Double-click on the script file CalcTowerDistance in the Project >Scripts direction. It will open in a code or text editor. Type in the following code:

```
#pragma strict

var granny: GameObject;
var tower: GameObject;

function Update ()
{
    var d: int =
        Vector3.Distance(granny.transform.position,
                         tower.transform.position);
    this.GetComponent(Text).text =
        "Tower in " + d + "m";
}
```

Save the file but don't close the editor (just incase you've made a mistake). If you ever make a mistake in the code you'll get an error message in red across the bottom of the editor window. Double-clicking on the error message will provide more information.
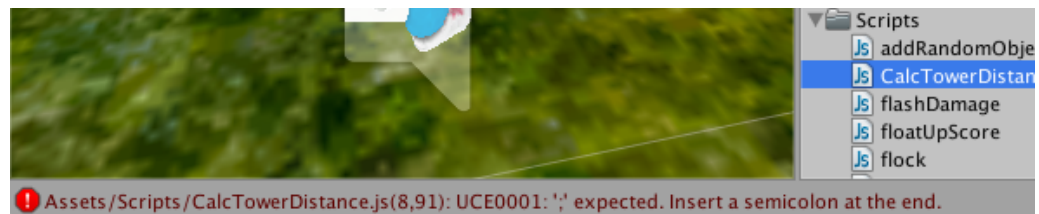
If there are no errors in your code the bottom of the editor window will be clear of messages.

Next, locate the TowerDistance game object in the Hierarchy. Drag and drop the CalcTowerDistance script from the Project and drop it onto TowerDistance. Select TowerDistance in the Hierarchy to
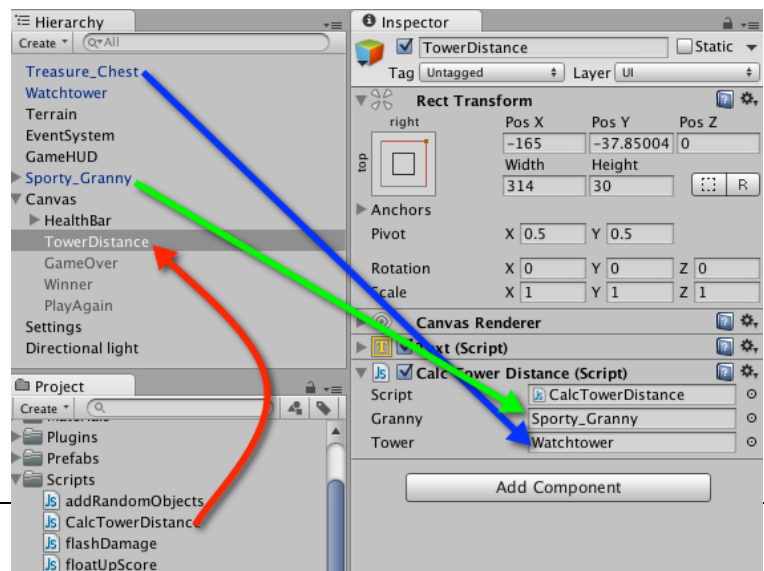
expose the script in the Inspector.

The script requires knowledge of Granny and the Tower in order to calculate the distance between them. Drag and drop Granny and the Tower game objects from the Hierarchy onto these boxes in the Inspector.

Play. The upper right corner of the HUD will show a changing distance to the tower value.

STEP 14

Some final touches

Imagine. Granny finds herself in the dark, surrounded by zombies, health rapidly declining. The forest would be gloomy and the grass damp. She'd be panicked, right?

To set the scene even more we can darken the sky, add some fog and more sounds.

To darken the sky select the Main Camera that is attached to Sporty_Granny in the Hierarchy. In the Inspector click on the Background property to bring up the colour selection box. Set the background colour to a gloomy grey.

You can also set the colour by typing in the Red, Green, Blue and Alpha values of 82, 85, 86 & 5 respectively into the colour sliders.

