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Final Documentation

* ***Introduction***
  + The game that I created sounds for is a prototype that I originally created for the IGME 603 Prototyping course. It features a spaceship that is tasked with retrieving astronauts that were blown away from their ship and out into space. The chance of those astronauts surviving might not be very high in real life, but this game is not really meant to be too realistic. As a summary, the player must guide the spaceship around the area of space that they are in and pick up the astronauts that they see floating around. Once all of the astronauts are picked up, the player has won the game.
* ***Analysis and Requirements***
  + I did not initially have time to complete any sounds for this game when I first created it for IGME 603, but I more or less already had an idea of what I wanted to hear when making it. This was the first personal project that I have worked on every single piece for (programming, 3D objects, sounds, etcetera). Since the game has a non-serious space theme, I knew the sounds needed to be hollow and spacy yet still a little whimsical. The game has a driving mechanic that is based off of plane movement (just minus the gravity). The camera follows the movement of the mouse. There are multiple directions that the ship can move in, and the main premise of the game is to collect astronauts that are floating around in space. All one needs to do to collect the astronauts is run into them. For now, the astronauts are all located close to the starting area of the ship for ease of testing. Most numbers in the game are regrettably hard-coded right now, but that was the easiest and quickest way for me to figure out how to program things. The UI in-game is simple, but it should accurately represent how many astronauts are left to collect. There is also a main menu available at the beginning that lists the controls.
* ***Sound Asset Development (Reaper)***
  + One major group of sounds that I created was the engine noises for when the ship moves in certain directions. Most of these noises more or less stayed the same as the jet engine source sound I used, and the work was mainly done for these in FMOD.
  + Another sound, the AstronautCollide sound, was made from combining a windchime and a metal candle dampener (if I remember correctly). This was more or less modeled after something you would hear in a Zelda game after picking up a useful item. I wanted the player to have positive audio feedback when collecting astronauts.
  + The ShipTilt sound effect was initially a kind of heavy and wet higher-pitched buzzing (if that makes sense). That ended up being a little out of place when compared to the other engine sounds, so I added some other tracks to the event in FMOD to make it sound closer to the other ship sounds.
  + There are several sounds that I recorded of myself saying different kinds of distress calls. I also recorded an intro voiceover to let the player know what the intention of the game is. The distress calls have 12-pole filters and distortion added to them to give a kind of radio effect. The intro voiceover uses a MIDI item, synth, a vocoder and some ReaVerbate reverb to give it a slightly echoed robot effect.
  + The two UI sounds for entering and exiting different menus (EnterPauseMenu and StartGame) are based around different sounds I have heard that are usually used to represent holographic projections turning on or off. EnterPauseMenu is a harsh buzz that is reminiscent of a screen turning on. StartGame is an ethereal ring used to signify that the user has pressed the key to start.
  + The last group of sounds I made in Reaper were the ambience sounds. I did these in a separate Reaper project in order to keep things somewhat organized. The repeating windchime sound and the sustained and drawn-out windchime note are both used in the MainMenuTheme sound. I wanted a whimsical feel while still having something that contained a hollow and echoing noise that would remind players of other space-themed games they have played. The pinging noise is used in conjunction with the effect of wind blowing in FMOD. That ping was originally a sound created for a submarine ping, but I added some reverb and some pitch tuning to make it sound less like it was underwater.
  + Side note: there is a test sound that can be found in the ambience Reaper project. This sound is not used in the game itself, but I ended up accidentally creating it while messing around with the single windchime noise. I added a “Delay (Floaty)” effect to that track, and it came out fairly creepy. It was pretty interesting, so I decided to keep it muted within the project for possible future use.
* ***FMOD Work***
  + *Folder Structure*: Ambience, SFX, UIUX. SFX has nested folders of Astronaut and Ship.
  + *Groups*: Same structure as folders. Added another group for AstronautDistressCall in AstronautSFX group in case the voiceovers in that specific sound event ever need to be messed with at runtime.
  + *MainMenuTheme* – This event has two instruments in it: BaseLoop and ChimeScatter. The loop is just a simple loop that keeps the main ambience playing continuously in the menu. The chime instrument is more complex. It has a random pitch modulator attached to it that changes the pitch of the sound whenever it plays. To keep this from happening too often, I set a probability condition on this instrument. The sound will only start up 50% of the time whenever the main loop restarts. Without this probability condition, it felt like the echoing chime sound got to be too overbearing when it was constantly kicking in on each loop. I remember that there seemed to be a clipping bug with these sounds in the main menu. While testing on my PC, I did not seem to run across this issue. Perhaps I missed something on my end.
