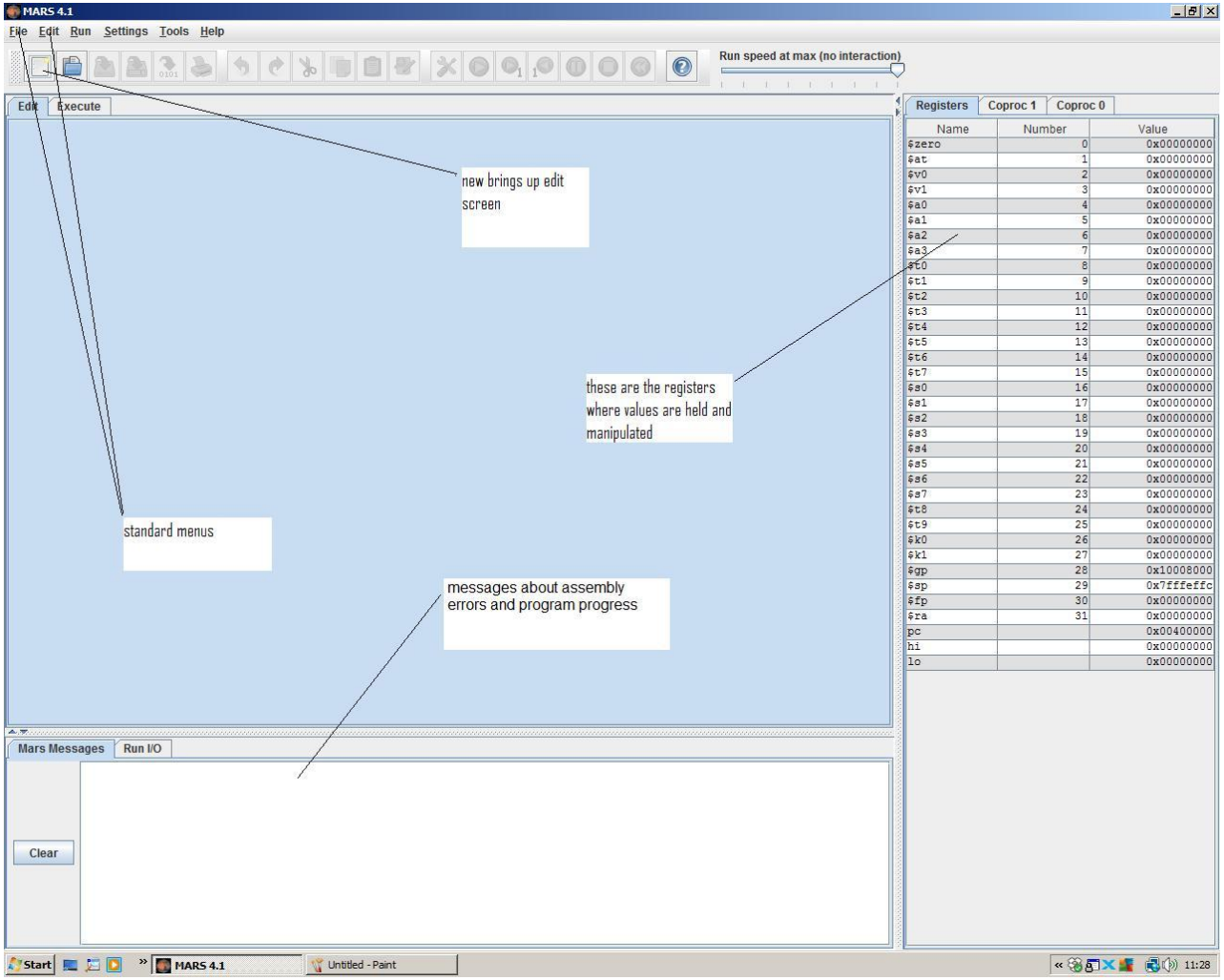
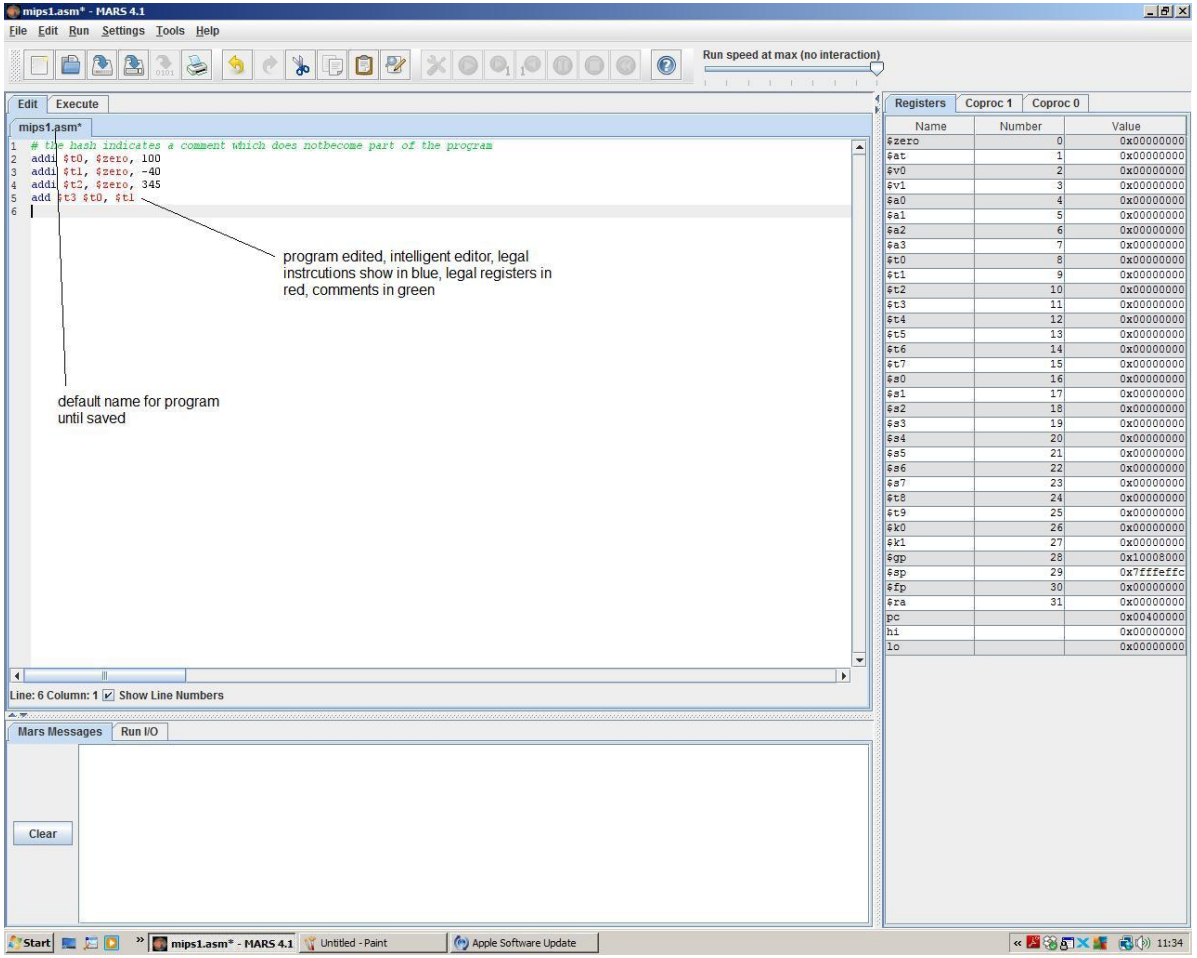
Using MARS

