

廈門大學



《汇编语言》实验报告

(一)

姓 名 宋浩元

学 号 37220232203808

学 院 信息学院

专 业 软件工程

2024 年 9 月

1 实验目的

- (1) 了解汇编语言程序(源程序)的基本组成部分;
- (2) 掌握汇编语言程序编写、编译、链接、运行的基本环境和步骤;
- (3) 自学并掌握运用 DEBUG 命令进行程序调试的基本命令。

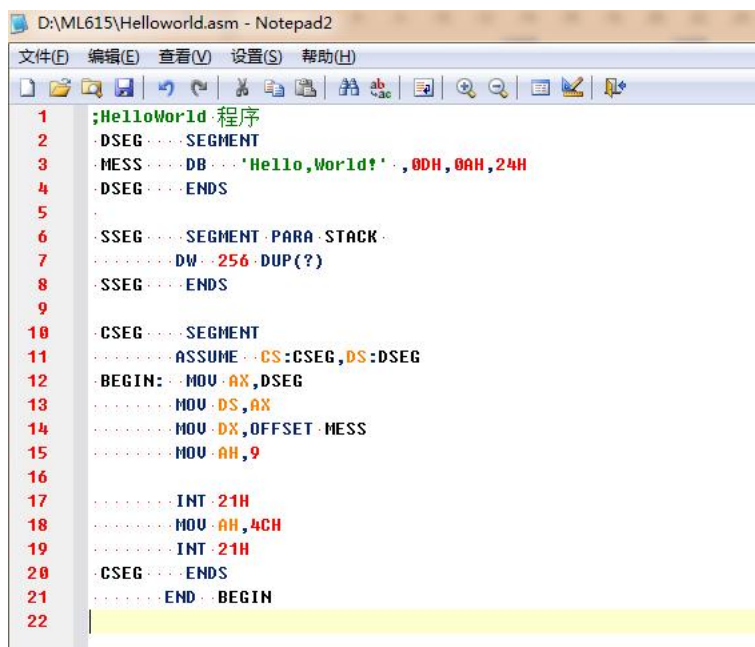
2 实验环境

Windows11 环境下的 masm 与 DOSBOX;

3 实验内容

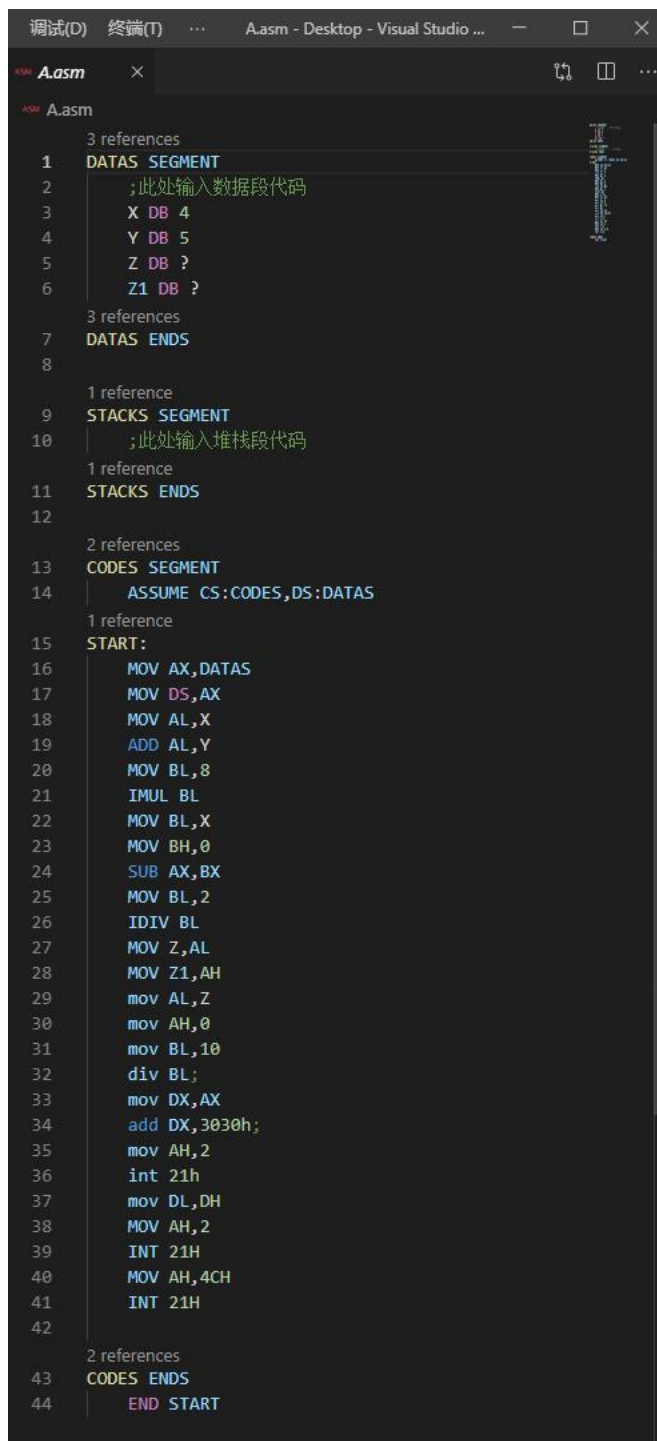
针对例程 a)和 b) 分别采用模拟 DOS 环境以及集成环境完成程序的编辑、汇编、连接以及调试过程。

