# Universal Footstep Sounds Documentation

## Asset Overview

Universal Footstep Sounds began as an item which I implemented in to my main Unity project and after receiving feedback on its functionality (documented in a video development blog I did), I decided to repurpose it as a standalone asset for use in (virtually) any other project with a character that moves. Rather than use a tag-oriented solution, I wanted something more diverse that would also apply to terrains – and anything with a texture assigned to it. Essentially what the script does is determine the surface which the character is currently standing on and finds the texture of the material applied to said object (or in the case of terrain, finds the dominant texture among the blend) and plays a distinct sound while moving on it. The same Raycast used to determine the texture of the surface beneath the character also prevents the sounds from playing when the character is not touching the ground (provided that the Raycast itself is not too long; see the "Script Variables and Configuration" section).

## The Logic

Although the code in the script is thoroughly commented to better assist those who would want to modify it, I'll break down the general flow of how it functions.

- Compares the characters current position with the last cached position to determine if they have moved. If they have…
- Raycast is performed
    - If it hits the ground, this gathers both the texture name and assuming the length is correctly configured (see the "Script Variables and Configuration" section), determines if the character is on the ground or not.
- If the Raycast hits, it calls a method to check if the surface is an object or terrain.
    - If it's an object, it finds the texture name in the material.
    - If it's terrain, it compares the splat maps to find the dominant texture at that spot.
    - If it's neither (or has no texture assigned), it will return the default sound effect.
- That information is then passed to the next method which compares the texture name gathered in the last step to the texture array configured in the Inspector.
    - If it finds the texture name in the array, it plays back the configured sound effect.
    - If not, it plays the default footstep sound.
        - If you would like to have areas where no sound effect is played, add the texture to the array but do **not** assign a sound effect to it.

## Package Contents

After importing the package as you would any other Unity package, you will see 2 folders:

- Universal Footstep Sounds
    - Standard Assets

The ‘Footstep Sounds’ folder is the important one here as it contains the script for the functionality. The ‘Standard Assets’ is the basic Unity package containing the first-person and third-person controllers used in the example scenes. I have renamed the scripts in here in hopes that it will not conflict with any projects that have these already added (as it is a standard Unity asset), however in the event that there are issues, these can be left out without breaking the footstep sounds script functionality.

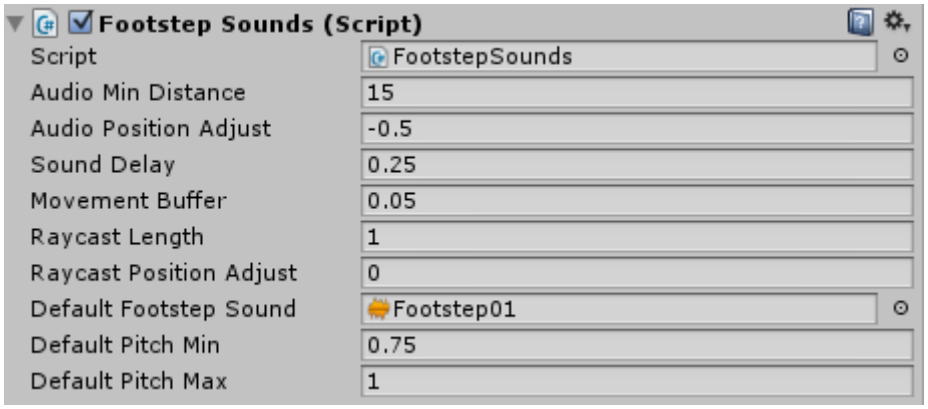
Within the ‘Footstep Sounds’ folder, you will find a few subfolders. For the most part, everything but the Scripts folder can be ignored as these are just the assets used in the example scenes. If however you want to view the example scenes to see how things are setup, that is why they were included. If not, proceed to the next section.

## Getting Started

Once the package is imported, browse to the “Universal Footstep Sounds/Script” directory and click and drag and script on to the character you want to generate the footstep sounds. With regards to general setup, that is all that needs to be done. To get everything working more appropriately, proceed to the next section for an explanation of the variables and what they all do.

## Script Variables and Configuration

Time to break down what each of the variables does and how you can get the most from this asset. After adding the script to your character, you will see the following items:



**Audio Min Distance:** This is the minimum distance applied to the 3D volume for the Audio Source created on the character at the start of the scene. Tweak this to increase the distance at which the footsteps can be heard.

**Audio Position Adjust:** This is applied to the localPosition.y of both of the AudioSources at the start of the scene. This is so that the sources can be positioned as close to where the characters feet are as possible. You will likely use a negative number here to move the AudioSources down. The actual value needed can be observed by checking the scene view/hierarchy to verify the location of "Footstep Audio Source" and "Footstep Audio Source 2". Both of the AudioSources will use this value.

**Sound Delay**: This controls the time (in seconds) between footsteps. A higher number means that you will hear the footstep sounds play back at a faster rate while moving and vice versa for a lower number.