- Mars is a mips simulation
- A processor is defined by its register set and the instruction set which manipulates them
- Mars.jar is a java simulation of the Mips processor
- Download from moodle and double-click the file to run

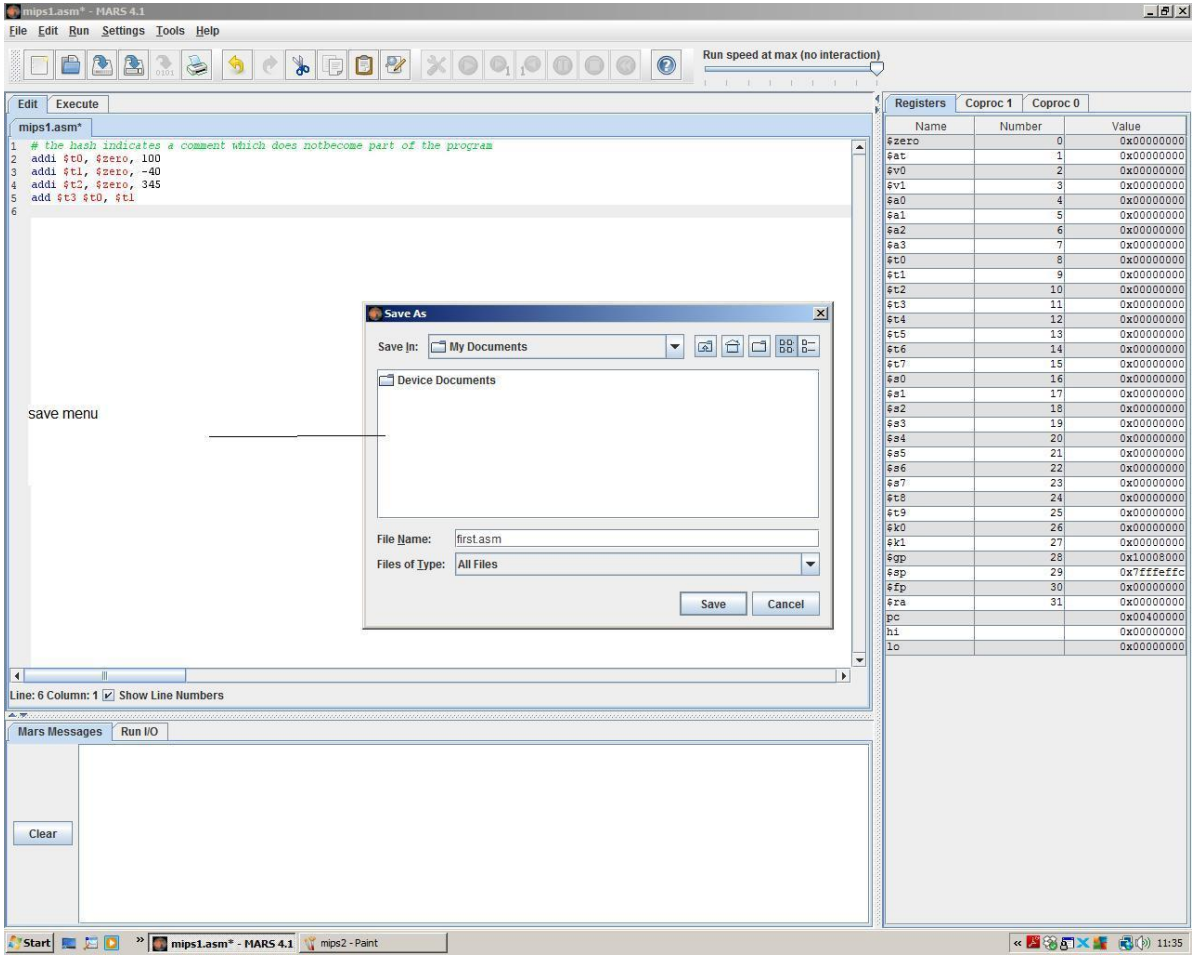
Opening screen



Edit screen


mips1.asm* - MARS 4.1
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
mips1.asm*
1 # the hash indicates a comment which does notbecome part of the program
2 addi $t0, $zero, 100
3 addi $t1, $zero, -40
4 addi $t2, $zero, 345
5 add $t3 $t0, $t1
6
program edited, intelligent editor, legal instrcutions show in blue, legal registers in red, comments in green
default name for program until saved
Line: 6 Column: 1 Show Line Numbers
Mars Messages Run I/O
Clear
Registers Coproc 1 Coproc 0
Name Number 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
$s0 16 0x00000000
$s1 17 0x00000000
$s2 18 0x00000000
$s3 19 0x00000000
$s4 20 0x00000000
$s5 21 0x00000000
$s6 22 0x00000000
$s7 23 0x00000000
$t8 24 0x00000000
$t9 25 0x00000000
$k0 26 0x00000000
$k1 27 0x00000000
$gp 28 0x10008000
$sp 29 0x7fffeffc
$fp 30 0x00000000
$ra 31 0x00000000
pc 0x00400000
hi 0x00000000
lo 0x00000000
Start
mips1.asm* - MARS 4.1
Untitled - Paint
Apple Software Update
11:34

