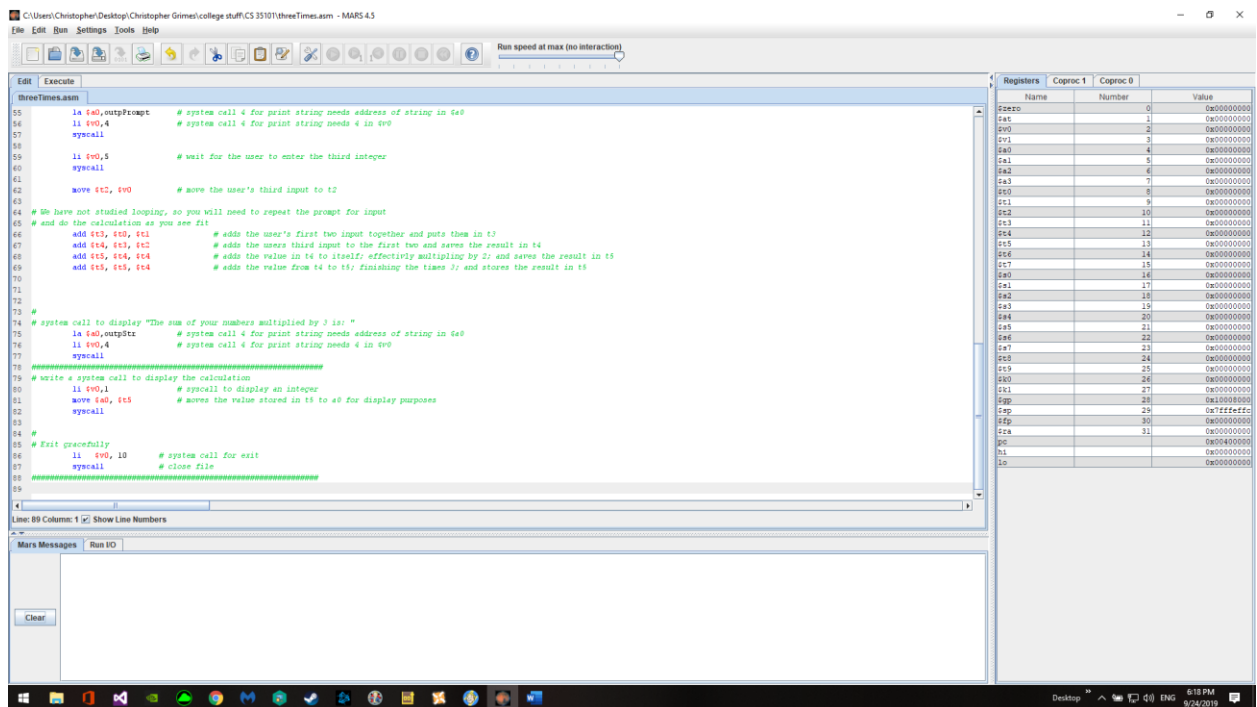


List of the assembly code files:

timesthree.asm

To implement this project I had to modify the existing source file, timesthree.asm, from blackboard. I accomplished this by adding system calls to prompt the user for three integers, system calls to move the user's inputs from \$v0 to some temporary registers, system calls to add said temporary registers together, system calls to add the result of the inputs to itself effectively multiplying by 3, and finally a system call to show the result of this calculation.



