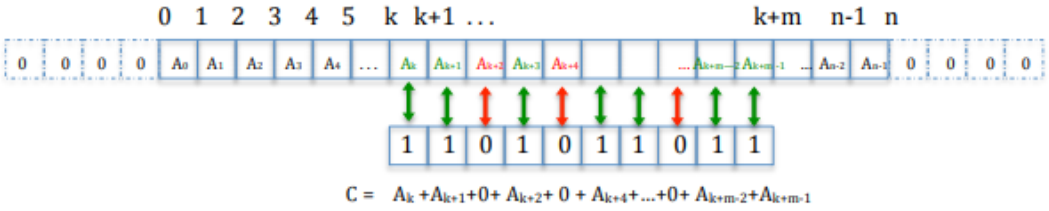
ASSIGNMENT2 QUESTION3

3. Assume you are given a map of a straight sea shore of length $100n$ meters as a sequence on $100n$ numbers such that A_i is the number of fish between i^{th} meter of the shore and $(i+1)^{th}$ meter, $0 \leq i \leq 100n-1$. You also have a net of length n meters but unfortunately it has holes in it. Such a net is described as a sequence N of n ones and zeros, where 0's denote where the holes are. If you throw such a net starting at meter k and ending at meter $k+n$, then you will catch only the fish in one meter stretches of the shore where the corresponding bit of the net is 1. Find the spot where you should place the left end of your net in order to catch the largest possible number of fish using an algorithm which runs in time $O(n \log n)$. (30 pts)



Answer:

Let N' be the net sequence in the reverse order; the associated polynomial is $P_{N'}(x) = N_0 + N_1 x + \cdots + N_{n-1}x^{n-1}$ .And for sequence A we have polynomial $P_A(x) = A_0 + A_1 x + \cdots + A_{100n-1}x^{100n-1}$ Then we will find the convolution of A*N', We can do this use FTT in $(100n-1+n-1)\,log(100n-1+n-1)$ time which is $O(n\,log(n))$. So we get $P_C(x) = A_0N_0 + (A_0N_1 + A_1N_0)x + \cdots + (A_{100n-1} \cdot N_{n-1})x^{101n-2}$we need to know the peak coefficient $P_C(x)$. We will go through all coefficient of $P_C(x)$ and it will take O(n) time. The final will be $O(n\,log(n)) + O(n) = O(nlogn)$.