

Scan pattern

By using the scan pattern, give a parallel solution for the following problems.

Prefix sum

The prefix sum operation takes a binary associative operator \oplus and an ordered set of n elements $[a_0, a_1, \dots, a_{n-1}]$ and returns the ordered set

$$[a_0, (a_0 \oplus a_1), \dots, (a_0 \oplus a_1 \oplus \dots \oplus a_{n-1})]$$

Design and implement a parallel algorithm to compute the prefix sum operation, assuming that the binary operator \oplus corresponds to the addition.

List ranking

The list ranking operation takes a binary associative operator \oplus and a linked list L with n nodes. Let a be an element of L , where $\text{next}(a)$ is the position of the node following a on L , and $\text{val}(a)$ is the value stored in the node a . The linked list operations is defined as the computation of the distance of each node of L from the head of the list. An alternative definition is this: The computation of the prefix sum operation over the values $\text{val}()$, using the operator \oplus , by following the references given by the $\text{next}()$ function.

Design and implement a parallel algorithm to compute the list ranking operation, assuming that the binary operator \oplus corresponds to the addition.

Filtering

Given an array of integers, implement a parallel algorithm to filter of the elements that meet a given condition. The output of the algorithm must be an array with all the elements that meet the condition.

Note: The pattern to reduce the size of an array, by deleting unused elements is called **pack**

Hint: Use the prefix sum operation.

Graph to tree

Given a the adjacency list representation of a graph G and the list of visited edges after a DFS traversal, implement a parallel algorithm to construct an spanning tree of G using the visited edges.

Note: Assume the adjacency list representation given in www.josefuentes.cl/datasets/graphs.php. To test your algorithm, use the datasets given in the same web page.

Hint: Use the prefix sum operation.

Euler tour

Given a tree T , design and implement a parallel algorithm to compute the Euler Tour of T .

Note: Assume the adjacency list representation given in www.josefuentes.cl/datasets/trees.php. To test your algorithm, use the datasets given in the same web page.

Hint: Use the list ranking operation.