Digital Signal Processing

Lab 2: Convolution

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Exercise 1

Implement a convolution function in MATLAB or Python and perform it on the following signals and plot the results:

- x[n] = [1, 1, 1, 1] h[m] = [1, 0, −1]
- x[n] = [4, 1, 2, −5] h[m] = [−1, 2, −1]
- x[n] = sin(n/5) h[m] = [−1, −2, 8, −2, −1] 20 ≤ n < 20

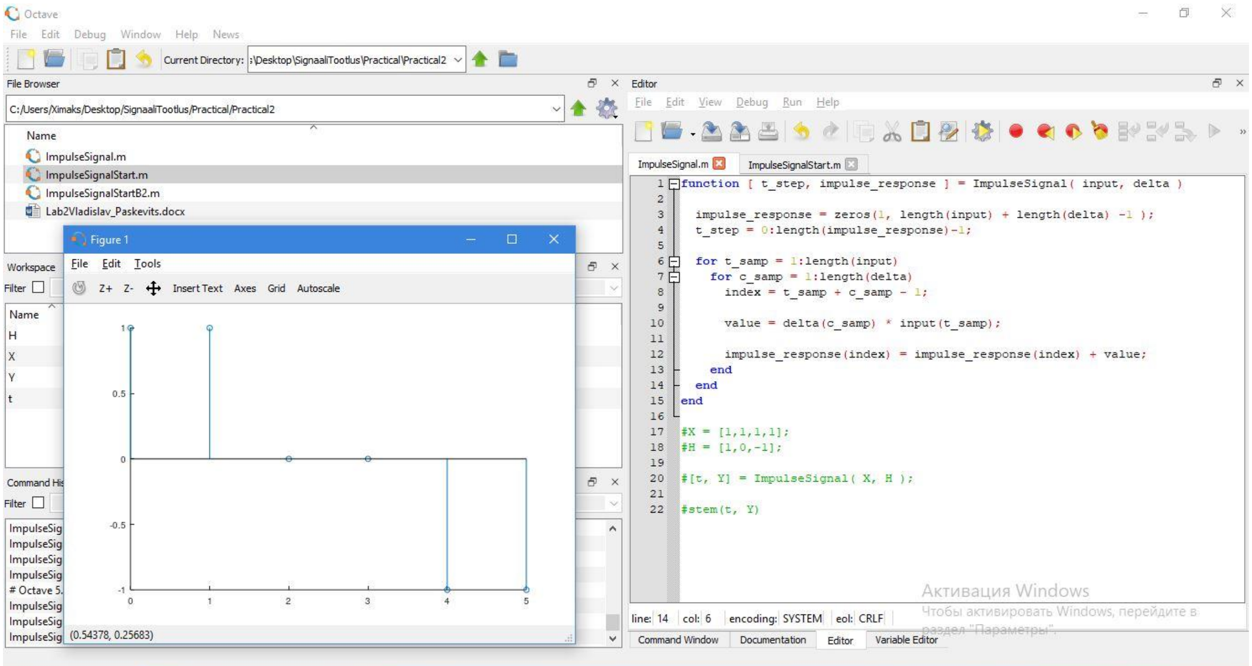

Figure 1 x[n] = [1, 1, 1, 1] h[m] = [1, 0, −1]

