國立臺灣科技大學
電子工程系

資料結構
Lab1

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Methodology：

將所有字元照順序讀入，如果是左括號就使用 Stack 儲存，如果是右括號就和 Stack pop data 比對，如果錯誤就輸出錯誤訊息，其餘資料則不做動作，最後所有資料讀取完 top 會=-1，如果不為-1 則出現錯誤訊息。

Code：

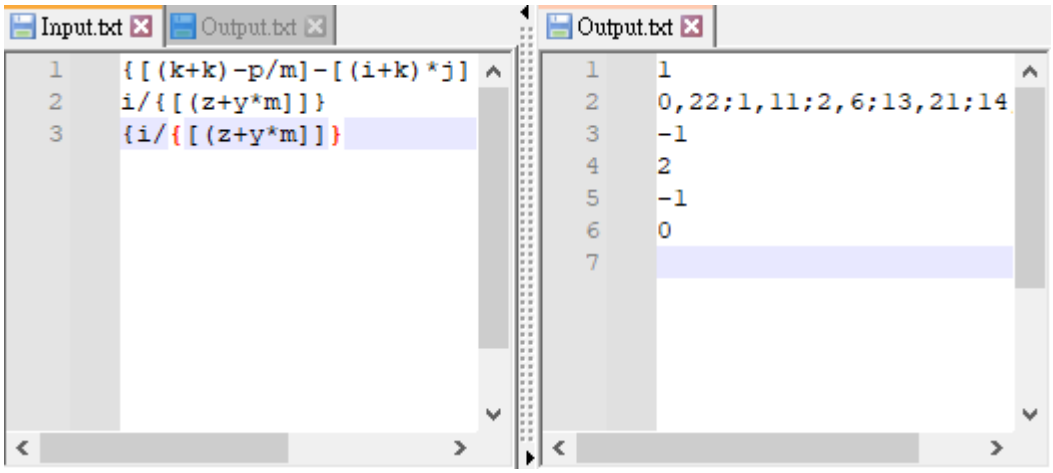
```
#include <stdio.h>
#include <stdlib.h>
#define _CRT_SECURE_NO_WARNINGS

void SelectionSort(int list[], int list2[], int n);//Sort資料
void SWAP(int* a, int* b);                          //SWAP資料
int whichBracket(char c);                           //判斷為何種括號
int judgeBracket(char c);                           //判斷左括號右刮號or不是括號
typedef struct Stack                                //Stack
{
     int top;
     int array[256];
}Stack;

int main()
{
     int c = 0;                                 //當前文件字元
     int arrayindex = 0;                        //當前陣列index
     int BracketError = 0;                      //如果配對失敗 = 1
     int Match = 0;                             //括號Match數量
     int Matcharray1[256] = { '\0' };           //match左括號index
     int Matcharray2[256] = { '\0' };           //match右括號index
     FILE* inFILE;                              //input.txt
     FILE* outFILE;                             //output.txt
     Stack CharStack;                           //字元Stack
     Stack IndexStack;                          //IndexStack
     CharStack.top = -1;
     IndexStack.top = -1;

     fopen_s(&inFILE, "Input.txt", "r");        //開啟Input.txt
     fopen_s(&outFILE, "Output.txt", "w+");     //開啟Output.txt
```

```
    if (inFILE == NULL)                         //檔案開啟是否正常
    {
        printf("fail to open file");
        return -1;
    }

    while (c != EOF)
    {
        c = fgetc(inFILE);
        if (c == '\n' || c == EOF)                          //資料換行
        {
            if (BracketError == 1|| CharStack.top != -1)  //括號配對失敗
            {                                               //輸出至檔案
                fprintf(outFILE, "-1\n");
                fprintf(outFILE, "%d\n",IndexStack.array[0]);
            }
            else
            {                                                   //資料配對成功
                SelectionSort(Matcharray1,Matcharray2, Match);//排序資料
                fprintf(outFILE, "1\n");                        //輸出至檔案
                for (int i = 0; i < Match; i++)fprintf(outFILE, "%d,%d;",
Matcharray1[i], Matcharray2[i]);
                fprintf(outFILE,"\n");
            }
            BracketError = 0;                                   //initialize
            arrayindex = 0;
            CharStack.top = -1;
            IndexStack.top = -1;
            Match = 0;
        }
        else
        {
            switch (judgeBracket(c))  //判斷左括號右刮號
            {
            //是左括號:pushchar & pushindex
            case 1:   CharStack.array[++(CharStack.top)] = c;
                      IndexStack.array[++(IndexStack.top)] = arrayindex;
                      break;
```

```
                //是右括號:pop & detect是否正確
                case 2:
                  if(whichBracket(c)==whichBracket(CharStack.array[CharStack.top--]))
                  {
                      Matcharray1[Match] = (IndexStack.array[IndexStack.top--]);
                      Matcharray2[Match++] = arrayindex;
                  }
                 else BracketError = 1;
                 break;
                default:break;
                }
                arrayindex++;
           }
     }
     fclose(inFILE);      //關閉Input.txt
     fclose(outFILE);     //關閉Output.txt
     return 0;
}

int judgeBracket(char c)
{
     if (c == '(' || c == '[' || c == '{') return 1;
     else if (c == ')' || c == ']' || c == '}') return 2;
     else return 0;
}
int whichBracket(char c)
{
     if (c == '(' || c == ')') return 0;
     if (c == '[' || c == ']') return 1;
     if (c == '{' || c == '}') return 2;
}
void SelectionSort(int list[],int list2[], int n)
{
     for (int i = 0; i < n - 1; i++) {
          int min = i;
          for (int j = i + 1; j < n; j++) if (list[j] < list[min]) min = j;
          SWAP(&list[i], &list[min]);
          SWAP(&list2[i], &list2[min]);
```

```
    }
}
void SWAP(int* a, int* b)
{
    int temp = *a;
    *a = *b;
    *b = temp;
}
```

Result：



Discussion and Conclusion：

我原本將 Struct Stack 包裝成包含 push pop top array
但我將語言從 C++換成 C 時才發現 Struct 在 C 和 C++的差別，C++的 Struct 裡面可以包含 function，但是 C 的不能包含 function。