Experiment 2 – DSP Lab

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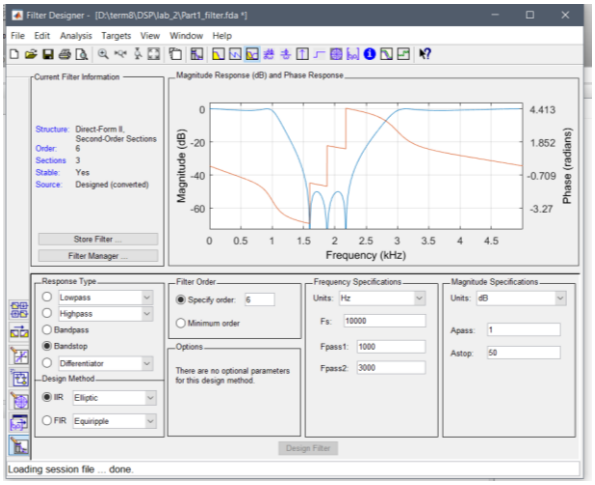
I. Part One

In this part we implement an IIR filter using fdatool in Matlab, the following is my IIR_Filter in Matlab:

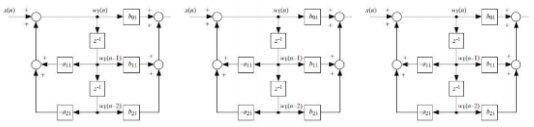


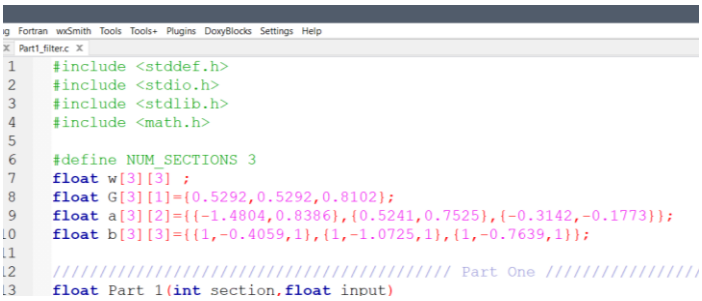
IIR_Filter

This IIR filter have the following properties:

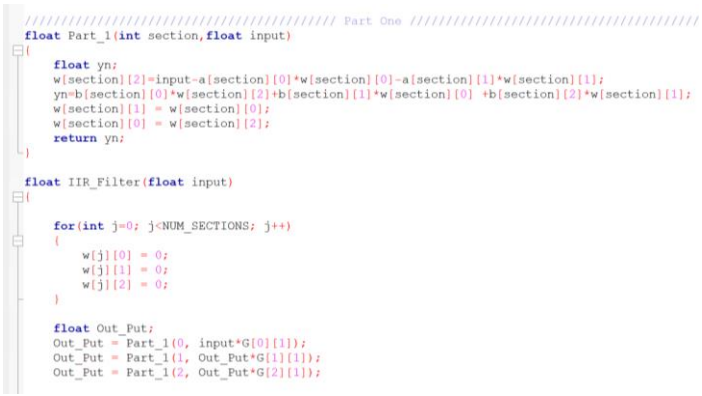
I. Fs = 10000Hz
II. Fpass1 = 1000Hz
III. Fpass2 = 3000Hz
IV. Apass = 1dB
V. Astop = 50dB

The aim is to implement this filter using 3 serialized second degree filters.





First part of the code concerns with coefficients like a&b and G as a gain.



The second part of the code is our IIR filter like the code in manual description with the gain part which has been added.

```
////////////////////////////////////////// Part Two ////////////////////////////

#define M_PI 3.141592
float FT(float input)
{
    int n=sizeof(input);
    float Out_put;
    for(int k=0;k<n;k++)
    {
        float sumreal=0;
        float sumimag=0;
        for(int t=0;t<n;t++)
        {
            float angle = 2 * M_PI * t * k / n;
            sumreal +=  creal(input) * cos(angle) + cimag(input) * sin(angle);
            sumimag += -creal(input) * sin(angle) + cimag(input) * cos(angle);
            Out_put = sqrt(pow(sumreal,2)+pow(sumimag,2));
            return Out_put;
        }
    }
}
```

Part two takes the signal as an input and returns the DFT of the input signal as the discrete Fourier transform of the signal.

```
////////////////////////////////////////// Part Three //////////////

float noise_generator(int fs, int t, float mu, float sigma) {

    float rand_gen() {
        // return a uniformly distributed random value
        return ( (float)(rand()) + 1. )/( (float)(RAND_MAX) + 1. );
    }
    float normalRandom() {
        // return a normally distributed random value
        float v1=rand_gen();
        float v2=rand_gen();
        return cos(2*3.14*v2)*sqrt(-2.*log(v1));
    }

    float x = normalRandom()*sigma+mu;
    return x;
}

////////////////////////////////////////// Main Part ///////////////
```

Unfortunately, I couldn’t plot my output file. All the files are in the code folder.