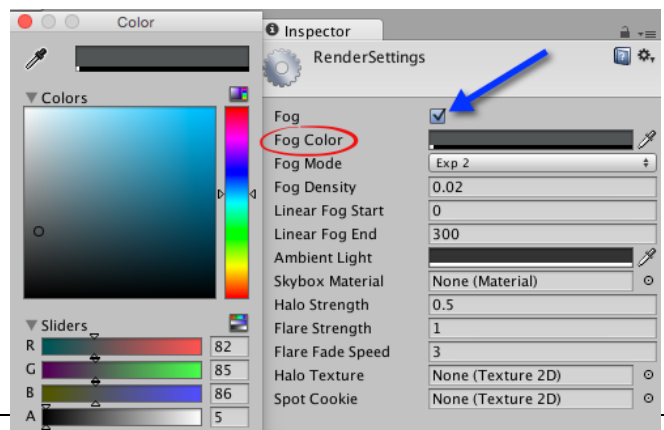In the Scene and Game views the sky will now be grey.
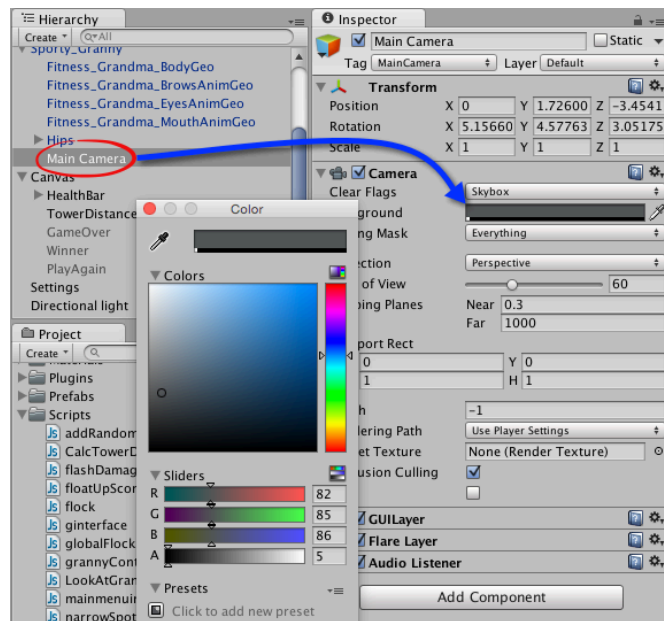
Of course, if you prefer, the sky can be green, red or pink. Its up to you!

Fog

To add fog to the scene select from the main menu Edit > Render Settings. In the Inspector window a render settings dialog will appear.

Turn on the fog by clicking the Fog check box.

17

Its important to know that the sky is *not* affected by the fog colour. Therefore, if you want a seamless blend between the sky and distant fog you'll need to make the fog colour exactly the *same* colour as the sky.

Change the fog density value to get thinner or thicker fog as desired.

At anytime you can Play and take Granny for a job through the fog to check the density and colour is just right.
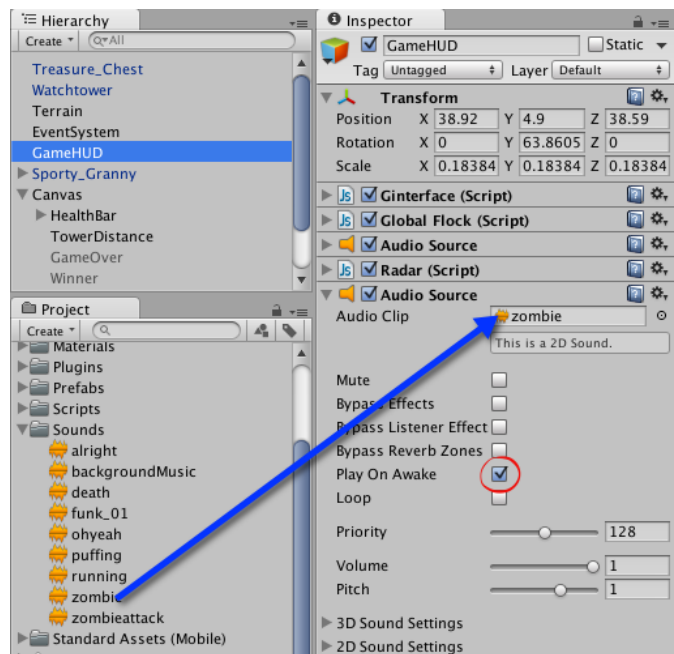
Zombie Moans

To inform the player there are zombies nearby, lets play a zombie moan sound when the game first runs.