  + *SpaceAmbience* – This event has two instruments in it as well. The BaseLoop here contains a low howling wind that creates a feeling of emptiness within space. The ChimeScatter instrument contains the pings that also have a probability condition set to them. Each instance of the ping only plays 30% of the time. I suppose I could have done this by adding some type of randomizer, but I instead opted to place the sound into the event multiple times and set a probability for each instance. This makes the pings play like how I suspect a sci-fi radar would. It hopefully gives off the feeling of searching for something.
  + *AstronautCollide* – This sound is the one that I figured could be most useful for creating something with developer parameters. Originally, the sound was a one-shot that would play each time the ship collided with an astronaut. After some thought, I added a discrete parameter and a pitch shifter. When used by the developer within the game, the parameter changes the pitch of the sound each time an astronaut is picked up. The more astronauts a player picks up, the higher in pitch the sound will be. I liked the original one-shot sound, but the parameter adds more depth and feedback for the player within the game. Like mostly everything else, things are hard coded right now. I hope to change that and make things more open and adjustable in the future. I will discuss the parameter a little more in the sound mixing section found below.
  + *AstronautDistressCall* – This event consists of a multi instrument with another multi instrument and a silent instrument inside of it. From what I could find online, this is the way to create a 3D event with multiple sounds in it with a pause in between each instance. The nested multi instrument contains 4 different astronaut distress calls recorded by yours truly. All of these calls have a 25% chance of playing when the event is triggered. After playing a distress call, the event then has a 5 second period of silence using the silence instrument. This stops the distress calls from playing constantly and gives them a break. I suppose it could be considered as the astronauts getting their bearings and thinking about what they are going to say over the radio. Due to some volume adjustments/equalizations done in Reaper to the original distress call tracks, I really had to reduce the volume on the nested multi instrument. Everything seems to be at good levels now though.
  + *ShipBackward* – This event has a single track containing a jet engine noise. I added volume automation to the track, so the sound now gradually gets louder as time goes on. Then, the sound will loop at the loudest point if the player continues to hold the key down. I wanted the sound to start up gradually, for this is how engines usually sound to me (especially planes). They do not start out extremely loud. The engines need time to get up to speed. The pitch of the entire event is also lowered slightly. I added a pitch shifter to achieve this. I figured that backing up would sound a little deeper and slower than flying forward.
  + *ShipForward* – I did pretty much the same thing for this event as I did for the ShipBackward event. A volume automation makes the track get gradually louder as the player drives forward, and then the loudest piece of the track keeps looping if the player holds the key down. Again, an engine for a plane starts up gradually. I wanted to have the ship engine sounds start up gradually as well. That is why there is volume automation.
  + *ShipSideways* – Again, this sound does not stray too far from the average on what I’ve done for the ship movement events. I wanted to keep everything in the same relative vein of sounds. The main difference here is that there is a pitch automation on the track rather than a volume automation. I wanted to make the initial drifting sound higher pitched. As time goes on, the drifting noise evens out in pitch and then continues looping until the key that moves the ship sideways is released. This event is also referenced by the upcoming ShipTilt event.
  + *ShipTilt* – This event sounds a little off in FMOD, but it sounds just right to me in the actual game. Anyhow, The track with the original ShipTilt sound is pitched down a bit to match the atmosphere of the game. After some different testing iterations, it was decided that the sound just didn’t match with the other ship sounds anymore. To remedy that situation, I added an event instrument that references the ShipSideways sound. Now the ShipTilt sound has a version of the ShipSideways sound that plays alongside of it. I had to reprogram the sound on the tilt key to stop when it was released (thanks to the loop in the ShipSideways sound), but it seems to work as intended in-game.
  + *DialogIntro* – This event is pretty much just a one shot sound. All of the major tweaks and changes to this were done in Reaper. It is easier (and less resource intensive) to make a robot voice in Reaper than it is to make one at runtime in FMOD. The event only triggers once at the beginning of the main game scene, and then it never has to play again.
  + *EnterPauseMenu* – This is another one shot event, but I did need to add some effects to it to get what I wanted out of it. I added a pitch shifter and some tremolo to it to make it sound more futuristic. The original sound was just a sharp buzz. With the different effects, it sounds more like a computer screen (or something of the like) starting up. This sound might act as a one shot, but it plays every time a player opens the pause menu.
  + *StartGame* – Lastly, this event is another one shot that will likely only be heard once by the player. It plays whenever the player chooses to leave the main menu screen. I did all of the editing for this sound in Reaper, so there is not much to tell for it in terms of FMOD modifications.
