C – List Ranking (Pointer Jumping)

in4026

For the list of requirements of this lab course exercise, please read the lab course manual (can be downloaded from the BlackBoard), especially Section 1.

Given a linked list L with N nodes, represented by an array S such that $S(i)$ is the successor of i. The last node is represented by $S(i) = 0$.

Desing and implement a parallel program in PThreads and OpenMP that calculates an array R such that each value $R(i)$ is the distance from node i to the end (last node) of L. Base this program on the pointer jumping algorithm and make sure that it has a time complexity of $\mathcal{O}(\log(N))$.

Test your program, among others, with the following input

i	$S(i)$	i	$S(i)$	i	$S(i)$	i	$S(i)$
1	14	5	11	9	0	13	4
2	13	6	10	10	8	14	3
3	5	7	9	11	7	15	2
4	16	8	12	12	15	16	1

The correct output should then be similar to:

i	$R(i)$	i	$R(i)$	i	$R(i)$	i	$R(i)$
1	6	5	3	9	0	13	9
2	10	6	15	10	14	14	5
3	4	7	1	11	2	15	11
4	8	8	13	12	12	16	7

Note that normal I/O (e.g., reading the input array from a file, displaying the solution) is not considered part of the algorithm's time complexity.