(例程 a



```
1 ;HelloWorld 程序
2 .DSEG . . . . . SEGMENT
3 .MESS . . . . . DB . . . . . 'Hello,World!', 0DH, 0AH, 24H
4 .DSEG . . . . . ENDS
5
6 .SSEG . . . . . SEGMENT PARA STACK
7 . . . . . DW . . . . . 256 DUP(?)
8 .SSEG . . . . . ENDS
9
10 .CSEG . . . . . SEGMENT
11 . . . . . ASSUME . . . . . CS:CSEG, DS:DSEG
12 .BEGIN: . . . . . MOV . . . . . AX, DSEG
13 . . . . . MOV . . . . . DS, AX
14 . . . . . MOV . . . . . DX, OFFSET MESS
15 . . . . . MOV . . . . . AH, 9
16
17 . . . . . INT . . . . . 21H
18 . . . . . MOV . . . . . AH, 4CH
19 . . . . . INT . . . . . 21H
20 .CSEG . . . . . ENDS
21 . . . . . END . . . . . BEGIN
22
```

例程 b)



```
1  DATAS SEGMENT
2      ;此处输入数据段代码
3      X DB 4
4      Y DB 5
5      Z DB ?
6      Z1 DB ?
7  DATAS ENDS
8
9  STACKS SEGMENT
10     ;此处输入堆栈段代码
11 STACKS ENDS
12
13 CODES SEGMENT
14     ASSUME CS:CODES,DS:DATAS
15 START:
16     MOV AX,DATAS
17     MOV DS,AX
18     MOV AL,X
19     ADD AL,Y
20     MOV BL,8
21     IMUL BL
22     MOV BL,X
23     MOV BH,0
24     SUB AX,BX
25     MOV BL,2
26     IDIV BL
27     MOV Z,AL
28     MOV Z1,AH
29     mov AL,Z
30     mov AH,0
31     mov BL,10
32     div BL;
33     mov DX,AX
34     add DX,3030h;
35     mov AH,2
36     int 21h
37     mov DL,DH
38     MOV AH,2
39     INT 21H
40     MOV AH,4CH
41     INT 21H
42
43 CODES ENDS
44     END START
```

4 实验具体实现

(1) 配置环境，在 ftp 上下载好相关软件并且安装完毕

(2) 创建好 a.asm 文件并完成编辑

名称	修改日期	类型	大小
DOSBox-0.74-3	2024/9/11 15:12	文件夹	
A.ASM	2024/9/11 15:05	Assembler Source	1 KB
A.EXE	2024/9/11 15:12	应用程序	2 KB
A.OBJ	2024/9/11 15:11	Object File	1 KB
CREF.EXE	1987/7/31 0:00	应用程序	16 KB
debug.exe	2009/7/14 5:40	应用程序	21 KB
DEBUG32.EXE	2013/11/14 0:31	应用程序	89 KB
DEBUG各命令详细说明.pdf	2019/9/25 0:00	Foxit PDF Reader D...	310 KB
debug命令实用使用说明文件.ppt	2019/9/25 0:00	PPT 演示文稿	335 KB
edit.com	2017/4/4 13:16	MS-DOS 应用程序	69 KB
ERROUT.EXE	1996/5/12 16:28	应用程序	10 KB
EXEMOD.EXE	1996/5/12 16:28	应用程序	12 KB
EXEPACK.EXE	1996/5/12 16:28	应用程序	15 KB
LIB.EXE	1987/7/31 0:00	应用程序	32 KB
LINK.EXE	1987/7/31 0:00	应用程序	64 KB
MASM.EXE	1987/7/31 0:00	应用程序	101 KB
README.DOC	1996/5/12 16:28	DOC 文档	9 KB
SETENV.EXE	1996/5/12 16:28	应用程序	11 KB