The screenshot shows the MARS MIPS simulator interface. The main window displays the assembly code for `timesthree.asm`. The code is as follows:

```
1  # timesthree.asm
2
3  # Prompt user for three integers
4  la $a0, outputPrompt      # system call 4 for print string needs address of string in $a0
5  li $v0, 4                 # system call 4 for print string needs 4 in $v0
6  syscall
7
8  # Prompt user for first integer
9  li $v0, 5                 # wait for the user to enter the third integer
10 syscall
11
12 # Prompt user for second integer
13 li $v0, 5
14 syscall
15
16 # Prompt user for third integer
17 li $v0, 5
18 syscall
19
20 # Move the user's third input to $t2
21 move $t2, $v0
22
23 # We have not studied looping, so you will need to repeat the prompt for input
24 # and do the calculation as you see fit
25
26 # Add the user's first two inputs together and store the result in $t3
27 add $t3, $t0, $t1
28
29 # Add the user's third input to the first two and store the result in $t4
30 add $t4, $t3, $t2
31
32 # Add the value in $t4 to itself; effectively multiplying by 2; and store the result in $t5
33 add $t5, $t4, $t4
34
35 # Add the value from $t4 to $t5; finishing the times 3; and store the result in $t5
36 add $t5, $t5, $t4
37
38 # System call to display "The sum of your numbers multiplied by 3 is: "
39 la $a0, outputStr
40 li $v0, 4
41 syscall
42
43 # Write a system call to display the calculation
44 li $v0, 1
45 move $a0, $t5
46 syscall
47
48 # Exit gracefully
49 li $v0, 10
50 syscall
```

The right-hand pane shows the MIPS registers. The registers are listed in a table with columns for Name, Number, Coproc 1, Coproc 0, and Value. The registers are numbered 0 through 31. The values are shown in hexadecimal.

Name	Number	Coproc 1	Coproc 0	Value
\$zero	0			0x00000000
\$at	1			0x00000000
\$v0	2			0x00000000
\$v1	3			0x00000000
\$a0	4			0x00000000
\$a1	5			0x00000000
\$a2	6			0x00000000
\$a3	7			0x00000000
\$t0	8			0x00000000
\$t1	9			0x00000000
\$t2	10			0x00000000
\$t3	11			0x00000000
\$t4	12			0x00000000
\$t5	13			0x00000000
\$t6	14			0x00000000
\$t7	15			0x00000000
\$t8	16			0x00000000
\$t9	17			0x00000000
\$s0	18			0x00000000
\$s1	19			0x00000000
\$s2	20			0x00000000
\$s3	21			0x00000000
\$s4	22			0x00000000
\$s5	23			0x00000000
\$s6	24			0x00000000
\$s7	25			0x00000000
\$s8	26			0x00000000
\$s9	27			0x00000000
\$fp	28			0x00000000
\$gp	29			0x00000000
\$t0	30			0x00000000
\$t1	31			0x00000000

Chris Grimes
CS 35101
timesthree.pdf

CS 35101/Christopher Grimes/college stuff/CS 35101/threeTimes.asm - MARS 4.5

Run speed at max (no interaction)

Text Segment

Inst	Address	Code	Basic	Source
0x00000000	0x3011001	lui \$t0,0x00001001	31:	la \$a0,outAuth # system call 4 for print string needs address of string in...
0x00000004	0x3424000	ori \$t1,\$t0,0x00000000		
0x00000008	0x2402000	addiu \$t2,\$t0,0x00000004	32:	li \$v0,4 # system call 4 for print string needs 4 in \$v0
0x0000000c	0x00000000	syscall	33:	syscall
0x00000010	0x3011001	lui \$t0,0x00001001	36:	la \$a0,outPrompt # system call 4 for print string needs address of string in...
0x00000014	0x3424000	addiu \$t2,\$t0,0x00000004	37:	li \$v0,4 # system call 4 for print string needs 4 in \$v0
0x00000018	0x00000000	syscall	38:	syscall
0x0000001c	0x2402000	addiu \$t2,\$t0,0x00000005	41:	li \$v0,5 # wait for user to enter the first integer
0x00000020	0x00000000	syscall	42:	syscall
0x00000024	0x0002400	addu \$t0,\$t2	44:	move \$t0,\$v0
0x00000028	0x3011001	lui \$t1,0x00001001	46:	la \$a0,outPrompt # system call 4 for print string needs address of string in...
0x0000002c	0x3424000	addiu \$t2,\$t0,0x00000004	47:	li \$v0,4 # system call 4 for print string needs 4 in \$v0
0x00000030	0x00000000	syscall	48:	syscall
0x00000034	0x2402000	addiu \$t2,\$t0,0x00000005	50:	li \$v0,5 # wait for the user to enter the second integer
0x00000038	0x00000000	syscall	51:	syscall

