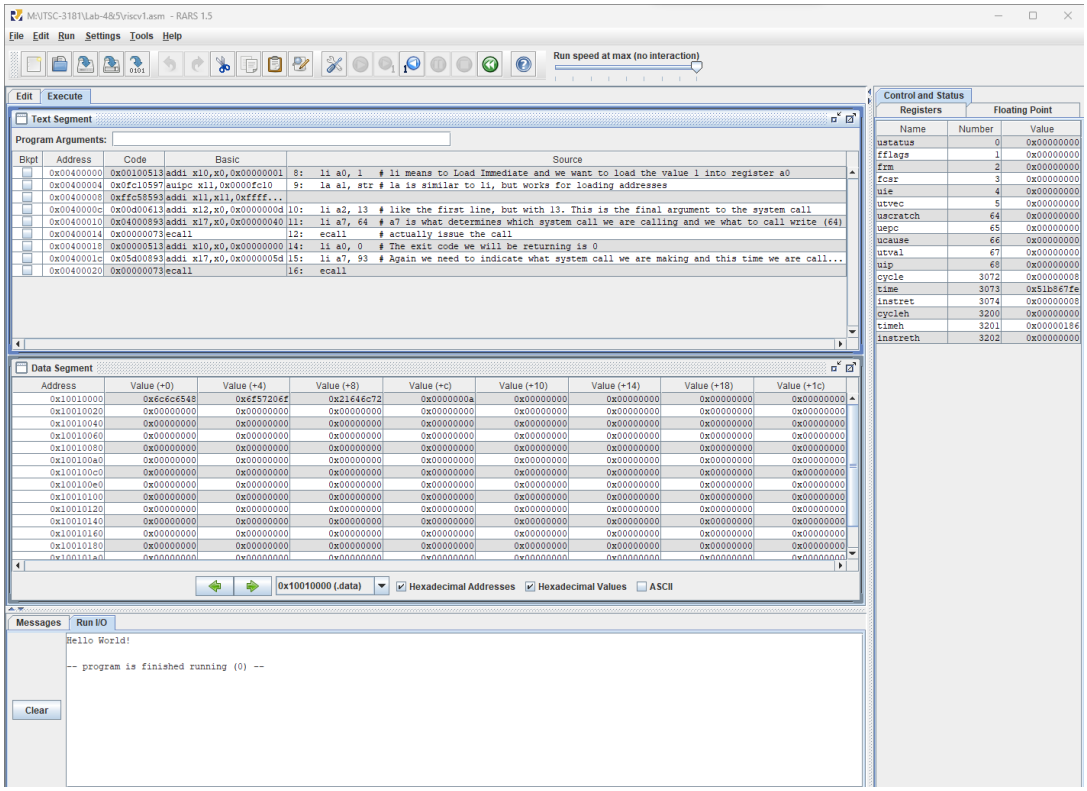
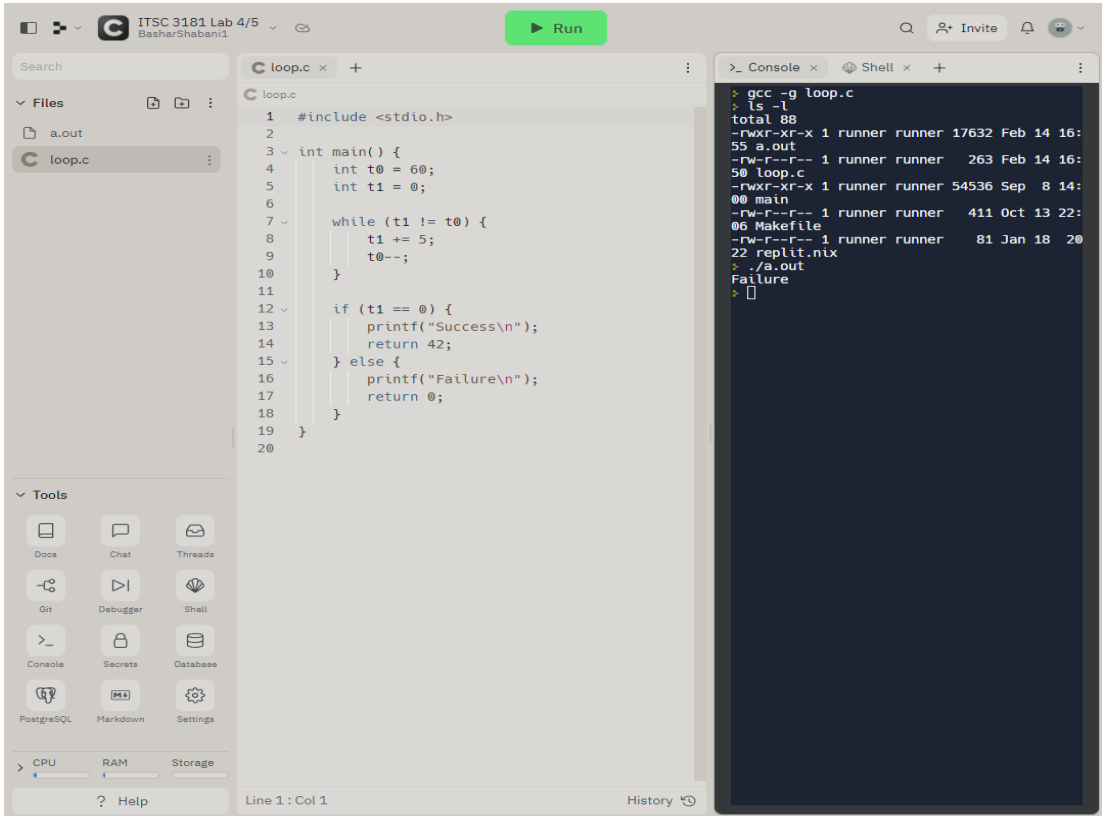
Part 2:


M:\ITSC-3181\Lab-4&5\riscv1.asm - RARS 1.5
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
Text Segment
Program Arguments:
Bkpt Address Code Basic Source
0x00400000 0x00100513 addi x10,x0,0x00000001 8: li a0, 1 # li means to Load Immediate and we want to load the value 1 into register a0
0x00400004 0x0fc10597 auipc x11,0x0000fc10 9: la a1, str # la is similar to li, but works for loading addresses
0x00400008 0xffc58593 addi x11,x11,0xffff...
