**Introduction:**

Assault on the Black Court is an attempt at a top-down roguelike game that fits into the Dresden Files universe crafted by Jim Butcher. In it, the main character, Harry Dresden, must make his way through the floors of the Willis Tower (formally the Sears Tower) in Chicago and defeat Black Court Vampires and their Darkhounds. Along the way, the player can pick up items such as Soulfire and Hellfire that can empower their spells to do more damage, but which also can be detrimental if not used carefully. The game was originally designed for Game Design and Development II, but has been modified (mostly in terms of audio) for this class, Interactive Game and Audio Design.

**Analyis of Game and its Requirements:**

The game itself wasn’t too difficult to design audio for. Partly, this was because I helped design the game so I knew what “vibe” to pursue in designing audio. I also knew what interactions there were, and, therefore, what interactions needed to be sonified. It did require quite a few different sounds though. I included 3 different types of music: 1 for the menu, 1 for the basic levels, and 1 for the boss levels. Sounds were needed for all of the player’s interactions such as being hit, firing fireballs (which required 3 different sounds itself), and ambiance for the player. The game also includes 2 different types of enemies along with bosses so all of the enemy attacks and ambiances had to be sonified as well. Some of the sounds could be recycled because the bosses are just larger versions of other enemies. The 2 different pickups also required ambiance for the player to know they are near and sounds for picking them up. Healing tiles required sounds so the player knows they are near as well and a player healing sound. The UI also required a few different sounds like button clicking, mousing over, getting rid of an item, etc.

**Discussion of Sound Assets Developed for the Game:**

I ended up creating I think somewhere around 30 assets for this project. A lot of the assets are pretty straightforward. I found a sound on freesound that I knew I wouldn’t have to do much work to, downloaded it, and tweaked it to my purposes. This included sometimes shortening it or making it longer, often pitching it up or down, etc. I also made quite a few sound into looping sounds. I’m pretty proud of how those sounds ended up turning out too as I spent quite a bit of time making them seamless. I also tried to layer quite a few sounds to make them more complex and interesting where I could.

Regarding some of the assets in particular, the fireball sounds were some of the first sounds I made. I used a flamethrower sound for the charging sound. Some of this series of sounds are also used by the enemies that use magic to signify that they can do the same thing the player can. I also created melee attack sounds for both types of enemies because the majority of damage they do is melee damage. I attempted to add a rip sound to the vampire’s melee attack sound, but I’m not sure how well it turned out as it’s just hard to find a good base sound because rips are almost inaudbible most of the time. For the player hit sound, I used 3 different sounds so that it’s not always the same sound when the player gets hit.

I really like how the healing tile sounds came out as a whole. I think the ambiance for the tile worked well and I also think the player healing sound sonifies that interaction well. I even included sparks to simulate somewhat unstable magic in the ambiance sound. The player healing sound is 3 sounds layered on top of one another with the bottom sound being a looping music sound.

The pickup sounds I also think turned out well. For the soulfire pickup I actually created an ascending chord with a MIDI instrument and layered that on top of an explosion. For the hellfire I did a similar thing, except I used evil laughter instead of the chord. The ambiance also turned out well. They both include fire crackling, but Soulfire has wind chimes and hellfire has screams. I wanted to make them sound similar but with different moods because they are very similar things in the game.

I also recorded dialogue for the tutorial of the game. I’m not entirely happy with how they turned out, but I think they’re better than having nothing. I pitched them down just a bit so they wouldn’t sound exactly like my own voice. I also ended up adding a noise gate to remove some of the room sound, or try to anyway.

