# How to use the NetLogo Command Center

As a comprehensive and general-purpose computational modeling *program* (or *environment*), NetLogo's expressive power comes from its own programming *language*, also called NetLogo. The language NetLogo is a dialect of Logo which has built-in support for large numbers of *agents* like the original Logo's *turtle*. The Logo family of languages are designed to be easily learned by non-specialists, while remaining concisely expressive and powerful enough for experts.

As a user of NetLogo, you'll encounter its programming language in a few places: of course, through the Code tab of the main window where program definitions are written, but also in the configuration of interface elements like sliders and plots — and in the Command Center, located at the bottom of the main window's Interface tab. It has two parts: the *output area*, where NetLogo can respond by printing text, and the *input line*, labelled by the `observer>` prompt. You can select and copy text from the output area, or clear it, but you can't overwrite it.
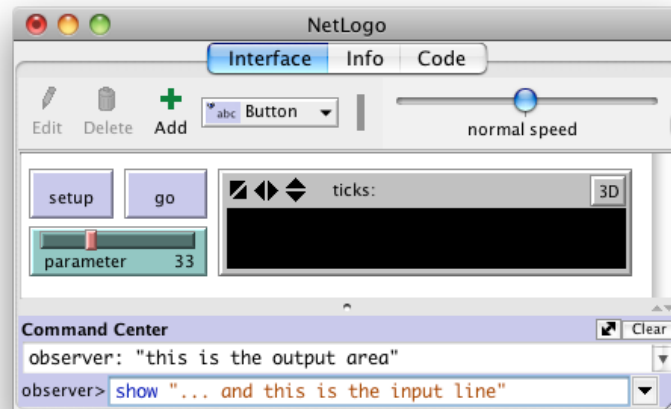
As the name implies, the Command Center is where one can issue *commands* to turtles, patches, or link agents, telling them where to go, what color to turn, etc. If you click on the input line, you should see a blinking text cursor: this is where you can write a command, to which NetLogo will respond when you press the return or enter key. Pressing the tab key will toggle between `observer`, `turtles`, `patches`, and `links` prompts: writing `set color red` at the `turtles` prompt is the same as writing `ask turtles [set color red]` at the `observer` prompt, where one may directly 'command' slider settings and many other environment features with the `set` command.

But as well as obeying commands, NetLogo can also answer certain kinds of questions by *evaluating symbolic expressions*, so you'll also want to think of the Command Center as a kind of calculator. It works as a pretty good arithmetic calculator, to begin with. Try typing the arithmetic expression `1 + 2 * 3 ^ 4` at the prompt (always typing a space between numbers and operator symbols). When you press return, you'll see your expression, and its *value* or reduction to a single number, printed in the output area. Notice that NetLogo correctly orders the evaluation.

Many other functions of numbers, like `sin` and `log`, are built into the language — as are numeric approximations of the constants `pi` and `e`. In just the same way, NetLogo can evaluate other kinds of expressions, like those involving Boolean values and operators, as well as order and equality relations between numbers (for example, `0 < 1 or 2 <= 3 and not false`); text strings (like `reverse "ABCD"`); and lists (e.g. `item 0 ["abc" "def" "ghi"]`. Agents, as well as the environment, have *variables* associated with them, so you can evaluate an expression like `[color = blue] of turtle 0`. (NetLogo colors are specified with a number between 0 and 140: you can see the Color Swatches palette from the Tools menu.) A variable can refer to a number, a string, a boolean value, a list, or even an unevaluated piece of code called a task. Environment variables are created implicitly with each sliders, switch, chooser, and or user input box added to the Interface tab. Variables can also be introduced explicitly in the Code tab by keywords like `turtles-own` or `globals`. Temporary variables are introduced in a NetLogo program using the keyword `let`. Any of these variables can be used in expressions or have their values changed with the `set` command. For example, try the command line: `let x 0  set x x + 1  show x`.

The Command Center can be very helpful, both for interacting with a finished NetLogo model, and for developing new models. In addition to the built-in *primitive* keywords of the language, you may define your own *procedures* in the Code tab, which may be sequences of commands, or *reporters*: symbolic expression which can be evaluated. Any of these, once defined, can be used from the Command Center. Every well-formed sentence in the NetLogo language is a sequence of commands, each of which changes a variable or otherwise effects the environment. The input line, when given a reporter like `red + 2` , assumes you meant the command `show red + 2`, and inserts the `show` for you. When NetLogo recognizes a primitive, it colors the word blue. Numbers and strings get colored brown. Each output line is printed at the bottom of the output area. To see more than one line of output at a time, click on the divider above the Command Center area and drag up. If you want to re-use a line which you've already entered, you can use the up and down arrow keys to scroll back through your "command history".

You can learn more about the NetLogo language, and the Command Center, in the second Tutorial of the NetLogo User Manual (available from the Help menu). Every primitive command and reporter is listed with an explanatory definition in the the Dictionary section of the Manual. Highlighting a keyword and pressing the F1 function key will bring up a Dictionary definition. If NetLogo doesn't understand something you write, it won't hurt anything. It just prints an error message and highlights the confusing text.

Have fun exploring the NetLogo language!