

LAB REPORT 实验报告

Lab Title	Bit-masking			Lab No.	13
Stud. Name		Major	CST	Class	
Student ID			Date		

Lab description/objectives:
Investigate the difference between the binary representation of alphabets' uppercase and their lowercase, for instance, 'a' is 01100001, 'A' is 01000001, 'z' is 01111010, 'Z' is 01011010. Write functions, upperToLower(), lowerToUpper(), that convert between lowercase and uppercase by **using bitwise operations**.

Based on the above functions, Write a C program to toggle all characters in a string, for example,

Input: tu@kmiNi123

Output: TU@KMInI123

Source code:

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#define MAXLEN 2021102716

char str[MAXLEN];

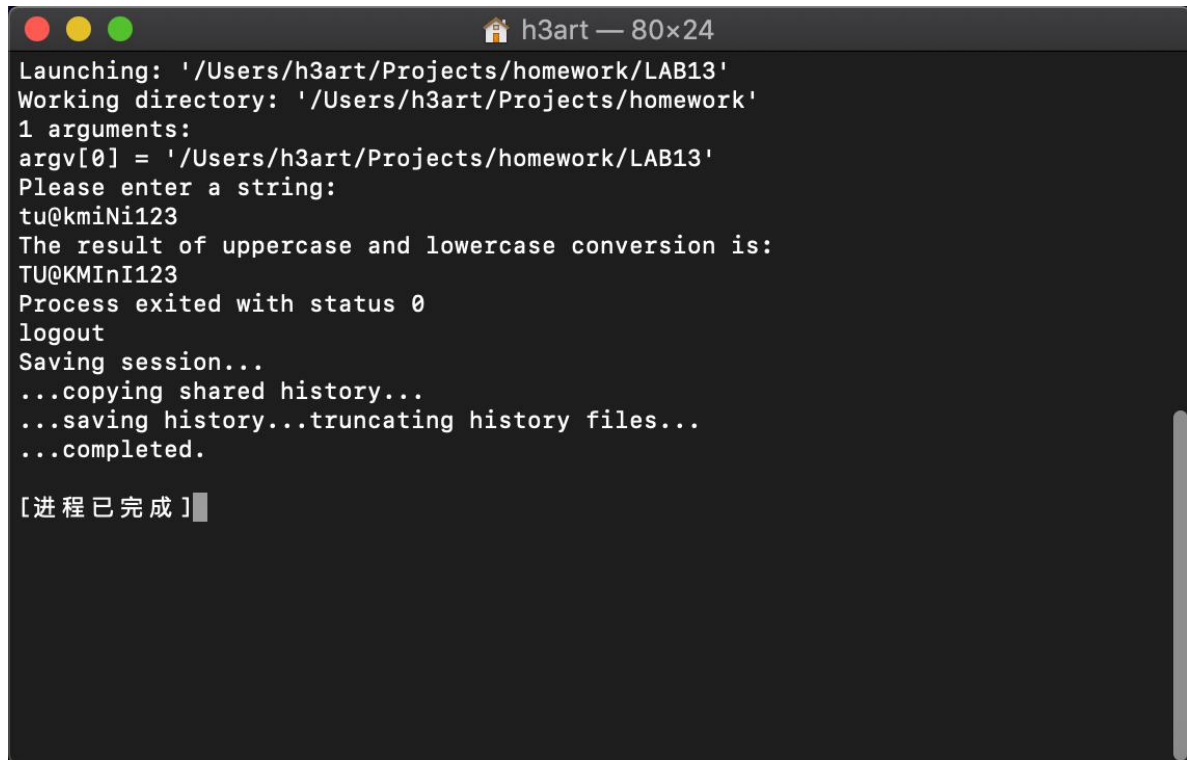
void upperToLower(char* letter)
{
    *letter = (*letter) | ' ';
    return;
}

