OPERATING SYSTEMS

Assignment-1

System Calls Through Assembly Language

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Number of experiments run :

N = 50

Average 'user time' for hello (int-based calls):

I = 0.169400

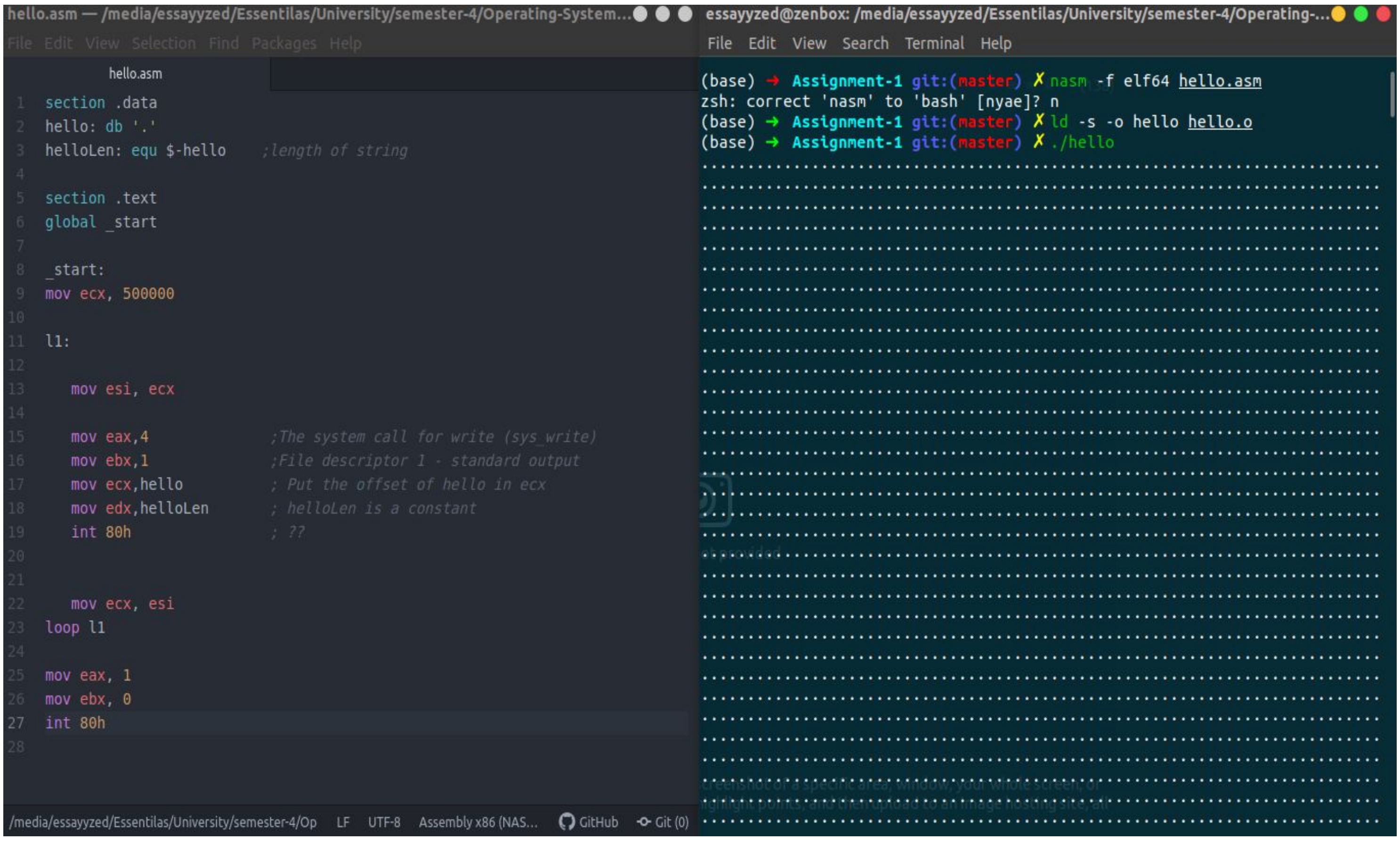
Average 'user time' for hello2 (syscall-based calls):

