XJTLU | Computing

Recursions

Problem 1. Given a data structure D that supports Sequence operations:

- `D.build(X)` in $O(n)$ time, and
- `D.insert_at(i,x)` and `D.delete_at(i)`, each in $O(\lg n)$ time,

where n is the number of items stored in D at the time of the operation, describe algorithms to implement the following high-level operations in terms of the provided low-level operations. Each operation below should run in $O(k \lg n)$ time. Note that, `delete_at` returns the deleted item.

(a) `reverse(D, i, k)`: Reverse in D the order of the k items starting at index i (up to index $i + k + 1$).

(b) `move(D, i, k, j)`: Move the k items in D starting at index i, in order, to be in front of the item at index j. Assume that expression $i \leq j < i + k$ is false.