EE6641 Analysis and Synthesis of Audio Signals

**Hw1 : Testing your uncertainty limit**

Due Nov. 3, 2015

Brought to you by Yi-Wen Liu

**Objectives:** In this assignment, we will talk about the uncertainty rule introduced in the lecture in order to test your own uncertainty limit by carrying out successive hearing tests.

**Tasking description:**

1. You are going to implement the task 5 described in the paper. There are two flanking notes and a testing note. One flanking note (higher one) is generated after another flanking note within a certain time, say 1 second, while the testing note locates (time domain) near the second flanking note. In addition, the frequency of the testing note will be nearly the same as the first flanking note. You can see task5 of Fig.1 in the paper to get yourself more familiar.

2. The center of the testing space is generated in Gaussian, the multiplication of the std(Dt) and std(Df) is assumed to be 1 initially. The mean of the begin time and the mean of the frequency is referenced by two flanking notes. (std is standard deviation.)

3. After knowing the parameters of the testing space (i.e. the mean of the testing frequency and the mean of the beginning). You can create $\Delta t, \Delta f$ such that

$$4\pi\Delta t\Delta f = 1$$

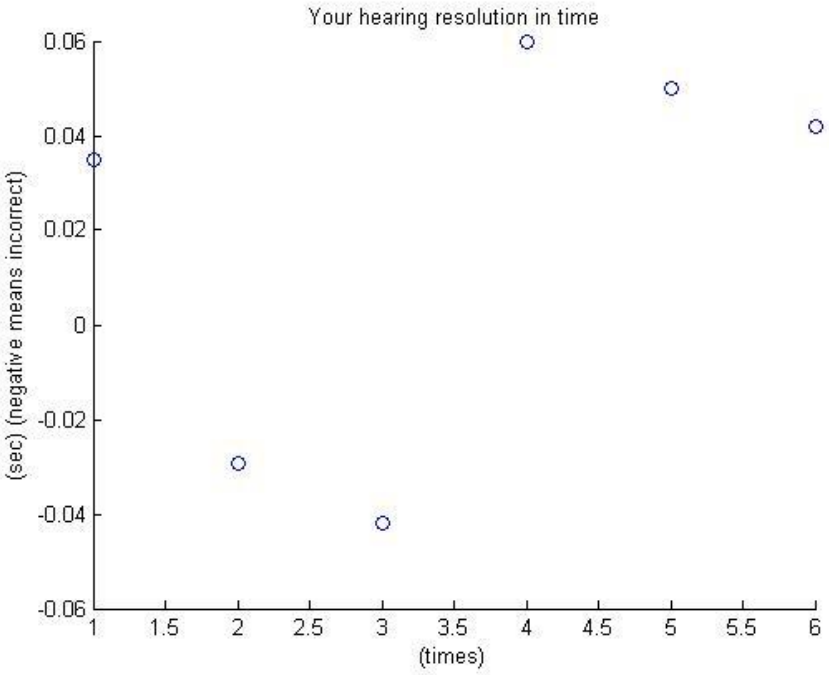
4. Finally we have enough parameters to carry out the task. Please implement the test. The user may face two questions:

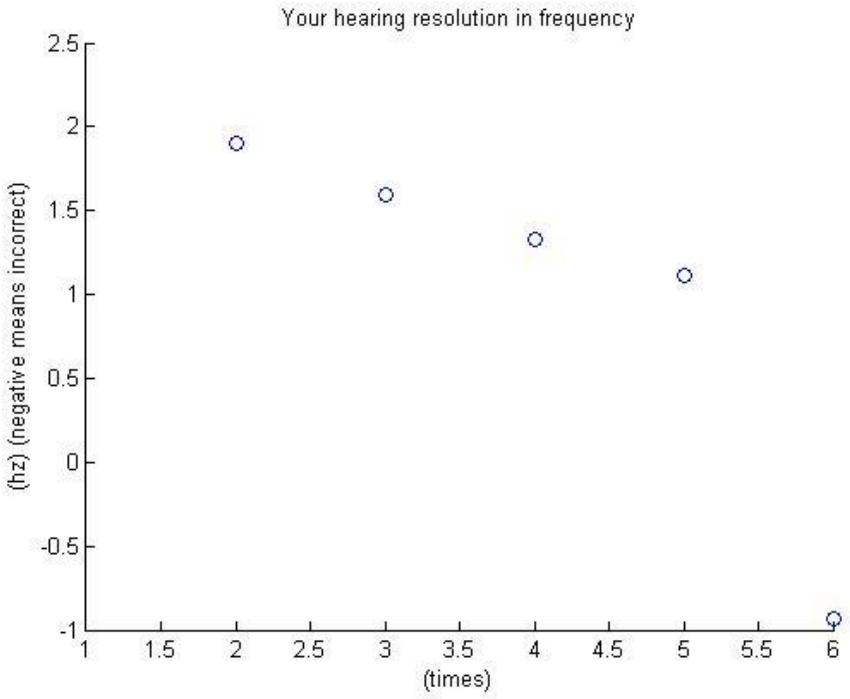
Q1: Is the testing note before or after the second flanking note?

Q2: Is the testing note higher or lower than the first flanking note?

The test should be harder once the user have had the correct answer (i.e. decrease Dt/Df). Contrarily, if the user have had the wrong answer, the test should be easier (i.e. increase Dt/Df). You may have to use while loop.

5. After finishing the test, you should also have some figures to understand the performance in the process of testing like below.




The y-axis represents Dt/Df. If the participant answers correctly, the value will be positive. On the contrary, if the participant answers incorrectly, the value will be negative.

**Questions leaving for you:**

1. In the lecture, TAs have used sin wave to demo the task. If the testing notes and the flanking notes are different timbres, what may happen?

2. What is resolution? And what is precision? Do you agree with Author's opinion in the paper?

3. Do you think this lab is feasible? Are there any unreasonable points in this lab?

4. Is time difference easier to be detected by human beings or frequency difference? What may be the reason?

<u>Things to turn in on LMS:</u>

Please find a group with 2 people. One of you should turn in all of your code and a 正式報告. The report may include the answers to the questions above