

Homework 5 (Due: 7/3)

- (1) Write a Matlab or Python program to compute the DFT of two N -point real signals x and y using only one N -point DFT. (20 scores)

$$[Fx, Fy] = \text{dftreal}(x, y)$$

The code should be handed out by ceiba.

- (2) What are the two main advantages of the sectioned convolution? (10 scores)

- (3) What are the most important applications of (a) the Walsh transform and (b) the Haar transform nowadays? (10 scores)

- (4) What are the number of additions required for (a) the 2^k -point Walsh transform, (b) the 2^k -point Haar transform, and (c) the 2^k -point NTT? (20 scores)

(5) In what condition we can use the NTT to compute convolution (write two constraints). (b) In addition to computing convolution, what is the main application of the NTT? (10 scores)

(6) Suppose that $M = 13$. (a) Write the 6-point NTT (α should be chosen as small as possible). (b) Write the corresponding inverse NTT. (10 scores)

(7) (a) What is the results of CDMA if there are three data $[1\ 0\ 1]$, $[0\ 1\ 0]$, $[1\ 1\ 0]$ and these three data are modulated by the 1st, 5th, and 10th columns (equivalent to the 1st, 5th, and 10th rows ($m = 0, 4, 9$)) of the 16-point Walsh transform?
(b) Is it better to use the Haar for CDMA? Why? (20 scores)

(Extra): 根據你的學號來回答 6/12, 6/19 上課影片中的問題 (一題)