CS4590: Fall 2015 - Homework #3

For this **group assignment**, you will be creating an interactive 3D sound environment using Unity. This involves designing the basic architecture of your environment, identifying/authoring/preparing the sounds, and placing these sounds in your scene, which will be navigated from a first-person perspective.

This sounds like a lot, but Unity3D does much of the heavy lifting for you. You are provided scripts to handle the first-person controller, and the geometry of your scene can be entirely created from the simple primitives provided with Unity (Cubes, Spheres). **Your grade will entirely be based on the quality of your 3D soundscape, not on the visuals**. You are welcome to improve the visual quality of your scene, but it is not required, and should come after the sound requirements are completed.

Overview

You will be building a virtual soundscape that mimics the interior and exterior of a restaurant environment. This should include indoor and outdoor environments (e.g. the parking lot outside the restaurant, etc). The sounds you choose should be appropriate for the environment you are creating. For example, in a fast-food restaurant, you may have customers talking/screaming/walking, workers behind the counter, a playground outside, etc.

To define the boundaries of your environment, you will utilize placeholder primitive 3D objects for reference and for collision detection. Again, *the visuals of your experience will not matter at all*. The entire assignment can be completed using only Cube primitives.

Important: In addition to creating a convincing soundscape, your environment should be recognizable and navigable using sound alone! One of the provided prefabs (CameraPowerSwitch) will disable the in-game camera. This will be used during grading to determine how navigable your environment is without visuals.

Your environment must have **high quality**, **contextually appropriate**, 3D sound sources. The goal is to immerse the user in your environment (providing the context for the wearable application that later you will be prototyping inside of it) and that provide enough cues that the user could find their way around the

space without visuals. For example, you may hear the sounds of the kitchen as you approach a doorway leading to it, suggesting the environment within.

Included Files

Attached to the assignment is a HW3 Includes unitypackage. This package includes:

- A first-person controller prefab (First-Person Controller)
- A base environment you can use as a starting point (this size should be sufficient for this homework, but feel free to change it however you need to for your specific needs). This environment includes invisible walls to prevent your character from walking off the edge. (Base Environment)
- A small room prefab to demonstrate creating basic buildings with Unity Cube primitives. (Sample Room)
- A prefab that when added to your scene will disable the in-game camera when **Escape** is pressed (CameraPowerSwitch).
- A scene that includes all of these prefabs together (Sample.unity)

Sound Sources

You are required to have at least **20 distinct sound sources** placed within your scene. This is not a hard limit, and you are encouraged to aim for more than this if you find your overall environment is lacking.

Your environment should be dynamic (sound sources that move around the scene) and interactive (movements/location of the character controller trigger sounds in the scene). This can be achieved by writing scripts that when attached to your objects will create your desired behavior.

See the Requirements section below for the exact technical requirements.

For the sound files themselves, you are welcome to utilize sounds you find on http://www.freesound.org/ as well as any other available sources. Please note that merely downloading the sounds and placing them in your environment is not enough... you are expected to edit the sound files before bringing them into the engine (trimming leading silence, normalizing your sound files, applying audio filters when necessary, etc). You should also be adjusting the volume of sounds in-engine for clarity.

In particular, sounds that loop should be no longer than they need to be. If you have a refrigerator humming in your scene, you do not need 30 minutes of that

sound. A loop of around 15 seconds will do, and depending on the volume of the sound you can likely get away with less (~8 seconds). **Loops must be seamless**.

Distinct Spaces

To aid in navigability, you will create acoustically distinct spaces. This is achieved in Unity (and other game engines) largely through the use of Reverb Zones, which apply reverb over a a section of 3D space. You will need to have at least two Reverb Zones in your scene which affect the sounds in different ways that make sense.

http://docs.unity3d.com/Manual/class-AudioReverbZone.html

Each member of your group must "own" one space of your environment. For example, if you have three members, one could be responsible for the kitchen, another the dining room, and another the exterior. This should be documented in your write-up.