S = 0.221600

*Percentage speedup: (I-S)*100/I = ((0.169400 – 0.221600)) * 100 / 0.169400*

= -129.81%

Int Based Call:


hello.asm — /media/essayyzed/Essentilas/University/semester-4/Operating-System...
File Edit View Selection Find Packages Help
hello.asm
/media/essayyzed/Essentilas/University/semester-4/Op LF UTF-8 Assembly x86 (NAS... GitHub Git (0)
essayyzed@zenbox: /media/essayyzed/Essentilas/University/semester-4/Operating-...
File Edit View Search Terminal Help

```
section .data
hello: db '.'
helloLen: equ $-hello    ;length of string

section .text
global _start

_start:
mov ecx, 500000

l1:

   mov esi, ecx

   mov eax,4             ;The system call for write (sys_write)
   mov ebx,1             ;File descriptor 1 - standard output
   mov ecx,hello         ; Put the offset of hello in ecx
   mov edx,helloLen      ; helloLen is a constant
   int 80h               ; ??


   mov ecx, esi
loop l1

mov eax, 1
mov ebx, 0
int 80h
```

```
(base) ➜ Assignment-1 git:(master) ✗ nasm -f elf64 hello.asm
zsh: correct 'nasm' to 'bash' [nyae]? n
(base) ➜ Assignment-1 git:(master) ✗ ld -s -o hello hello.o
(base) ➜ Assignment-1 git:(master) ✗ ./hello
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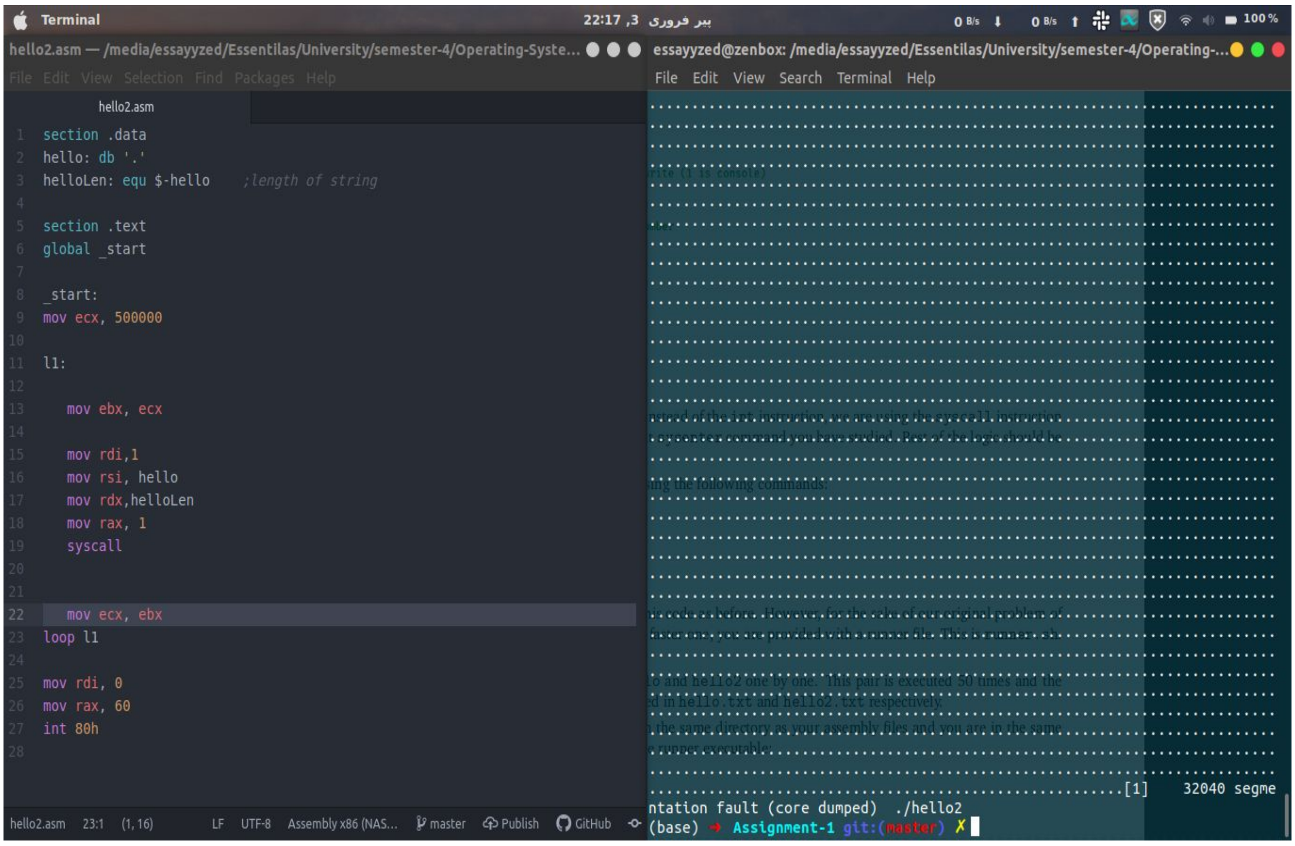
System Call Based


Terminal
22:17 ,3 فروری پیر
0 B/s 0 B/s 100 %
hello2.asm — /media/essayyzed/Essentilas/University/semester-4/Operating-Syste...
File Edit View Selection Find Packages Help
hello2.asm
hello2.asm 23:1 (1, 16) LF UTF-8 Assembly x86 (NAS... master Publish GitHub
essayyzed@zenbox: /media/essayyzed/Essentilas/University/semester-4/Operating-...
File Edit View Search Terminal Help