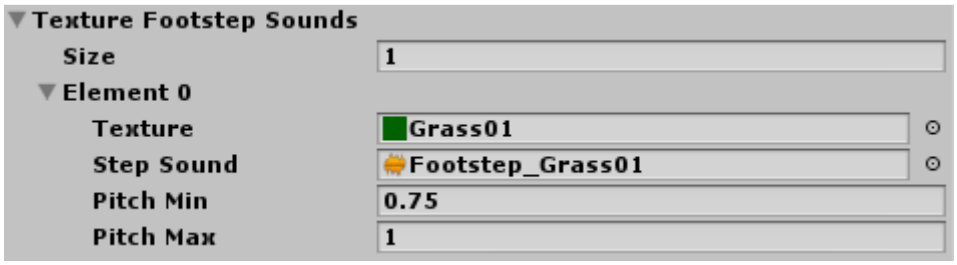
**Movement Buffer:** The percentage difference allowed internally within the script while determining whether or not the character is moving and we should play a footstep sound or not. Higher numbers mean more forgiving with the defaults being 5% (or 0.05f).
**Raycast Length**: The trickiest of the variables in this script. Remember that raycast mentioned above that is used to determine the texture of the surface which the character is standing on? This variable controls the length of that. The number itself is in Unity units, so to get a rough approximation of that, create an object (perhaps a cube 1 x 1 x 1) and use it to measure from the pivot point of your character/object (the x/y/z/ arrows on the selected object while using the move tool) to the ground. You may need to play with the value as determining the exact length can be a bit tricky. If it is too short, it will never hit the ground and as a result, you will never hear footstep sounds played back. If it is too long, you will continue to hear footstep sounds play back even when your character is not touching the ground.
*This method/variable was used so that the character moving would not need a rigidbody attached to generate the footstep sounds.*

**Raycast Position Adjust:** This is used to adjust the y position origin of where the Raycast gets fired from. In most cases, keeping this at 0 will be just fine, however if the pivot point of the object (where the Raycast originates) that the footstep script is attached to is at the very bottom (or top) of the object, you will need to use this variable to move it upwards (or downwards) so that it is not cast beneath the surface which it is supposed to hit.

**Default Footstep Sound** *(AudioClip)***:** This is the footstep sound that is played when moving on a surface containing a texture not specifically defined in the "Texture Footstep Sounds" array (this is explained in the next section). If this is not set and the character is moving on a texture not assigned a specific footstep sound, nothing will be heard.

**Default Pitch Min:** Defines the minimum value of the pitch variation applied to the **default** footstep sound when played back (lower numbers result in a deeper sound).

**Default Pitch Max:** Much like the "Pitch Min" value, this defines the maximum value allowed for pitch variation (higher numbers result in faster, higher-pitched sounds) for the **default** footstep sound.




**Texture Footstep Sounds (array):** This is the section where the magic happens; where our textures are assigned a specific footstep sound to be played when walked on. Increase the 'Size' to however many textures you would like mapped to a custom footstep sound.

**Texture** *(Texture2D)***:** This is the texture itself that will be returned when walked on. It is irrelevant if it is assigned to a material or not so long as the names match with what is being walked on. If you have more than one of the exact same texture in your project files (with a different name) and one of the others is defined in this array, the sound will only play for the one configured here.

**Step Sound** *(AudioClip)***:** The actual footstep sound that is played when the character is walking/running on the object (or terrain) with this texture (or material containing) is applied to.

**Pitch Min:** Similar to the "Default Pitch Min" but is specific to the respective footstep sound for the element in the array.
**Pitch Max:** Much like the "Pitch Min" value, this defines the maximum value allowed for pitch variation (higher numbers result in faster, higher-pitched sounds) for the respective element in the array.

## Potential Issues and Solutions

**Issue:**

- No sound is heard when walking on a texture defined in the "Texture Footstep Sounds" array.

**Solution:**

- Verify that the "Raycast Length" is appropriate for the model which the footstep sounds script is attached to.
- Try increasing the "Audio Min Distance" as the falloff for the 3D audio source may not be large enough to reach the audio listener.

- Verify that the texture assigned to the material that is being walked on shares the same name as the one defined in the array.
- Confirm that the pivot point of the object that the footstep script is attached to is not at or below the surface. If it is, use the "Raycast Position Adjust" variable to move it so that the Raycast can successfully hit the surface.

**Issue:**

- Sound is heard regardless of the player being on the ground while moving.

**Solution:**

- Reduce the "Raycast Length" variable as the Raycast is likely still hitting the ground even while in the air. If no sound is heard afterwards, see the above issue.

**Issue:**

- The footstep sound I am hearing sounds different from the actual audio clip.

**Solution:**

- Change the "Pitch Min" and/or "Pitch Max" number (or the "Default Pitch Min/Max if the issue is with the "Default FootstepSound"). A value of '1' means the sound plays at its normal speed. Lower means is plays more slowly while higher means that it plays more quickly. I typically keep the range around: 0.5 – 1.2.

**Issue:**

- Footstep sounds continue to play even when the character/object is not moving.

**Solution:**

- Try increasing the "Movement Buffer" variable. Higher numbers mean that it is more forgiving (sound will stop playing almost immediately after the character stops moving) while lower numbers may result in sounds playing for a second (or more) after the character stops moving. I personally found that between 0.01 (1%) and 0.05 (5%) works best in most situations.

**Issue:**

- The next footstep sound plays and interrupts the one before it.

**Solution:**

- Given that there are already 2 AudioSources spawned (and attached) to the main character (or whatever object the script is applied to), you will likely either need to reduce the "Sound Delay" variable or modify the script itself to include additional AudioSources.

If any other issues are encountered that are not covered here, please let me know at: Brandon@BesusProductions.com.