(3) 打开 dosbox 开始编译链接并且运行程序,结果如图所示

按顺序输入以下指令:

1. mount c d:\asm_file
2. C:
3. Masm a.asm
4. Link a.obj

5. a.exe

```
C:\>link a.asm

Microsoft (R) Overlay Linker Version 3.60
Copyright (C) Microsoft Corp 1983-1987. All rights reserved.

Run File [A.EXE]:
List File [NUL.MAP]:
Libraries [.LIB]:
A.ASM : fatal error L1101: invalid object module
pos: 1 Record type: 44

C:\>link a.obj

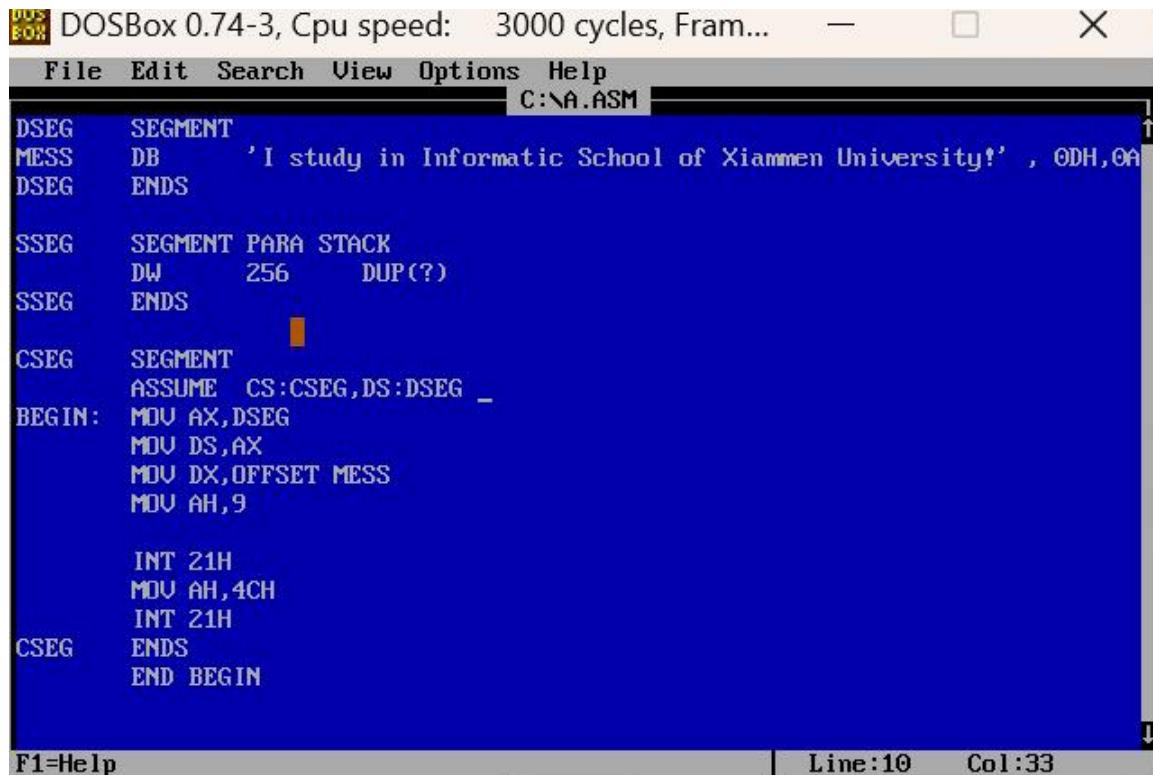
Microsoft (R) Overlay Linker Version 3.60
Copyright (C) Microsoft Corp 1983-1987. All rights reserved.

Run File [A.EXE]:
List File [NUL.MAP]:
Libraries [.LIB]:

C:\>a.exe
HELLO, WORLD

C:\>
```