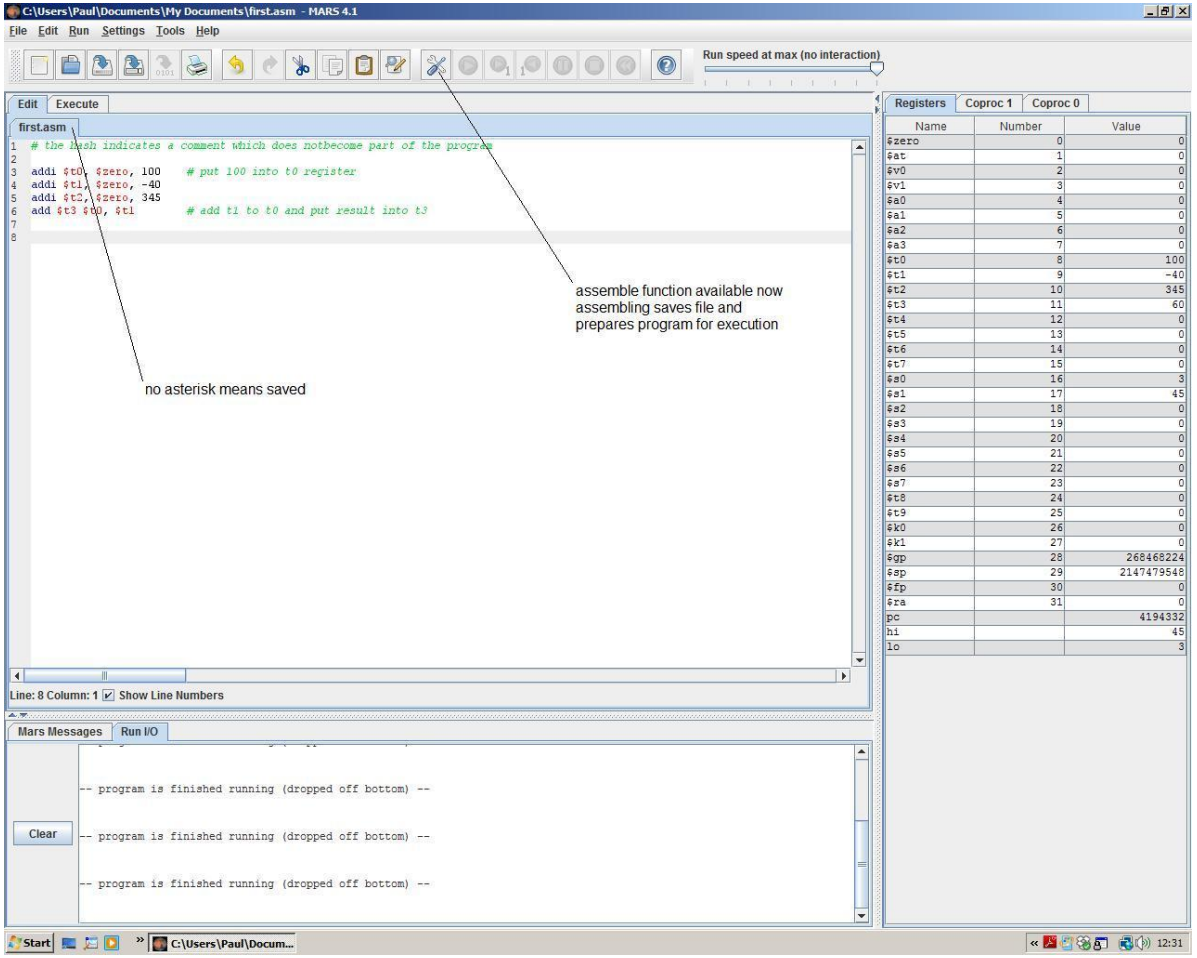
Save file


mips1.asm* - MARS 4.1
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
mips1.asm*
1 # the hash indicates a comment which does notbecome part of the program
2 addi $t0, $zero, 100
3 addi $t1, $zero, -40
4 addi $t2, $zero, 345
5 add $t3 $t0, $t1
6
save menu
Save As
Save In: My Documents
Device Documents
File Name: first.asm
Files of Type: All Files
Save
Cancel
Line: 6 Column: 1 Show Line Numbers
Mars Messages Run I/O
Clear
Registers Coproc 1 Coproc 0
Name Number 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
$s0 16 0x00000000