Select the GameHUD in the Hierarchy and add a new Audio Source to it (Add Component > Audio > Audio Source).   Set the Audio Clip of the new source to the zombie sound clip.

Click the PlayOnAwake checkbox.

Play. A zombie moan will play as soon as the game loads.

Footsteps on Wet Grass

We can further engagement with the game by adding footstep sounds to Granny.

Select Sporty_Granny from the Hierarchy and add an Audio Source to her, just like you did with the zombie moans above. Set the Audio Clip to the running sound. Turn *off* PlayOnAwake.

Granny's footstep sounds need to begin when she runs and end when she stops moving. The Granny Controls script already attached to Sporty_Granny controls this for you. You just need to give it a sound. Drag and drop the new Audio Source with
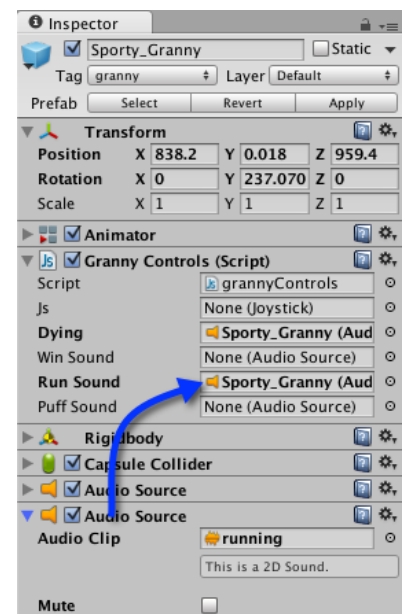
the running clip onto the Granny Controls script and into the Run Sound box.

Play. You will hear footsteps with Granny runs.

Puffing from Exhaustion

You can add as many sounds to a scene as you like. Along with the footsteps we will now add a puffing sound. The procedure to do this is exactly as that for adding the footsteps.

Add a new Audio Source to Sporty_Granny, set the Audio Clip to the puffing sound and then drag and drop this Audio Source onto the Granny Controls script in the Puff Sound box.

Play. Granny will puff when running.

If you get the sounds play immediately when the game loads it will be because you've forgotten to uncheck PlayOnAwake.

Celebration Sound

There's another clip called *alright* in the Project > Sounds folder. This sound will be used later, but while you are adding sounds to Sporty_Granny, now is probably a good time to add this. Follow the same steps you did for adding puffing and running to add the *alright* sound as an Audio Source. Set the Win Sound box of the Granny Controls script to this new Audio Source.

STEP 15

Reaching Safety

If you've tried the game thus far you'll find that reaching the tower does not ensure safety. As of yet we've not programmed the game to recognize when Granny reaches it.

Locate the reachTower script in Project > Scripts. Double-click to open in the script editor. Enter the following code:

```
#pragma strict

function OnTriggerEnter(other : Collider)
{
     if(other.gameObject.tag == "granny")
     {
          ginterface.winner = 1;
     }
}
```

Select the Watchtower object in the Hierarchy. Drag and drop reachTower from Project > Scripts onto it.

When Granny reaches safety we should celebrate with a new backing track. Select GameHUD from the Hierarchy and add another Audio Source. Set the clip to funk_01 from Project > Sounds. Turn PlayOnAwake off.