**Discussion of Work Done in FMOD:**

My FMOD project is organized into 5 different banks (and folders that match them): Ambiance, Dialogue, Interface, Music, and SFX. The ambiance bank includes:

* Exit Sign Buzz
  + This event includes a buzzing sound with a scatterer instrument that holds an electrical sparking sound layered on top of it. I did randomize the pitch and volume of the scatterer so that it was more lifelike. It only plays at the end of the game though so I wasn’t too concerned with it.
* Healing Tile Ambiance
  + The healing tile ambiance sound is a 3D sound to help the player recognize when they are near a healing tile. It took quite a while to fine tune the attenuation for this sound as I didn’t want it to be distracting when the player is still far away from the tile. This event includes 1 single instrument and 2 scatterers. Neither has any randomization, but one of them includes 8 different sounds so it’s somewhat self randomizing. I did spend time tweaking the spawn rates of these sounds though trying to make it so the sparks didn’t overshadow the magic sound.
* Hellfire Ambiance
  + Hellfire ambiance is 3D for the same reason as healing tile ambiance. It includes a single instrument with fire crackling and a scatterer instrument that holds 4 different screams. This scatterer does include randomization for volume and pitch to better simulate the screams expected from an object from hell. I also worked with the spawn rate of this instrument so that it didin’t become distracting.
* Hellhound Ambiance
  + Hellhound ambiance is one of the more interesting ambiance sounds. It includes 3 different scatterer instruments. 1 holds barking sounds, 1 holds breathing sounds, and 1 holds growling sounds. The event also exposes 2 local paramaters: Moving and EnemyHealth. Some of the scatterers only play or play more when the enemy is moving. Some of them also change their spawn rate if they enemy is closer to death. This is to simulate the enemy being distressed.
* Player Health Alert
  + Player Health Alert is an event I added later in development. It exposes the player health parameter. It only includes a looping single instrument, but changes in volume as the player’s health goes down, reaching its peak when the player is around 25% of their full health. It corresponds somewhat with a change in tempo of the music.
* Player Ambiance
  + The player ambiance event includes 3 different scatterer instruments. 1 plays footsteps, 1 plays cloth rustling (for the player’s cloak), and 1 plays breathing sounds. This event also exposes the local moving parameter. This is because the breathing instrument is quieter and plays more when the player is moving to simulate running or jogging.
* Soulfire Ambiance
  + Soulfire ambiance is similar to hellfire ambiance except for the fact that it is all in 1 looping single instrument. Most of the work for this sound was done in Reaper.
* Vampire Ambiance
  + Vampire Ambiance is similar to Hellhound Ambiance. It includes 3 scatterer instruments, 1 plays footsteps (but a different selection of footsteps than the player), 1 plays cloth rustling sounds, and the third plays hissing sounds. It also exposes the Moving and EnemyHealth paramaters because some of the instruments only play when the vampire is moving and the pitch and spawn rate of the hissing instrument are modified as the vampire’s health goes down.

The Dialogue bank includes 7 events but 6 of them are linked to the 7th event. The 7th event acts as a master tutorial dialogue event. It allows the game to play the same event and only alter the dialogue number parameter. I did this so that only 1 of the dialogue statements would be playing at any given time because I set the max instances of the dialogue event to 1.

The Music bank includes 3 different music events:

* Menu Music
  + This event is only played on menu screens. Not much was done to alter this event.
* Boss Music
  + This event includes 2 layered looping single instruments. I wanted this track to sound more active and exciting than the normal level music.
* Spooky Music
  + This event includes 1 looping single instrument with a music track. This event and the boss music event both utilize the global player health event because their tempo and pitch change as the player loses health. It doesn’t start changing till around 25% of max health though so it’s not too distracting.

The SFX bank includes:

* Enemy Hit
  + This is one of the more complex events in this bank. It includes 2 different single instruments that play when their respective enemy type is selected. It exposes 2 local paramaters: EnemyType (either vampire or hellhound) and IsBoss. EnemyType allowed me to create 1 event for both types of enemies. IsBoss is used because the sound changes pitch if the enemy is a boss to indicate that its different than a regular enemy.
* Enemy Melee Attack
  + Enemy Melee Attack is very similar to enemy hit. In fact, it uses almost exactly the same logic except it uses different sounds and has slightly different base volume.
* Fireball
  + Fireball is an event that holds both the fireball charing sound and the fireball fire sound. It exposes a parameter called holding mouse. This parameter is marked true while the player is holding the mouse and marked false when it is released. While it’s true this event plays a looping charge sound. When it’s false, it plays a 1 shot fireball fire sound. For this instrument I had to mark it to only play 1 time so it wouldn’t continue playing as long as the parameter was false.
* Player Healing
  + Player Healing includes a single instrument for the magic sound and a scatterer instrument that plays 2 different magic sounds, 1 is higher, 1 is lower. Both of these sounds loop as long as the player is standing on the healing tile. I also added an AHDSR to this sound so that it fades in and out more realistically than just starting and stopping.
* Player Hit
  + Player Hit includes a scatterer instrument with 3 different grunt sounds for the player because I didn’t want it to always be the same sound. There is also randomization of both pitch and volume on this scatterer to make it sound more realistic.
* The remaining sounds in the SFX bank: Fireball Hit, Soulfire Pickup, Hellhound Death, Stone Door Opening, and Boss Death, are all pretty simple one-shot sounds that don’t expose paramaters and only include a single instrument.

The final bank, UI, includes 6 events: Click Button, Hit Pause Key, Inventory Item Disappear, MouseOver, Pause Menu Disappear, and Staff Fire Crackling. All of these are simple 1-shot sounds except for Staff Fire Crackling, which is a looping single instrument. Staff Fire Crackling only exists because I thought it felt odd to have an animated image of the player character on the menus without the fire of his staff crackling. None of these events have paramaters exposed.

**Discussion of Work Done to Adress Mixing of Sounds:**

I didn’t find mixing to be too difficult for this project. I did end up making quite a few tweaks along the way, but I think it turned out well. I created 5 groups for routing with the same names as the banks. Within these banks I also often created subbanks. In the Ambiance group there are: Enemy, Healing Tile, Hellfire, Soulfire, and Player subbanks. SFX has Enemy, Fireball, and Player subbanks. I also created 3 VCAs for the enemies, the player, and the healing tile. A lot of the work I did with mixing involved balancing the player’s sounds with the enemies’ sounds and the other ambient sounds. For example, I set the Enemy VCA lower than the player and healing tile VCAs because I felt the player’s own sounds should be louder. However, I did set the player’s sound effect goup lower because I found that the sounds included in that group could be somewhat distracting if they are played often. I also set the interface group much lower than almost everything else because they don’t need to be as loud. Regarding compressors, I ended up adding them to I think around 9 of the groups. Most of them are pretty simple. They are there just to keep the group from going over a certain level. The enemy groups though utilize a sidechain to link the ambiance and SFX enemy groups to make one quieter while the other is playing.

**Discussion of Work Done to Adress Mastering of Sounds:**

For mastering I found 2 different games to use as reference: Enter the Gungeon and Tangledeep. Both games are top down roguelikes. Enter the Gungeon was actually used as reference for the actual design of this game as well. To get reference values, I recorded myself playing Enter the Gungeon and watching a video about Tangledeep and then put the recordings in Reaper with the YouLean plugin. I came up with these values:

* Enter the Gungeon
  + -16.2 Integrated
  + 12.1 Dynamic Range
  + -11.9 Short Term Max
* Tangledeep
  + -17.2 Integrated
  + 14.0 Dynamic Range
  + -15.8 Short Term Max

As a result, I knew that I had some space to work with as both of these games are louder than the recommended -23 LUFS. I decided to split the difference and aim for around -20 LUFS for the Integrated measure on the Loudness Meter in FMOD. I did end up having to tweak a few of the groups to keep it at this level or lower. Most of the sounds that caused problems were in the SFX group because it wouldn’t register higher LUFS until I hit a specific sound. Then, later and as a result of feedback, I tweaked a few more aspects of the audio to keep the peak around 0 or -1 dBTP. I think it turned out pretty well. There may be a few times that it goes up to around 0.4, but I couldn’t reliably reproduce it so it leads me to belive it’s likely the result of a bug.

