

Merge a linked list into another linked list at alternate positions

Given two linked lists, insert nodes of second list into first list at alternate positions of first list. For example, if first list is 5->7->17->13->11 and second is 12->10->2->4->6, the first list should become 5->12->7->10->17->2->13->4->11->6 and second list should become empty. The nodes of second list should only be inserted when there are positions available. For example, if the first list is 1->2->3 and second list is 4->5->6->7->8, then first list should become 1->4->2->5->3->6 and second list to 7->8.

Use of extra space is not allowed (Not allowed to create additional nodes), i.e., insertion must be done in-place. Expected time complexity is $O(n)$ where n is number of nodes in first list.

The idea is to run a loop while there are available positions in first loop and insert nodes of second list by changing pointers. Following is C implementation of this approach.

```
// C implementation of above program.
#include <stdio.h>
#include <stdlib.h>

// A nexted list node
struct node
{
    int data;
    struct node *next;
};

/* Function to insert a node at the beginning */
void push(struct node **head_ref, int new_data)
{
    struct node* new_node = (struct node*) malloc(sizeof(struct node))
    new_node->data = new_data;
```

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new_node->next = (*head_ref);
(*head_ref) = new_node;
}

/* Utility function to print a singly linked list */
void printList(struct node *head)
{
    struct node *temp = head;
    while (temp != NULL)
    {
        printf("%d ", temp->data);
        temp = temp->next;
    }
    printf("\n");
}

// Main function that inserts nodes of linked list q into p at alternating
// positions. Since head of first list never changes and head of second
// may change, we need single pointer for first list and double pointer
// for second list.
void merge(struct node *p, struct node **q)
{
    struct node *p_curr = p, *q_curr = *q;
    struct node *p_next, *q_next;

    // While there are available positions in p
    while (p_curr != NULL && q_curr != NULL)
    {
        // Save next pointers
        p_next = p_curr->next;
        q_next = q_curr->next;

        // Make q_curr as next of p_curr
        q_curr->next = p_next; // Change next pointer of q_curr
        p_curr->next = q_curr; // Change next pointer of p_curr

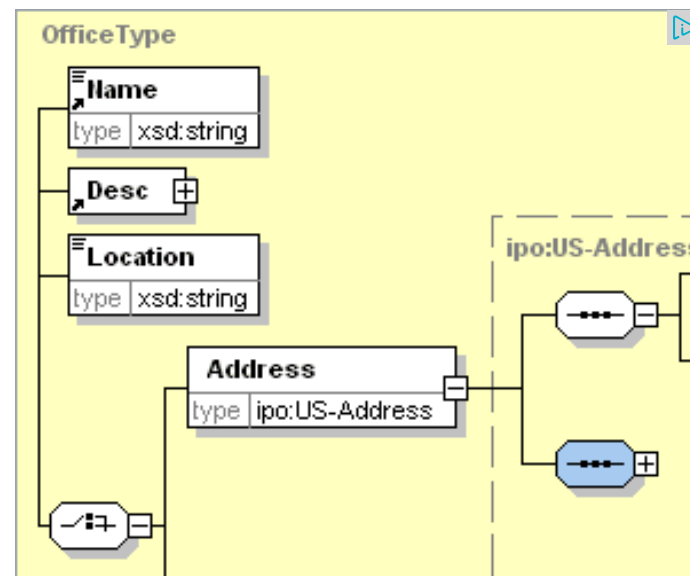
        // Update current pointers for next iteration
        p_curr = p_next;
        q_curr = q_next;
    }

    *q = q_curr; // Update head pointer of second list
}

// Driver program to test above functions
int main()
{

```

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struct node *p = NULL, *q = NULL;
push(&p, 3);
push(&p, 2);
push(&p, 1);
printf("First Linked List:\n");
printList(p);

push(&q, 8);
push(&q, 7);
push(&q, 6);
push(&q, 5);
push(&q, 4);
printf("Second Linked List:\n");
printList(q);

merge(p, &q);

printf("Modified First Linked List:\n");
printList(p);

printf("Modified Second Linked List:\n");
printList(q);

getchar();
return 0;
}

```

Output:

```

First Linked List:
1 2 3
Second Linked List:
4 5 6 7 8
Modified First Linked List:
1 4 2 5 3 6
Modified Second Linked List:
7 8

```

This article is contributed by **Chandra Prakash**. Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above.

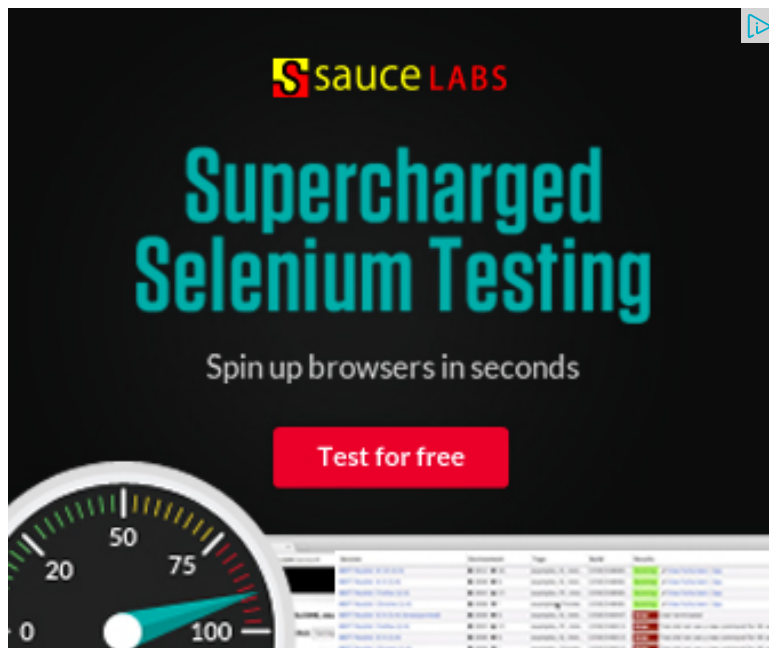
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