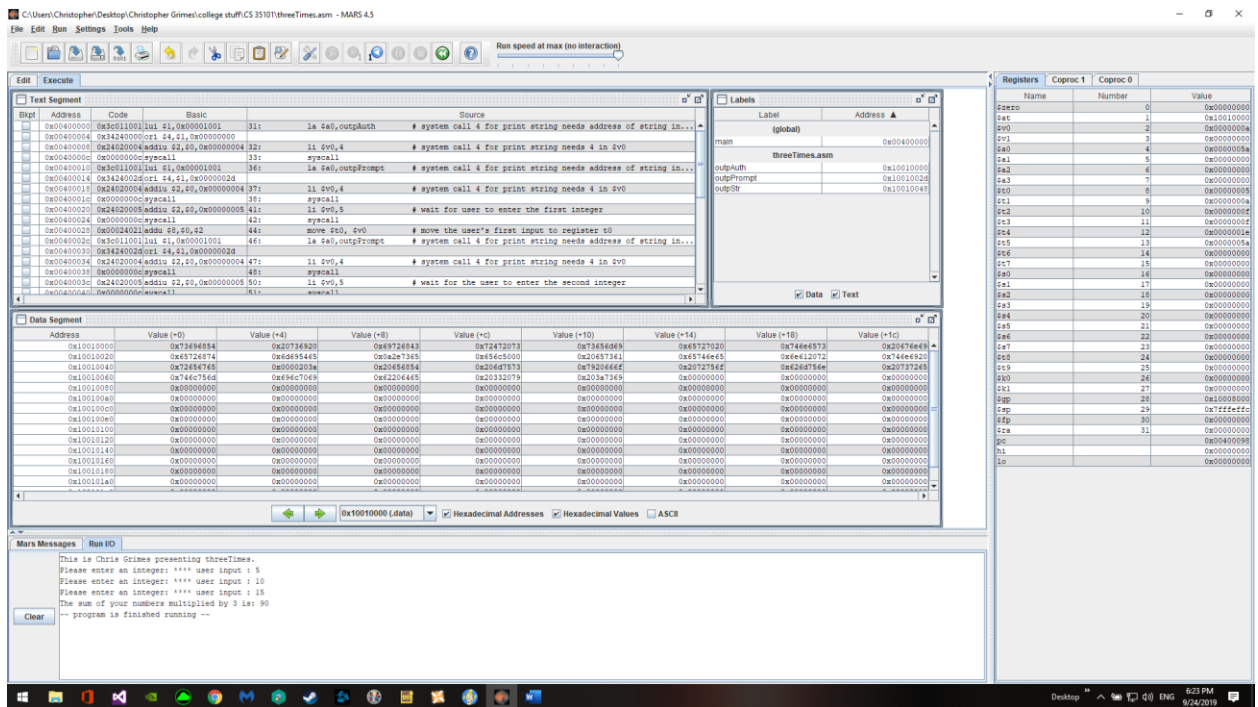
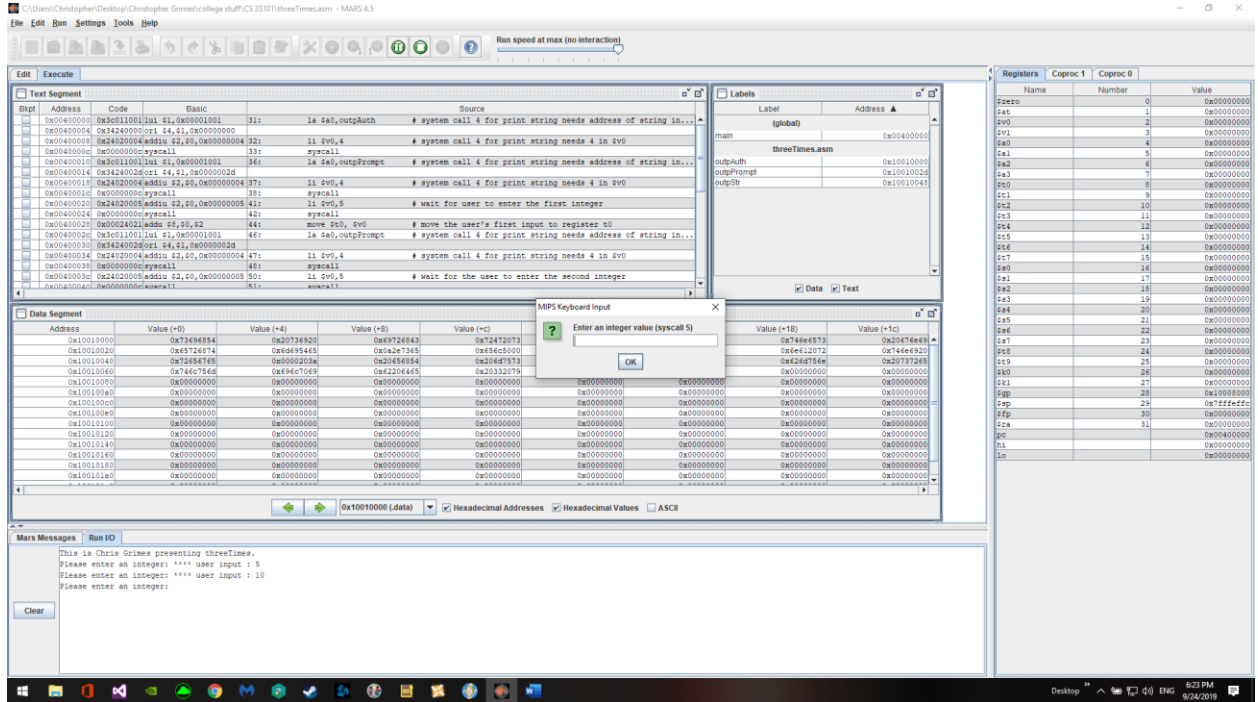
Labels

