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1  #include <stdlib.h>
2
3  typedef struct node_t {
4      int x;
5      struct node_t *next;
6  } *Node;
7
8
9  typedef enum {
10     SUCCESS=0,
11     MEMORY_ERROR,
12     UNSORTED_LIST,
13     NULL_ARGUMENT,
14 } ErrorCode;
15
16
17 int getListLength(Node list);
18 bool isListSorted(Node list);
19 Node mergeSortedList(Node list1, Node list2, ErrorCode* error_code);
20
21 // copy a node and return a pointer to it
22 // Node node - the node to copy
23 // return NULL if allocation failed
24 Node copyNode(Node node){
25     if (node == NULL){
26         return NULL;
27     }
28     Node node_copy = malloc(sizeof(node_t));
29     if (node_copy == NULL)
30     {
31         return NULL;
32     }
33
34     node_copy->x = node->x;
35     node->next = NULL;
36     return node_copy;
37 }
38 // free nodes after a memory error
39 // Node head - pointer to the first node
40 // int count - number of nodes to free
41
42 void freeNodesAfterMemoryError(Node head, int count){
43     Node previos_node = head;
44     Node current_node = previos_node->next;
45     while (count > 1)
46     {
47         free(previos_node);
48         previos_node = current_node;
49         current_node = previos_node->next;
50         count--;
51     }
52     free(previos_node);
53 }
54
55 // take two sorted Node lists, create a new sorted Node list that is the union of the
    two.
56 // returns a pointer to the new list or NULL if an error accoured
57 //Node list1 - pointer to the first list
58 //Node list2 - pointer to the second list
59 // ErrorCode* error_code - pointer to an ErrorCode enum which will be updated with
    ann according value
60 Node mergeSortedList(Node list1, Node list2, ErrorCode* error_code){
61     if (list1 == NULL || list2 == NULL){
62         *error_code = NULL_ARGUMENT;
63         return NULL;
64     }
65     if (!isListSorted(list1) || !isListSorted(list2))
66     {
67         *error_code = UNSORTED_LIST;
68         return NULL;
69     }
70     int list1_len = getListLength(list1);

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71     int list2_len = getListLength(list2);
72     int merged_len = list1_len + list2_len;
73
74     Node out_merged;
75     Node current_node = out_merged;
76     int counter = 0;
77     while (counter < merged_len)
78     {
79         if (list1_len == 0){
80             current_node = copyNode(list2);
81             list2_len--;
82         }
83         else if(list2_len == 0){
84             current_node = copyNode(list1);
85             list1_len--;
86         }
87         else{
88             if(list1->x <= list2->x){
89                 current_node = copyNode(list1);
90                 list1_len--;
91             }
92             else{
93                 current_node = copyNode(list2);
94                 list2_len--;
95             }
96         }
97
98         if (current_node == NULL){
99             freeNodesAfterMemoryError(out_merged, counter);
100             *error_code = MEMORY_ERROR;
101             return NULL;
102         }
103         current_node = current_node->next;
104         counter++;
105     }
106
107     *error_code = SUCCESS;
108     return out_merged;
109 }
110
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