```
section .data
hello: db '.'
helloLen: equ $-hello    ;length of string

section .text
global _start

_start:
mov ecx, 500000

l1:

   mov ebx, ecx

   mov rdi,1
   mov rsi, hello
   mov rdx,helloLen
   mov rax, 1
   syscall


   mov ecx, ebx
loop l1

mov rdi, 0
mov rax, 60
int 80h
```

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.......................................................[1]    32040 segme
ntation fault (core dumped)  ./hello2
(base) ➜ Assignment-1 git:(master) ✗
```
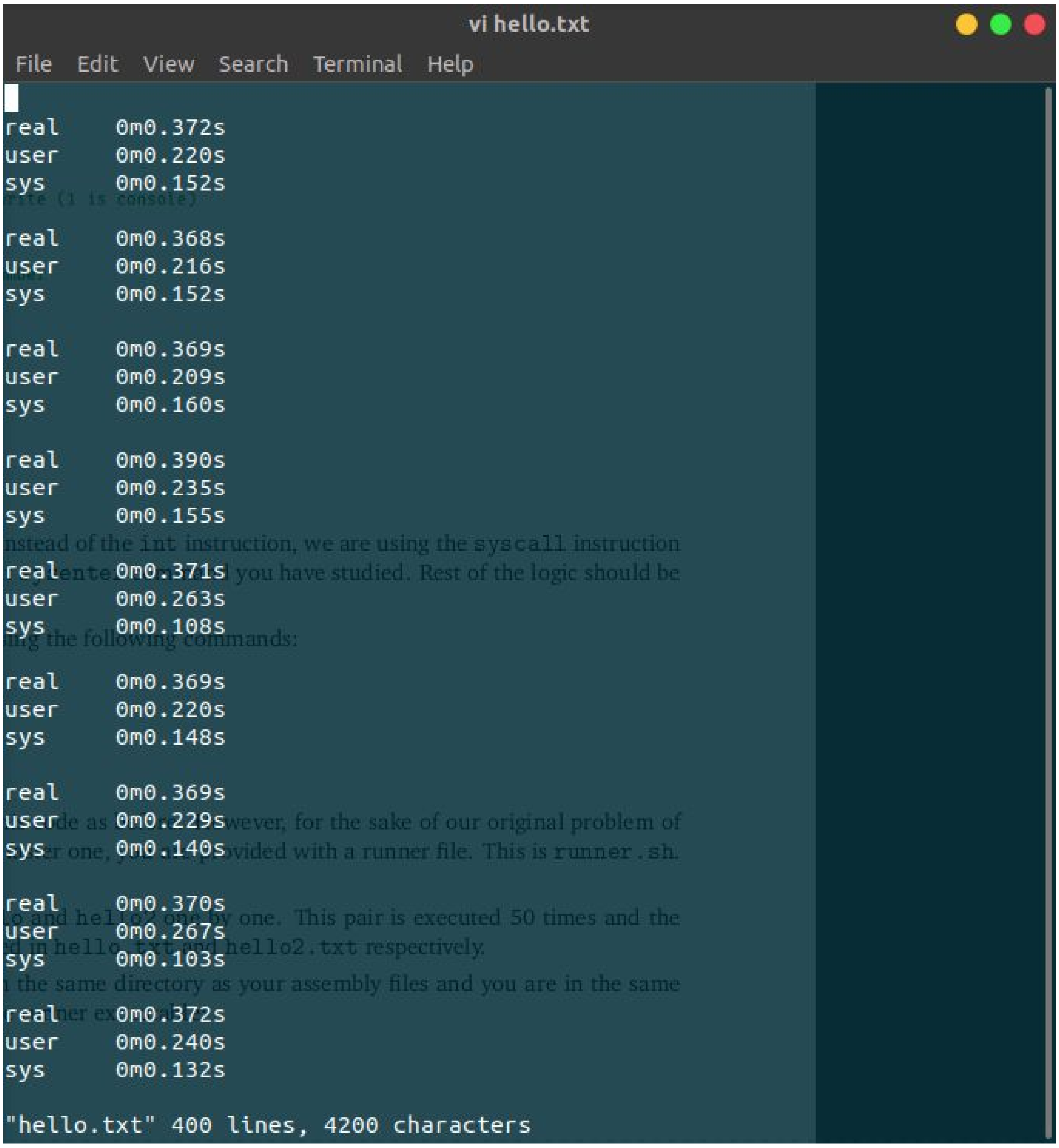