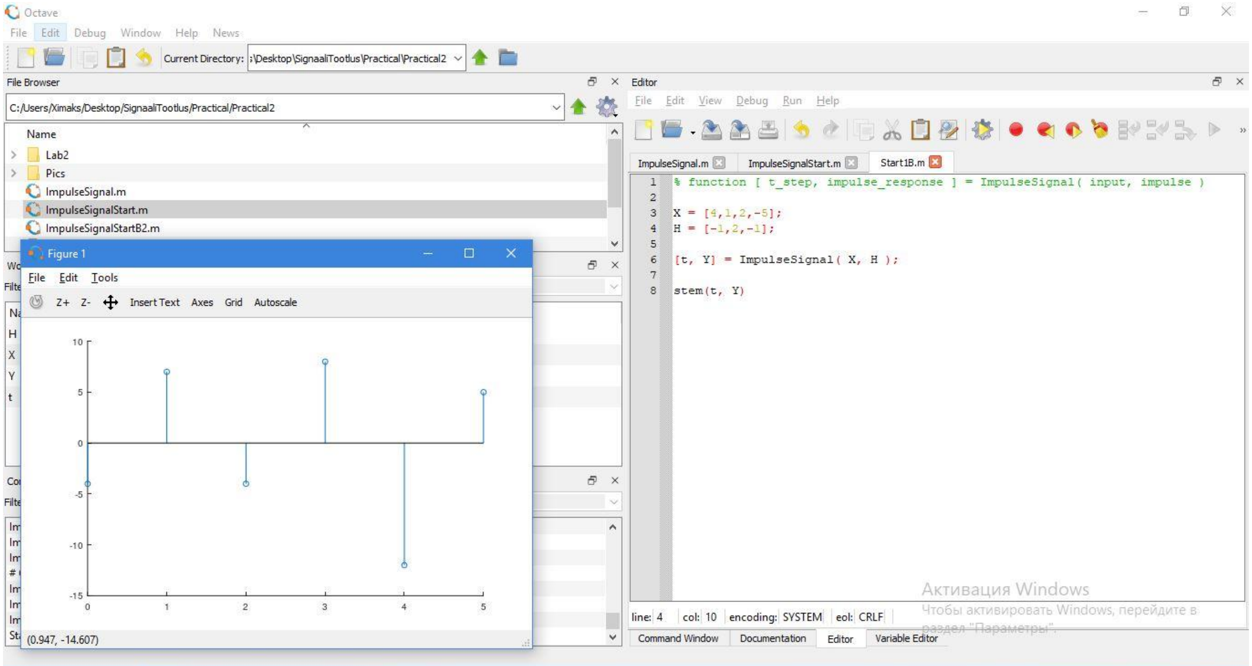

Figure 2 x[n] = [4, 1, 2, −5] h[m] = [−1, 2, −1]

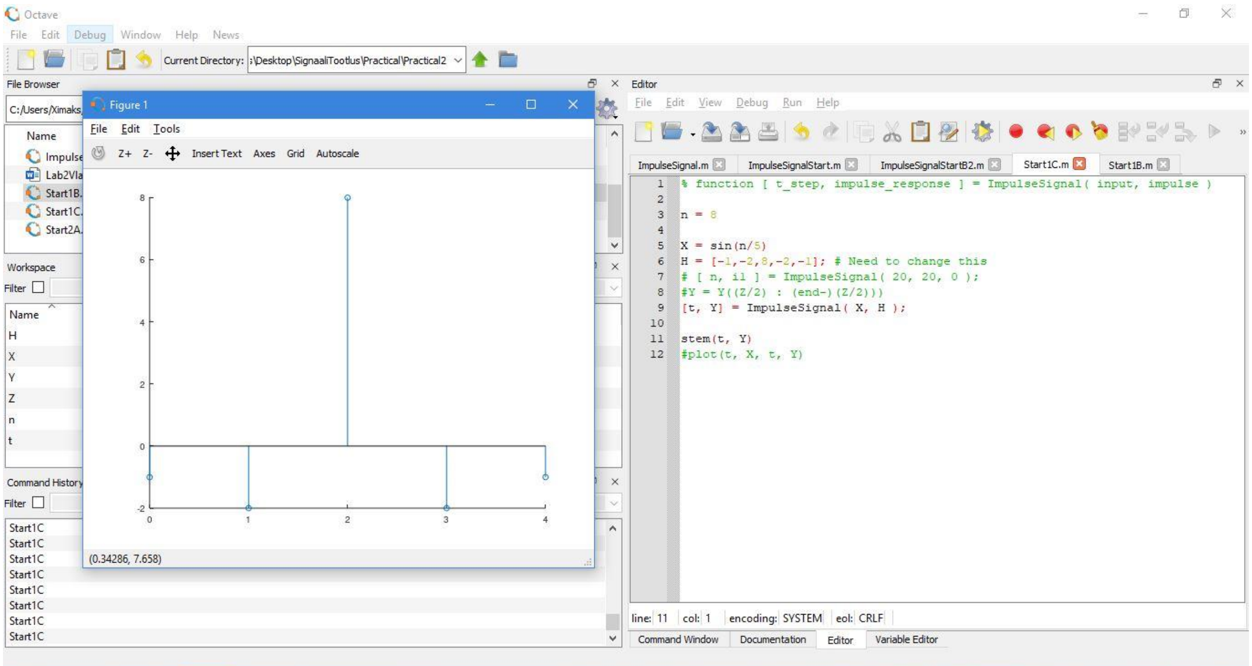

Figure 3 x[n] = sin(n/5) h[m] = [−1, −2, 8, −2, −1]

Exercise 2

Given the input signal x[n] = 0.3∗sin(n/5) + sin(n/50)