The Ginterace script on the GameHUD controls the background music. It will need to turn off the background music and turn on the celebration music. You therefore need to set the Win Music and Back Ground Music boxes for Ginterface to the associated sounds.
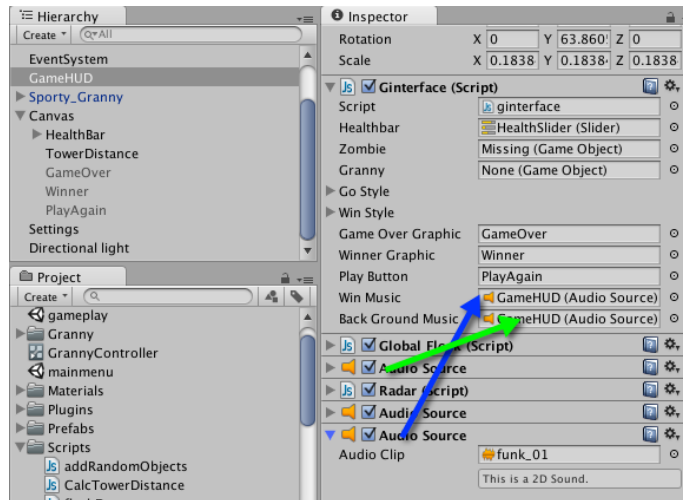
As before drag and drop the appropriate Audio Sources that are attached to the GameHUD onto the script.

STEP 16

Testing the Tower

To test this is working you could play and run Granny all the way across the map to the tower, or you could test the end game condition for bugs without running through the entire scenario.

In the Scene, zoom in on the tower. Select Sporty_Granny in the Hierarchy and then from the main menu choose GameObject > Move to View. The Sporty_Granny object will be relocated near the tower. You might have to manipulate the position of the model with its axis to ensure it is slightly away from the tower and also above the terrain.
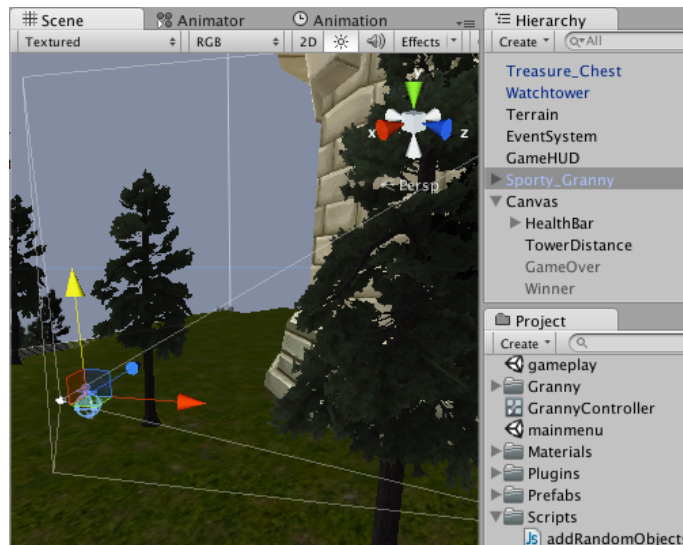
Sporty_Granny can also be moved by selecting the game object in the Hierarchy, pressing W and then using the axes system to move the model into place.

Play. You'll find a plethora of chests between Granny and the tower. This is because the script that randomly creates the chests makes sure they are between the objects. So it creates all the chests in a small space.

Ignore this effect though as you are here to test the game over scenario.

Run Granny at the tower. When she is close enough the game will be over and a little surprise awaits you!

Game Tweaking and Testing

STEP 17

The game is now complete. Move Granny back to the other side of the map and play through the scene to see if you can beat the zombies to the tower.

