EE6641 Analysis and Synthesis of Audio Signals

Lab 1: Tone synthesis

Due Sep. 22, 2015

Brought to you by Yi-Wen Liu

Objectives: In this lab, you will familiarize yourself with digital audio storage using MATLAB. You will create a .wav file that contains mixture of pure tones which sounds similar to the dual-tone signals you hear when you press a button on the telephone.

Tasking description:

1. You are given a MATLAB script to begin with. In the script, you will find several lines that define the following parameter for synthesizing a tone: the amplitude, the frequency, the phase, and the duration.
2. Make sure you understand that the following line creates a signal (that is, a vector) representing the tone:

   ```
   y = A*cos(2*pi*f*nn/fs + phi);
   ```

3. Play it back to the default output of your computer using either the sound() function, or alternatively you may use wavwrite(y,fs,FILENAME) first and then use a media player for listening.
4. Now, extend the code so as to synthesize the superposition of two tones.
5. Refer to the following table to synthesize "telephone button tones". This protocol is known as *Dual-Tone Multiple Frequency*. Remember to normalize your signal so its maximum amplitude does not exceed 1.0.

   Remarks: You may use

   ```
   y = y/max(abs(y));
   ```

   for normalization.

	1209 Hz	**1336 Hz**	**1477 Hz**	**1633 Hz**
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

Things to turn in on LMS:

Please turn in a .wav file that contains a series of DTMF encoding your cellphone number. Later in this semester, we will distribute your file to the class as testing materials. Therefore, please name the file *anonymously* (that is, without revealing your identity so only the professor and the TAs know whose file it is).

A question for further experimentation and pondering

In this line below, if we change cos to sin, thus introducing a 90-degree phase shift, will the sound sound differently?

```
y = A*cos(2*pi*f*nn/fs + phi);
```