0x0040000c 0x00d00613 addi x12,x0,0x0000000d 10: li a2, 13 # like the first line, but with 13. This is the final argument to the system call
0x00400010 0x04000893 addi x17,x0,0x00000040 11: li a7, 64 # a7 is what determines which system call we are calling and we what to call write (64)
0x00400014 0x00000073 ecall 12: ecall # actually issue the call
0x00400018 0x00000513 addi x10,x0,0x00000000 14: li a0, 0 # The exit code we will be returning is 0
0x0040001c 0x05d00893 addi x17,x0,0x0000005d 15: li a7, 93 # Again we need to indicate what system call we are making and this time we are call...
0x00400020 0x00000073 ecall 16: ecall
Data Segment
Address Value (+0) Value (+4) Value (+8) Value (+c) Value (+10) Value (+14) Value (+18) Value (+1c)
0x10010000 0x6c6c6548 0x6f57206f 0x21646c72 0x0000000a 0x00000000 0x00000000 0x00000000 0x00000000
0x0x10010000 (.data)
Hexadecimal Addresses
Hexadecimal Values
ASCII
Messages Run I/O
Hello World!
-- program is finished running (0) --
Clear
Control and Status
Registers Floating Point
Name Number Value
ustatus 0 0x00000000
fflags 1 0x00000000
frm 2 0x00000000
fcsr 3 0x00000000
uie 4 0x00000000
utvec 5 0x00000000
uscratch 64 0x00000000
uepc 65 0x00000000
ucause 66 0x00000000
utval 67 0x00000000
uip 68 0x00000000
cycle 3072 0x00000008
time 3073 0x51b867fe
instret 3074 0x00000008
cycleh 3200 0x00000000
timeh 3201 0x00000186
instreth 3202 0x00000000

Part 3:


ITSC 3181 Lab 4/5
BasharShabani1
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loop.c
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Markdown
Settings
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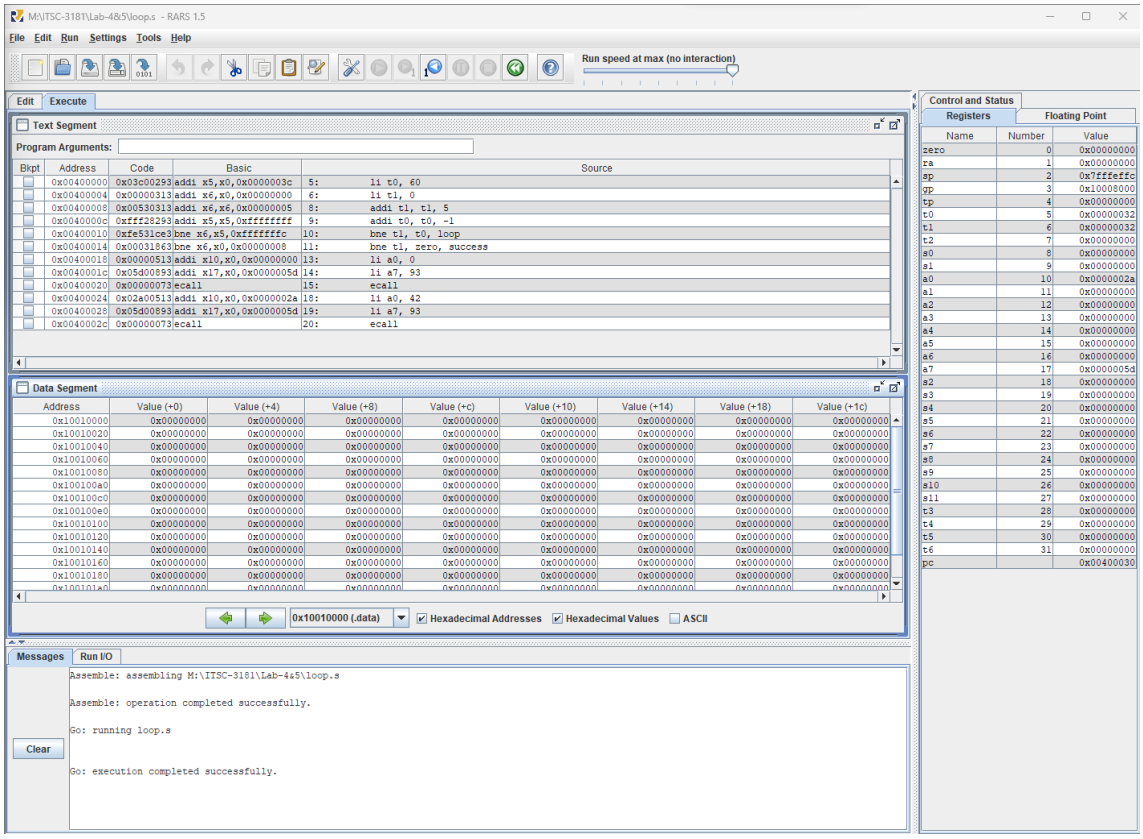
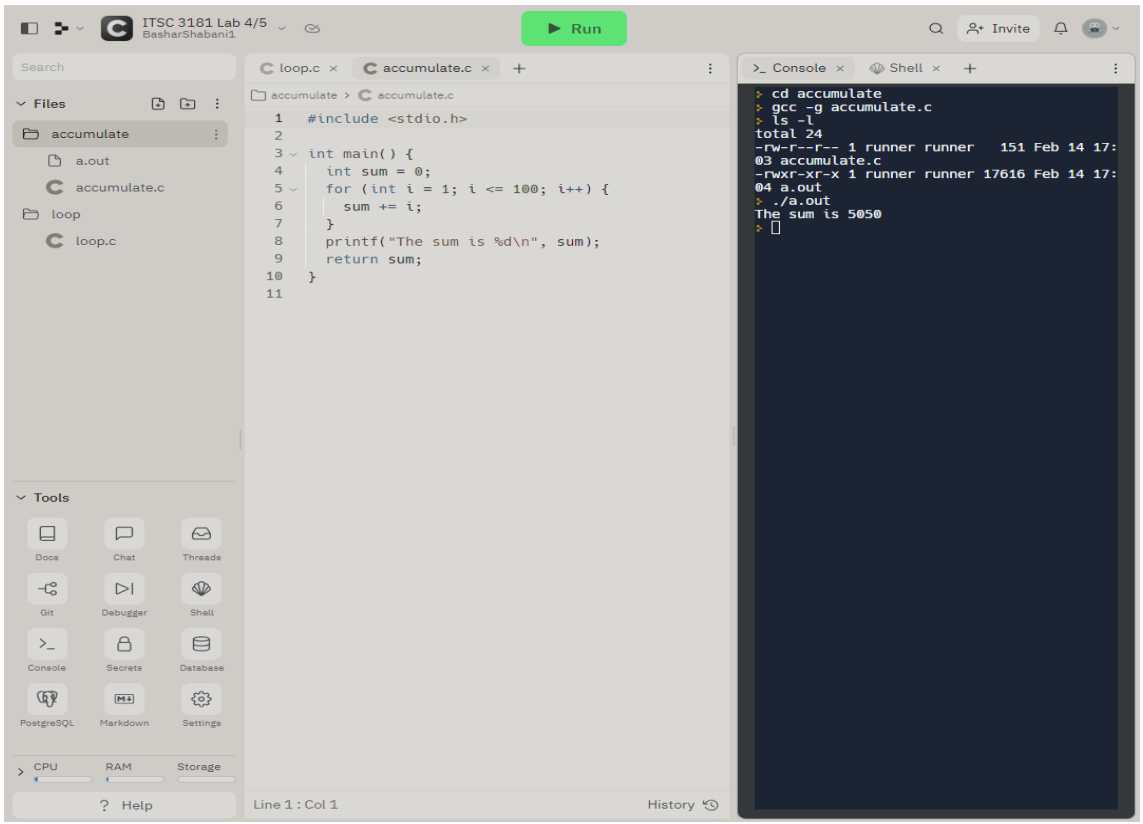
Help
loop.c
1 #include <stdio.h>
2
3 int main() {
4 int t0 = 60;
5 int t1 = 0;
6
7 while (t1 != t0) {
8 t1 += 5;
9 t0--;
10 }
11
12 if (t1 == 0) {
13 printf("Success\n");
14 return 42;
15 } else {
16 printf("Failure\n");
17 return 0;
18 }
19 }
20
Line 1 : Col 1
History
Console
Shell
gcc -g loop.c
ls -l
total 88
-rwxr-xr-x 1 runner runner 17632 Feb 14 16:55 a.out
-rw-r--r-- 1 runner runner 263 Feb 14 16:50 loop.c
-rwxr-xr-x 1 runner runner 54536 Sep 8 14:00 main
-rw-r--r-- 1 runner runner 411 Oct 13 22:06 Makefile
-rw-r--r-- 1 runner runner 81 Jan 18 2022 replit.nix
./a.out
Failure


M:\ITSC-3181\Lab-4&5\loop.s - RARS 1.5
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
Text Segment
Program Arguments:
Bkpt Address Code Basic Source
0x00400000 0x03c00293 addi x5,x0,0x0000003c 5: li t0, 60
0x00400004 0x00000313 addi x6,x0,0x00000000 6: li t1, 0
0x00400008 0x00530313 addi x6,x6,0x00000005 8: addi t1, t1, 5
0x0040000c 0xfff28293 addi x5,x5,0xffffffff 9: addi t0, t0, -1
0x00400010 0xfe531ce3 bne x6,x5,0xfffffffc 10: bne t1, t0, loop
0x00400014 0x00031863 bne x6,x0,0x00000008 11: bne t1, zero, success
0x00400018 0x00000513 addi x10,x0,0x00000000 13: li a0, 0
0x0040001c 0x05d00893 addi x17,x0,0x0000005d 14: li a7, 93
0x00400020 0x00000073 ecall 15: ecall
0x00400024 0x02a00513 addi x10,x0,0x0000002a 18: li a0, 42
0x00400028 0x05d00893 addi x17,x0,0x0000005d 19: li a7, 93
0x0040002c 0x00000073 ecall 20: ecall
Data Segment
Address Value (+0) Value (+4) Value (+8) Value (+c) Value (+10) Value (+14) Value (+18) Value (+1c)
0x10010000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010020 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010040 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010060 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010080 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100100a0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100100c0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100100e0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010100 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010120 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010140 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010160 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010180 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100101a0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010000 (.data)
Hexadecimal Addresses
Hexadecimal Values
ASCII
Control and Status
Registers
Floating Point
Name Number Value
zero 0 0x00000000
ra 1 0x00000000
sp 2 0x7fffeffc
gp 3 0x10008000
tp 4 0x00000000
t0 5 0x00000032
t1 6 0x00000032
t2 7 0x00000000
s0 8 0x00000000
s1 9 0x00000000
a0 10 0x0000002a
a1 11 0x00000000
a2 12 0x00000000
a3 13 0x00000000
a4 14 0x00000000
a5 15 0x00000000
a6 16 0x00000000
a7 17 0x0000005d
s2 18 0x00000000
s3 19 0x00000000
s4 20 0x00000000
s5 21 0x00000000
s6 22 0x00000000
s7 23 0x00000000
s8 24 0x00000000
s9 25 0x00000000
s10 26 0x00000000
s11 27 0x00000000
t3 28 0x00000000
t4 29 0x00000000
t5 30 0x00000000
t6 31 0x00000000
pc 0x00400030
Messages
Run I/O
Assemble: assembling M:\ITSC-3181\Lab-4&5\loop.s
Assemble: operation completed successfully.