$s1 17 0x00000000
$s2 18 0x00000000
$s3 19 0x00000000
$s4 20 0x00000000
$s5 21 0x00000000
$s6 22 0x00000000
$s7 23 0x00000000
$t8 24 0x00000000
$t9 25 0x00000000
$k0 26 0x00000000
$k1 27 0x00000000
$gp 28 0x10008000
$sp 29 0x7fffeffc
$fp 30 0x00000000
$ra 31 0x00000000
pc 0x00400000
hi 0x00000000
lo 0x00000000
Start
mips1.asm* - MARS 4.1
mips2 - Paint
11:35

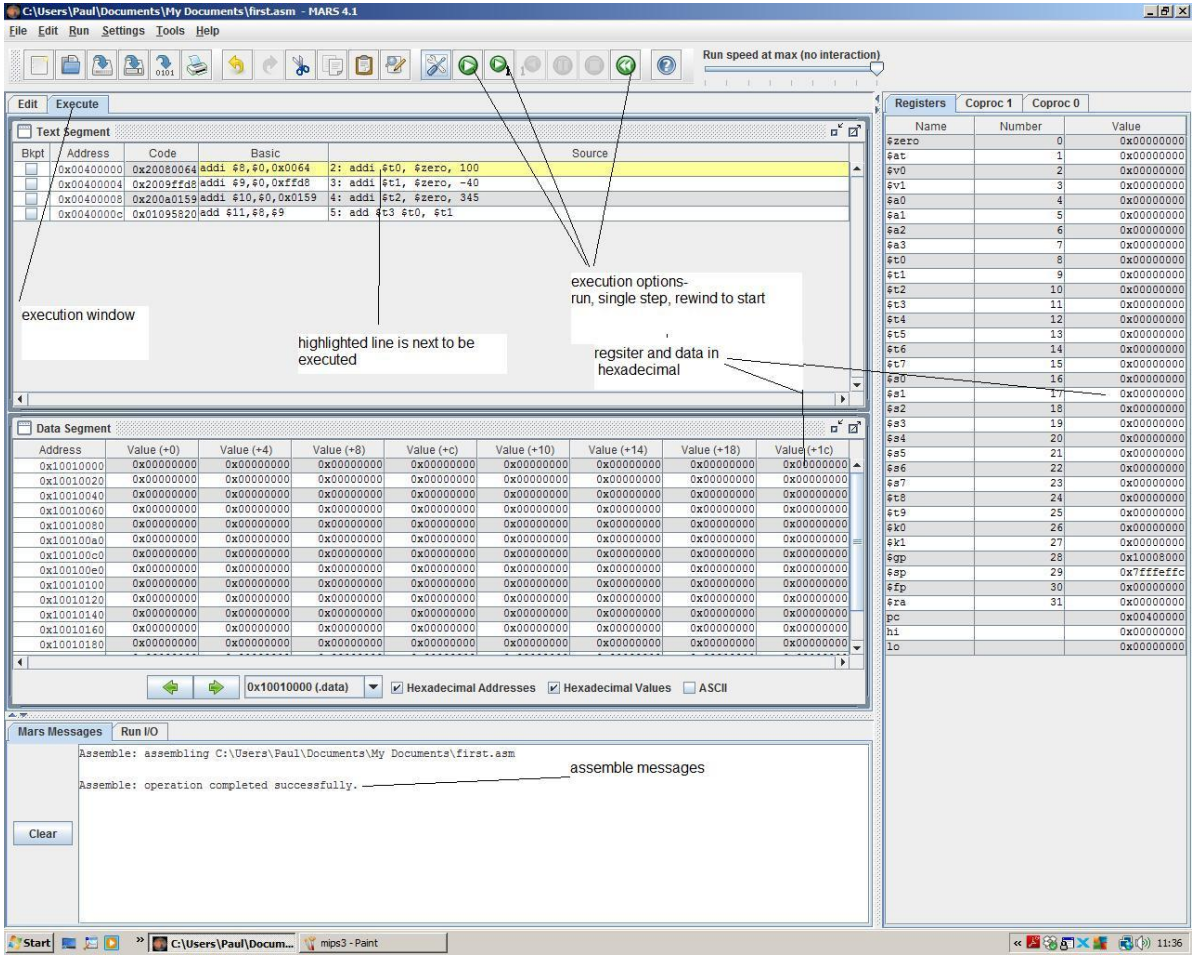
Saving

- Saving allows assembly and execution to take place
- Assembling – checks that program consists of legal operations
- Assembling – does not check that your program does anything sensible

