Applied signal processing

Lab 1, April-2007

In this first lab exercise, we will learn how to use a DSP-card.

When you start developing application for DSP, you normally buy something named "Starter-kit" or "Development-board". These packages normally include

1. A DSP development card
2. Necessary cables for interfacing to a PC
3. IDE to run on PC for developing the software

In this lab exercise, we will use either of the two following DSP-cards:

1. TMS320C6711
2. TMS320C6713

Hence, both are Texas Instruments based DSP's. Even if the card are slightly different, they are programmed almost the same way.

A DSP development card is basically used for developing some specific functionality that is programmed into a Digital Signal Processor. The actual application is usually some kind of embedded system, where a specific PCB is designed for the application. The development card is a easy way of starting up the development procedure.

Depending on the type of development card, different amount of additional hardware is available. Typical additional hardware is I/O ports and memory. For instance, both TMS320C6711 and TMS320C6713 include A/D-D/A converters programmable for frequencies of normal sound.

Tasks of lab 1:

1. Learn how to use the DSP card by finding the sine wave generator software supplied as example, it is found in c:/asp/tone. Copy this software to a own directory, compile and run the software. Make sure that you get sound out of the loudspeakers (you should hear a sine wave). Change the frequency of the sine wave.
2. In the example program, the sine wave is generated using a sine wave table. In some applications, this can however be a poor solution, as the solution may require heavy memory usage if generating simultaneously many sine waves. Instead, a digital resonator ("Magic circle") can be constructed using e.g. the following recursion:

$$\begin{aligned} x_n &= x_{n-1} + \epsilon y_n \\ y_n &= -\epsilon x_n + y_{n-1} \end{aligned} \tag{1}$$

   where y_n is the output sequence. The magic circle parameter is $\epsilon = 2 * \sin(\pi f_n T)$. Implement this digital resonator and test it on the DSP card.

The work is performed as a group work, however, in order to get credits from this course, everyone must make a lab report from each of the labs. The lab report must describe what has been done, how the work was performed, note any observation and analyze the job performed.