Assignment - IV

Merges k-sorted (Time complexity)

Input:

[[1, 10, 11, 15]
 [2, 4, 9, 14]
 [5, 6, 8, 16]
 [3, 7, 12, 13]]

k

N

k = 4
N = 4

output:

[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
 13, 14, 15, 16]

KN

Given array of K sorted arrays of an average length N, return a sorted array of length KN consisting of the original elements in the arrays.

Naive Approach

1) concatenate all the arrays.

[1, 10, 11, 15] + [2, 4, 9, 14] +

[5, 6, 8, 16] + [3, 7, 12, 13]

[1, 10, 11, 15, 2, 4, 9, 14, 5, 6, 8, 16, 3, 7, 12, 13]

2) sort that array.

[1, 2, 3, 4, 5, 6, 7, 8, 9, 10
11, 12, 13, 14, 15, 16]

Time complexity

N: Total No. of elements across all arrays
K: Number of input arrays
K * K: The worst-case number of comparisons per array

Time complexity of doing K comparisons each iteration

$$O(N * K * K$$

Time complexity of concatenating and sorting:

$$O(N * K * \log(N * K))$$