Assignment: Homework 7

What to Hand In

1. Your code with appropriate comments and a **readme file**. You are responsible for making us understand and know how to run your code.
2. A report with answers, figures, and explanations.
3. Any sound files requested in the problems.

How to Hand It In

1. Put all your files in one folder. Compress this folder and name it <firstname>_<lastname>_HW7.zip. For example, "Zhiyao_Duan_HW7.zip".
2. Submit via blackboard to the appropriate entry**.**

When to Hand It In

It is due immediately at the beginning of the day (i.e., 0:00AM) specified on the course calendar. **Late assignments will receive a grade deduction of 20% of the full grade each day.**

Problems (10 points in total)

1. (2 points) Read paper "Schroeder_1961.pdf" and "Schroeder_1962.pdf". Explain in plain English the main benefits of using/adding a series of all-pass filters in a reverberator implementation.

2. (8 points) Implement on the OMAP L-138 DSP board the reverberator described in Figure 6 in "Schroeder_1962.pdf". As suggested in the paper, fix $\tau_1 : \tau_4 = 1 : 1.5$, and $\tau_5$and $\tau_6$be 5 and 1.7 ms, respectively. Also fix $g_5$and $g_6$be 0.7. Depending on the room you want to simulate, you need to choose appropriate values for τ_1 and g_1, which basically determine the reverberation time according to the formula $T = 3\tau_n/(-\log_{10} g_n)$. Then you can determine g_1, g_2, g_3, g_4 using the same formula.
    a. (2 points) Choose τ_1 and $g_1$for the following rooms and explain how you came up with the values. Assuming you are in the middle of the room.
        i. A small bright room (Eastman practice room): 4*2.5*3 meters with 85% sound reflection at each wall
        ii. A small "dead" room (your dorm packed with stuff): same size but with 30% sound reflection
        iii. A large bright room (a church): 30*50*10 meters with 85% sound reflection
        iv. A large "dead" room (a concert hall with full audience): same size but with 30% sound reflection
    b. (4 points) Implement the reverberator for the third room (church). Apply it to your favorite songs. Does the reverberator sound like what you expected?

c. (2 points) Implement two sliders, one for τ_1 and one for g_1, so that you can change the room size and wall material in real time. Choose the range of their values yourself. Experiment the reverberator on your favorite songs and change the parameters. Describe your observations.