Go: running loop.s
Clear
Go: execution completed successfully.

Part 4: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BasharShabani1
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loop.c
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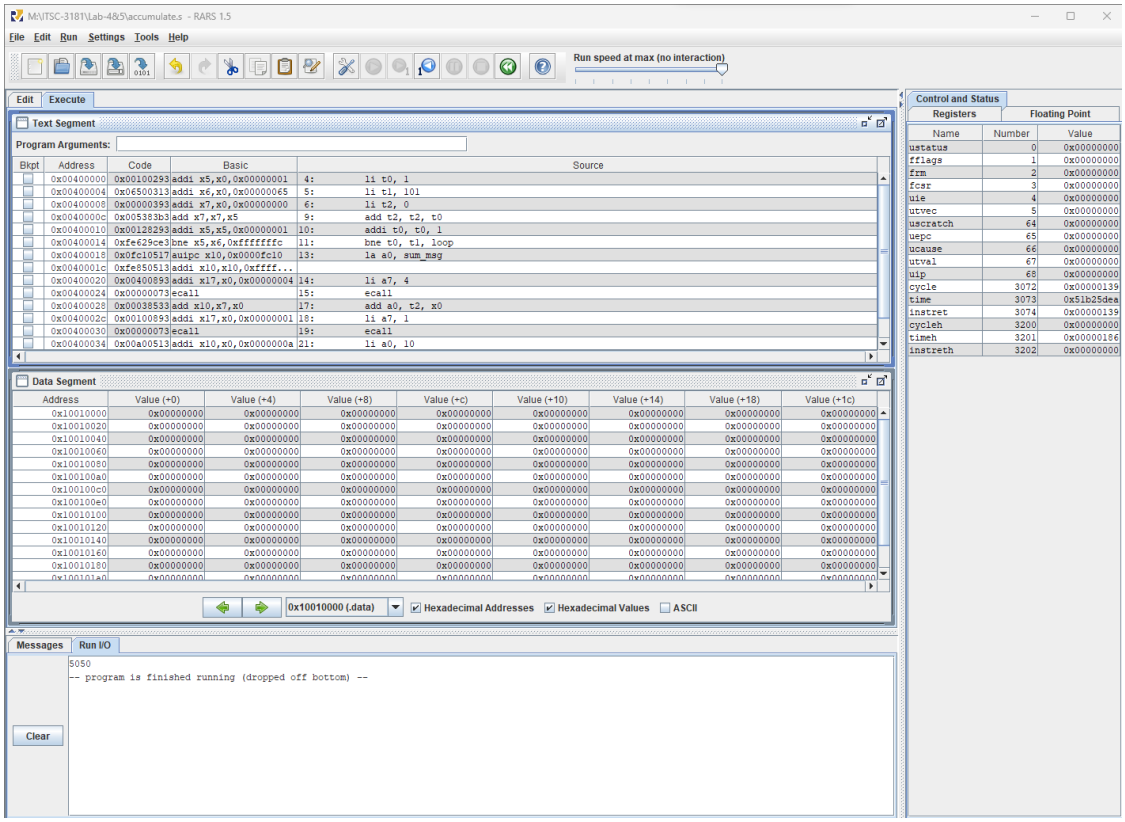
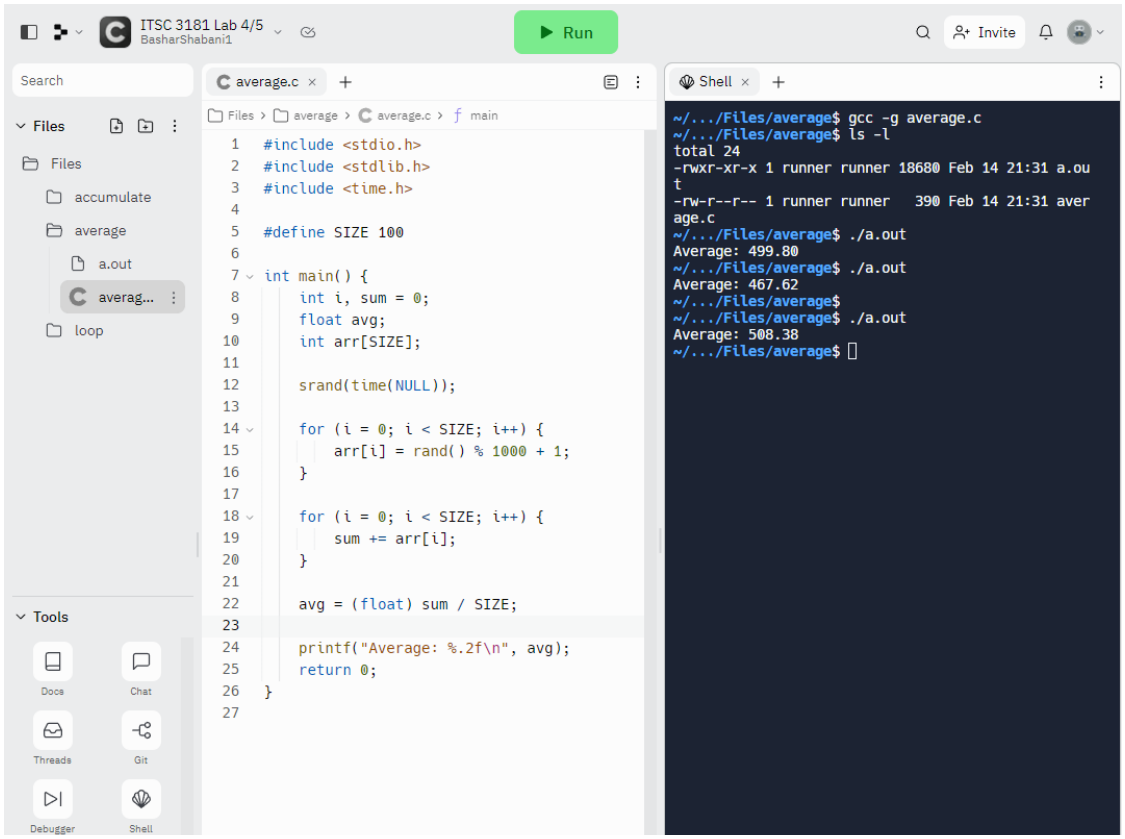
Markdown
Settings
CPU
RAM
Storage
Help
loop.c
accumulate.c
accumulate > accumulate.c
1 #include <stdio.h>
2
3 int main() {
4 int sum = 0;
5 for (int i = 1; i <= 100; i++) {
6 sum += i;
7 }
8 printf("The sum is %d\n", sum);
9 return sum;
10 }
11
Line 1 : Col 1
History
Console
Shell
cd accumulate
gcc -g accumulate.c
ls -l
total 24
-rw-r--r-- 1 runner runner 151 Feb 14 17:03 accumulate.c
-rwxr-xr-x 1 runner runner 17616 Feb 14 17:04 a.out
./a.out
The sum is 5050


M:\ITSC-3181\Lab-4&5\accumulate.s - RARS 1.5
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
Text Segment
Program Arguments:
Bkpt Address Code Basic Source
0x00400000 0x00100293 addi x5,x0,0x00000001 4: li t0, 1
0x00400004 0x06500313 addi x6,x0,0x00000065 5: li t1, 101
0x00400008 0x00000393 addi x7,x0,0x00000000 6: li t2, 0
0x0040000c 0x005383b3 add x7,x7,x5 9: add t2, t2, t0
0x00400010 0x00128293 addi x5,x5,0x00000001 10: addi t0, t0, 1
0x00400014 0xfe629ce3 bne x5,x6,0xfffffffc 11: bne t0, t1, loop
0x00400018 0x0fc10517 auipc x10,0x0000fc10 13: la a0, sum_msg
0x0040001c 0xfe850513 addi x10,x10,0xffff...
0x00400020 0x00400893 addi x17,x0,0x00000004 14: li a7, 4
0x00400024 0x00000073 ecall 15: ecall
0x00400028 0x00038533 add x10,x7,x0 17: add a0, t2, x0
0x0040002c 0x00100893 addi x17,x0,0x00000001 18: li a7, 1
0x00400030 0x00000073 ecall 19: ecall
0x00400034 0x00a00513 addi x10,x0,0x0000000a 21: li a0, 10
Data Segment
Address Value (+0) Value (+4) Value (+8) Value (+c) Value (+10) Value (+14) Value (+18) Value (+1c)
0x10010000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010020 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010040 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010060 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010080 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100100a0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100100c0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100100e0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010100 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010120 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010140 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010160 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010180 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010000 (.data) Hexadecimal Addresses Hexadecimal Values ASCII
Messages Run I/O
5050
-- program is finished running (dropped off bottom) --
Clear
Control and Status
Registers Floating Point
Name Number Value
ustatus 0 0x00000000
fflags 1 0x00000000
frm 2 0x00000000
fcsr 3 0x00000000
uie 4 0x00000000
utvec 5 0x00000000
uscratch 64 0x00000000
uepc 65 0x00000000
ucause 66 0x00000000
utval 67 0x00000000
uip 68 0x00000000
cycle 3072 0x00000139
time 3073 0x51b25dea
instret 3074 0x00000139
cycleh 3200 0x00000000
timeh 3201 0x00000186
instreth 3202 0x00000000

Part 5:


ITSC 3181 Lab 4/5
BasharShabani1
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averag...
