

System Programming Assignment #1

SIC Assembler

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Assignment Description

Write an SIC assembler that reads an SIC assembly program, translates SIC statements into their machine code equivalents, and generates an object file.

Highlight of the way you write the program

- assembler() -> To assemble the SIC code
 - pass1() -> To do first scanning to assembly
 - To give all instruction local address
 - To create symbol table
 - pass2() -> To do second scanning to assembly
 - To complete the object code
- toTarget() -> To make object code store into the target file
 - According to the SIC object code format
 - Comment at line 307, 368-375, 399 in assembler.c is optional to make user easy to read, but not the correct format for SIC object code

The program listing

- main.c
 - main file
 - do simple I/O & usage
- optab.h
 - define the opcode table
- assembler.h
 - the library of SIC assembler
 - void ini();
 - to initial the memory, prepare to do assembly
 - void addCode(char*);
 - to store a statement of SIC code, split them to four fields
 - void assembler();
 - the core of assembly
 - void toTarget(FILE*);
 - the core of make object code store to a output file
- assembler.c
 - define
 - symbol table structure
 - symbol, address
 - filed of instruction
 - lable, operation, operands, comment, locate address, object code
 - the source code of assembler.h
 - void showIns();
 - to show all instruction on the screen
 - void showSym();
 - to show symbol table on the screen
 - void addCode(char*);
 - void pass1();
 - Scanning first time
 - to give all instruction locall address
 - to create symbol table
 - void pass2();
 - Scanning second time
 - to complete the object code for each instruction
 - void ini();
 - void assembler();
 - void toTarget(FILE*);

Test run results

- Environment & Tools
 - OS: Ubuntu 14.04 LTS, i686, 3.13.0-40-generic, GNU/Linux
 - Compiler: gcc (Ubuntu 4.8.2-19ubuntu1) 4.8.2
 - Language: C89
 - Developpe Tool: vim
- Execute
 - cd HW1
 - make
 - ./410121021_58 <your SIC code> [the output file name you want]

change director into it, and make it

Execute.

The output file content

Cancel the ^ sign

Discuss

其實SIC的組譯器演算規則並不複雜，且老師又說保證輸入的SIC Code會是合法的，因此這次的作業僅僅只是可以進行轉換的不完整組譯器。

但無奈由於對C的字串處理不甚熟悉，尤其在字串分割時不停的出現segmentation fault，實在是讓人很心煩，後來才知道錯誤的主因有兩個，一個是記憶體方面的 strtok 誤用，另一個則是 strcmp 字串比較時的回傳值誤解。

strtok，字串分割函式，它的執行方式是依照指定的起始位址向後尋找，找到指定的分割字元（在這次作業我們用到的字元分別有空白、單引號）後，用空字元（'\0'）將它取代，並回傳起始位置，而完成字串分割的目的。

strcmp，字串比較函式，它在兩字串比較後，若完全相同，會回傳0，而0在C當中代表的是false，因此過程中許多的判斷式全部相反了，造成整個程式出現各種意外。

經過了這次的練習，我們最大的收穫就是對於字串、字元的處理，而且我們的Coding Style並不算是非常好，有些變數的命名，隔天就忘了它的用處，註解也使用的不夠多，造成前一天寫的思考邏輯接不上來。