Execution Time of INT Based Call

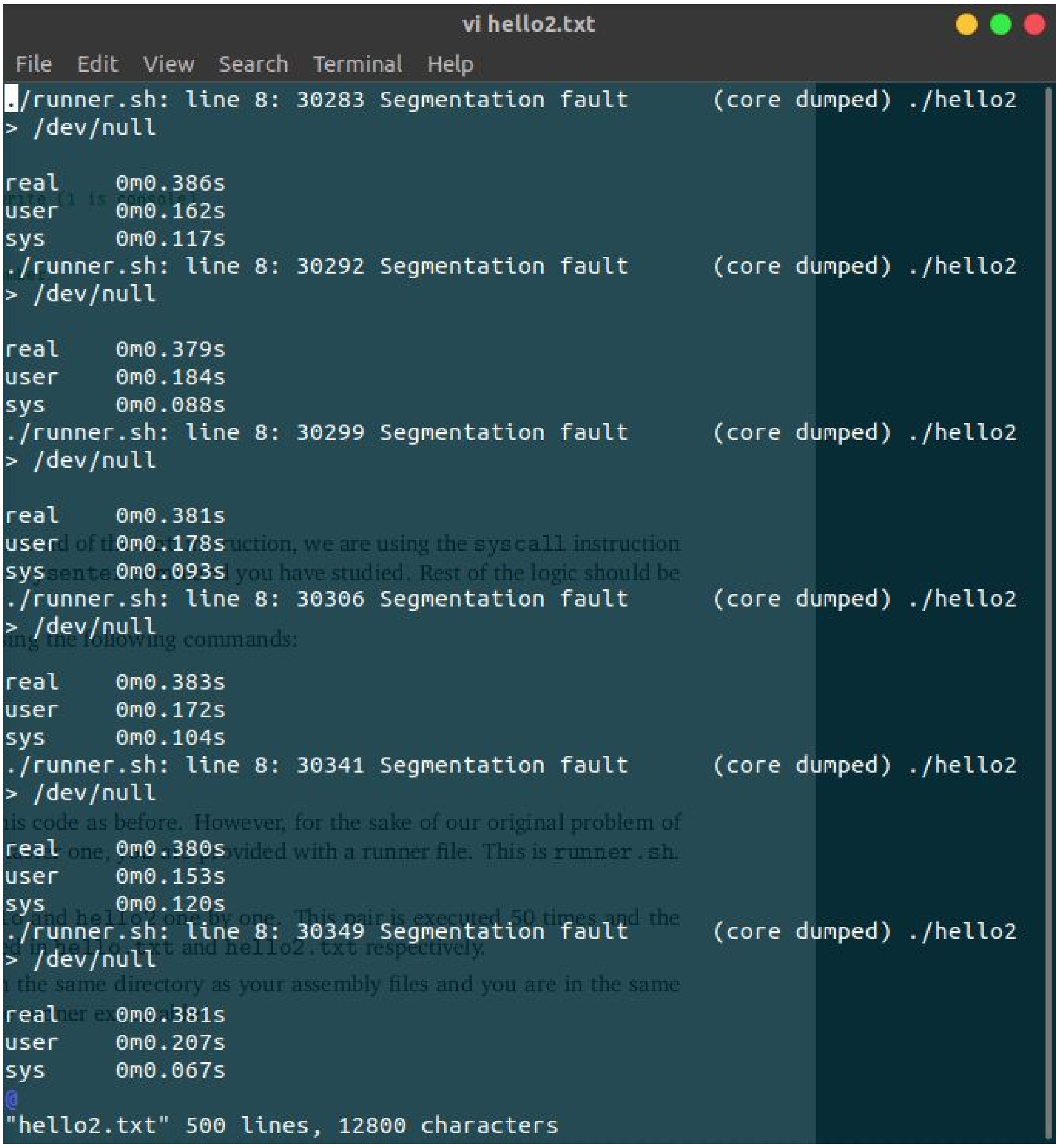


vi hello.txt

File Edit View Search Terminal Help

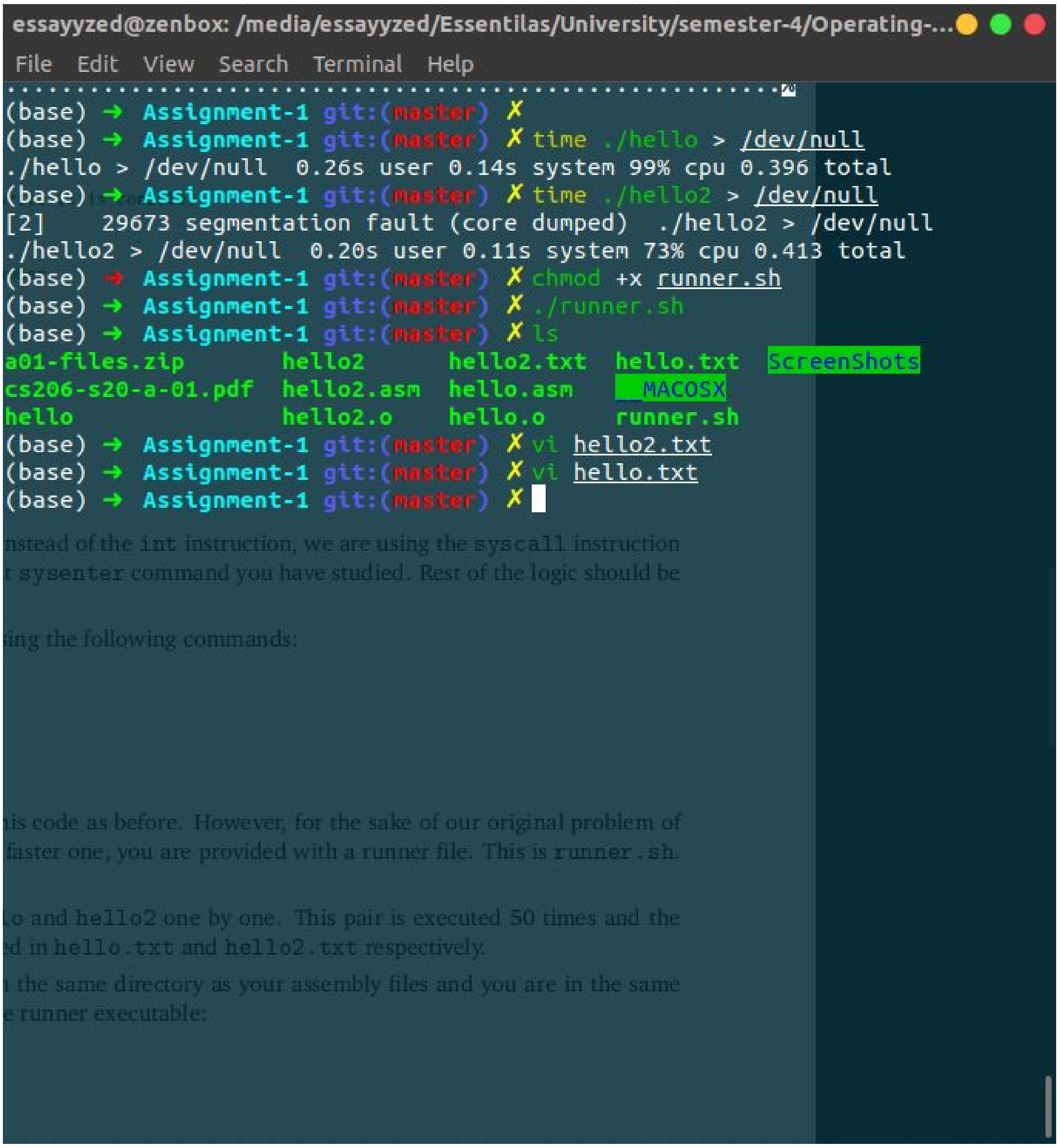
```
real    0m0.372s
user    0m0.220s
sys     0m0.152s

real    0m0.368s
user    0m0.216s
sys     0m0.152s

real    0m0.369s
user    0m0.209s
sys     0m0.160s

real    0m0.390s
user    0m0.235s
sys     0m0.155s

real    0m0.371s
user    0m0.263s
sys     0m0.108s

real    0m0.369s
user    0m0.220s
sys     0m0.148s

real    0m0.369s
user    0m0.229s
sys     0m0.140s

real    0m0.370s
user    0m0.267s
sys     0m0.103s

real    0m0.372s
user    0m0.240s
sys     0m0.132s

"hello.txt" 400 lines, 4200 characters
```