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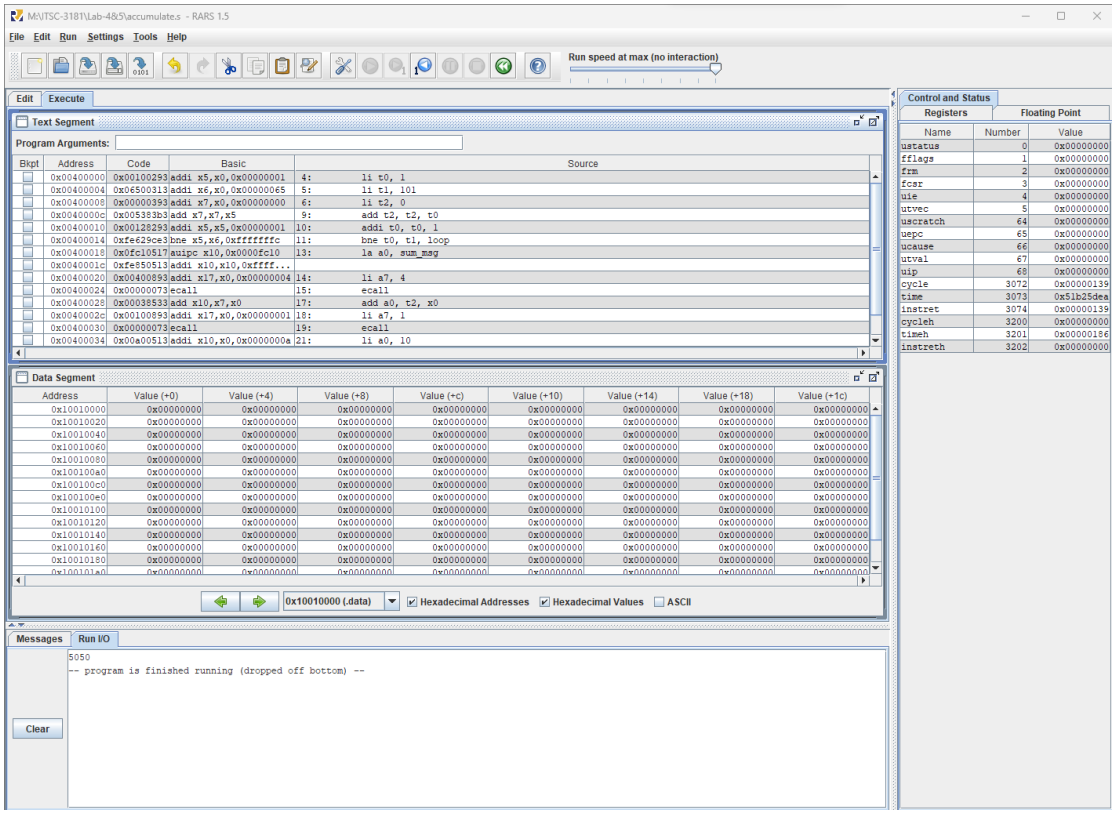
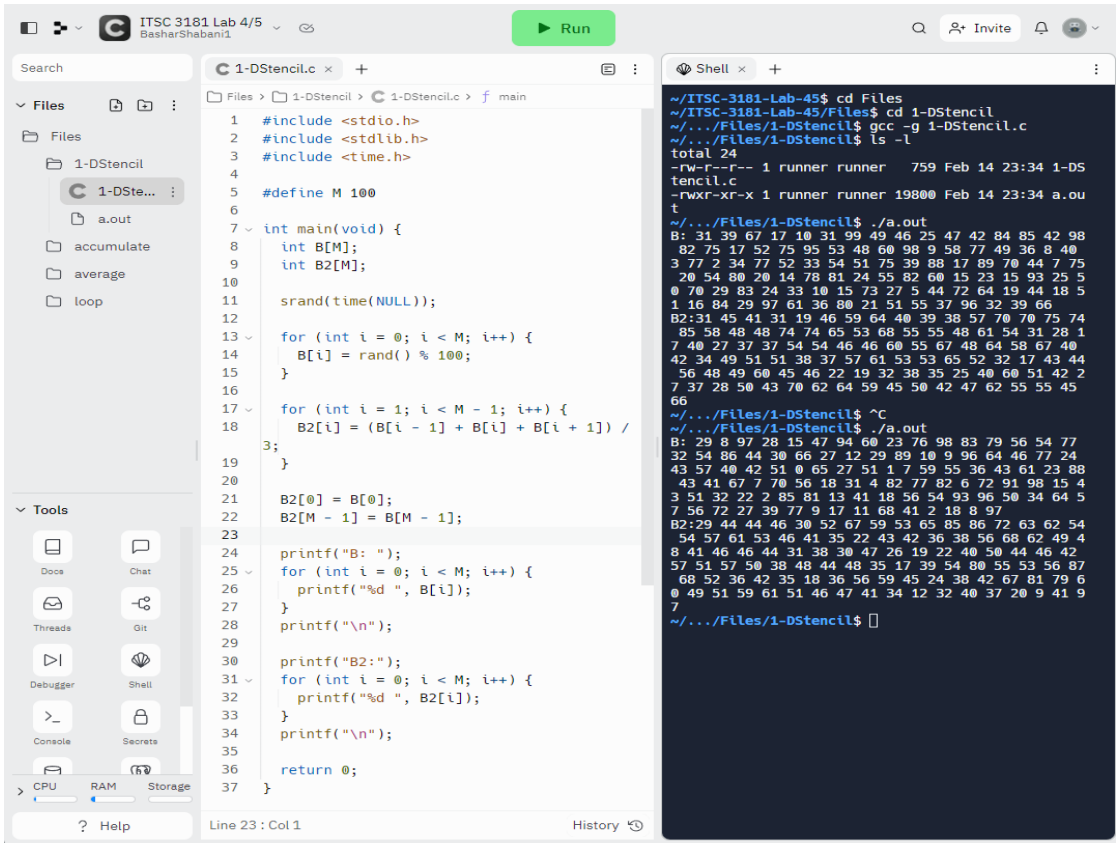
Debugger
Shell
average.c
Files > average > average.c > main
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
#define SIZE 100
int main() {
int i, sum = 0;
float avg;
int arr[SIZE];
srand(time(NULL));
for (i = 0; i < SIZE; i++) {
arr[i] = rand() % 1000 + 1;
}
for (i = 0; i < SIZE; i++) {
sum += arr[i];
}
avg = (float) sum / SIZE;
printf("Average: %.2f\n", avg);
return 0;
}
Shell
~/.../Files/average$ gcc -g average.c
~/.../Files/average$ ls -l
total 24
-rwxr-xr-x 1 runner runner 18680 Feb 14 21:31 a.out
-rw-r--r-- 1 runner runner 390 Feb 14 21:31 average.c
~/.../Files/average$ ./a.out
Average: 499.80
~/.../Files/average$ ./a.out
Average: 467.62
~/.../Files/average$
~/.../Files/average$ ./a.out
Average: 508.38
~/.../Files/average$


M:\ITSC-3181\Lab-4&5\accumulate.s - RARS 1.5
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
Text Segment
Program Arguments:
Bkpt Address Code Basic Source
0x00400000 0x00100293 addi x5,x0,0x00000001 4: li t0, 1
0x00400004 0x06500313 addi x6,x0,0x00000065 5: li t1, 101
0x00400008 0x00000393 addi x7,x0,0x00000000 6: li t2, 0
0x0040000c 0x005383b3 add x7,x7,x5 9: add t2, t2, t0
0x00400010 0x00128293 addi x5,x5,0x00000001 10: addi t0, t0, 1
0x00400014 0xfe629ce3 bne x5,x6,0xfffffffc 11: bne t0, t1, loop
0x00400018 0x0fc10517 auipc x10,0x0000fc10 13: la a0, sum_msg
0x0040001c 0xfe850513 addi x10,x10,0xffff...
