# DSP Project

## Multirate polyphase filter banks

This document provides an outline for a Matlab project to be completed by the end of the course. You are expected to investigate, in detail, methods related to solving the problem. There is a design element to the project, and a quantitative evaluation of the performance of the proposed methods must be performed and presented. You are to write up a comprehensive report (of no more than 8 pages) describing your method and results. You should work in groups of two, although you may work alone if you really want to.

If you wish to propose a project of your own, then please come and talk to me. Project descriptions from previous years on the course website are also options.

### The Task

Take a look at

`http://www.dsprelated.com/dspbooks/sasp/Multirate_Polyphase_Filter_Banks.html`

and show me something interesting with multirate filters.

If you like hardware you might want to implement a real-time factor of two downsampler. Any microcontroller board that you know how to program should do, and I have some lying around if you don't have one. Recall that a downsampler is a lowpass antialiasing filter followed by a decimator that throws away many (most?) of the hard-earned output samples. Also, the lowpass filter is operating at the higher data rate. Neither of these sound good. Polyphase filtes give you a way of thinking about it all.

Alternatively, if you don't want to build anything, you could do a detailed analysis of what signals look like at different parts of a multirate system and show how and why it is a good representation for implementation. An interesting possibility is to look at the case of a fractional sampling rate converter, which involves both upsampling and downsampling, but investigating a simpler case is also okay.