CSCI5020 External Memory Data Structures: Exercise List 5

In the following problems, B is the block size, and M is the memory capacity.

Problem 1. Let P be a set of n points. Give a structure of $O(n/B)$ space that answers an orthogonal range reporting query in $O((n/B)^{1/3} + k/B)$ I/Os, where k is the number of points reported.

Problem 2. Let P be a set of n points, and $\epsilon > 0$ an arbitrarily small constant. Give a structure of $O(n/B)$ space that answers an orthogonal range reporting query in $O((n/B)^{\epsilon} + k/B)$ I/Os, where k is the number of points reported.

Problem 3*. Let P be a set of n points, each of which is associated with an information field of $L = o(B)$ words. Give a structure of $O(n/B) + 2L/B$ space that answers an orthogonal range reporting query in $O((nL/B)^{1/3} + kL/B)$ I/Os, where k is the number of points reported.

Problem 4. Give an algorithm to construct a CRB-tree on n points using $O((n/B)\log_2(n/B))$ I/Os.