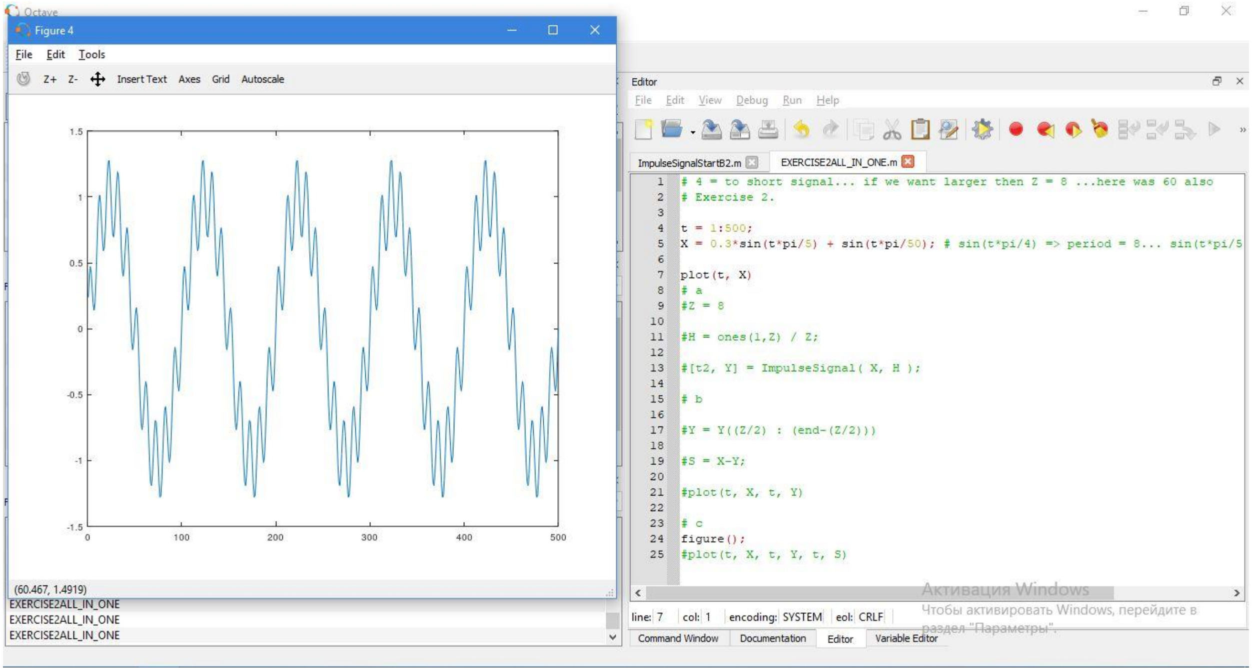

*Figure 4 x[n] = 0.3*sin(n/5) + sin(n/50)*

(a) Create your own delta signal h[m] that removes the higher frequency sinusoidal component to get yl [n].

(b) Subtract the yl [n] from the original signal(x[n]) and get the higher frequency component yh[n](pay attention to array sizes and phase shift)

(c) Plot x[n], yl [n] and yh[n] on the same graph

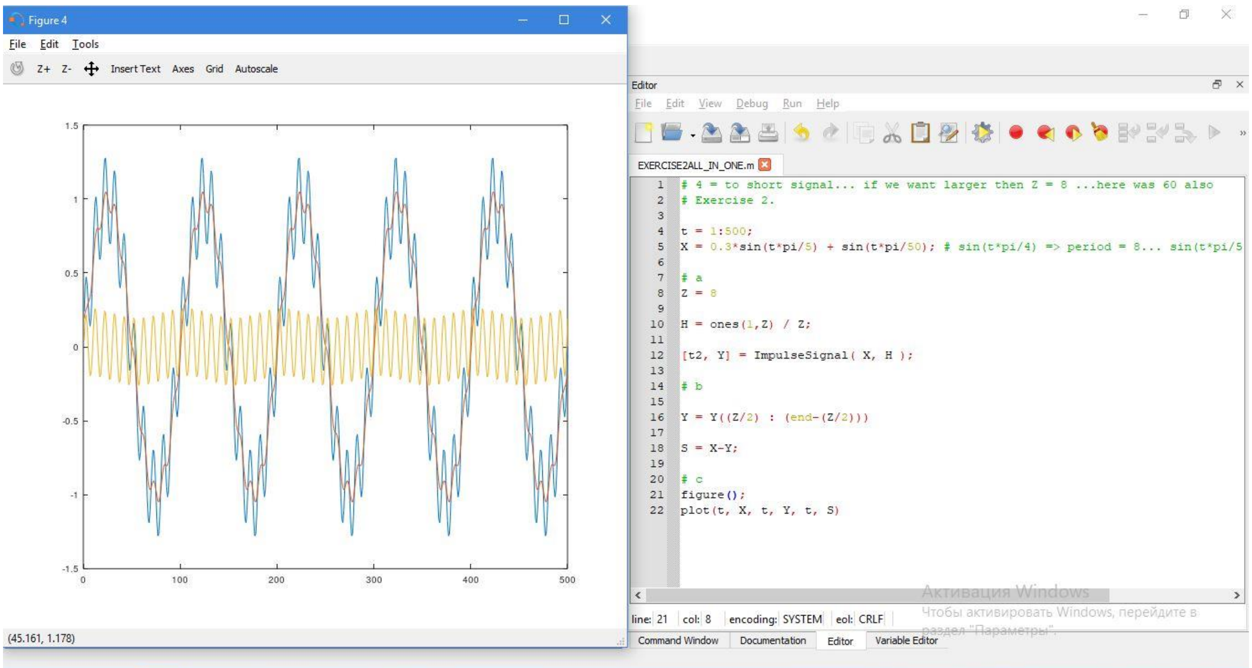

Figure 5 Plot x[n], yl [n] and yh[n] on the same graph