* ***Sound Mixing***
  + Regarding mixing of sounds, the biggest change that I made was placing a compressor on the entire SFX group and a sidechain on the UI group. These changes caused all of the sound effects to be very quiet whenever the UI sounds are playing in-game. This way, the astronauts and their distress calls (along with ship sounds) will be nearly silent until the initial intro dialog is done playing. Initially, everything was playing at the same volume when the game started, and the intro was drown out and difficult to understand. Now, the intro plays and is at the normal volume while everything else gets lowered significantly.
  + Another addition that I made was adding a compressor to the ambience group as well. The sidechain used for this compressor is still the one located on the UI group. I noticed that the pings in the space ambience were a little overbearing during the intro dialog, so the compressor is there mainly to help with the strength of that ping.
  + I was able to get one parameterized sound to work within the game. This sound is the AstronautCollide effect. The parameter (AstrosCollected) is discrete, and the pitch of the sound goes up gradually each time a player collects an astronaut. The number of astronauts is currently hard coded in the game, and I would like to change this in the future. However, the sound and its parameter currently work as intended for this game prototype.
* ***Mastering***
  + Overall, I based the mastering of my overall sound volumes and levels on other space-themed games. One such game (even though it is much more serious than what I was going for) was Mass Effect. When characters are speaking or any kind of dialog is present, all other sounds are lowered. There is an emphasis on world-building sounds in Mass Effect. If something important is happening, that is the sound that is loudest at the time. If nothing important is occurring, the music or ambience is given precedent in volume. Also, I just really like the Mass Effect series.
  + Another game I took loudness inspiration from was the game PixelJunk Shooter Ultimate. This is a 2D space-themed game, and I thought about its sound levels while deciding on the volume of my 2D sounds (UI, certain ship SFX, etcetera). It is a colorful and light-hearted game, so I also took a bit of sound style and direction from this game as well.
* ***Source Audio Files***
  + File: 437337\_\_giddster\_\_wind-chimes-1
    - Original Author: giddster
    - URL: <https://freesound.org/people/giddster/sounds/437337/>
  + File: 398495\_\_anthousai\_\_wind-chimes-rough
    - Original Author: Anthousai
    - URL: <https://freesound.org/people/Anthousai/sounds/398495/>
  + File: 398493\_\_anthousai\_\_wind-chimes-single-02
    - Original Author: Anthousai
    - URL: <https://freesound.org/people/Anthousai/sounds/398493/>
  + File: 411088\_\_inspectorj\_\_bell-candle-damper-a-h4n
    - Original Author: InspectorJ
    - URL: <https://freesound.org/people/InspectorJ/sounds/411088/>
  + File: 256246\_\_spectral9\_\_wine-glass-sustained-note-c5
    - Original Author: spectral9
    - URL: <https://freesound.org/people/spectral9/sounds/256246/>
  + File: 32158\_\_zin\_\_piano-2-140bpm
    - Original Author: -zin-
    - URL: <https://freesound.org/people/-zin-/sounds/32158/>
  + File: 414483\_\_daliacoss\_\_jet-engine-airplane-interior
    - Original Author: daliacoss
    - URL: <https://freesound.org/people/daliacoss/sounds/414483/>
  + File: 28693\_\_infobandit\_\_sonar
    - Original Author: infobandit
    - URL: <https://freesound.org/people/infobandit/sounds/28693/>
  + File: 415873\_\_inspectorj\_\_buzzing-electric-lamp-a
    - Original Author: InspectorJ
    - URL: <https://freesound.org/people/InspectorJ/sounds/415873/>
  + File: 19486\_\_halleck\_\_jacobsladdersingle1
    - Original Author: Halleck
    - URL: <https://freesound.org/people/Halleck/sounds/19486/>
  + File: 528730\_\_alexhanj\_\_ping
    - Original Author: Alexhanj
    - URL: <https://freesound.org/people/Alexhanj/sounds/528730/>
  + File: 459977\_\_florianreichelt\_\_soft-wind
    - Original Author: florianreichelt
    - URL: <https://freesound.org/people/florianreichelt/sounds/459977/>
* ***Extra Section: Known Bugs and Future Work***
  + I am happy with how my sounds turned out, and I am impressed with how much I was able to do for this little game. However, after some testing, I found that there are a few things that I just do not have the knowledge or time to fix. One bug is within the pause menu. If the player presses the keys to move the ship while inside of the pause menu, the sounds for those keys start playing. I believe I know how to fix this, so I have put it on my list of future work. Another thing that is not necessarily a bug is the lack of an ending screen. I did not have time to make an ending screen UI that I would be proud of, so there is no “You Win” screen once the player collects all of the astronauts. This is easy enough to implement, so that has been placed on my future work list as well.