<span style="color:#4472C4">**Final Project Proposal
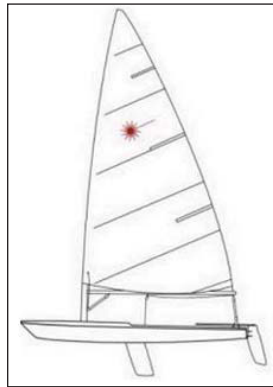Requirements Specification Document**</span>

      For my final project I want to create a sailing soundscape. The objective of my Pd patch is to make the audience feel as if they are sailing, purely using sound. I am also considering different ways to indicate to the user what direction the wind is coming from with respect to the boat, which I will elaborate later on. I will separate the nature of the sounds I need for my sailing soundscape into two categories: 1) Sounds from the boat as a result of interactions with the environment. 1) Sounds from the environment.

1. <span style="color:#4472C4">Sounds from the Boat Interacting with the Environment.</span>

      To keep it relatively simple the boat I will use as a model to create sounds is 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 the sounds of sailing it. (See Figure 1 for image of laser)
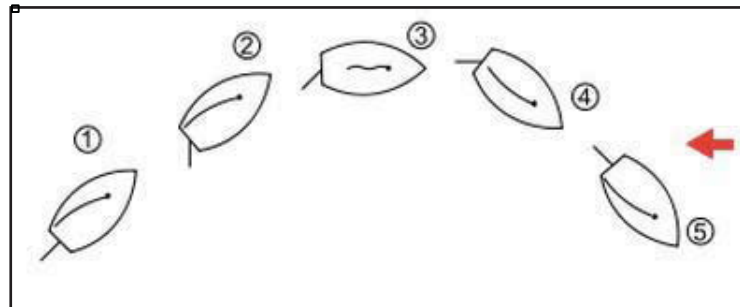


**Figure 1. Laser Sailboat Diagram**
Taken from Google Images
Courtesy of Wikipedia User: Gustavb. License CC BY 2.5.

      The first sound I want to focus on is the sound of the sailboat and the water interface. This sound will be a dynamic sound and will change according to the speed of the wind, which is a parameter that the user can change. If the weather conditions are very light wind then the sound of the sailboat cutting through the water is a subtle lapping sound of the water on the bots hull. This would have a gentle rippling sound and sporadic slapping of the boat on the surface of the water. The slapping sound of the boat would be implemented so there is randomness between the intervals of 'slaps'. If the user chooses to sail in windy conditions,

there will naturally be larger waves and therefore the soothing sound of the boat cutting through the water will be replaced by harsher slapping sounds followed by water splashing on the boat.

The other sounds to consider are related to tacking and jibing. These two phrases refer to sailing maneuvers. 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.



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

Jibing is done when the wind is coming from behind the sailboat and the sail changes 180°. For simplicity, my boat will only go upwind (the wind is coming from the front of the boat) and I will only tack.

While describing what sound I am considering I will refer to the stages of the tack in Figure 1. In default mode, the boat will be in stage 1. Once the user hits the tack command, a series of sounds will be triggered. The first step is turning the rudder (stage 2). A squeaking sound will indicate the rudder is being pushed forward to initiate the turn. The time that this squeaking will last depend on how strong the wind is. In light wind, the boat will turn slower and therefore the transition between stages will be slow. In very windy weather the boat will turn much faster and therefore steps 2-4 will be fast. Another sound to consider in step 2 is the sound of the sailor pulling in the main sail with the rope. The rope attached to the main sail goes through a pulley, called a block, which has a guard to stop the rope from slipping. This block makes a clicking sound as the rope is pulled on. Once the rudder is turned, the head of the boat will move toward the wind, leading into step 3 where the sails are not filled with wind but are just flapping freely. The flapping sound is a very characteristic sound and it is a good indicator to the sailor when he/she is entering the turn. The flapping will also depend on wind intensity. Faster wind means higher frequency of flapping that sounds very loud. At stage three the only dominant sound will be the sails. As the boat's head keeps

turning it will eventually be filled with air, the smooth whooshing of the wind over the sails will return to normal and to complete the turn the rudder will squeak back into place and the distinct clicking sound of the main sails being pulled in will indicate the turn is complete. Since adjusting the sails is something done quite frequently in laser sailing the clicking sound will also be present at random times outside of the 'tacking mode'.

As I mentioned before, for the sake of keeping things simple I will assume this boat can only go upwind and can only tack. I am also assuming the boat does not tip over or turn upside down during heavy wind conditions (which is very common in laser sailboats)
I am also considering adding a game aspect to the patch where there are shallow part the boat has to avoid and a beeping alarm lets you know if your hull is getting close to something (like the cars beep to tell you are too close to the car behind you when parking). The more frequent beeping would indicate the boat is getting closer to a shallow part or rock and the user would then know to press the tack button. If not, the boat will crash into the rock. The sound effects there would involve crashing or bumping depending on the intensity of the wind (i.e. speed of the boat). I would imagine a 'celery breaking' type crushing, since the laser is not made of wood but of glass-reinforced plastic. After the crash the user would be brought back to default settings, which the blow of a horn can indicate. I have not yet done feasibility research on this game idea and may not include it in the final version.


2. Sounds from the Environment.

The boat will be traveling in a secluded sea so I do not plan on adding sounds from other motorboats or ships. The sounds from the environment I will consider are: the wind, the waves/water and the occasional seagull squawk and potentially a horn. The wind will be the only parameter the user can vary. I decided to do this because the wind speed is very much related to the waves. Fast winds mean higher waves and light wind will mean no waves. I plan to have three wind settings: low (5-10 knots), moderate (10-15 knots) and heavy (20-25 knots). There will be no storm condition since lightening makes sailing dangerous. I will also assume that the user will not want to go sailing on a rainy day and therefore I will not account for the rain. The seagull squawks can be modeled from a horn sound and they will appear at random times during the game. I am planning to use the horn to indicate the start of the soundscape, and if I end up implementing the game aspect, it will sound the restart of the game after a crash. I am thinking of using an air horn sound effect since that is what is commonly used during laser races. It would be high pitched and decay slowly. When the game starts the boat will be moving so I will also incorporate the Doppler effect.

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