Execution Time of Sys Based Call



```
./runner.sh: line 8: 30283 Segmentation fault      (core dumped) ./hello2
> /dev/null

real    0m0.386s
user    0m0.162s
sys     0m0.117s
./runner.sh: line 8: 30292 Segmentation fault      (core dumped) ./hello2
> /dev/null

real    0m0.379s
user    0m0.184s
sys     0m0.088s
./runner.sh: line 8: 30299 Segmentation fault      (core dumped) ./hello2
> /dev/null

real    0m0.381s
user    0m0.178s
sys     0m0.093s
./runner.sh: line 8: 30306 Segmentation fault      (core dumped) ./hello2
> /dev/null

real    0m0.383s
user    0m0.172s
sys     0m0.104s
./runner.sh: line 8: 30341 Segmentation fault      (core dumped) ./hello2
> /dev/null

real    0m0.380s
user    0m0.153s
sys     0m0.120s
./runner.sh: line 8: 30349 Segmentation fault      (core dumped) ./hello2
> /dev/null

real    0m0.381s
user    0m0.207s
sys     0m0.067s
@
"hello2.txt" 500 lines, 12800 characters
```

Memory & Time Usage Info.



```
essayyzed@zenbox: /media/essayyzed/Essentilas/University/semester-4/Operating-...
File  Edit  View  Search  Terminal  Help
...............................................................%
(base) ➜  Assignment-1 git:(master) ✗
(base) ➜  Assignment-1 git:(master) ✗ time ./hello > /dev/null
./hello > /dev/null  0.26s user 0.14s system 99% cpu 0.396 total
(base) ➜  Assignment-1 git:(master) ✗ time ./hello2 > /dev/null
[2]    29673 segmentation fault (core dumped)  ./hello2 > /dev/null
./hello2 > /dev/null  0.20s user 0.11s system 73% cpu 0.413 total
(base) ➜  Assignment-1 git:(master) ✗ chmod +x runner.sh
(base) ➜  Assignment-1 git:(master) ✗ ./runner.sh
(base) ➜  Assignment-1 git:(master) ✗ ls
a01-files.zip        hello2      hello2.txt  hello.txt  ScreenShots
cs206-s20-a-01.pdf   hello2.asm  hello.asm   __MACOSX
hello                hello2.o    hello.o     runner.sh
(base) ➜  Assignment-1 git:(master) ✗ vi hello2.txt
(base) ➜  Assignment-1 git:(master) ✗ vi hello.txt
(base) ➜  Assignment-1 git:(master) ✗ 
```

nstead of the int instruction, we are using the syscall instruction
t sysenter command you have studied. Rest of the logic should be