(4) 进入 edit 界面，将 helloworld 改为 I study in Informatic School of Xiamen University!



```
DOSBox 0.74-3, Cpu speed: 3000 cycles, Fram...
File Edit Search View Options Help
C:\A.ASM
DSEG SEGMENT
MESS DB 'I study in Informatic School of Xiammen University!' , 0DH,0AH
DSEG ENDS

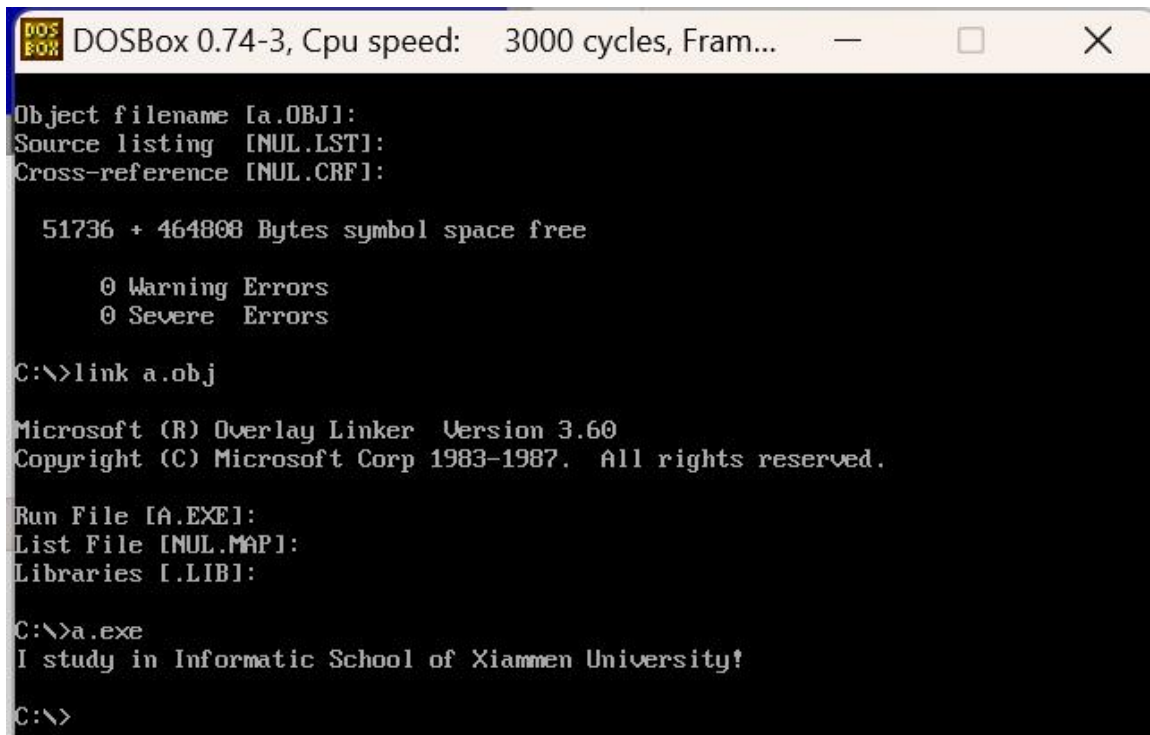
SSEG SEGMENT PARA STACK
DW 256 DUP(?)
SSEG ENDS

CSEG SEGMENT
ASSUME CS:CSEG,DS:DSEG _
BEGIN: MOV AX,DSEG
MOV DS,AX
MOV DX,OFFSET MESS
MOV AH,9

INT 21H
MOV AH,4CH
INT 21H
CSEG ENDS
END BEGIN

F1=Help Line:10 Col:33
```

