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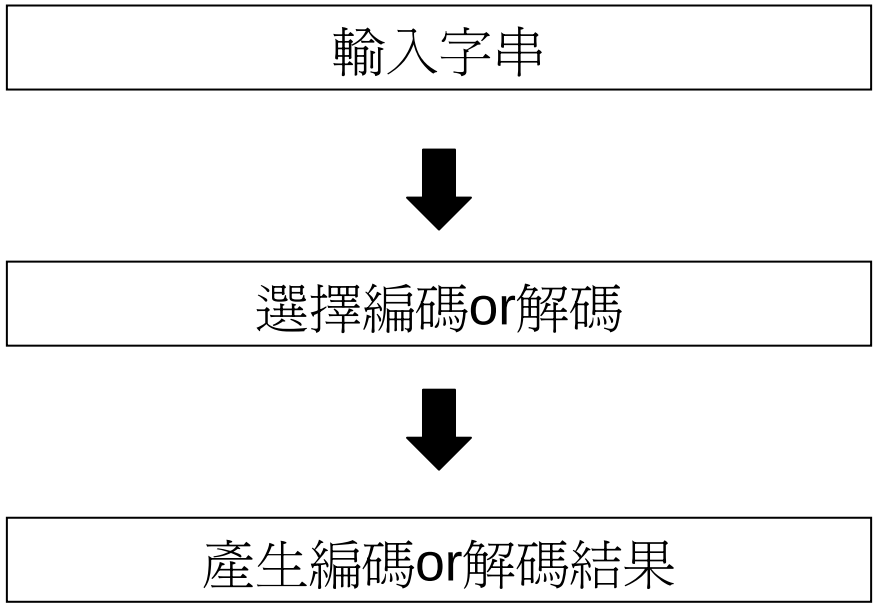
Case Study of C Characters and Strings

Example 1: Encoder/Decoder

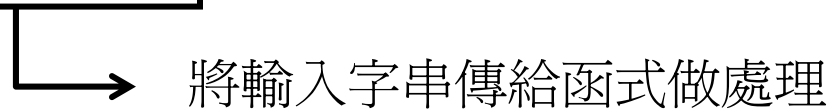
- **Problem definition**
  - 1.Encode: 使用者輸入一連續英文字串(字串長度小於10)，將每個英文字母之間插入一個數字
  - ex: MAY ➔M0A1Y2
  - 2.Decode: 使用者輸入一連續含英文字母及數字之字串(字串長度小於20)，將數字去除僅留下英文字母
  - ex: M0A1Y2➔MAY

Encoder/Decoder Flow



函式的定義與呼叫

```
void Encode( char string1[ ] );   //編碼程式
void Decode( char string1[ ] );   //解碼程式
```



Encoder/Decoder 程式(1/4)

```
#include <stdio.h>
#include <string.h>
#include <ctype.h>
void Encode(char string1[]);
void Decode(char string1[]);
int main()
{
        char string1[21];
        int choice;

        printf("1.Encode\n");
        printf("2.Decode");
        printf("\nPlease enter your choice (1 or 2) : ");
        scanf("%d",&choice);
        printf("\n");
```

Encoder/Decoder 程式(2/4)

```
    if(choice==1)
    {
            printf("Please enter a string(length<=10) : ");    // 輸入小於或等於10個字母之字串
            scanf("%s",string1);
            printf("\n");
            Encode(string1);
    }
    else if(choice==2)
    {
            printf("Please enter a string(length<=20) : ");    // 輸入小於或等於20個字母之字串
            scanf("%s",string1);
            printf("\n");
            Decode(string1);
    }
    return 0;
}
```

Encoder/Decoder 程式(3/4)

```
void Encode(char string1[])
{
        char num[10]={'0','1','2','3','4','5','6','7','8','9'};
        char buffer[21]="                    ";          // 宣告一空白陣列
        char *Ptr;
        int stringlength;
        int i;
        stringlength=strlen(string1);       // string1 字串長度
        for (i=0;i<stringlength;i++) {
                buffer[i*2]=string1[i];   // 將輸入字串之英文字母分開
                buffer[i*2+1]=num[i];   // 插入數字
        }
        Ptr=buffer;
        Ptr=strtok(buffer," ");
        while (Ptr!=NULL) {
                printf("%s",Ptr);
                Ptr=strtok(NULL," ");
        }
        printf("The string after encoding is : %s",buffer);
}
```

刪除空白符號

Encoder/Decoder 程式(4/4)

```
void Decode(char string1[])
{
        char *Ptr;
        int stringlength;
        stringlength=strlen(string1);
        Ptr=string1;                                    // 指向string1初始位址

        for (int i=0; i<stringlength;i++) {
                if (isdigit(*Ptr)) {
                        *Ptr=' ';
                }
                Ptr=Ptr+1;
        }
        Ptr=string1;
        Ptr=strtok(string1," ");
        while(Ptr!=NULL) {
                printf("%s",Ptr);
                Ptr=strtok(NULL," ");
        }
}
```

判斷是否爲數字,若是則替換成空白符號

Encoder/Decoder 執行結果

Encode :

```
1.Encode
2.Decode
Please enter your choice (1 or 2) : 1

Please enter a string(length<=10) : Encode

E0n1c2o3d4e5_
```