All Source Audio Files and References:

|  |  |  |
| --- | --- | --- |
| **Name of Source File** | **Name of Original Author** | **URL** |
| 396890\_\_pugaeme\_\_flamethrower.wav | pugaeme | <https://freesound.org/people/pugaeme/sounds/396890/> |
| 72724\_\_moffet\_\_impatient-whimpers-and-barks.mp3 | moffet | <https://freesound.org/people/moffet/sounds/72724/> |
| 370159\_\_tony01726\_\_dogs-barking-and-whimpering.wav | Tony01726 | <https://freesound.org/people/Tony01726/sounds/370159/> |
| 483182\_\_spacejoe\_\_barking-dog-2.wav | SpaceJoe | <https://freesound.org/people/SpaceJoe/sounds/483182/> |
| 260777\_\_jaylew1987\_\_angry-dog-bark-snarl-with-reverb.wav | Jaylew1987 | <https://freesound.org/people/Jaylew1987/sounds/260777/> |
| 413459\_\_thatmisfit\_\_growl-3.wav | ThatMisfit | <https://freesound.org/people/ThatMisfit/sounds/413459/> |
| 269111\_\_visualpony\_\_hissing.mp3 | VisualPony | <https://freesound.org/people/VisualPony/sounds/269111/> |
| 406782\_\_kretopi\_\_scratchingmaterial-001.wav | kretopi | <https://freesound.org/people/kretopi/sounds/406782/> |
| 159087\_\_duncanlewismackinnon\_\_rip-3.aiff | duncanlewismackinnon | <https://freesound.org/people/duncanlewismackinnon/sounds/159087/> |
| 235426\_\_allanz10d\_\_explosion-simulation.wav | ALLANZ10D | <https://freesound.org/people/ALLANZ10D/sounds/235426/> |
| 336535\_\_giddster\_\_laughter-evil.wav | giddster | <https://freesound.org/people/giddster/sounds/336535/> |
| 414767\_\_samarobryn\_\_crackling-fire.wav | samarobryn | <https://freesound.org/people/samarobryn/sounds/414767/> |
| 353194\_\_inspectorj\_\_wind-chimes-a.wav | InspectorJ | <https://freesound.org/people/InspectorJ/sounds/353194/> |
| 351336\_\_visions68\_\_girl-scream-frank-3.wav | visions68 | <https://freesound.org/people/visions68/sounds/351336/> |
| 486459\_\_tootoos24\_\_male-inarticulate-slowed-down-screams.wav | tootoos24 | <https://freesound.org/people/tootoos24/sounds/486459/> |
| 186093\_\_yoh\_\_screams-male-high-pitched.wav | YOH | <https://freesound.org/people/YOH/sounds/186093/> |
| 218115\_\_mastersdisaster\_\_switch-on-livingroom.wav | MastersDisaster | <https://freesound.org/people/MastersDisaster/sounds/218115/> |
| 194795\_\_jim-ph\_\_vintage-keyboard-1.wav | jim-ph | <https://freesound.org/people/jim-ph/sounds/194795/> |
| 216089\_\_richerlandtv\_\_magic.mp3 | RICHERlandTV | <https://freesound.org/people/RICHERlandTV/sounds/216089/> |
| 460658\_\_ddmyzik\_\_story-logo.wav | DDmyzik | <https://freesound.org/people/DDmyzik/sounds/460658/> |
| 415884\_\_erlipresidente\_\_disappearing.wav | erlipresidente | <https://freesound.org/people/erlipresidente/sounds/415884/> |
| 232841\_\_xavimuse\_\_spark-sounds.wav | xavimuse | <https://freesound.org/people/xavimuse/sounds/232841/> |
| 31348\_\_erh\_\_spark-1.wav | ERH | <https://freesound.org/people/ERH/sounds/31348/> |
