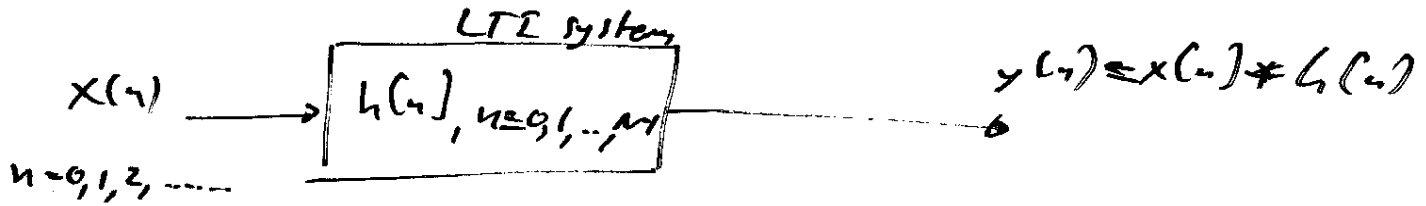


LECTURE 14

BLOCK CONVOLUTION METHODS FOR LINEAR FILTERING

Objective: To filter a long input sequence with a finite length impulse response system.



(A) OVERLAP AND ADD METHOD

Given $x(n), n=0,1,2,\dots,\infty$

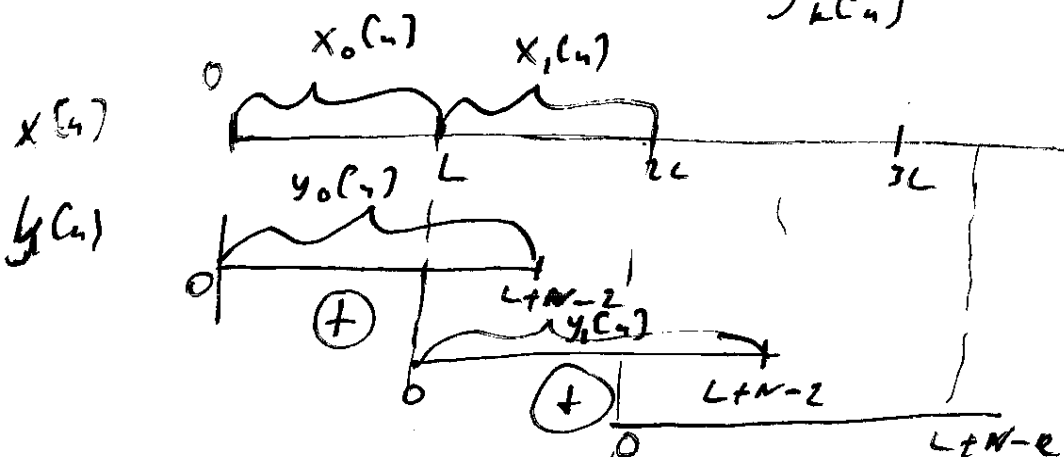
$h(n), n=0,1,2,\dots,N-1$

i) Divide $x(n)$ into records of length L . Then

$$x(n) = \sum_k x_k(n)$$

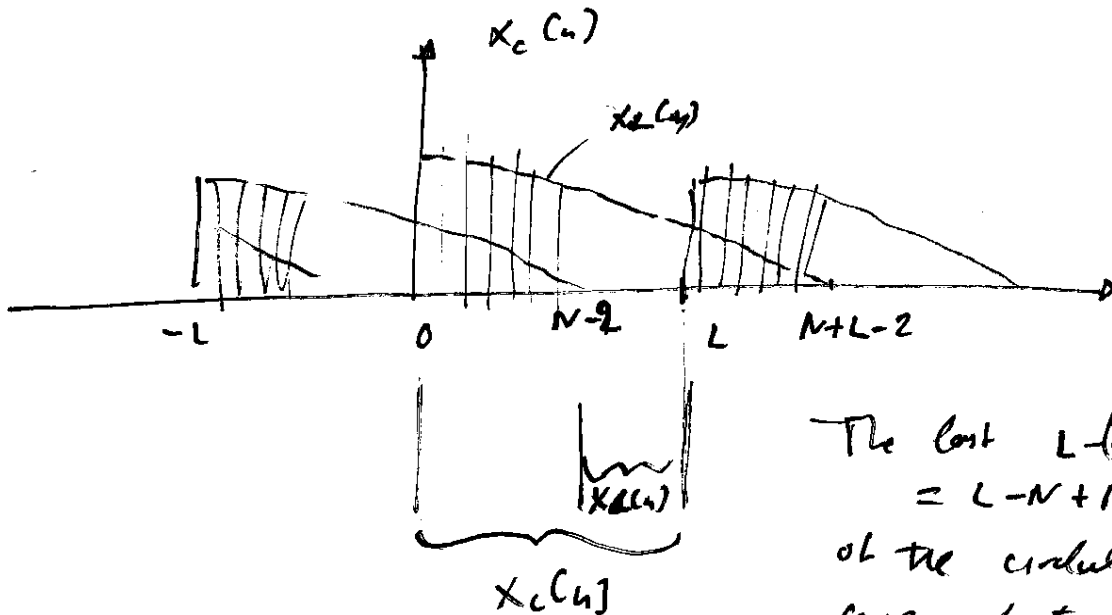
where $x_k(n) = x(n + kL), n=0,1,\dots,L-1$

$$ii) x(n) * h(n) = \sum_k \underbrace{x_k(n) * h(n)}_{y_k(n)}$$



(B) L-point Circular Convolution of an L-length sequence with an N-length sequence ($N < L$)

Let $x(n), n=0, 1, \dots, L-1$ then $x_c(n) = \left[\sum_l x_L(n+ell) \right] R_L(n)$
 $h(n), n=0, 1, 2, \dots, N-1$



The last $L - (N-2) = 1 = L - N + 1$ points of the circular convolution correspond to linear convolution

OVERLAP AND SAVE METHOD

- Divide $x(n)$ into records of length $L - N + 1$ samples
- Extend each record to the left by $N-1$ samples
- Obtain circular convolution of each extended record with $h(n)$
- Discard the first $N-1$ samples
- Put the remaining samples in sequence

