AP Computer Science A @ Beijing National Day School

Lab 5: `Smooth Signal`

Due date: Friday, November 9, 2018
Instructor: Mr. Alwin Tareen
Total Points: 15

Task Overview

- Implement a program that smoothes an audio signal by averaging an array of integers.

Background

- An audio signal is sometimes stored as a list of `int` values. The values represent the intensity of the signal at successive time intervals. Of course, in a program the signal is represented with an array.

- Often, a small amount of noise is included in the signal. Noise is usually small, momentary changes in the signal level. An example is the "static" that is heard in addition to the signal in AM radio.

- Smoothing a signal removes some of the noise, and improves the perceptual quality of the signal. This assignment requires you to smooth the values in an integer array.

Specification

The Information Box Which Includes Your Name[5 points]

- Type your English and Pinyin name into the `Author` field, where it says: `YOUR NAME HERE`

Smooth an Audio Signal [10 points]

- Write a `Java` program in the file `SmoothSignal.java` that smoothes an audio signal by averaging an array of integers.

- You will write your solution in a function called: `public static int[] levelling(int[] audio)` right below the place where it says: `YOUR CODE HERE`.

- Make sure that you run your `Java` program, and ensure that it is free of errors. When the following statements are executed:

```
int[] signal = {1, 5, 4, 5, 7, 6, 8, 6, 5, 4, 5, 4};
int[] result = levelling(signal);
System.out.println(Arrays.toString(result));
```

The output of your program should be:

```
[3 3 4 5 6 7 6 6 5 4 4 4 ]
```

Hints

- Consider an array named `signal` that contains the original audio values. Compute the smoothed array by performing the following calculation: Each value in the result array `smooth[N]` is the average of three values: `signal[N-1]`, `signal[N]`, and `signal[N+1]`.

- Note that the result array `smooth` has exactly the same number of elements at the array `signal`.

- Calculate the endpoints of the resulting smooth signal before you calculate the internal parts. In other words, for the first element of the result array `smooth`, average the first two elements of `signal`. For the last element of the result array `smooth`, average the last two elements of `signal`. Then, calculate the internal elements by using a `for` loop with the proper boundaries.

Testing

- The file `SmoothSignalJUnitTest.java` contains the `JUnit` test cases which verify the correct functionality of the program.

Submission

- Submit your `Java` program by uploading it to the `Web-CAT` automated grading platform: `http://ec2-54-65-207-33.ap-northeast-1.compute.amazonaws.com:8080/Web-CAT/WebObjects/Web-CAT.woa`