(5) 重新做 (3) 操作



```
DOSBox 0.74-3, Cpu speed: 3000 cycles, Fram...
Object filename [a.OBJ]:
Source listing [NUL.LST]:
Cross-reference [NUL.CRF]:

51736 + 464808 Bytes symbol space free

0 Warning Errors
0 Severe Errors

C:\>link a.obj

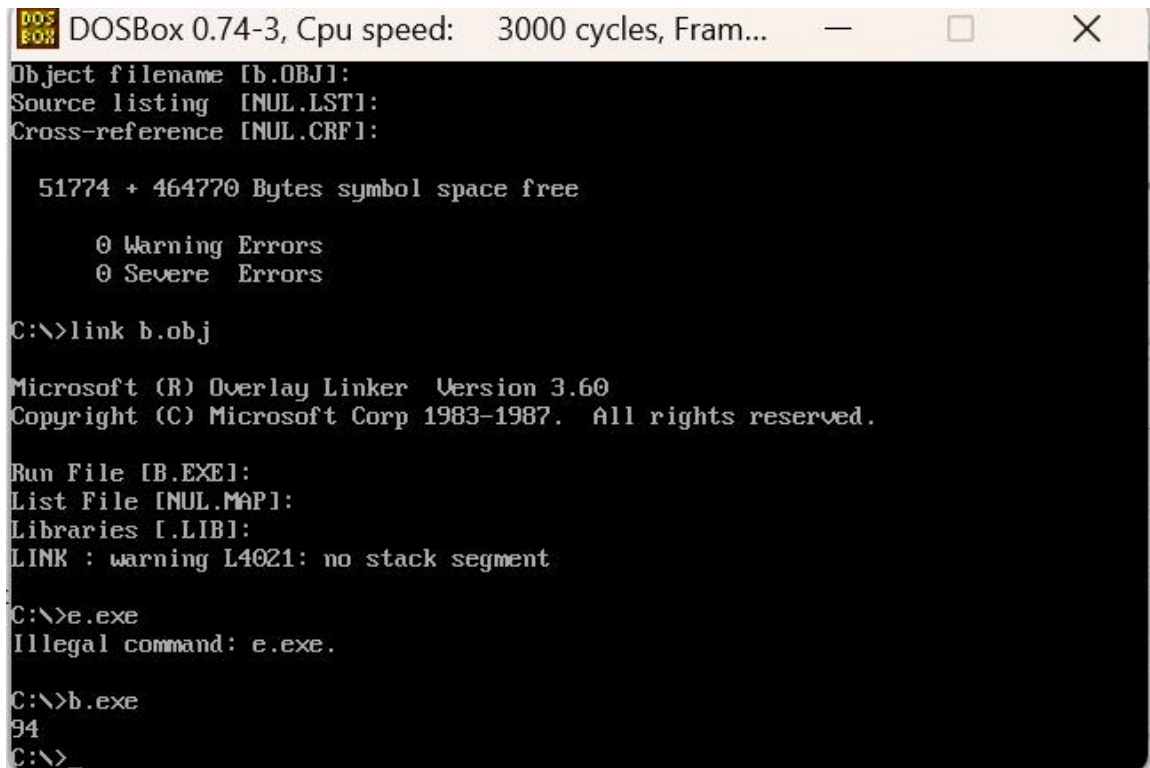
Microsoft (R) Overlay Linker Version 3.60
Copyright (C) Microsoft Corp 1983-1987. All rights reserved.

Run File [A.EXE]:
List File [NUL.MAP]:
Libraries [.LIB]:

C:\>a.exe
I study in Informatic School of Xiammen University!

C:\>
```

