# Game Audio Design Documentation

David Patch

IGME.671.01

## Introduction - WotBB

*Wrath of the Bony Boys* (*WotBB*) is a satire-horror game developed by Simon Demirjian, Adam Hall, Drake Richards, John Vance, and myself for IGME 320. The goal of the player is simple - collect all the bells scattered around the graveyard to win. The challenge lies in the band of floating, ragdolling skeletons chasing after the player. If they collide with the player, they lose the game. *WotBB* uses standard first-person keyboard controls with movement bound to WASD and E to interact with objects. The satire aspect of the game has been discarded for this project to focus on the horror mood.

## Analysis

As a horror game, *WotBB* required ambient sounds that made the player feel a sense of unease. The player walks around a graveyard and forest, so noises that reflect those environments were needed. The player is able to walk around on grass, pick up bells, and bump into trees, stones, and metal fences. I wanted realistic sounds for these interactions for a better sense of immersion, despite the polygonal graphics. The skeleton adversaries also needed sound to reflect their bodies that were jumbling messes of bone. Lastly, the menus of the game needed accompanying sounds for the mouse hovering over and selecting buttons.

## Sound Assets Developed

### Character Sounds

The player character has sounds for footsteps on grass, dying, and their heartbeat. The heartbeat is used to represent the player character’s stress. The sound effect gets louder and more rapid as enemies get closer. The dying sound is one of three male shrieks. The skeletons make a rattling sound to match the animations that the model goes through, as described in the above paragraph. There is also a ‘bonk’ sound for when a skeleton collides with a player, ending the game. I added reverb to the rattling and the death shrieks to make them feel less flat.

### Interaction Sounds

The player is able to directly collide with several objects, so sounds had to be provided for each of those. The sound of a body hitting a metal fence is used for collisions with the metal fences in the game. A ‘thud’ sound is used for running into trees, and the sound of two large stones hitting each other is used for running into large rocks and gravestones. The collectibles of the game are bells, so a bell sound was used with a ‘whoosh’ effect to simulate picking up the bell when one is interacted with. To stick with the bell theme, an eerie, low chime of bells plays upon winning the game.

### **Ambient Sounds**

The horror mood and forest setting called for uneasy ambience. I went with howling winds and creaking trees to get there. There are three wind howls and three tree creaks for some variation. The creaking sounds started as a wooden bench creak. I lowered them several semitones, stretched their lengths, and added reverb to get the sound of a distant tree creaking. Behind these sounds is another track of forest noises. The sound of birds, insects, and leaves felt right at home in the graveyard/forest setting of *WotBB*.

### UI Sounds

All of the UI sounds are taken from a clip of someone pressing the buttons of a cassette player. I thought the analog clicks worked well for the horror theme, as a lot of horror games tend to take place a few decades ago. All of them have an EQ that boosts frequencies around 600Hz by about 6dB. The hover-on sound is specifically pitched higher than the hover-off sound to get an on-off feeling. The select sound has two clicks to differentiate it from the single clicks of the hover sounds.

## FMOD

### Character Sounds

The footsteps, heartbeat, and shriek all use scatterer instruments with three to ten audio files for each instrument. This, combined with minor pitch and spawn shift, makes these effects sound less processed. The variation makes it all sound more natural. The heartbeat and footsteps both have their volume levels changed with the Terror parameter. As Terror goes up, the footsteps get quieter and the heartbeat accelerates and gets louder. In-game, Terror is determined by the distance from the player to the closest skeleton, scaling inversely with distance. The skeletons’ rattle is a single looping instrument. The victory chime is a simple single instrument with no parameters, as it only ever needs to play once.

### Interaction Sounds

Much like some of the character sounds, the metal and stone collisions are scatterer instruments with four and three audio files respectively. This is again to add natural variance to the sound in-game. The wood collision on the other hand is a single instrument with no variation (due to unfortunate neglect). The item pickup sound is composed of two single instruments: a short ‘whoosh’ and a bell ringing lightly. The goal of this sound was to simulate the bell being picked up and put into an inventory. Other games have used similar ‘whoosh’ sound effects for picking items up, so I mimicked them. The items being picked up are bells, so a jingling bell is a natural sound to accompany the interaction. None of these sounds are parameterized. They are all called individually when collisions are detected in-game at a maximum of once per second.

### Ambient Sounds

The ambient sound is composed of a single instrument and two scatterers. The single instrument is for the long track of forest noises that is looped. The scatterers are for the wind howls and tree creaks. Both have three audio files that they shuffle between. The volume and pitch are also randomly modulated for more variance. These three effects are all affected by two parameters, Terror and Location. The volume of the entire sound is reduced slightly as Terror increases. Location is switched between zero and one depending on the player’s location on the map (whether they are in the graveyard or the forest). In the graveyard, the ambient forest noises are quieter and the wind howls are louder compared to being in the forest.