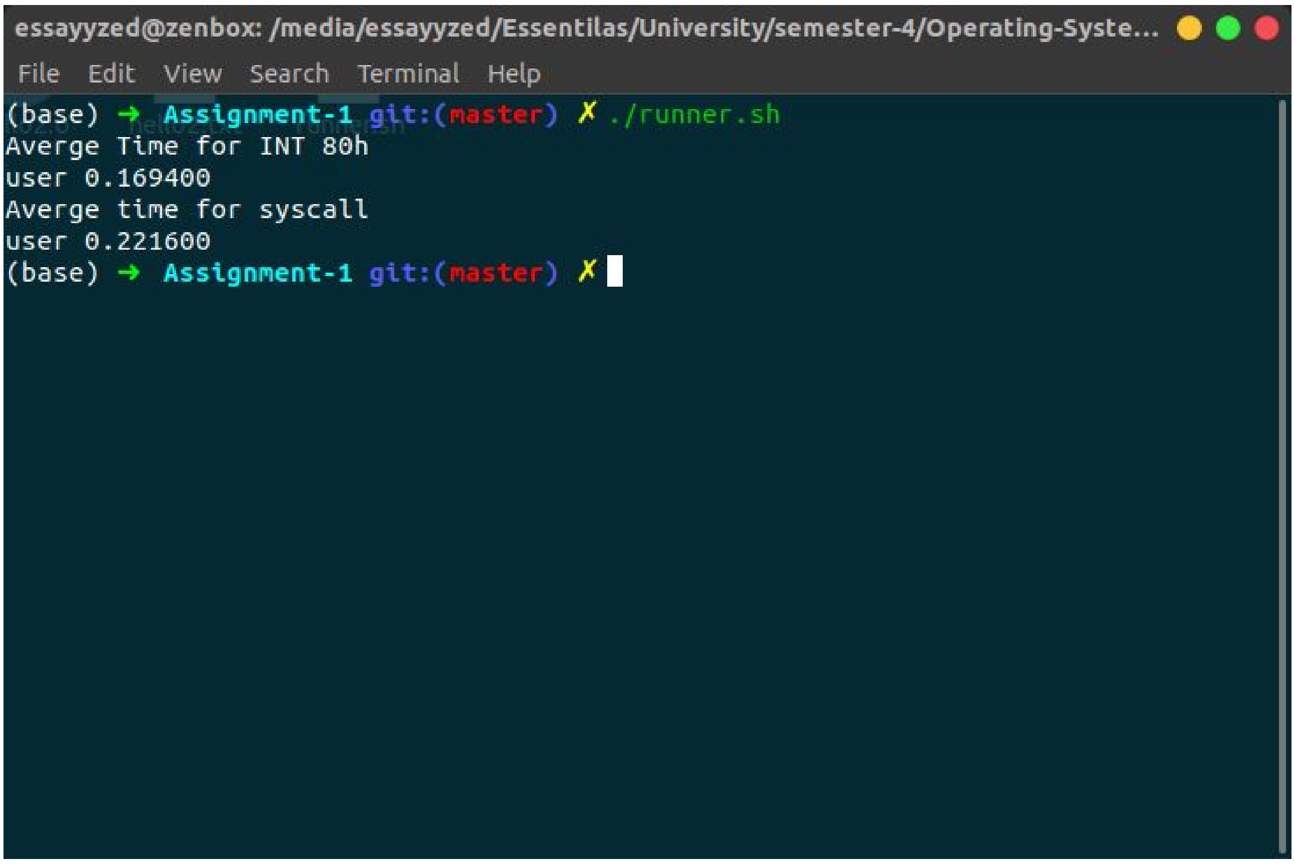
sing the following commands:

nis code as before. However, for the sake of our original problem of
faster one, you are provided with a runner file. This is runner.sh.

lo and hello2 one by one. This pair is executed 50 times and the
d in hello.txt and hello2.txt respectively.

n the same directory as your assembly files and you are in the same
e runner executable:

Average Time (Both Sys & INT based Calls)


essayyzed@zenbox: /media/essayyzed/Essentilas/University/semester-4/Operating-Syste...
File Edit View Search Terminal Help

```
(base) ➜  Assignment-1 git:(master) ✗ ./runner.sh
Averge Time for INT 80h
user 0.169400
Averge time for syscall
user 0.221600
(base) ➜  Assignment-1 git:(master) ✗
```

Note:

why did we issue 500k syscalls?

We issued 500k syscalls in order to find the time in microsecond in any other case we won't be able to compute it because it won't take to much time.

Why not less or more?

In case of less we won't be able to find the time because it is so much less that it is approximately zero(0).

In case of More it will be unstoppable at certain level and will take too much time.

Why did we run the experiment 50 times?

In order to find Average time taken by both the calls.. in other case we won’t be able to compute the average time taken.