(6) 编辑好 b.asm 文件并编译链接运行



```
DOSBox 0.74-3, Cpu speed: 3000 cycles, Fram...
Object filename [b.OBJ]:
Source listing [NUL.LST]:
Cross-reference [NUL.CRF]:

51774 + 464770 Bytes symbol space free

0 Warning Errors
0 Severe Errors

C:\>link b.obj

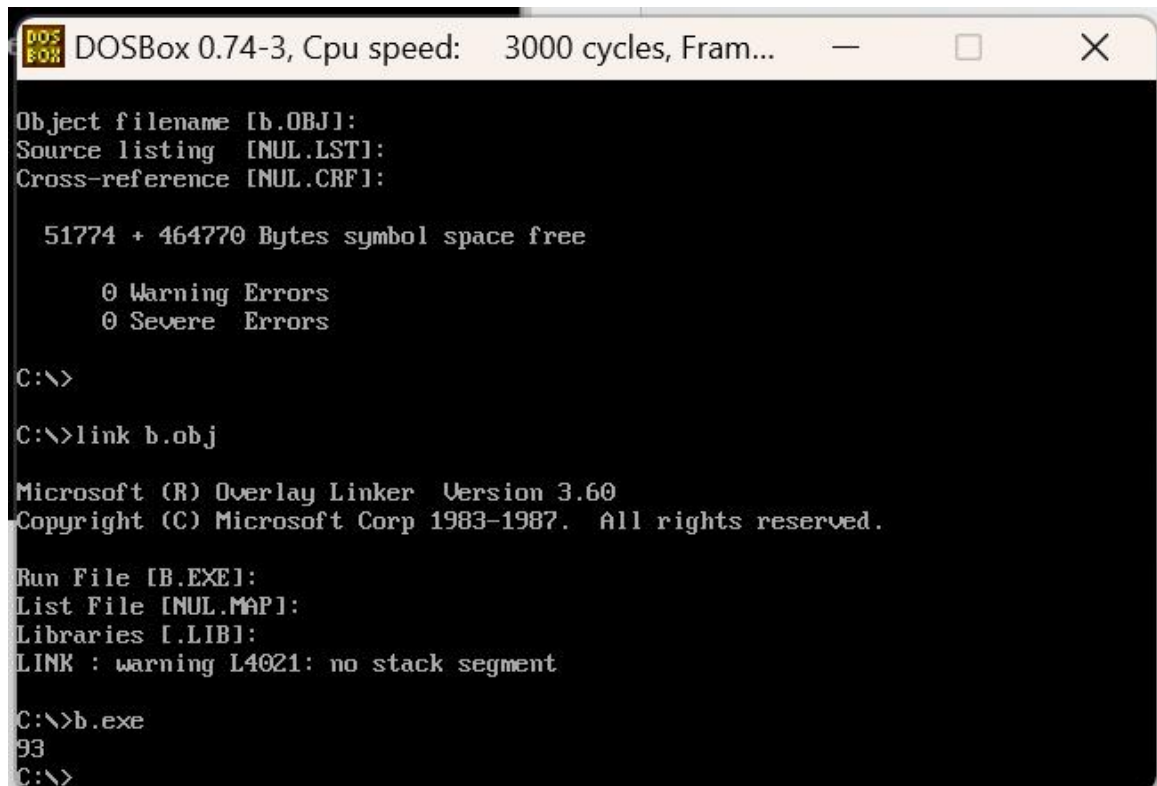
Microsoft (R) Overlay Linker Version 3.60
Copyright (C) Microsoft Corp 1983-1987. All rights reserved.

Run File [B.EXE]:
List File [NUL.MAP]:
Libraries [.LIB]:
LINK : warning L4021: no stack segment

C:\>e.exe
Illegal command: e.exe.

C:\>b.exe
94
C:\>
```

(7) 改变 x 的值为 5, y 的值为 4 后结果为 93



```
DOSBox 0.74-3, Cpu speed: 3000 cycles, Fram...
Object filename [b.OBJ]:
Source listing [NUL.LST]:
Cross-reference [NUL.CRF]:

51774 + 464770 Bytes symbol space free

0 Warning Errors
0 Severe Errors

C:\>

C:\>link b.obj

Microsoft (R) Overlay Linker Version 3.60
Copyright (C) Microsoft Corp 1983-1987. All rights reserved.

Run File [B.EXE]:
List File [NUL.MAP]:
Libraries [LIB]:
LINK : warning L4021: no stack segment

C:\>b.exe
93
C:\>
```

(8) Debug helloworld 程序 (将 study 的 t 改为 k)


```

DOSBox 0.74-3, Cpu speed: 3000 cycles, Fram...
-t
AX=076A BX=0000 CX=0250 DX=0000 SP=0200 BP=0000 SI=0000 DI=0000
DS=076A ES=075A SS=076E CS=078E IP=0005 NU UP EI PL NZ NA PO NC
078E:0005 BA0000 MOV DX,0000
-d 0000
076A:0000 49 20 73 74 75 64 79 20-69 6E 20 49 6E 66 6F 72 I study in Infor
076A:0010 6D 61 74 69 63 20 53 63-68 6F 6F 6C 20 6F 66 20 matic School of
076A:0020 58 69 61 6D 6D 65 6E 20-55 6E 69 76 65 72 73 69 Xiammen Universi
076A:0030 74 79 21 0D 0A 24 00 00-00 00 00 00 00 00 00 00 ty!..$.
076A:0040 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0050 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0060 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0070 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
-e 076A:0003 6B
-D 0000
076A:0000 49 20 73 6B 75 64 79 20-69 6E 20 49 6E 66 6F 72 I skudy in Infor
076A:0010 6D 61 74 69 63 20 53 63-68 6F 6F 6C 20 6F 66 20 matic School of
076A:0020 58 69 61 6D 6D 65 6E 20-55 6E 69 76 65 72 73 69 Xiammen Universi
076A:0030 74 79 21 0D 0A 24 00 00-00 00 00 00 00 00 00 00 ty!..$.
076A:0040 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0050 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0060 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0070 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....