### UI Sounds

The UI sounds are fairly straightforward. They are all single instruments with no parameterization or modulation. The menus are meant to sound constant and not varied. Each sound is called based on the mouse positions in the menus in game.

### Snapshots and Mixer

All of the sounds that can loop (i.e. do not fire and forget) are also affected by the Gamestate parameter. This parameter utilizes snapshots for determining volume control in different situations: the menu, pausing, and in-game. Pausing or losing the game will change the Gamestate parameter, which will in turn affect the volumes of all of the sounds to match. For example, the Pause snapshot is used in the pause menu, and it reduces the volume of everything except the UI sounds. In the mixer, all of the events are divided into these categories: Ambience, Enemy, Interactables, Interface, and Player.

## Mixing

For every source audio asset, I initially normalized the amplitude. From there, I separated out the parts I needed and brought volume levels down as needed. The only sounds I wanted to be overbearing were the heartbeat and skeleton rattle, and that would only be when a skeleton is very close to the player. To that end, I made sure every sound could be heard clearly in the mixing process. The skeleton rattle particularly needed a heavy compressor due to very loud spikes in amplitude. Most of the sounds have rather conservative EQs where only a single range (maybe an octave or two at the most) were brought up or down three to six decibels. The footsteps in grass needed a hefty low shelf filter to get the higher crunch sound I wanted.

## Mastering

I used *The Walking Dead* (Telltale) game as a target for loudness with its integrated loudness of -16.8 LUFS. *WotBB* fell between -15 and -16 LUFS at its loudest parts, and I consider that well within the margin of error. The ambient sounds were the biggest culprit for being too loud, so I ended up tuning most of them down several decibels to get to around -16 LUFS. Some tweaking was done in FMOD after the loudness monitoring in Reaper, but most of those were reducing the gain of sounds by one to five decibels. I did this tweaking between playtests to ensure the loudness of different sounds in-game was what I wanted.

## Link

[GitHub repo](https://github.com/dop4398/IGME.671)

## Source Audio Files

All files taken from [freesound.org](https://freesound.org/)

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| **Source File** | **Author (user)** |
| [Rattling Bones.wav](https://freesound.org/people/spookymodem/sounds/202102/#) | spookymodem |
| [Footsteps\_Grass\_1.wav](https://freesound.org/people/SilentStrikeZ/sounds/389625/#) | SilentStrikeZ |
| [Heartbeat Fast](https://freesound.org/people/harrybates01/sounds/254366/#) | harrybates01 |
| [Whoosh\_1.wav](https://freesound.org/people/speedygonzo/sounds/257656/#) | speedygonzo |
| [Small bell ringing](https://freesound.org/people/giddster/sounds/414480/#) | giddster |
| [bonk.wav](https://freesound.org/people/phoenixdk/sounds/80407/#) | phoenixdk |
| [Tape Deck Buttons and Switches](https://freesound.org/people/Nekkowe/sounds/403247/#) | Nekkowe |
| [179498\_\_toiletrolltube\_\_111224-02-wind.wav](https://freesound.org/people/deleted_user_3247643/sounds/179498/) | toiletrolltube |
| [Wind space howling effect.wav](https://freesound.org/people/alexkandrell/sounds/158684/#) | alexkandrell |
| [Wind, Soft. Crickets.wav](https://freesound.org/people/Leandros.Ntounis/sounds/163607/#) | Leandros.Ntounis |
| [Bench Creak 2.wav](https://freesound.org/people/tbhicba/sounds/148335/#) | tbhicba |
| [Bench Creak 3.wav](https://freesound.org/people/tbhicba/sounds/148334/#) | tbhicba |
| [Owl Hoot](https://freesound.org/people/Breviceps/sounds/465697/#) | Breviceps |
| [4CH012I.wav](https://freesound.org/people/cjpowderhound/sounds/90172/#) | cjpowderhound |
| [Large duffel bag drop](https://freesound.org/people/vintage2005/sounds/438988/#) | vintage2005 |
| [Body Hit On Metal Fence 1](https://freesound.org/people/Gammelsmurfen778/sounds/474007/#) | Gammelsmurfen778 |
| [human male scream multi](https://freesound.org/people/JohnsonBrandEditing/sounds/173944/#) | JohnsonBrandEditing |
| [Cmaj7 Bell30.ogg](https://freesound.org/people/loopsamples.club/sounds/483383/#) | loopsamples.club |
| [StoneOnStoneAggressive.wav](https://freesound.org/people/daveincamas/sounds/44241/#) | daveincamas |