void lowerToUpper(char* letter)
{
    *letter = (*letter) & ' _';
}
```

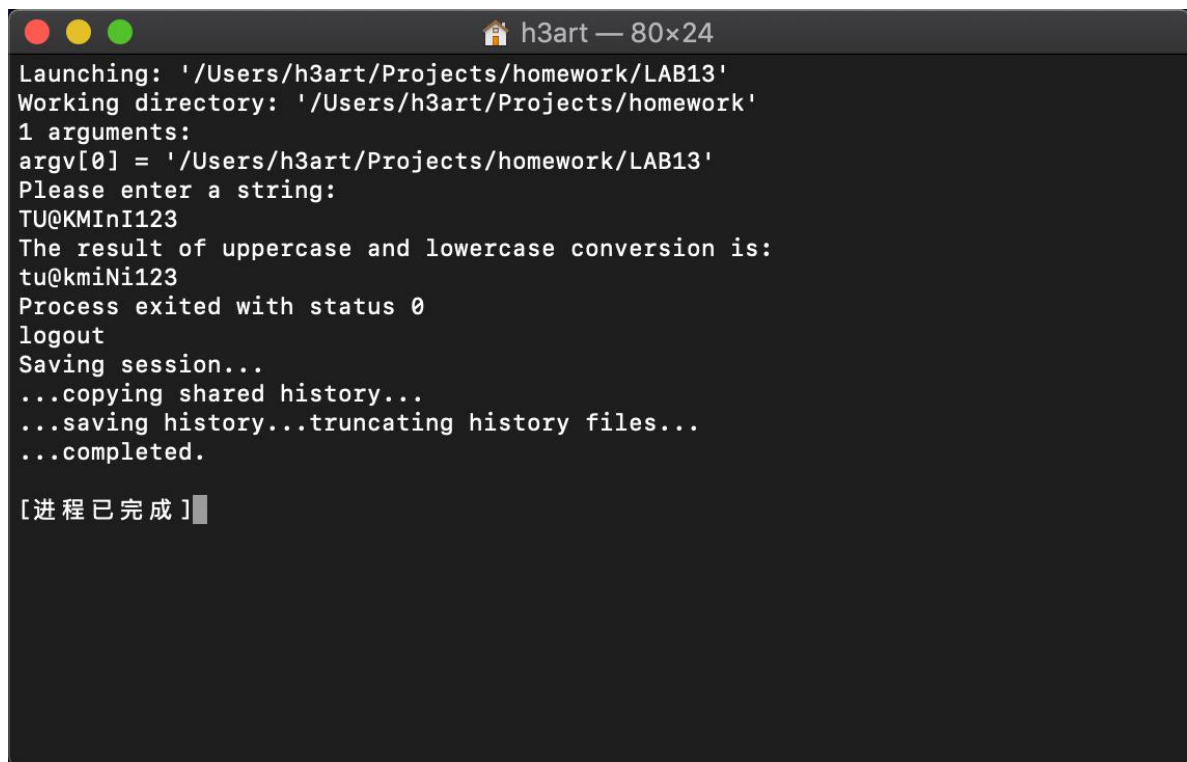
```
    return;
}

int main(void)
{
    printf("Please enter a string:\n");
    scanf("%s", str);
    for (int i = 0; str[i] != '\0'; i++) {
        if (str[i] >= 'a' && str[i] <= 'z') {
            lowerToUpper(&str[i]);
        }
        else if (str[i] >= 'A' && str[i] <= 'Z') {
            upperToLower(&str[i]);
        }
    }
    printf("The result of uppercase and lowercase conversion is:\n");
    printf("%s\n", str);
    return 0;
}
```

Program outputs:

A screenshot of a macOS terminal window titled 'h3art — 80x24'. The window has a dark background and a light gray title bar with three colored window control buttons (red, yellow, green) on the left. The terminal text is as follows:

```
Launching: '/Users/h3art/Projects/homework/LAB13'  
Working directory: '/Users/h3art/Projects/homework'  
1 arguments:  
argv[0] = '/Users/h3art/Projects/homework/LAB13'  
Please enter a string:  
tu@kmiNi123  
The result of upercase and lowercase conversion is:  
TU@KMIInI123  
Process exited with status 0  
logout  
Saving session...  
...copying shared history...  
...saving history...truncating history files...  
...completed.  
  
[进程已完成]
```

A second screenshot of a macOS terminal window, identical to the first one, showing the same program output. The text is:

```
Launching: '/Users/h3art/Projects/homework/LAB13'  
Working directory: '/Users/h3art/Projects/homework'  
1 arguments:  
argv[0] = '/Users/h3art/Projects/homework/LAB13'  
Please enter a string:  
TU@KMIInI123  
The result of upercase and lowercase conversion is:  
tu@kmiNi123  
Process exited with status 0  
logout  
Saving session...  
...copying shared history...  
...saving history...truncating history files...  
...completed.  
  
[进程已完成]
```

Discussion:

1. Most difficult parts
2. Bugs and/or Errors