```

(9) 对 a.asm debug 改变字符串的值

```

DS=076A ES=075A SS=076E CS=078E IP=0005 NU UP EI PL NZ NA PO NC
078E:0005 BA0000 MOV DX,0000
-d 0000
076A:0000 49 20 73 74 75 64 79 20-69 6E 20 49 6E 66 6F 72 I study in Infor
076A:0010 6D 61 74 69 63 20 53 63-68 6F 6F 6C 20 6F 66 20 matic School of
076A:0020 58 69 61 6D 6D 65 6E 20-55 6E 69 76 65 72 73 69 Xiammen Universi
076A:0030 74 79 21 0D 0A 24 00 00-00 00 00 00 00 00 00 00 ty!..$.
076A:0040 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0050 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0060 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0070 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
-e ds:0000 'xiamen!$'
-d ds:0000
076A:0000 78 69 61 6D 65 6E 21 24-69 6E 20 49 6E 66 6F 72 xiamen!$in Infor
076A:0010 6D 61 74 69 63 20 53 63-68 6F 6F 6C 20 6F 66 20 matic School of
076A:0020 58 69 61 6D 6D 65 6E 20-55 6E 69 76 65 72 73 69 Xiammen Universi
076A:0030 74 79 21 0D 0A 24 00 00-00 00 00 00 00 00 00 00 ty!..$.
076A:0040 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0050 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0060 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....
076A:0070 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....

```



```

-t
AX=096A BX=0000 CX=0250 DX=0000 SP=01FA BP=0000 SI=0000 DI=0000
DS=076A ES=075A SS=076E CS=F000 IP=14A0  NU UP DI PL NZ NA PO NC
F000:14A0 FB          STI
-t
AX=096A BX=0000 CX=0250 DX=0000 SP=01FA BP=0000 SI=0000 DI=0000
DS=076A ES=075A SS=076E CS=F000 IP=14A1  NU UP EI PL NZ NA PO NC
F000:14A1 FE38      ???    [BX+SI]          DS:0000=78
-t
xiamen!

```

(10) 对 b.asm debug 观察每次 t 的结果和 xyz 的地址的变化

x 与 y 的地址被分配到 0000 和 0001, 值分别是 5, 4

```

DOS
BOX DOSBox 0.74-3, Cpu speed: 3000 cycles, Fram...
-t
AX=076A BX=0000 CX=0050 DX=0000 SP=0000 BP=0000 SI=0000 DI=0000
DS=075A ES=075A SS=0769 CS=076B IP=0003  NU UP EI PL NZ NA PO NC
076B:0003 8ED8      MOV     DS,AX
-t
AX=076A BX=0000 CX=0050 DX=0000 SP=0000 BP=0000 SI=0000 DI=0000
DS=076A ES=075A SS=0769 CS=076B IP=0005  NU UP EI PL NZ NA PO NC
076B:0005 A00000    MOV     AL,[0000]          DS:0000=05
-t
AX=0705 BX=0000 CX=0050 DX=0000 SP=0000 BP=0000 SI=0000 DI=0000
DS=076A ES=075A SS=0769 CS=076B IP=0008  NU UP EI PL NZ NA PO NC
076B:0008 02060100  ADD     AL,[0001]          DS:0001=04
-d 0000
076A:0000 05 04 00 00 00 00 00 00-00 00 00 00 00 00 00 00 .....

```

接着进行除法之后, z 被分配到了 0002, z1 被分配到了 0003, 值分别为 33, 1

```

-t
AX=0121 BX=0002 CX=0050 DX=0000 SP=0000 BP=0000 SI=0000 DI=0000
DS=076A ES=075A SS=0769 CS=076B IP=0023  NU UP EI PL NZ NA PO NC
076B:0023 A00200    MOV     AL,[0002]          DS:0002=21
-d 0000\
^ Error
-d 0000
076A:0000 05 04 21 01 00 00 00 00-00 00 00 00 00 00 00 00 ...!.....

```

最后程序运行完毕

5 实验分析与总结

- (1) 学会了用 docbox 编译链接运行汇编程序
- (2) 学习了基础的 debug 操作
- (3) 学会了汇编程序的一些基本概念，如段，寄存器等
- (4) 学会了如何用编译命令