0x00400020 0x00400893 addi x17,x0,0x00000004 14: li a7, 4
0x00400024 0x00000073 ecall 15: ecall
0x00400028 0x00038533 add x10,x7,x0 17: add a0, t2, x0
0x0040002c 0x00100893 addi x17,x0,0x00000001 18: li a7, 1
0x00400030 0x00000073 ecall 19: ecall
0x00400034 0x00a00513 addi x10,x0,0x0000000a 21: li a0, 10
Data Segment
Address Value (+0) Value (+4) Value (+8) Value (+c) Value (+10) Value (+14) Value (+18) Value (+1c)
0x10010000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010020 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010040 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010060 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010080 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100100a0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100100c0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x100100e0 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010100 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010120 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010140 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010160 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010180 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
0x10010000 (.data)
Hexadecimal Addresses
Hexadecimal Values
ASCII
Messages
Run I/O
5050
-- program is finished running (dropped off bottom) --
Clear
Control and Status
Registers
Floating Point
Name Number Value
ustatus 0 0x00000000
fflags 1 0x00000000
frm 2 0x00000000
fcsr 3 0x00000000
uie 4 0x00000000
utvec 5 0x00000000
uscratch 64 0x00000000
uepc 65 0x00000000
ucause 66 0x00000000
utval 67 0x00000000
uip 68 0x00000000
cycle 3072 0x00000139
time 3073 0x51b254ea
instret 3074 0x00000139
cycleh 3200 0x00000000
timeh 3201 0x00000186
instreth 3202 0x00000000

Part 6:


ITSC 3181 Lab 4/5
BasharShabani1
Run
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1-DSte...
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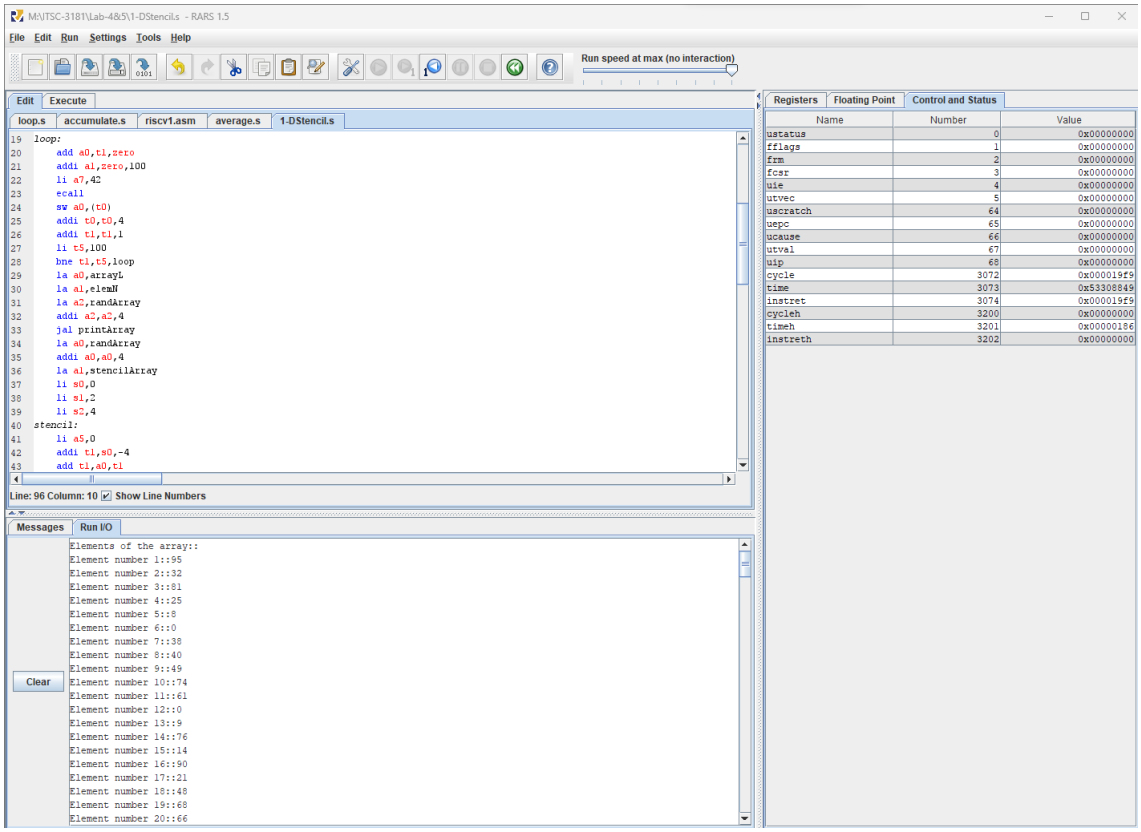
Storage
Help
1-DStencil.c
Files > 1-DStencil > 1-DStencil.c > main
1 #include <stdio.h>
2 #include <stdlib.h>
3 #include <time.h>
4
5 #define M 100
6
7 int main(void) {
8 int B[M];
9 int B2[M];
10
11 srand(time(NULL));
12
13 for (int i = 0; i < M; i++) {
14 B[i] = rand() % 100;
15 }
16
17 for (int i = 1; i < M - 1; i++) {
18 B2[i] = (B[i - 1] + B[i] + B[i + 1]) / 3;
19 }
20
21 B2[0] = B[0];
22 B2[M - 1] = B[M - 1];
23
24 printf("B: ");
25 for (int i = 0; i < M; i++) {
26 printf("%d ", B[i]);
27 }
28 printf("\n");
29
30 printf("B2:");
31 for (int i = 0; i < M; i++) {
32 printf("%d ", B2[i]);
33 }
34 printf("\n");
35
36 return 0;
37 }
Line 23 : Col 1
History
Shell
~/ITSC-3181-Lab-45$ cd Files
~/ITSC-3181-Lab-45/Files$ cd 1-DStencil
~/.../Files/1-DStencil$ gcc -g 1-DStencil.c
~/.../Files/1-DStencil$ ls -l
total 24
-rw-r--r-- 1 runner runner 759 Feb 14 23:34 1-DStencil.c