| SuspensefulUnderscoreMusic2019-01-31\_-\_A\_World\_In\_Trouble\_-\_David\_Fesliyan.mp3 | David Fesliyan | <https://www.fesliyanstudios.com/royalty-free-music/download/a-world-in-trouble/294> |
| 2019-05-01\_-\_Undercover\_Spy\_Agent\_-\_David\_Fesliyan.mp3 | David Fesliyan | <https://www.fesliyanstudios.com/royalty-free-music/download/undercover-spy-agent/332> |
| 483273\_\_mattiagiovanetti\_\_looped-mind.wav | MattiaGiovanetti | <https://freesound.org/people/MattiaGiovanetti/sounds/483273/> |
| 371580\_\_sirkoto51\_\_spy-secret-agent-loop.wav | Sirkoto51 | <https://freesound.org/people/Sirkoto51/sounds/371580/> |
| 415924\_\_inspectorj\_\_static-stylophone-a.wav | InspectorJ | <https://freesound.org/people/InspectorJ/sounds/415924/> |
| 96023\_\_samule44\_\_heavy-breath.wav | samule44 | <https://freesound.org/people/samule44/sounds/96023/> |
| 483702\_\_joao-janz\_\_dog-heavy-breathing-1-1.wav | Joao\_Janz | <https://freesound.org/people/Joao_Janz/sounds/483702/> |
| 158976\_\_cgeffex\_\_dog-howl-01.wav | CGEffex | <https://freesound.org/people/CGEffex/sounds/158976/> |
| 115357\_\_simcotter\_\_dog-howling.wav | simcotter | <https://freesound.org/people/simcotter/sounds/115357/> |
| 158974\_\_cgeffex\_\_dog-howl-03.wav | CGEffex | <https://freesound.org/people/CGEffex/sounds/158974/> |
| 158975\_\_cgeffex\_\_dog-howl-02.wav | CGEffex | <https://freesound.org/people/CGEffex/sounds/158975/> |
| 327666\_\_juan-merie-venter\_\_dog-bark.wav | Juan\_Merie\_Venter | <https://freesound.org/people/Juan_Merie_Venter/sounds/327666/> |
| 372531\_\_glitchedtones\_\_dog-shih-tzu-growling-01.wav | Glitchedtones | <https://freesound.org/people/Glitchedtones/sounds/372531/> |
| 366111\_\_dkiller2204\_\_indoor-footsteps.wav | dkiller2204 | <https://freesound.org/people/dkiller2204/sounds/366111/> |
| 490951\_\_nox-sound\_\_footsteps-walk.wav | Nox\_Sound | <https://freesound.org/people/Nox_Sound/sounds/490951/> |
| 336598\_\_inspectorj\_\_footsteps-concrete-a.wav | InspectorJ | <https://freesound.org/people/InspectorJ/sounds/336598/> |
| 429080\_\_leonelmail\_\_shirt-clothing-movement.mp3 | leonelmail | <https://freesound.org/people/leonelmail/sounds/429080/> |
| 400380\_\_klankbeeld\_\_running-dog-passing.wav | klankbeeld | <https://freesound.org/people/klankbeeld/sounds/400380/> |
| 273160\_\_indigocat\_\_hissing.wav | indigocat | <https://freesound.org/people/indigocat/sounds/273160/> |
| 467560\_\_ryusa\_\_mouseover.wav | ryusa | <https://freesound.org/people/ryusa/sounds/467560/> |
| 56778\_\_rene\_\_nuclear-alarm.wav | rene\_\_ | <https://freesound.org/people/rene___/sounds/56778/> |
| 85554\_\_maj061785\_\_male-scream.aiff | MAJ0617 | <https://freesound.org/people/MAJ061785/sounds/85554/> |
| 158976\_\_cgeffex\_\_dog-howl-01.wav | CGEffex | <https://freesound.org/people/CGEffex/sounds/158976/> |
| 25846\_\_freqman\_\_concrete-blocks-moving2.wav | FreqMan | <https://freesound.org/people/FreqMan/sounds/25846/> |