If you want to tip the odds in your favour you can play around with the variable settings for the game. You'll find these in the settings script attached to the Settings
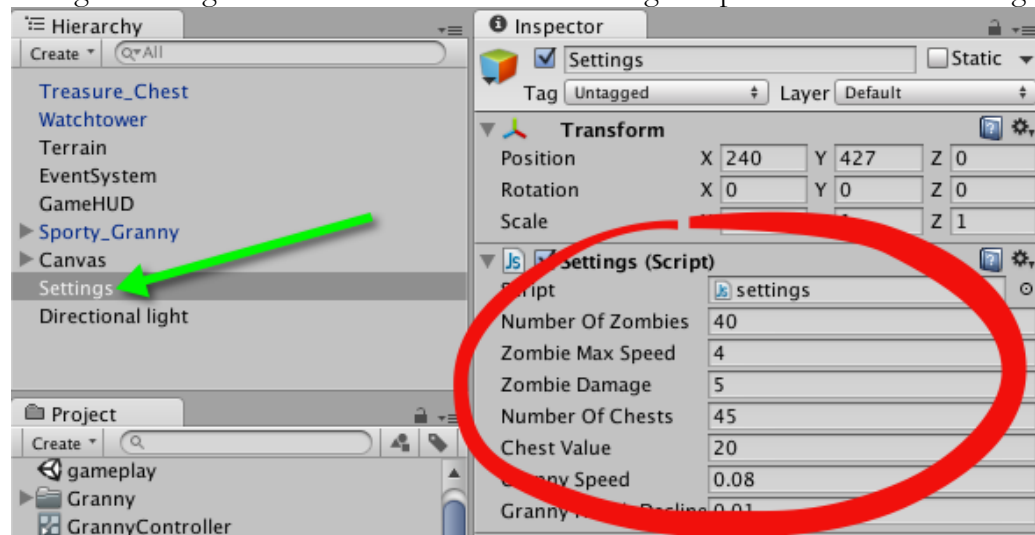

Stop the game while you change these settings and then recommence. Note: the game is achievable with the default settings!! ☺

Control for Tables: Adding a Joystick

STEP 18

Tablet devices don't have a keyboard. This will leave Granny a little high and dry or battered and bloody as the case may be. Luckily, Unity supplies a joystick controller for our use. Locate the Joystick prefab in the Project > Prefabs folder and drag and drop it into the Hierarchy. If you switch to the
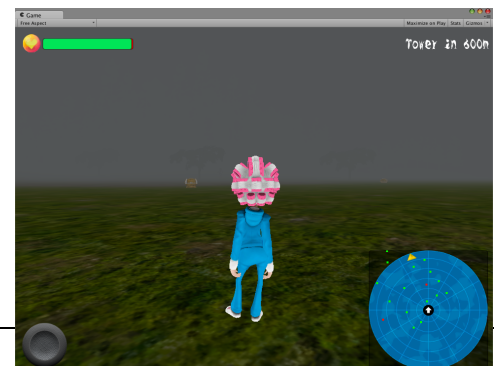
Game view you'll see the joystick graphic in the bottom right hand window.

Now to hook this up with Granny's controls select Sporty_Granny in the Hierarchy then drag and drop the new Joystick from the Hierarchy onto the Granny Controls script in the space provided called Js.

When you build out to a tablet device there will be a way to move Granny around.
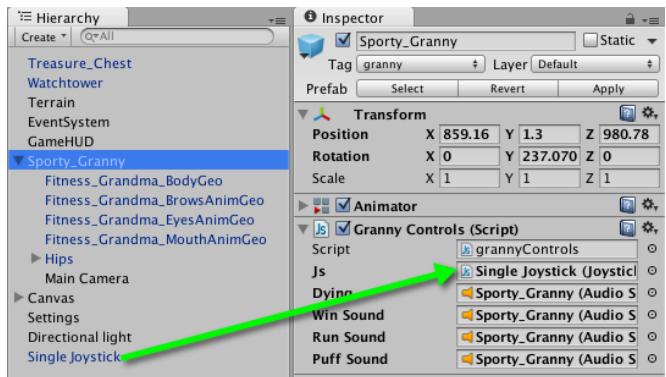
STEP 19

### Building for other platforms

Unity has the ability to build to a multitude of platforms. You can change the platform in the build settings window.

PC/Mac

To make a stand alone PC or Mac game select the PC, Mac & Linux Standalone platform and then click on the Switch Platform button. Select the Target Platform on the right and then click the Build Button.