-rwxr-xr-x 1 runner runner 19800 Feb 14 23:34 a.out
~/.../Files/1-DStencil$ ./a.out
B: 31 39 67 17 10 31 99 49 46 25 47 42 84 85 42 98 82 75 17 52 75 95 53 48 60 98 9 58 77 49 36 8 40 3 77 2 34 77 52 33 54 51 75 39 88 17 89 70 44 7 75 20 54 80 20 14 78 81 24 55 82 60 15 23 15 93 25 50 70 29 83 24 33 10 15 73 27 5 44 72 64 19 44 18 51 16 84 29 97 61 36 80 21 51 55 37 96 32 39 66
B2:31 45 41 31 19 46 59 64 40 39 38 57 70 70 75 74 85 58 48 48 74 74 65 53 68 55 55 48 61 54 31 28 17 40 27 37 37 54 54 46 46 60 55 67 48 64 58 67 40 42 34 49 51 51 38 37 57 61 53 53 65 52 32 17 43 44 56 48 49 60 45 46 22 19 32 38 35 25 40 60 51 42 27 37 28 50 43 70 62 64 59 45 50 42 47 62 55 55 45 66
~/.../Files/1-DStencil$ ^C
~/.../Files/1-DStencil$ ./a.out
B: 29 8 97 28 15 47 94 60 23 76 98 83 79 56 54 77 32 54 86 44 30 66 27 12 29 89 10 9 96 64 46 77 24 43 57 40 42 51 0 65 27 51 1 7 59 55 36 43 61 23 88 43 41 67 7 70 56 18 31 4 82 77 82 6 72 91 98 15 4 3 51 32 22 2 85 81 13 41 18 56 54 93 96 50 34 64 5 7 56 72 27 39 77 9 17 11 68 41 2 18 8 97
B2:29 44 44 46 30 52 67 59 53 65 85 86 72 63 62 54 54 57 61 53 46 41 35 22 43 42 36 38 56 68 62 49 4 8 41 46 46 44 31 38 30 47 26 19 22 40 50 44 46 42 57 51 57 50 38 48 44 48 35 17 39 54 80 55 53 56 87 68 52 36 42 35 18 36 56 59 45 24 38 42 67 81 79 60 49 51 59 61 51 46 47 41 34 12 32 40 37 20 9 41 97
~/.../Files/1-DStencil$


M:\TSC-3181\Lab-4&5\1-DStencil.s - RARS 1.5
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
loop.s accumulate.s riscv1.asm average.s 1-DStencil.s
19 loop:
20 add a0,t1,zero
21 addi a1,zero,100
22 li a7,42
23 ecall
24 sw a0,(t0)
25 addi t0,t0,4
26 addi t1,t1,1
27 li t5,100
28 bne t1,t5,loop
29 la a0,arrayL
30 la a1,elemN
31 la a2,randArray
32 addi a2,a2,4
33 jal printArray
34 la a0,randArray
35 addi a0,a0,4
36 la a1,stencilArray
37 li s0,0
38 li s1,2
39 li s2,4
40 stencil:
41 li a5,0
42 addi t1,s0,-4
43 add t1,a0,t1
Line: 96 Column: 10 Show Line Numbers
Messages Run I/O
Clear
Elements of the array::
Element number 1::95
Element number 2::32
Element number 3::81
Element number 4::25
Element number 5::8
Element number 6::0
Element number 7::38
Element number 8::40
Element number 9::49
Element number 10::74
Element number 11::61
Element number 12::0
Element number 13::9
Element number 14::76
Element number 15::14
Element number 16::90
Element number 17::21
Element number 18::48
Element number 19::68
Element number 20::66
Registers Floating Point Control and Status
Name Number Value
ustatus 0 0x00000000
fflags 1 0x00000000
frm 2 0x00000000
fcsr 3 0x00000000
uie 4 0x00000000
utvec 5 0x00000000
uscratch 64 0x00000000
uepc 65 0x00000000
ucause 66 0x00000000
utval 67 0x00000000
uip 68 0x00000000
cycle 3072 0x000019f9
time 3073 0x53308849
instret 3074 0x000019f9
cycleh 3200 0x00000000
timeh 3201 0x00000186
instreth 3202 0x00000000