Spatial Audio (Unity)

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Unity – Sound – Basic Concepts

- In order to play sound effects and music in Unity, you need to learn some basic concepts:
    - AudioListener
    - AudioSource
    - AudioMixer

- Unity provides only some basic scripts to play audio.

- But they also provide the Audio Spatializer SDK, an extension that allows replacing the standard audio system with a more advanced one.
   - We will have a quick look at Resonance Audio.

Audio Listener

- There must be only ONE Audio Listener in a scene.

- Usually, it is attached to the Camera.

- It represents the listener, i.e., the player.

- It does not have any parameters, just add it to the camera, that's all.
  - In case of need, you can also detach it from the camera or move it somewhere else, but it's not really common.
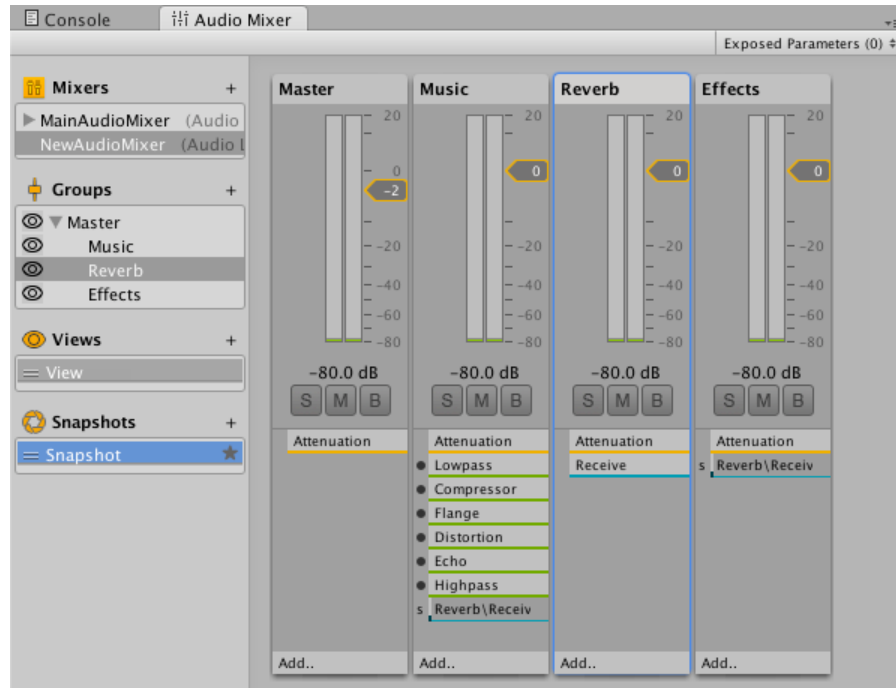
Audio Source

- Used to play a sound.

- It is mandatory to set the Audio Clip (the sound that you want to play)

- You can set an Audio Mixer Group (more details in the next slide).

- It has a lot of parameters, like Volume, Pitch, …

- Be careful about "Play on Awake", true by default. It'll play the sound on Awake, and maybe it is not what you want.

- Modify Spatial Blend, to range between 2D sounds (such as UI-related sounds) and 3D sounds.
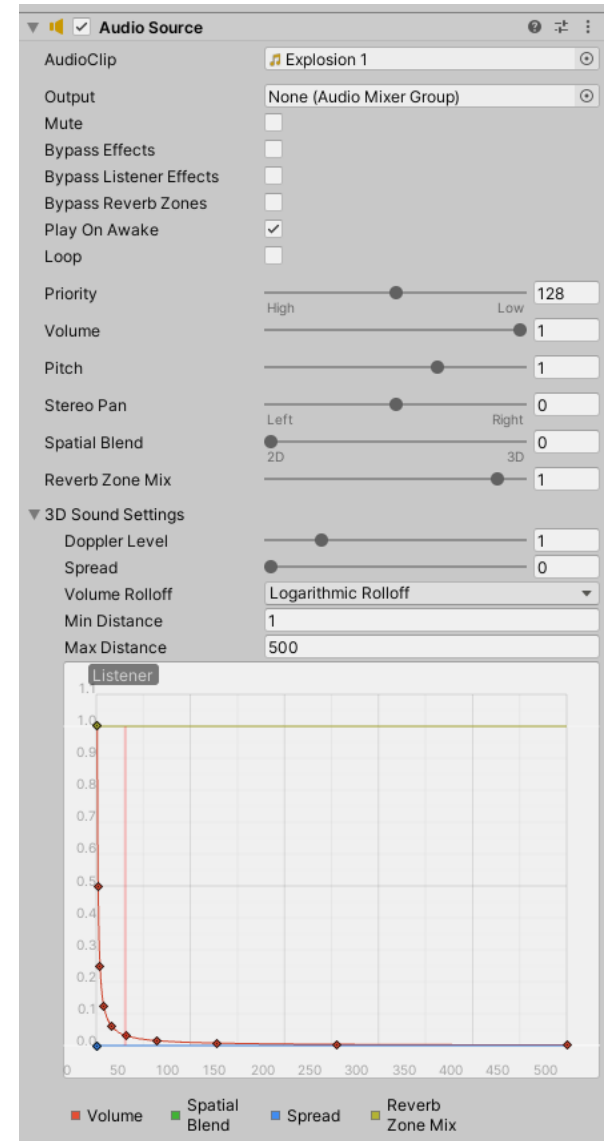
Audio Mixer

- Used to provide "advances" effects. You must select an Audio Mixer Group in the Output parameter of the AudioSource script.
- It allows you to create more groups (e.g., Music, Effects, …).
- It is possible to expose parameters and change them from C#.
  - We will see how it is possible to easily configure the volume of a game according to the type of sound.
    - E.g., the player can reduce the volume of the background music and increase the volume of the sound effects.