Once saved


C:\Users\Paul\Documents\My Documents\first.asm - MARS 4.1
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
first.asm
1 # the hash indicates a comment which does notbecome part of the program
2
3 addi $t0, $zero, 100 # put 100 into t0 register
4 addi $t1, $zero, -40
5 addi $t2, $zero, 345
6 add $t3 $t0, $t1 # add t1 to t0 and put result into t3
7
8
assemble function available now
assembling saves file and
prepares program for execution
no asterisk means saved
Line: 8 Column: 1 Show Line Numbers
Mars Messages Run I/O
-- program is finished running (dropped off bottom) --
-- program is finished running (dropped off bottom) --
-- program is finished running (dropped off bottom) --
Clear
Registers Coproc 1 Coproc 0
Name Number Value
$zero 0 0
$at 1 0
$v0 2 0
$v1 3 0
$a0 4 0
$a1 5 0
$a2 6 0
$a3 7 0
$t0 8 100
$t1 9 -40
$t2 10 345
$t3 11 60
$t4 12 0
$t5 13 0
$t6 14 0
$t7 15 0
$s0 16 3
$s1 17 45
$s2 18 0
$s3 19 0
$s4 20 0
$s5 21 0
$s6 22 0
$s7 23 0
$t8 24 0
$t9 25 0
$k0 26 0
$k1 27 0
$gp 28 268468224
$sp 29 2147479548
$fp 30 0
$ra 31 0
pc 4194332
hi 45
lo 3
Start
C:\Users\Paul\Docum...
12:31

