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The Laser Sailing Soundscape

FINAL PROJECT DOCUMENTATION

MIT Student
21M.380
Massachusetts Institute of Technology

Introduction

For my final project I implemented a sailing soundscape. The user is sailing in the ocean on a laser boat where they can hear the seagulls fly above. The user has the ability to choose between light, moderate and heavy wind conditions as well as make the boat tack. The objective of my Pd patch is to make the audience feel as if they are sailing, purely using sound.

There were three main parts to tackling this sound design problem:

1. Creating the Model
2. Making the Sounds
3. Incorporating and Putting together the Sounds (so that the appropriate sounds are played with given conditions.)

Creating the Model

To keep it relatively simple the model boat I used was a 4-meter long boat that has one main sail and is suitable for single-handed sailing, specifically the laser class sailboat. I chose this boat because I sailed lasers throughout 4 years of high school and I am very familiar with sounds associated with it. (See Figure 1 for image of laser)

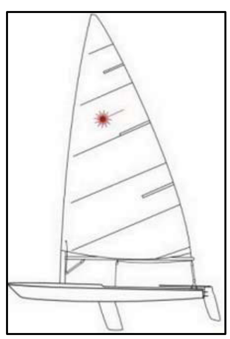


Figure 1. Laser Sailboat Diagram
Taken from Google Images

The user is able to select one of the three wind speeds he/she would like to sail at (light, medium, heavy) and then press the start button. By default the user is sailing upwind on the starboard side. The user can press a tack button that makes the sail change direction and the user to switch from starboard to port. This is the only type of turn implemented in this patch. The important components I considered when creating my model were:

a) The Tack
b) Panning
c) Environmental Sounds (i.e waves, seagulls)

a) The Tack

Tacking is a term used when the boat turns its head towards the wind and maneuvers the boat so that the direction from which the wind is filling up the sail changes. This is better illustrated in Figure 2. While describing the sounds for each stage of the tack I will refer to the numbers Figure 1.

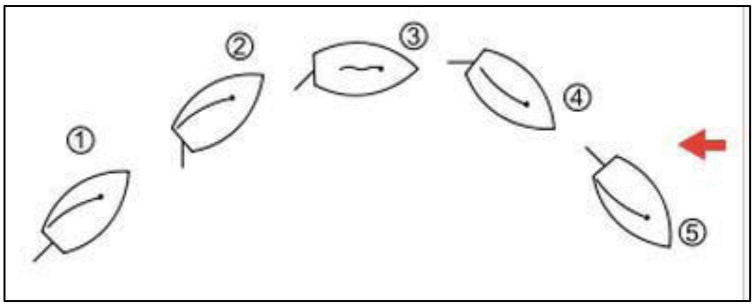


Figure 2. Tacking, bird view.
The red arrow indicates the direction of the wind. Taken from Wikipedia.

When the user opens the patch the boat will be in stage 1 by default, and the user will be sitting on the starboard side. Once the user hits the tack command, a series of events will be triggered. As the rudder turns the head of the boat towards the wind (stage 3), this causes the sails to flap freely since they are not filling up with wind. This will be the dominant sound of the turn. The frequency and intensity of the flapping will be determined by the wind strength, which is decided by the user at the beginning of the patch. As the boat's head keeps turning, it will eventually be filled with air again (stage 4), and the smooth whooshing of the wind over the sails will return to normal.

The time it takes to complete the tack will vary according to the wind speed of choice. It could take as short as 5 seconds to complete a turn in windy conditions and as long as 10 seconds in light wind. For the sake of keeping things simple I will assume the boat does not tip over or turn upside down during heavy wind conditions (which is very common in laser sailboats)

b) Panning

In order to make the user feel that they are actually changing sides while tacking, the sound of the wind is panned depending on what side of the boat you sit as shown in Figure 3.

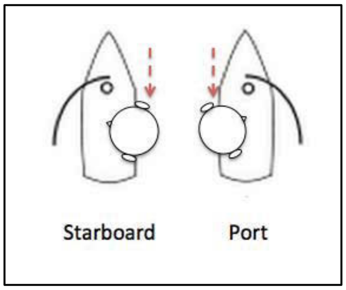


Figure 3. Representation of Starboard and Port positioning.

