Data Structure Assignment 4

Programming Homework

(Textbook p.189 Exercises 4)

4. Consider the operation XOR (exclusive OR, also written as $\oplus$) defined as follows (for i, j binary):

$$i \oplus j = \begin{cases} 0 \text{ if } i \text{ and } j \text{ are identical} \\ 1 \text{ otherwise} \end{cases}$$

This definition differs from the usual OR of logic, which is defined as

$$i \text{ OR } j = \begin{cases} 0 \text{ if } i = j = 0 \\ 1 \text{ otherwise} \end{cases}$$

The definition can be extended to the case in which i and j are binary strings (i.e., take the XOR of corresponding bits of i and j). So, for example, if i = 10110 and j = 01100, then i XOR j = $i \oplus j$ = 11010. Note that

$$a \oplus (a \oplus b) = (a \oplus a) \oplus b = b$$

and

$$(a \oplus b) \oplus b = a \oplus (b \oplus b) = a$$

This notation gives us a space-saving device for storing the right and left links of a doubly linked list. The nodes will now have only two data members: *data* and *link*. If l is to the left of node x and r to its right, then $x \rightarrow link = l \oplus r$ If x is the leftmost node of a non-circular list, l = 0, and if x is the rightmost node, r = 0. For a new doubly linked list class in which the link field of each node is the exclusive OR of the addresses of the nodes to its left and right, do the followings.

Create a doubly linked list with 20 nodes.

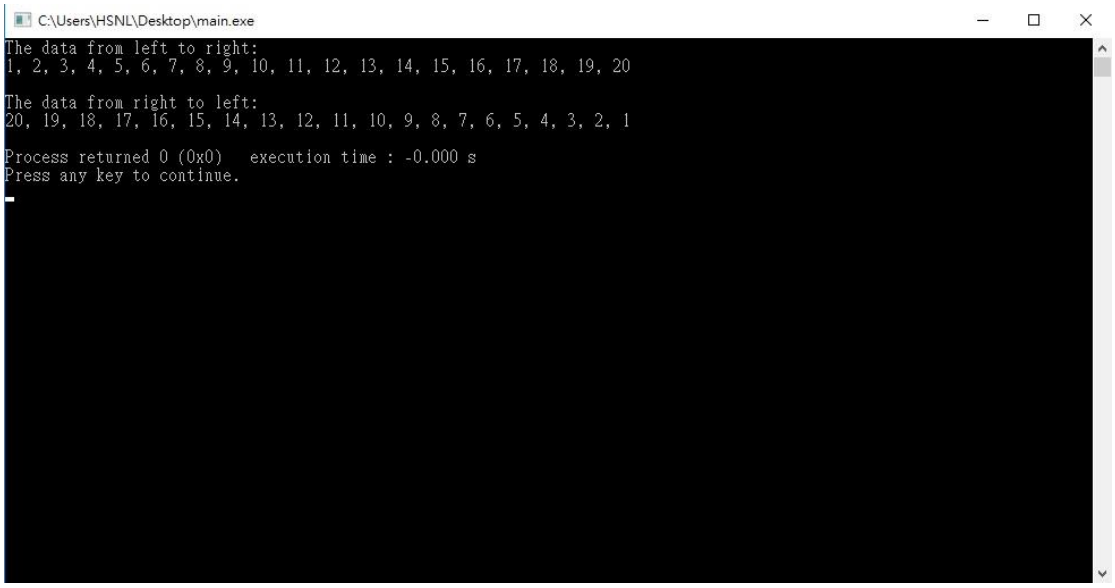
(a) Print out the contents of the *data* field of each node from left to right.

(b) Print out the contents of the *data* field of each node from right to left.

Attention:

You need to use exclusive OR to find the left or right node. If you don't use exclusive OR, you will get 0. Even if your output is correct.

Output:



General Information:

- Deadline：**2017/12/01 23:55**.
- Upload your assignment to Moodle system.
- Upload file format: Student-Id_Name.rar , Ex.P76991094_王小明.rar
- Your file should consist of the following items: Source Code & Readme file (Program description).
- Late homework will not be accepted.
- Any copies will be scored as zero. Do not plagiarize.
- Programming homework TA 傅瑄方 Email: p76051226@mail.ncku.edu.tw