Requirements

Technical:

1. A Unity application which creates a 3D scene with visual (primitive) and auditory elements. The world does not have to look realistic visually, the goal is to make it convincing and navigable **sound wise**. (10 points)

2. The application allows the user to use standard first-person controls to navigate the avatar around the space. You may use the supplied code or roll your own. If you change the controls, make sure this is noted in your write-up. (5 points)

3. The application must properly handle collision when the character collides with an object (i.e. the character should not pass through the geometry) and it must play a sound appropriate for that collision. (**Sound requirement #1: 2 (or more) collision sounds triggered when a user collides with objects in the scene**). (5 points)

4. There should be static sound sources (ones that don't move) and dynamic sound sources (sources that move around the scene in 2D/3D either on a set animation path or move based on collision with the character). (**Sound requirement #2: Must have (at least) 20 <u>unique</u> sound sources**

in the project. At least 5 of these must be dynamic sounds. These should be distinct from the other requirements.) (20 points)

5. There must be audio sources that change audio clips based on the distance of the player from the audio source when the player approaches its location or enters a zone you define (e.g. walking up to the counter and hearing activities in the kitchen when you get close, versus just the clerks voice when far away). (**Sound requirement #3: At least 3 sound sources that change their content/AudioClip(s) based on user distance/location. (not just getting louder or softer)** (3 points)

6. You must have at least two different acoustic environments (e.g. when you walk into an area there is more reverb because you are inside of a building versus outside in the parking lot). Utilize Unity Reverb Zones for this. (**Sound requirement #4: at least two areas in the world where the acoustics of the sound sources are noticeably different**) (4 points)

7. Your scene must also include ambient (2D) sounds that immerse the user in the setting/environment. The volume of these sounds should not be affected by the user's position. (**sound requirement #5: At least 2 ambient sound sources in the scene**) (2 points)

8. You must have at least one 3D sound source that doesn't just play the same sound over and over, but chooses randomly which sound to play each iteration from a bank of at least 4 possible sound clips (e.g. changing footstep sounds for a person in the scene, different action sounds emanating from a machine or person etc.). (**Sound requirement #6: a sound source that randomly chooses which sound clip to play from a bank of 4 or more pre-made sounds**) (2 points)

9. One sound clip must programmatically change pitch during the experience based on some input (e.g. random number, character location). (**Sound requirement #7: a sound that changes pitch programmatically during the experience based on some input**) (2 points)

10. At least two sound sources must be human voices, which are clear and intelligible. (**sound requirement #8: At least 2 sounds must be of human voices**) (2 points)

11. Your sounds must loop appropriately and be of high quality. Sounds should be normalized (with the source volume lowered as needed) and audible in the scene based on their intended purpose. Loops must be seamless. (**sound requirement #7: sounds loop without noticeable**

clicking or other artifacts and are free of noise and unintended distortions) (5 points).

Note: It is possible to have sound sources that meet multiple requirements at once (e.g. a voice clip that changes pitch and moves around the environment dynamically), but you must still have at least 20 distinct sound sources. (In fact, you may have many more than this.)

Write-Up

1. A simple map that shows the locations of all of your sound sources. This can be hand-drawn, but it should be clear. This map should be labeled with the locations of all of your sound sources. *It is highly recommended you do this before you start work on this project!* (5 points) - image file or **PDF**

2. A 1-2 page write-up describing the scenario you have chosen, any control hints, and the URL sources for the sounds you used. You should also note who is responsible for which aspect of your overall environment, as noted above. (5 points) - **PDF**

Grading

1. **Technical**: Meeting all of the requirements listed above. (70 points)

2. **Usability**: Creating an environment that is navigable based on sound alone. (10 points)

3. **Design**: Consideration of the sound-scape, quality, and appropriateness of sounds with the goal of creating an immersive and pleasing environment. (20 points)

Submission Instructions

Please include the main UnityPackage, map and write-up as three separate attachments.

Please see T-Square for submission instructions for the UnityPackage.