

# Using MARS

## CSCI 260

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Since few of us have a MIPS CPU, we can not directly execute MIPS programs. However, there are a few MIPS simulators that allow us to simulate a MIPS program on most common platforms. The most common one is MARS, and directions for using MARS are below. In this course, most programs are small enough that you do not need to use MARS (it is also not recommended since most homeworks involve concepts and conventions that MARS may not support or enforce).

Caution: if you do use MARS for homeworks, make sure you use only allowed instructions. These include:

- All arithmetic and logic instructions (later including `mul/div/mflo/mflo`)
- `lw, sw, lb, sb,`
- `beq, bne, j, jal, jr, slt, slti.`
- `lui`, and with care the pseudoinstruction `li`

Note in particular that other pseudoinstructions are not allowed, nor are other forms of branch instructions. Also note that MARS will not check that you understand/follow conventions, which is a major point of the course.

### Installing MARS

MARS is installed on the department Linux lab at `/usr/local/bin/Mars4_5.jar`. You may also install it on your personal machine from <http://courses.missouristate.edu/kenvollmar/mars/download.htm>.

### Using MARS

Directions are given below for using MARS on the lab machines; you will need to figure it out for yourself if you want to use your own installation.

1. Login to one of the cslab machines. If you are using ssh, you should do `ssh -X` since MARS has a GUI, but it might be too slow to run remotely.
2. Use your favorite editor (emacs, vi/vim, etc.) to enter your MIPS program in a file whose name ends in `.asm` (more info in the next section).
3. Open a terminal and navigate to the directory containing your `.asm` file. Type:  
`java -jar /usr/local/sshankar.software/Mars4.5.jar`
4. Use the File menu to open your file and then select Run→Assemble. Then, use Run→Go to run your program. You may also use Run→Step to single-step through your program when debugging, or click on the appropriate Bkpt checkbox (left column of text segment) to set a breakpoint before running.

You should get familiar with the different panes in the MARS interface before using it.

## Creating a Source File

Your source file will contain MIPS code as well as other information needed to assemble your program. Consider the row-major example at:

<https://courses.missouristate.edu/KenVollmar/mars/tutorial.htm>

The file has two parts delimited with the `.data` and `.text` assembler directives. The data segment reserves storage space in memory for program variables, and also allows for referring to these variables by name instead of address (*e.g.*, the `data` label, not to be confused with the `.data` directive). The text segment contains the actual MIPS program. The last two lines of the text segment (`li` and `syscall`) are used to return to the operating system.

To create a source file, you probably want to edit an existing working file, modifying only the relevant sections.