CS 577: Introduction to Algorithms — Addendum to Homework 2

Addendum to Problem 1 on Homework 2

Here is an example to elucidate what problem 1 is asking for. Suppose that $k = 3$ and you are given the following array A of size 4:

1	0	1	1
0	1	1	0
0	1	1	1

The bit-wise AND of the subarray $A[1..3]$ is $100 \cdot 011 \cdot 111 = 000$. The bit-wise XOR of the same subarray is $100 \oplus 011 \oplus 111 = 000$. This subarray has the same bit-wise AND and bit-wise XOR, and therefore should count towards the output of your algorithm.

The matrix below lists the bit-wise ANDs and XORs of all of the subarrays of A. The rows of the matrix are indexed by the starting index of the subarray and the columns by the ending index (only the upper triangular half is populated). Each cell contains the bit-wise AND followed by the bit-wise XOR. Six of the cells have the same AND and XOR (four of these, along the diagonal of the matrix, correspond to subarrays of size 1). Therefore, on input A, your algorithm should return the answer 6.

	1	2	3	4
1	1 1 0 0 0 0	0 1 0 1 0 1	0 0 0 0 0 0	0 1 0 0 0 1
2		0 0 1 1 1 1	0 1 1 0 1 0	0 0 0 0 1 1
3			1 1 1 1 1 1	1 0 0 1 1 0
4				1 1 0 0 1 1