Label	Address
(global)	
main	0x00400000
threeTimes.asm	
outAuth	0x10010000
outPrompt	0x10010020
outStr	0x10010040

Registers

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$t0	8	0x00000000
\$t1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000000
\$s1	17	0x00000000
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$s8	24	0x00000000
\$s9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$kp	28	0x00000000
\$fp	29	0x00000000
\$ra	30	0x00000000
\$r0	31	0x00000000
\$t0	32	0x00000000
\$t1	33	0x00000000
\$t2	34	0x00000000
\$t3	35	0x00000000
\$t4	36	0x00000000
\$t5	37	0x00000000
\$t6	38	0x00000000
\$t7	39	0x00000000
\$s0	40	0x00000000
\$s1	41	0x00000000
\$s2	42	0x00000000
\$s3	43	0x00000000
\$s4	44	0x00000000
\$s5	45	0x00000000
\$s6	46	0x00000000
\$s7	47	0x00000000
\$s8	48	0x00000000
\$s9	49	0x00000000
\$k0	50	0x00000000
\$k1	51	0x00000000
\$kp	52	0x00000000
\$fp	53	0x00000000
\$ra	54	0x00000000
\$r0	55	0x00000000
\$t0	56	0x00000000
\$t1	57	0x00000000
\$t2	58	0x00000000
\$t3	59	0x00000000
\$t4	60	0x00000000
\$t5	61	0x00000000
\$t6	62	0x00000000
\$t7	63	0x00000000
\$s0	64	0x00000000
\$s1	65	0x00000000
\$s2	66	0x00000000
\$s3	67	0x00000000
\$s4	68	0x00000000
\$s5	69	0x00000000
\$s6	70	0x00000000
\$s7	71	0x00000000
\$s8	72	0x00000000
\$s9	73	0x00000000
\$k0	74	0x00000000
\$k1	75	0x00000000
\$kp	76	0x00000000
\$fp	77	0x00000000
\$ra	78	0x00000000
\$r0	79	0x00000000
\$t0	80	0x00000000
\$t1	81	0x00000000
\$t2	82	0x00000000
\$t3	83	0x00000000
\$t4	84	0x00000000
\$t5	85	0x00000000
\$t6	86	0x00000000
\$t7	87	0x00000000
\$s0	88	0x00000000
\$s1	89	0x00000000
\$s2	90	0x00000000
\$s3	91	0x00000000
\$s4	92	0x00000000
\$s5	93	0x00000000
\$s6	94	0x00000000
\$s7	95	0x00000000
\$s8	96	0x00000000
\$s9	97	0x00000000
\$k0	98	0x00000000
\$k1	99	0x00000000
\$kp	100	0x00000000
\$fp	101	0x00000000
\$ra	102	0x00000000
\$r0	103	0x00000000
\$t0	104	0x00000000
\$t1	105	0x00000000
\$t2	106	0x00000000
\$t3	107	0x00000000
\$t4	108	0x00000000
\$t5	109	0x00000000
\$t6	110	0x00000000
\$t7	111	0x00000000
\$s0	112	0x00000000
\$s1	113	0x00000000
\$s2	114	0x00000000
\$s3	115	0x00000000
\$s4	116	0x00000000
\$s5	117	0x00000000
\$s6	118	0x00000000
\$s7	119	0x00000000