Other effects

- Unity is shipped with some basic effects, like Reverb, High/Low pass filter, etc...
- You can simply add an effect by attaching the corresponding script in the same GameObject you have an AudioSource.
    - The effect is applied only to that AudioSource – you cannot apply this kind of scripts without an AudioSource component.
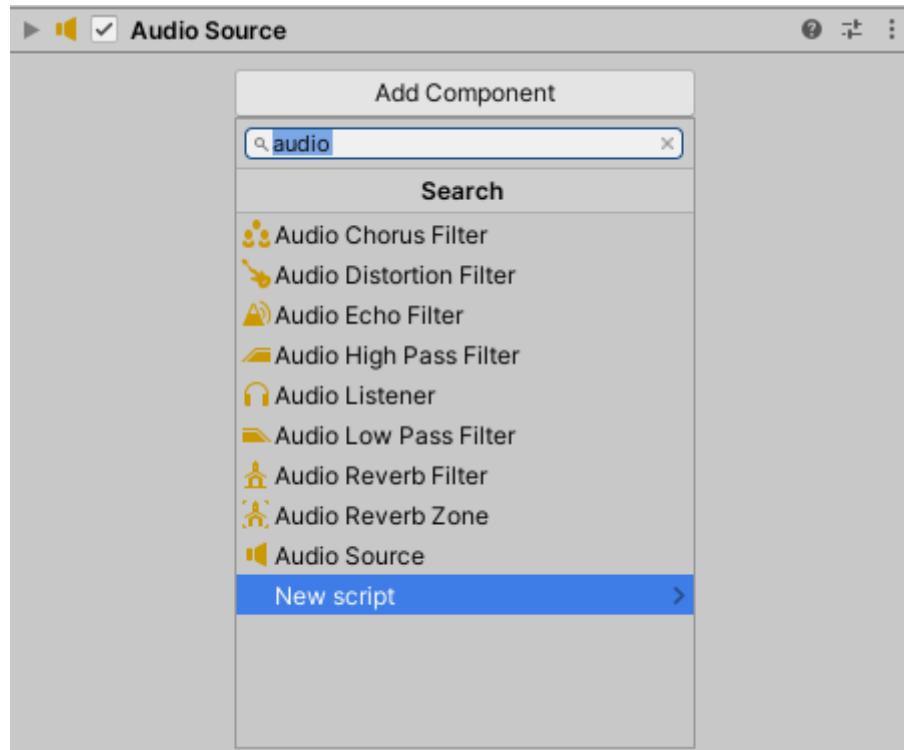
Useful pattern/functions

- Usually, to manage sounds, a couple of patterns/functions can be helpful.

- For example, it usually necessary a way to maintain the background music between the different menus/scenes.
  - You cannot destroy your AudioSource and use a new AudioSource in the destination scene, otherwise the sound will be interrupted and restarted.

  - You can use the "Don't destroy on load" script
    - https://docs.unity3d.com/ScriptReference/Object.DontDestroyOnLoad.html

  - Usually used together the Singleton Pattern

Audio Spatializer SDK

- It is possible to extend the basic functionalities offered by Unity using external SDK.

- Most used SDKs are:
  - [Resonance Audio](#)
  - [Oculus - Audio SDK](#)
  - [Microsoft Spatializers](#)

- In the [course repository](#), in the "Lab 10 – Audio (Part 2)" folder, you can find a small project with the Resonance Audio Plugin.
  - I suggest to use Unity 2018.3.x, in order to be sure that everything works. The newest versions may work, but I cannot guarantee.

Resonance Audio

- To enable Resonance Audio:
  - Go to **Edit** > **Project Settings** > **Audio** to open the AudioManager settings.
  - Select **Resonance Audio** as the **Spatializer Plugin**.
  - Select **Resonance Audio** as the **Ambisonic Decoder Plugin**.

- In Assets/ResonanceAudio/Demos/Scenes, you can find a couple of demos.
- Open "ReverbBakingDemo" scene, try it moving between the different elements of the scene.

Resonance Audio

Component / Prefab name	Description
ResonanceAudioListener	• Enhances Unity's **AudioListener** features by introducing additional optional parameters, such as global gain and source occlusion masks. • Includes an Ambisonic soundfield recorder component that allows baking spatial audio sources in the scene into an Ambisonic soundfield. • Requires a Unity **AudioListener** in the same game object.
ResonanceAudioSource	• Enhances Unity's **AudioSource** features by introducing additional optional parameters such as directivity patterns, occlusion, and rendering quality. • Requires a Unity **AudioSource** in the same game object.
ResonanceAudioSoundfield	• Represents full 360° spatial audio by encoding sound waves on a virtual sphere around a listener.
ResonanceAudioRoom	• Simulates room effects for a particular space by introducing dynamic early reflections and late reverberation. • Uses the **Transform** properties of the attached game object and applies room effects accordingly. • The corresponding room effects are enabled whenever the **AudioListener** is inside the specified boundaries of the room model.
ResonanceAudioReverbProbe	• Offers an advanced option for finer modeling of spaces and more nuanced reverb effects.

Source: https://resonance-audio.github.io/resonance-audio/develop/unity/getting-started

Resonance Audio

- In Assets/_Scenes, you can find four scenes. Open "AudioRoom.unity" scene.

- From here you can move to the Outdoor scene, or to Big/Giant scenes.

- Focus on the sound to listen to the differences on how the audio is propagated in the different environments.