Encode結果

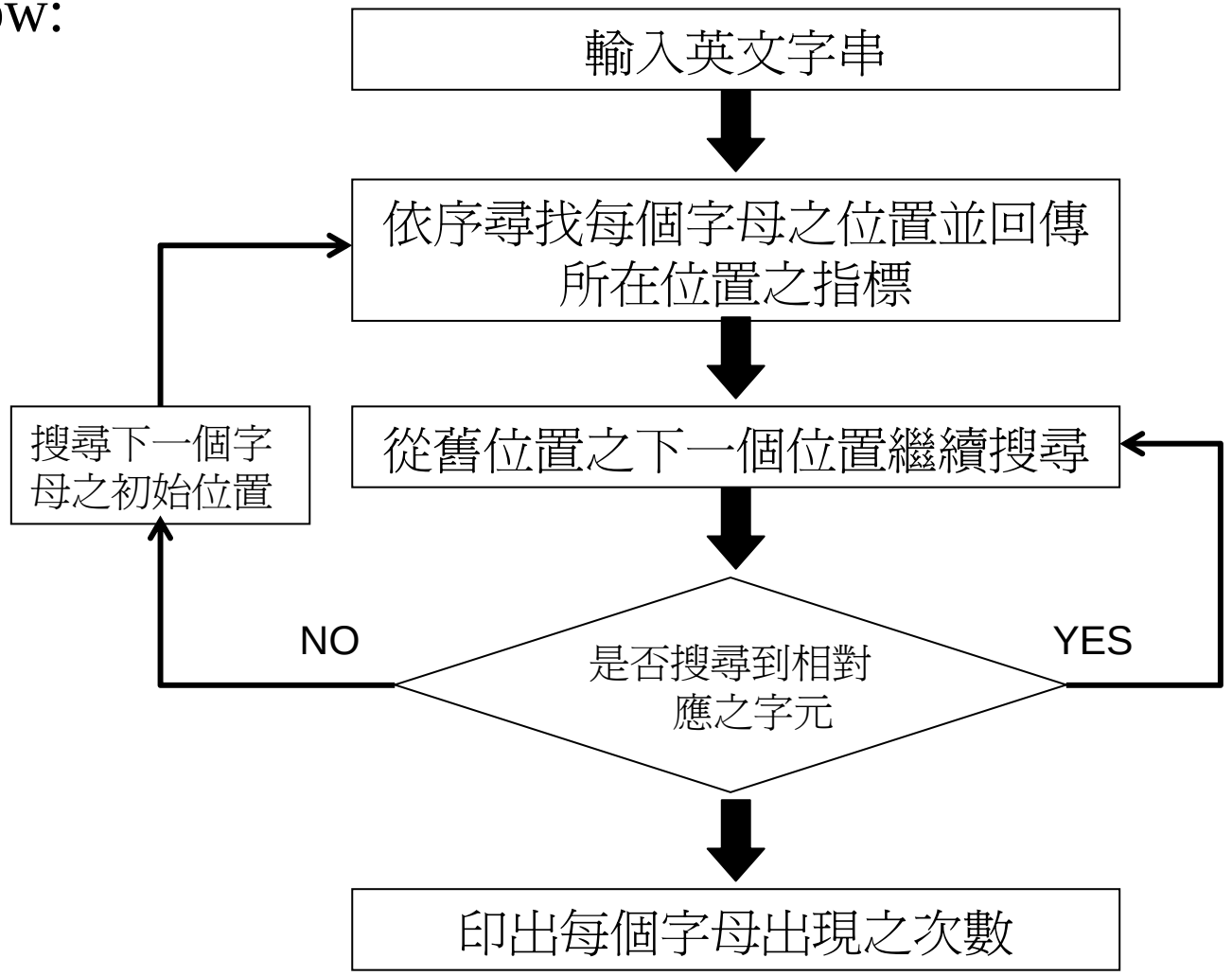
Decode :

```
1.Encode
2.Decode
Please enter your choice (1 or 2) : 2

Please enter a string(length<=20) : Dec91o3d56e

Decode_
```

Decode結果

Example 2 : Letter Counting

- 輸入任一英文字串，計算每個英文字母出現次數
- Flow:



Letter Counting 程式(1/2)

```
#include <stdio.h>
#include <string.h>

int main()
{
    char string1[200];
    char *Ptr;
    char
    letter[26]={'a','b','c','d','e','f','g','h','i','j','k','l','m','n','o','p','q','r','s','t','u','v','w','x','y','z'};
    int letter_index;
    int sum=0;

    printf("Enter a string : ");
    scanf("%s",string1);
    printf("\n");
```

Letter Counting 程式(2/2)

```
    for(letter_index=0 ; letter_index<=25 ; letter_index=letter_index+1)
    {
            sum=0;
            Ptr=strchr(string1,letter[letter_index]);          尋找字元位置
            while(Ptr!=NULL)
            {
                    sum=sum+1;                                 繼續搜尋判斷是否有相符合之字元,
                    Ptr=strchr(Ptr+1,letter[letter_index]);    若有則回傳新的位置
            }
            printf("Number of %c = %d",letter[letter_index],sum); 印出每個字母出現次數
            printf("\n");
    }

    return 0;
}
```

Letter Counting 執行結果

```
Enter a string : hahayouaresobeautiful

Number of a = 4
Number of b = 1
Number of c = 0
Number of d = 0
Number of e = 2
Number of f = 1
Number of g = 0
Number of h = 2
Number of i = 1
Number of j = 0
Number of k = 0
Number of l = 1
Number of m = 0
Number of n = 0
Number of o = 2
Number of p = 0
Number of q = 0
Number of r = 1
Number of s = 1
Number of t = 1
Number of u = 3
Number of v = 0
Number of w = 0
Number of x = 0
Number of y = 1
Number of z = 0
```