\$s8	120	0x00000000
\$s9	121	0x00000000
\$k0	122	0x00000000
\$k1	123	0x00000000
\$kp	124	0x00000000
\$fp	125	0x00000000
\$ra	126	0x00000000
\$r0	127	0x00000000
\$t0	128	0x00000000
\$t1	129	0x00000000
\$t2	130	0x00000000
\$t3	131	0x00000000
\$t4	132	0x00000000
\$t5	133	0x00000000
\$t6	134	0x00000000
\$t7	135	0x00000000
\$s0	136	0x00000000
\$s1	137	0x00000000
\$s2	138	0x00000000
\$s3	139	0x00000000
\$s4	140	0x00000000
\$s5	141	0x00000000
\$s6	142	0x00000000
\$s7	143	0x00000000
\$s8	144	0x00000000
\$s9	145	0x00000000
\$k0	146	0x00000000
\$k1	147	0x00000000
\$kp	148	0x00000000
\$fp	149	0x00000000
\$ra	150	0x00000000
\$r0	151	0x00000000
\$t0	152	0x00000000
\$t1	153	0x00000000
\$t2	154	0x00000000
\$t3	155	0x00000000
\$t4	156	0x00000000
\$t5	157	0x00000000
\$t6	158	0x00000000
\$t7	159	0x00000000
\$s0	160	0x00000000
\$s1	161	0x00000000
\$s2	162	0x00000000
\$s3	163	0x00000000
\$s4	164	0x00000000
\$s5	165	0x00000000
\$s6	166	0x00000000
\$s7	167	0x00000000
\$s8	168	0x00000000
\$s9	169	0x00000000
\$k0	170	0x00000000
\$k1	171	0x00000000
\$kp	172	0x00000000
\$fp	173	0x00000000
\$ra	174	0x00000000
\$r0	175	0x00000000
\$t0	176	0x00000000
\$t1	177	0x00000000
\$t2	178	0x00000000
\$t3	179	0x00000000
\$t4	180	0x00000000
\$t5	181	0x00000000
\$t6	182	0x00000000
\$t7	183	0x00000000
\$s0	184	0x00000000
\$s1	185	0x00000000
\$s2	186	0x00000000
\$s3	187	0x00000000
\$s4	188	0x00000000
\$s5	189	0x00000000
\$s6	190	0x00000000
\$s7	191	0x00000000
\$s8	192	0x00000000
\$s9	193	0x00000000
\$k0	194	0x00000000
\$k1	195	0x00000000
\$kp	196	0x00000000
\$fp	197	0x00000000
\$ra	198	0x00000000
\$r0	199	0x00000000
\$t0	200	0x00000000
\$t1	201	0x00000000
\$t2	202	0x00000000
\$t3	203	0x00000000
\$t4	204	0x00000000
\$t5	205	0x00000000
\$t6	206	0x00000000
\$t7	207	0x00000000
\$s0	208	0x00000000
\$s1	209	0x00000000
\$s2	210	0x00000000
\$s3	211	0x00000000
\$s4	212	0x00000000
\$s5	213	0x00000000
\$s6	214	0x00000000
\$s7	215	0x00000000
\$s8	216	0x00000000
\$s9	217	0x00000000
\$k0	218	0x00000000
\$k1	219	0x00000000
\$kp	220	0x00000000
\$fp	221	0x00000000
\$ra	222	0x00000000
\$r0	223	0x00000000
\$t0	224	0x00000000
\$t1	225	0x00000000
\$t2	226	0x00000000
\$t3	227	0x00000000