The files produced can be copied onto a USB and run on another machine.
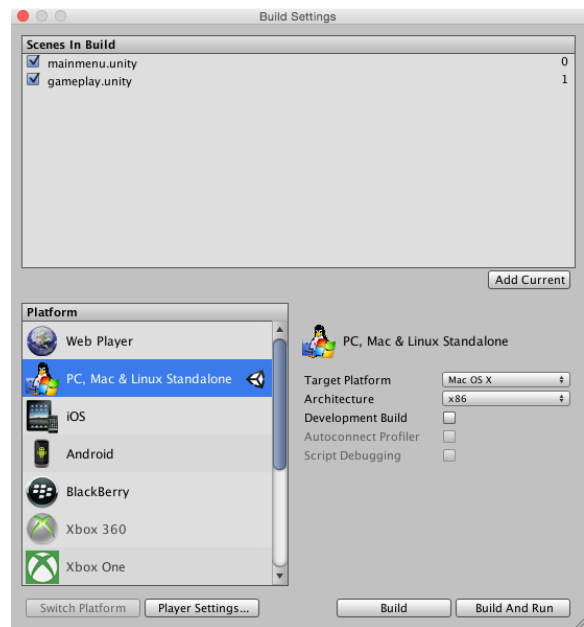
Web

To create a web game, select the Web Player platform, Swith Platform and then Build. Unity will create two files. One with .unity on the end and one with .html. Keeping these files together in the same folder you can open the .html file with a web browser and play the game.

These two files can be uploaded onto a website and run.

You'll find an example of Slender Granny here:

http://aliveed.com/slendergranny/

Android

To build out to an Android device you will need an android device plugged in via USB to the computer. You will also need the Android SDK installed and any other ancillary programs. Then it's a matter of clicking on the Build Button.

For detailed steps see: http://docs.unity3d.com/Manual/android-sdksetup.html

iOS

To build out to an iOS device (iPad, iPhone) you need to have the device plugged in. You also need to have XCode installed on your Mac and an Apple Developer account.

For detailed steps see: http://docs.unity3d.com/Manual/iphone-GettingStarted.html

Like to Learn More?

Unity is a free game development engine. It can be downloaded from http://www.unity3d.com.

I've two books that can help you get started with programming Unity to create your own desktop and mobile games. The books were written for students and are used in over 40 universities internationally as a text.

They are aimed at the novice and begin gently leading the reader through numerous simple exercises up to complete games.

Read more about them at:

http://www.holistic3d.com

Unity also has a comprehensive set of video tutorials for beginners at:

http://unity3d.com/learn

Contact Me

For more information or help with Unity or associated game creation matters feel free to contact me via email or on social media.
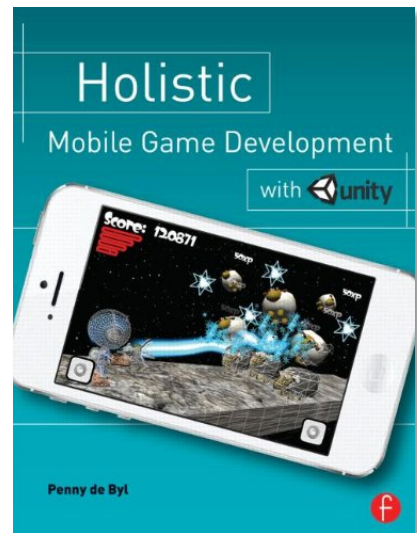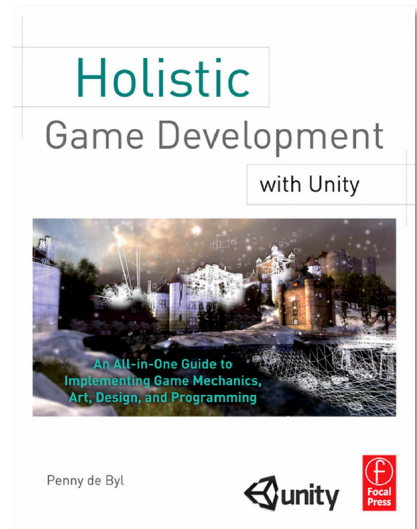
Penny de Byl
pdebyl@bond.edu.au
Twitter:
@penslayer
Facebook:
https://www.facebook.com/pdebyl
https://www.facebook.com/pages/Holistic3D/272575919455432

More about Bond's Bachelor of Interactive Media and Design

H T T P : / / W W W . T I N Y U R L . C O M / B O N D B I M D