Applied signal processing / JB

Lab 1, April 2011

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

- A DSP development card
- Necessary cables for interfacing to a PC
- IDE to run on PC for developing the software

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

- TMS320C6713 DSP Starter Kit

It is a development bard based on a Texas Instruments based DSP. 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 an 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 TMS320C6713 include A/D-D/A converters programmable for frequencies of normal sound.

Tasks of lab 1:

- Learn how to use the DSP card by finding the sine wave generator software supplied as example,

it is found in L:/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.

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:

$$x_n = x_{n-1} + \varepsilon y_n$$

$$y_n = -\varepsilon y_n + y_{n-1}$$

where y_n is the output sequence. The magic circle parameter is $\varepsilon = 2\sin(\pi f_n T)$. Implement this digital resonator and test it on the DSP card. The sampling frequency is at default 44,1 kHz.

The work is performed in groups, 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.