\$t4	228	0x00000000
\$t5	229	0x00000000
\$t6	230	0x00000000
\$t7	231	0x00000000
\$s0	232	0x00000000
\$s1	233	0x00000000
\$s2	234	0x00000000
\$s3	235	0x00000000
\$s4	236	0x00000000
\$s5	237	0x00000000
\$s6	238	0x00000000
\$s7	239	0x00000000
\$s8	240	0x00000000
\$s9	241	0x00000000
\$k0	242	0x00000000
\$k1	243	0x00000000
\$kp	244	0x00000000
\$fp	245	0x00000000
\$ra	246	0x00000000
\$r0	247	0x00000000
\$t0	248	0x00000000
\$t1	249	0x00000000
\$t2	250	0x00000000
\$t3	251	0x00000000
\$t4	252	0x00000000
\$t5	253	0x00000000
\$t6	254	0x00000000
\$t7	255	0x00000000
\$s0	256	0x00000000
\$s1	257	0x00000000
\$s2	258	0x00000000
\$s3	259	0x00000000
\$s4	260	0x00000000
\$s5	261	0x00000000
\$s6	262	0x00000000
\$s7	263	0x00000000
\$s8	264	0x00000000
\$s9	265	0x00000000
\$k0	266	0x00000000
\$k1	267	0x00000000
\$kp	268	0x00000000
\$fp	269	0x00000000
\$ra	270	0x00000000
\$r0	271	0x00000000
\$t0	272	0x00000000
\$t1	273	0x00000000
\$t2	274	0x00000000
\$t3	275	0x00000000
\$t4	276	0x00000000
\$t5	277	0x00000000
\$t6	278	0x00000000
\$t7	279	0x00000000
\$s0	280	0x00000000
\$s1	281	0x00000000
\$s2	282	0x00000000
\$s3	283	0x00000000
\$s4	284	0x00000000
\$s5	285	0x00000000
\$s6	286	0x00000000
\$s7	287	0x00000000
\$s8	288	0x00000000
\$s9	289	0x00000000
\$k0	290	0x00000000
\$k1	291	0x00000000
\$kp	292	0x00000000
\$fp	293	0x00000000
\$ra	294	0x00000000
\$r0	295	0x00000000
\$t0	296	0x00000000
\$t1	297	0x00000000
\$t2	298	0x00000000
\$t3	299	0x00000000
\$t4	300	0x00000000
\$t5	301	0x00000000
\$t6	302	0x00000000
\$t7	303	0x00000000
\$s0	304	0x00000000
\$s1	305	0x00000000
\$s2	306	0x00000000
\$s3	307	0x00000000
\$s4	308	0x00000000
\$s5	309	0x00000000
\$s6	310	0x00000000
\$s7	311	0x00000000
\$s8	312	0x00000000
\$s9	313	0x00000000
\$k0	314	0x00000000
\$k1	315	0x00000000
\$kp	316	0x00000000
\$fp	317	0x00000000
\$ra	318	0x00000000
\$r0	319	0x00000000
\$t0	320	0x00000000
\$t1	321	0x00000000
\$t2	322	0x00000000
\$t3	323	0x00000000
\$t4	324	0x00000000
\$t5	325	0x00000000
\$t		

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timesthree.pdf



The only real problem that was faced was trying to find an example of taking users inputs which was remedied by a quick Google search.