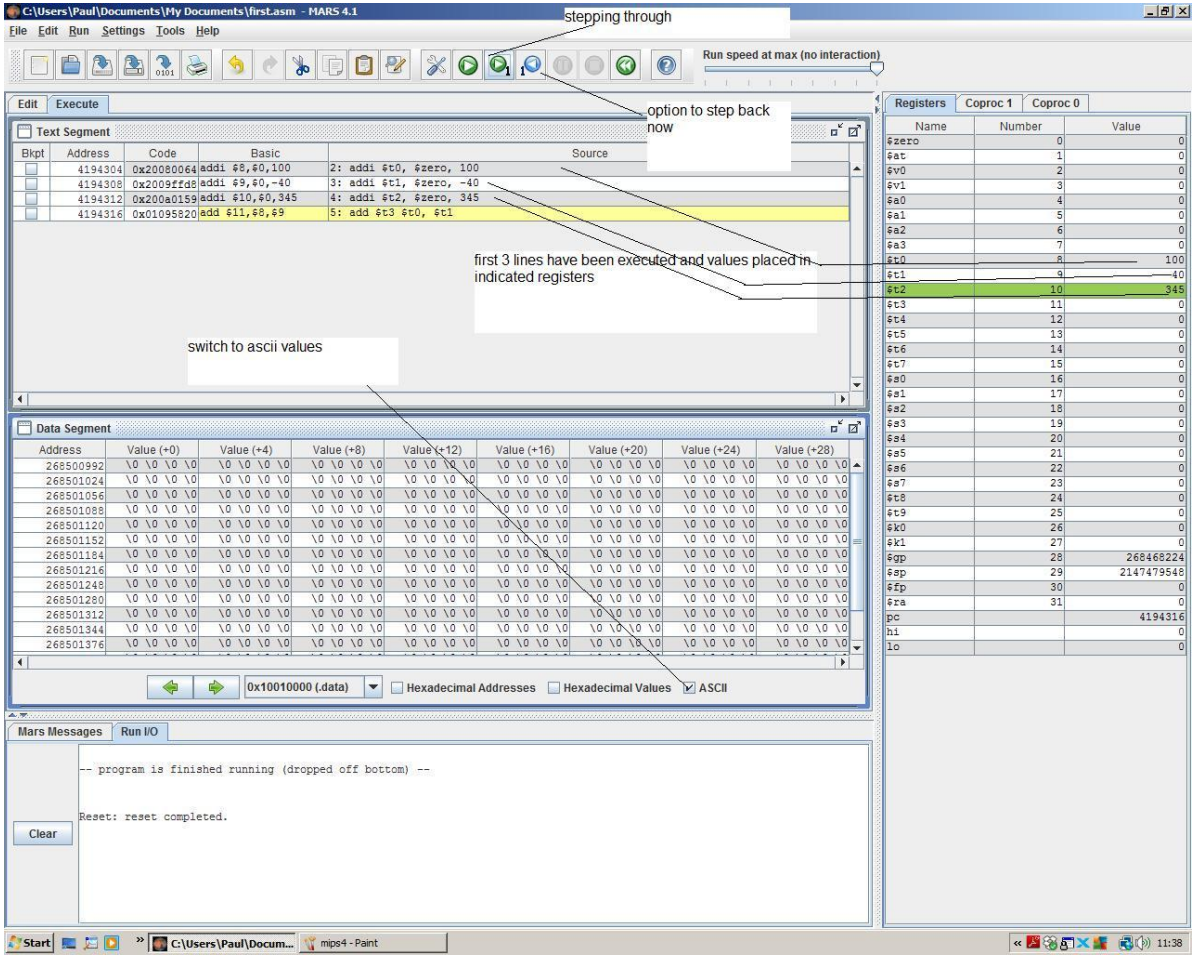
Execution screen



execution

- The execution screen allows for different modes
  - Run through – speed can be altered
  - Step through – line by line
  - Rewind to start
- Once executing other modes appear
  - Pause
  - Step back one
  - stop

