計算機程式語言

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Chapter 15_project 2

Modify the Justify program of Section 15.3 by having the read_word function (instead of main) store the * character at the end of a word that's been truncated.

Chapter 15_project 3

Modify the qsort.c program of Section 9.6 so that the quicksort and split functions are in a separate file named quicksort.c . Create a header file named quicksort.h that contains prototypes for the two functions and have both qsort.c and quicksort.c include this file.

本次作業請包涵 qsort.c quicksort.c quicksort.h 這三個檔案

Solution

```c
// qsort

#include <stdio.h>
#include "quicksort/quicksort.h"

#define N 10

int main(void){

    int a[N], i;

    printf("Enter %d numbers to be sorted : ", N);
    for(i = 0; i< N; i++){
        scanf("%d", &a[i]);
    }

    quicksort(a, 0, N-1);

    printf("In sorted order : ");
    for(i = 0; i < N; i++){
        printf("%d ", a[i]);
    }
    printf("\n");

    return 0;
}
```

Solution

quicksort.h

```
1   //  quicksort.h
2
3   #ifndef QUICKSORT_H
4   #define QUICKSORT_H
5
6   void quicksort(int a[], int low, int high);
7   int split(int a[], int low, int high);
8
9   #endif
```

Solution

quicksort.c

```c
#include "quicksort.h"

void quicksort(int a[], int low, int high)
{
    int middle;

    if(low >= high) return;
    middle = split(a, low, high);
    quicksort(a, low, middle - 1);
    quicksort(a, middle + 1, high);
}

int split(int a[], int low, int high)
{
    int part_element = a[low];

    for(;;){
        while(low < high && part_element <= a[high]){
            high--;
        }
        if(low >= high) break;
        a[low++] = a[high];

        while(low < high && a[low] <= part_element){
            low++;
        }
        if(low >= high) break;
        a[high--] = a[low];
    }

    a[high] = part_element;
    return high;
}
```

Example

```
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop/c15$ ./qsort
Enter 10 numbers to be sorted: 5 7 9 8 2 6 1 4 10 3
In sorted order: 1 2 3 4 5 6 7 8 9 10
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop/c15$
```

Chapter 15_project 4

Modify the remind.c program of Section 13.5 so that the read_line function is in a separate file named readline.c . Create a header file named readline.h that contains a prototype for the function and have both remind.c and readline.c include this file.

本次作業請包涵 remind.c readline.c readline.h 這三個檔案

Solution

```c
// remind

#include <stdio.h>
#include <string.h>
#include "./readline/readline.h"

#define MAX_REMIND 50   /* maximum number of reminders */
#define MSG_LEN 60      /* max length of reminder message */

int main(void){

    char reminders[MAX_REMIND][MSG_LEN + 3];
    char day_str[3], msg_str[MSG_LEN + 1];
    int day, i, j, num_remind = 0;

    for(;;){
        if(num_remind == MAX_REMIND){
            printf("-- No space left --\n");
            break;
        }

        printf("Enter day and reminder : ");
        scanf("%2d", &day);
        if(day == 0){
            break;
        }
```

Solution

```
27          sprintf(day_str, "%2d", day);
28          read_line(msg_str, MSG_LEN);
29
30          for(i = 0; i< num_remind; i++){
31              if(strcmp(day_str, reminders[i]) < 0){
32                  break;
33              }
34          }
35          for(j = num_remind; j > i; j--){
36              strcpy(reminders[j], reminders[j-1]);
37          }
38
39          strcpy(reminders[i], day_str);
40          strcat(reminders[i], msg_str);
41
42          num_remind++;
43      }
44
45      printf("\nDay Reminder\n");
46      for(i = 0; i < num_remind; i++){
47          printf(" %s\n", reminders[i]);
48      }
49
50      return 0;
51  }
```

Solution

readline.h

```
1  //  readline.h
2
3  #ifndef READLINE_H
4  #define READLINE_H
5
6  int read_line(char str[], int n);
7
8  #endif
```

readline.c

```
1  //  readline.c
2
3  #include <stdio.h>
4  #include "readline.h"
5
6  int read_line(char str[], int n){
7
8      int ch, i=0;
9
10     while((ch = getchar()) != '\n'){
11         if(i < n){
12             str[i++] = ch;
13         }
14     }
15
16     str[i] = '\0';
17
18     return i;
19 }
```

Example

```
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop/c15$ ./remind
Enter day and reminder: 16 project
Enter day and reminder: 17 PPT
Enter day and reminder: 18 POSD
Enter day and reminder: 19 Japan
Enter day and reminder: 20 AI
Enter day and reminder: 0

Day Reminder
 16 project
 17 PPT
 18 POSD
 19 Japan
 20 AI
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop/c15$
```

Chapter 15_project 5

Modify Programming Project 6 from Chapter 10 so that it has separate stack.h and stack.c files, as described in Section 15.2.

本次作業請包涵 **calc**.c stack.c stack.h 這三個檔案

Solution

```c
// rpn

#include <stdio.h>
#include <stdlib.h>
#include "./stack/stack.h"

int main(void){

    char ch;
    int op1, op2;

    printf("Enter an RPN expression : ");
    for(;;){
        scanf(" %c", &ch);
        switch(ch){
            case '0': case '1': case '2': case '3':
            case '4': case '5': case '6': case '7':
            case '8': case '9':
                push(ch - '0');
                break;
            case '+':
                push(pop() + pop());
                break;
            case '-':
                op2 = pop();
                op1 = pop();
                push(op1 - op2);
                break;
            case '*':
                push(pop() * pop());
                break;
            case '/':
                op2 = pop();
                op1 = pop();
                push(op1 / op2);
                break;
            case '=':
                printf("Value of expression : %d\n", pop());
                make_empty();
                printf("Enter an RPN expression : ");
                break;
            default:
                exit(EXIT_SUCCESS);
        }
    }

    return 0;
}
```

Solution

stack.h

```
1   //  stack.h
2
3   #ifndef STACK_H
4   #define STACK_H
5
6   #include <stdbool.h>
7
8   void make_empty(void);
9   bool is_empty(void);
10  bool is_full(void);
11  void push(int i);
12  int pop(void);
13  void stack_overflow(void);
14  void stack_underflow(void);
15
16  #endif
17
```

Solution

stack.c

```c
//  stack.c

#include <stdio.h>
#include <stdlib.h>
#include "stack.h"

#define STACK_SIZE 100

int contents[STACK_SIZE];
int top = 0;

void make_empty(void){
    top = 0;
}

bool is_empty(void){
    return top == 0;
}

bool is_full(void){
    return top == STACK_SIZE;
}

void push(int i){

    if(is_full()){
        stack_overflow();
    }else{
        contents[top++] = i;
    }
}
```

Solution

```
32
33  int pop(void){
34
35      if(is_empty()){
36          stack_underflow();
37      }else{
38          return contents[--top];
39      }
40
41      return '\0';
42  }
43
44  void stack_overflow(void){
45      printf("Expression is too complex\n");
46      exit(EXIT_FAILURE);
47  }
48
49  void stack_underflow(void){
50      printf("Not enough operands in expression\n");
51      exit(EXIT_FAILURE);
52  }
```

Example

```
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop/c15$ ./calc
Enter an RPN expression: 3 9 5 * - =
Value of expression: -42
Enter an RPN expression: 3 9 + 5 / =
Value of expression: 2
Enter an RPN expression: 3 9 + + + =

Not enough operands in expression
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop/c15$ ./calc
Enter an RPN expression: 5 3 + =
Value of expression: 8
Enter an RPN expression: q
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop/c15$
```