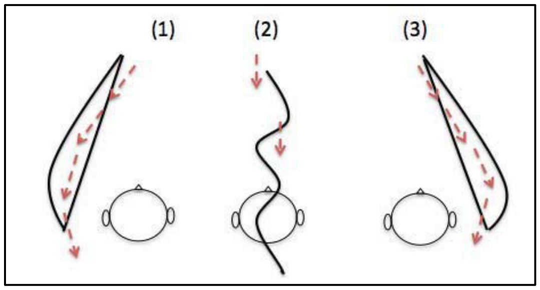


Figure 4.Panning during the Tack

When the user is cruising on the starboard side, the waves will be right panned, since the right ear of the user is turned towards the wind while the sail itself is blocking a lot of the sound for the left ear. For the same reason, when cruising on the port side, the waves will be left panned.

The panning effect happens through the tack as well. In stages 1 and 3 of Figure 4 the wind is mostly right panned and left panned respectively. For stage 2 the sails is right above the user so both ears will hear the sound equally. This gives the user the sense that the sail is crossing from one end of the boat to the other, which conveys the motion of tacking.

c) Environmental Sounds

The boat is traveling in the open sea with no other motorboats or ships around it, therefore the sounds from the environment I considered are: the waves and the occasional seagull squawk.

The wind speed is the only parameter the user can vary but is directly affects the wave frequency and intensity. Fast winds mean higher waves and light wind will mean no waves. There are no storm conditions since lightening makes sailing dangerous. I also assumed that the user does not want to go sailing on a rainy day and therefore I did not account for the rain either.

Making the Sounds

The three sounds that I constructed for this patch are the 1) Waves, 2) The Sail, and 3) Seagulls.

1) Wave (wave.pd)

The wave sound is the main component of project. A big part of sailing is hearing the waves around you rise and fall, so in order to make the user feel like they are sailing in the middle of the ocean, I tried to make sure the wave sounds were as realistic as possible. Since wave frequency and intensity increases with increasing wind speed, there are three different wave sounds: light, medium and heavy. Once the user chooses a wind speed, a message gets sent to the appropriate abstraction. Each wave abstraction is set to convey how intense the wind is blowing. Less wind means slower and fewer waves whereas more wind means frequent, strong waves. Each wave abstraction was created from scratch using [noise~] as the sound generator with a low pass filter. [phasor~] and [cos~] are used not as a noise source but as an amplitude modulater to create the rise and fall of the waves. To make the wave sounds as dynamic as possible I also made the frequency of the waves change using the [random] object. This created a realistic ocean sound that I felt satisfied with.

2) The Sail (tack.pd)

The sail flapping sounds every time the user hits the tack button. The sail sound is very important for the tacking effect because the panning gives the user the impression of the boat turning and the sail switching sides. Because the flapping intensity also varies with wind speed, the wind selection bangs the specific tacking sound (light, medium or heavy). As with the case of the waves, light wind corresponds to slower flapping, whereas strong wind corresponds to rapid flapping of the sail. The flapping of the sail can be thought of as the sound a flag makes in the wind (Appendix A). Although Farnell does have a section in his book describing the physical properties of a flag, there is no implemented patch. Rather than creating a model from scratch I decided to modify Farnell's Fan patch, which proved to be a pretty similar sound. The Fan patch had a [noise~] generator that was multiplied by [osc~] to create an amplitude modulation, similar to the waves. The only thing I modified was adding an envelope to imitate the sails flapping pattern as the tack is being completed.