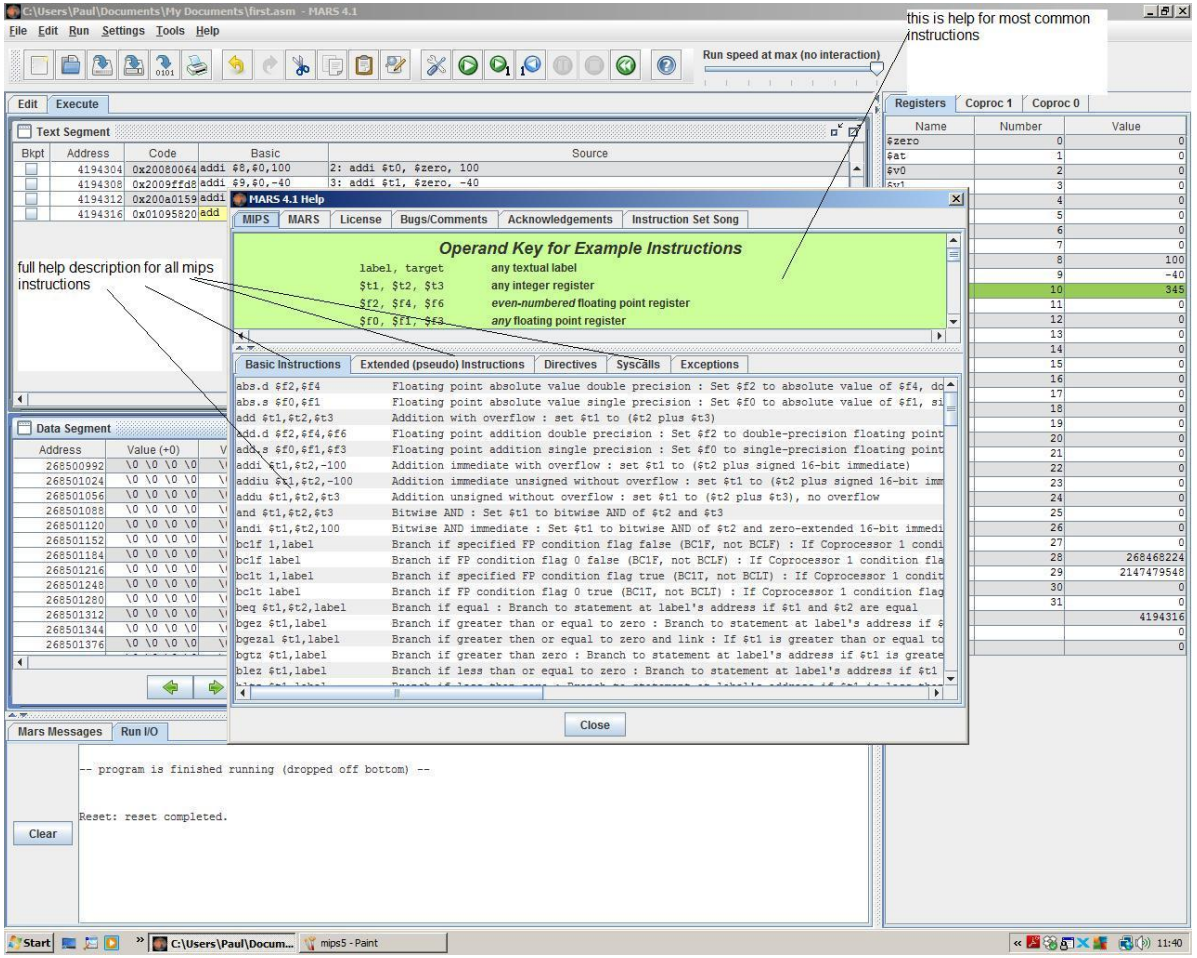
Executing program



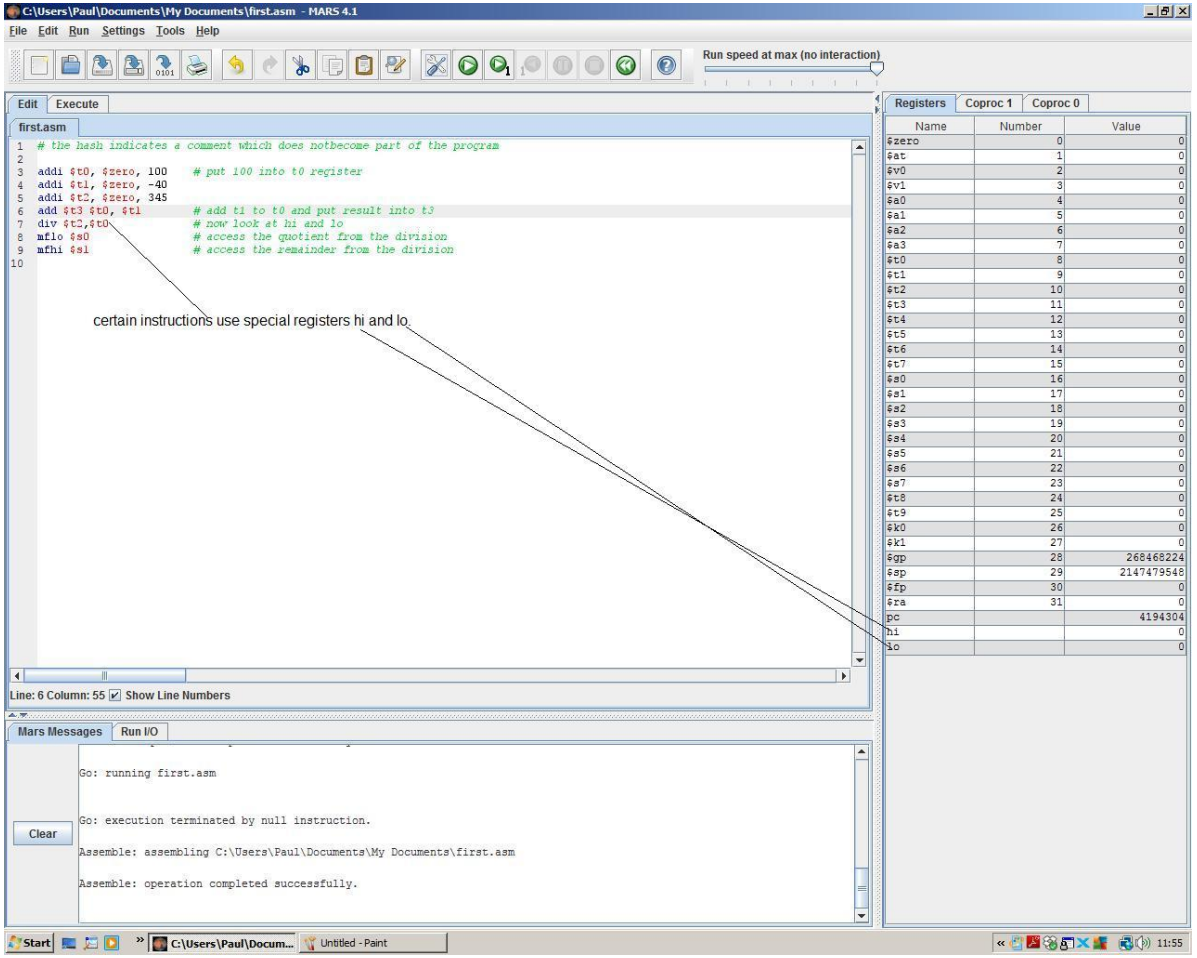
stuff

- Values appear in registers
- add, sub, mul, div – basic arithmetic ops
- mul, div – makes use of hi and lo regs
- Many other operations - look at help menu

