COSC 1P02 Assignment 5

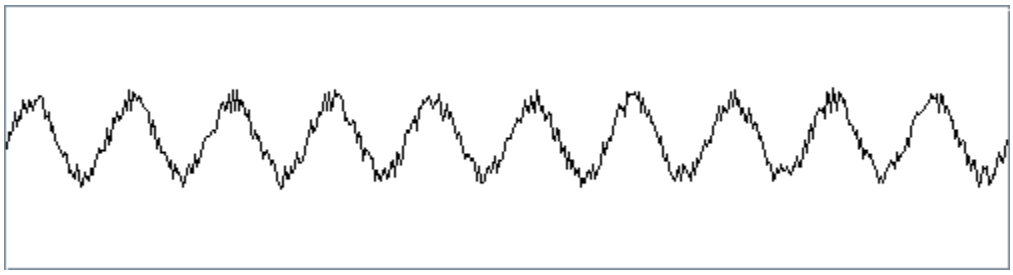
"I'm going to clean up this one-horse town."

Due: Nov. 16, 2015 @ 10:00 am ***(late date Nov. 19 @ 10:00 am)***

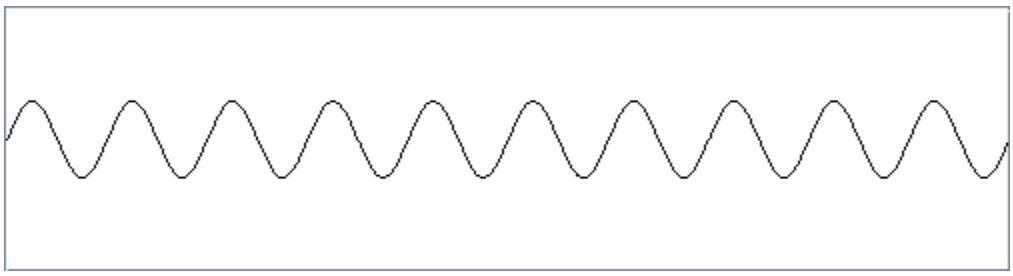
In preparation for this assignment, create a folder called `Assign_5` for the DrJava project for the assignment. The objective of this assignment is to apply processing of sounds using indexing.

Problem

Noise or hiss, when discussing sound, is random fluctuations within the amplitude of the sound waves. What does the noisy signal look like? Here is a 440 Hz sine wave distorted by random noise with amplitude of 3,000:



and here is the original:



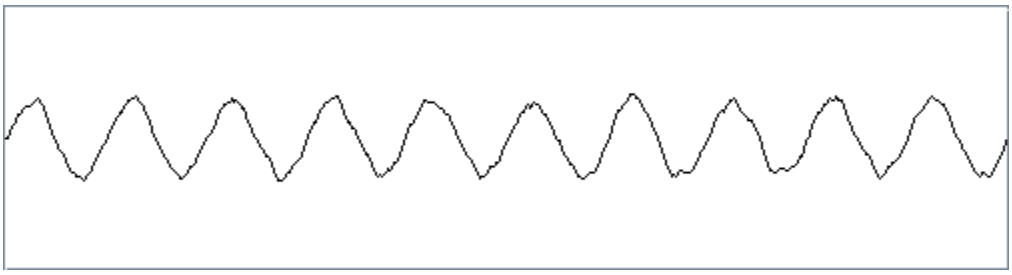
Notice that the noise creates fluctuations on the base signal. If we can remove those fluctuations, we should be able to clean up the sound.

The fluctuations are random values added and subtracted from the base sound. However the trend in the wave (shape of the wave) remains relatively intact. We could possibly compensate for the local variations in the wave by averaging the values of consecutive samples.

Implement a program which will:

1. Load a sound clip specified by the user
2. Process the samples of the sound by averaging its amplitude with the amplitudes of its neighbours (i.e. the average over the neighbors and the sample becomes the new amplitude of the sample).
3. Present the cleaned up sound for listening.
4. Save the cleaned up sound

The cleanup depends on how many neighbours in each direction will be averaged. That is, a reduction factor of 2 means each sample will be averaged with the 2 preceding and 2 following (five in total) samples in the original sound. The cleaned up (factor of 2) noisy sine wave looks like:



Write a method:

```
private Sound clean ( Sound original, int factor ) {…
```

which produces a new “cleaned up” sound based on the original sound with specified noise reduction factor. You will have to create a new sound with the same duration and characteristics as the original sound. Watch the “boundary conditions”, e.g. with a level of 2 the first two samples won’t have two predecessors, you can leave them silent. Likely the main loop should be over the samples that are to change.

Note:

You can test your program using the file: `sine-440-noisy-3000.wav` and a factor of 2 which should produce the result above. You can view the waveforms using the `SoundInspector` tool (see Sakai site under `Tools & References`). Once the inspector has loaded the sound, you can play it using the play button. To view the waveform, select the first 500 or so samples (move the bottom slider to the left until it shows 526) then click `Inspect`.

Submission:

For submission, the program should clean up the sound using a factor of 2. Run the program using the sound `thisisatest-noise.wav`.

Details regarding preparation and submission of assignments in COSC 1P02 are found on the COSC 1P02 Sakai Site as `Assignment Guidelines` under `Course Documents`. This document includes a discussion of assignment preparation, programming standards, evaluation criteria and academic conduct (including styles for citation) in addition to the detailed assignment submission process copied below.

To prepare and submit the assignment electronically from the lab, follow the procedure below:

1. Ensure your folder (say `Assign_5`) for the assignment is stored on your `Z:` drive.
2. Using DrJava, print (to `CutePDF Writer`) the `.java` file of your assignment using the name *`ClassName`*`.pdf` where *`ClassName`* is the class name (i.e. same name as the `.java` file) and save the `.pdf` file at the **top level** of the project folder (i.e. directly within `Assign_5`).
3. Run the program using `thisisatest-noise.wav` as the sound to be cleaned. When the program saves the resulting sound file, save it as `Output.wav` at the **top level** of the project folder (i.e. directly within `Assign_5`).

4. Create a `.zip` file of your submission by right-clicking on the top level folder (i.e. `Assign_5`) and selecting `Send to/Compressed (zipped) folder`. A zipped version of the folder will be created. Use the default name (`Assign_5.zip`).
5. Log on to Sakai and select the COSC 1P02 site.
6. On the `Assignments` page select `Assignment 5`. Attach your `.zip` file (e.g. `Assign_5.zip`) to the assignment submission (use the `Add Attachments` button and select `Browse`). Navigate to where you stored your assignment and select the `.zip` file (e.g. `Assign_5.zip`). The file will be added to your submission. Be sure to check the `Honor Pledge` checkbox. Press `Submit` to submit the assignment. You should receive a confirmation email.

DrJava

The `.zip` folder you submit should contain the project folder for Part D, including all files relevant to the project—the `.drjava`, `.java` and `.class` files for the assignment and `.pdf` files for program listings and output.

Other Platforms

If you are using an IDE other than DrJava to prepare your assignment, you must include the `.java` source files and the `.pdf` files described above as well as a file (likely `.class` or `.jar`) that will execute on the lab machines.