3) Seagulls (seagull.pd)

The seagulls are a nice addition I decided to implement in order to convey to the user they are sailing in the open ocean. I wanted to add this sound because I am nostalgic about sailing in the sea, like I did back home, where I could frequently hear seagulls. How I decided to create this patch involved some intuition and good listening. Farnell's bubble patch (bubble2c.), reminded me of the random squawking of a flock of seagulls. The timbre of the sound was very different so I changed the [osc~] used in the bubble patch to [saw~]. I also changed the envelope in order to imitate the attack and decay phase of seagull squawking (listening example found in Appendix B). Other effects I implemented were (i) randomizing how often you will hear a squawk, (ii) changing the volume of the squawk to convey the seagulls are at different distances from you and (iii) use random panning so some seagulls sound like they flew over your head while others sounded like they were flying by you in the distance.

Incorporating and putting together the Sounds

At the initial opening of the game, I wanted to initialize the patch so that the user is sitting on the starboard side of the boat with the lowest wind speed. Initializing the wind speed was important because when you open the main board, the HRadio used for wind selection is set at the leftmost inlet (the lowest wind speed). If the user pressed start, forgetting to actually press the HRadio, no sound would come because most of the abstractions are set up to be banged by the wind selection. As is, the program will play the lowest wind speed scenario even if the user forgets to select it.

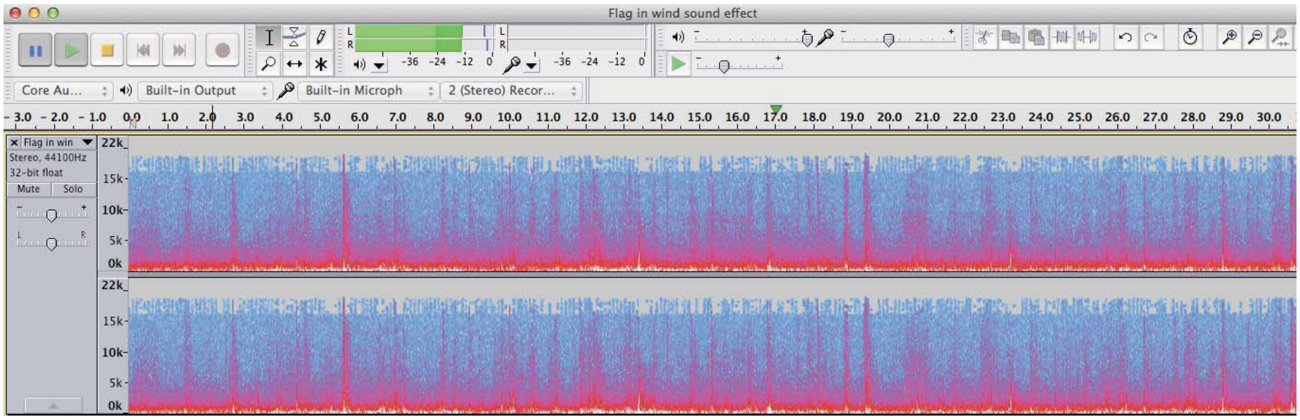
Initializing the start to starboard was also important for panning and to make sure the panning was done the correct way. When you are sitting on starboard the sail is to your left and your right ear is facing the ocean. When you hit tack, you hear a lot of the flapping in your left ear first, then it's equally heard in both ears as the sail passes above you and as you complete the turn you hear the sail flapping in your right before it comes to a stop (now the user is sitting on the port side). A panning effect was not only used for the sails but also the ocean. Your ear closest to the sail will be blocked off by some of the ocean noise and the higher partials will be blocked. Therefore I used a narrower low pass filter for the ear closest to the sail.

Closing Words

I had a lot of fun tackling this sound design problem. At the beginning of the semester I would have never imagined I would be able to create such an intricate and detailed Pd patch. The tools I learned in this class really helped me build a simplified yet realistic model and create powerful sound effects. I really appreciate the time you put in to help with my final project and the insights you provided to make this final project even better! I am very glad to have taken this class and I would like to thank you for a great semester of learning about sound design.

Appendix

A-Spectrographic Analysis of Flag in Wind



Taken from YouTube (https://www.youtube.com/watch?v=cMtse7_PwUU), analyzed in audacity.

B- Seagull Squawking

Listen to the accompanying audio file, Seagull.mp3

References

1. Farnell, A. (2010). Designing Sound. Cambridge: The MIT Press.