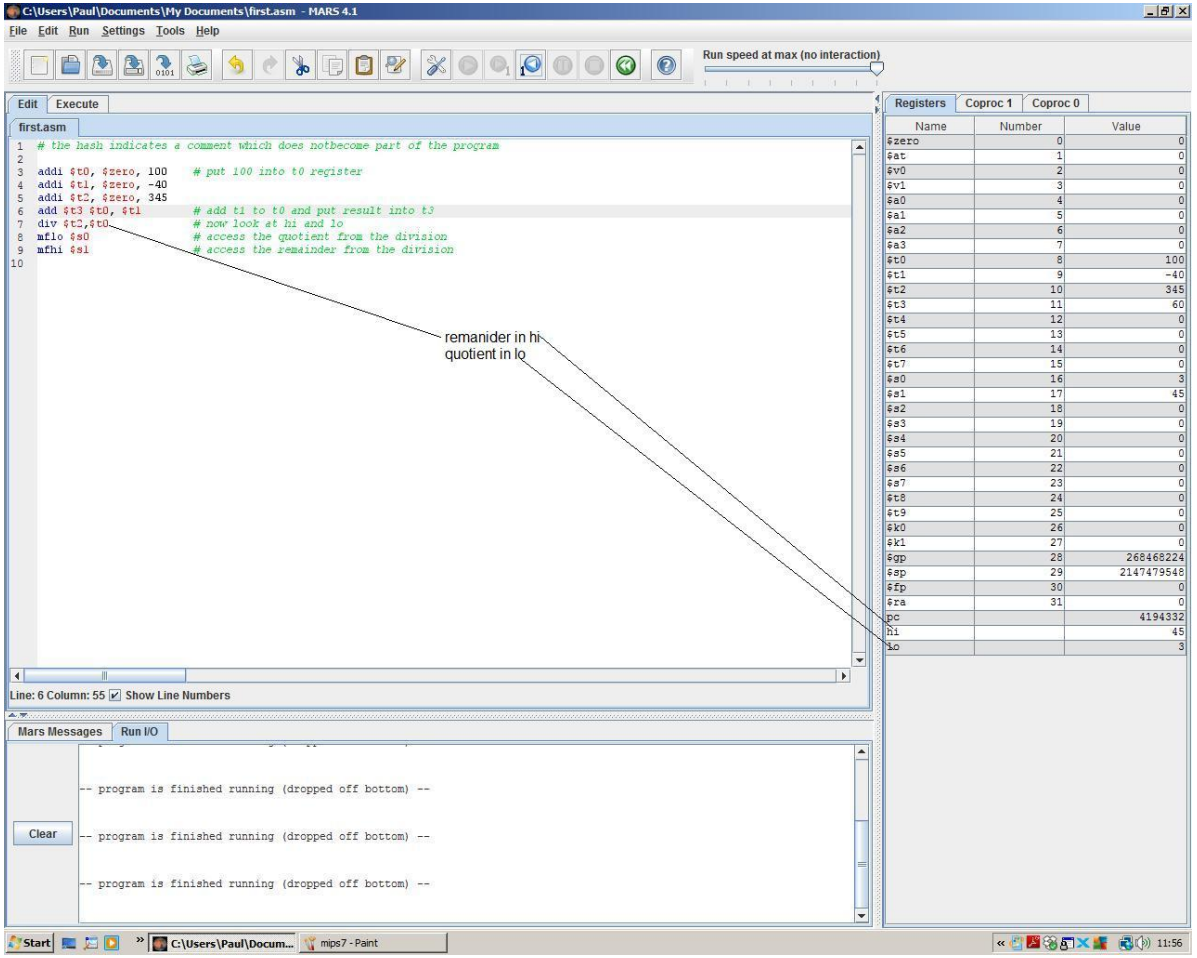
help


this is help for most common instructions
full help description for all mips instructions
MARS 4.1 Help
Operand Key for Example Instructions
Close

div


C:\Users\Paul\Documents\My Documents\first.asm - MARS 4.1
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
first.asm
1 # the hash indicates a comment which does notbecome part of the program
2
3 addi $t0, $zero, 100 # put 100 into t0 register
4 addi $t1, $zero, -40
5 addi $t2, $zero, 345
6 add $t3 $t0, $t1 # add t1 to t0 and put result into t3
7 div $t2,$t0 # now look at hi and lo
8 mflo $s0 # access the quotient from the division
9 mfhi $s1 # access the remainder from the division
10
certain instructions use special registers hi and lo
Line: 6 Column: 55 Show Line Numbers
Registers Coproc 1 Coproc 0
Name Number Value
$zero 0 0
$at 1 0
$v0 2 0
$v1 3 0
$a0 4 0
$a1 5 0
$a2 6 0
$a3 7 0
$t0 8 0
$t1 9 0
$t2 10 0
$t3 11 0
$t4 12 0
$t5 13 0
$t6 14 0
$t7 15 0
$s0 16 0
$s1 17 0
$s2 18 0
$s3 19 0
$s4 20 0
$s5 21 0
$s6 22 0
$s7 23 0
$t8 24 0
$t9 25 0
$k0 26 0
$k1 27 0
$gp 28 268468224
$sp 29 2147479548
$fp 30 0
$ra 31 0
pc 4194304
hi 0
lo 0
Mars Messages Run I/O
Clear
Go: running first.asm
Go: execution terminated by null instruction.
Assemble: assembling C:\Users\Paul\Documents\My Documents\first.asm
Assemble: operation completed successfully.
Start
C:\Users\Paul\Docum...
Untitled - Paint
11:55

hi and lo


C:\Users\Paul\Documents\My Documents\first.asm - MARS 4.1
File Edit Run Settings Tools Help
Run speed at max (no interaction)
Edit Execute
first.asm
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2
3 addi $t0, $zero, 100 # put 100 into t0 register
4 addi $t1, $zero, -40
5 addi $t2, $zero, 345
6 add $t3 $t0, $t1 # add t1 to t0 and put result into t3
7 div $t2,$t0 # now look at hi and lo
8 mflo $s0 # access the quotient from the division
9 mfhi $s1 # access the remainder from the division
10
remanider in hi
quotient in lo
Line: 6 Column: 55 Show Line Numbers
Mars Messages Run I/O
-- program is finished running (dropped off bottom) --
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-- program is finished running (dropped off bottom) --
Clear
Registers Coproc 1 Coproc 0
Name Number Value
$zero 0 0
$at 1 0
$v0 2 0
$v1 3 0
$a0 4 0
$a1 5 0
$a2 6 0
$a3 7 0
$t0 8 100
$t1 9 -40
$t2 10 345
$t3 11 60
$t4 12 0
$t5 13 0
$t6 14 0
$t7 15 0
$s0 16 3
$s1 17 45
$s2 18 0
$s3 19 0
$s4 20 0
$s5 21 0
$s6 22 0
$s7 23 0
$t8 24 0
$t9 25 0
$k0 26 0
$k1 27 0
$gp 28 268468224
$sp 29 2147479548
$fp 30 0
$ra 31 0
pc 4194332
hi 45
lo 3
Start
C:\Users\Paul\Docum...
mips7 - Paint
11:56

Some info about registers