

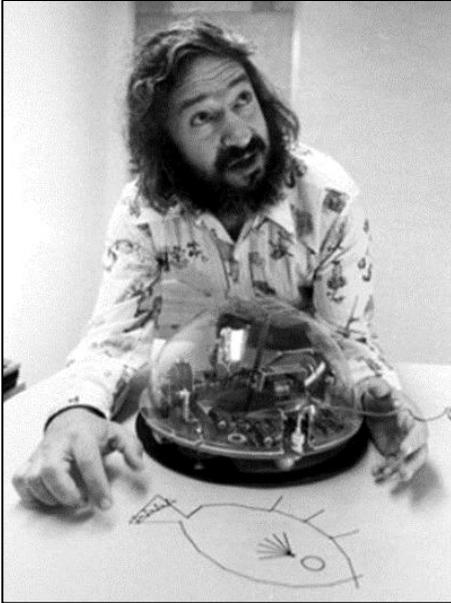
Chapter 1

Digital Designs and Artistic Patterns: Introduction to Turtle Graphics

Glen Bull and Joe Garofalo

Introduction

Robot Turtles



*Seymore Papert with a Logo Turtle
(credit: Cynthia Solomon, MIT)*

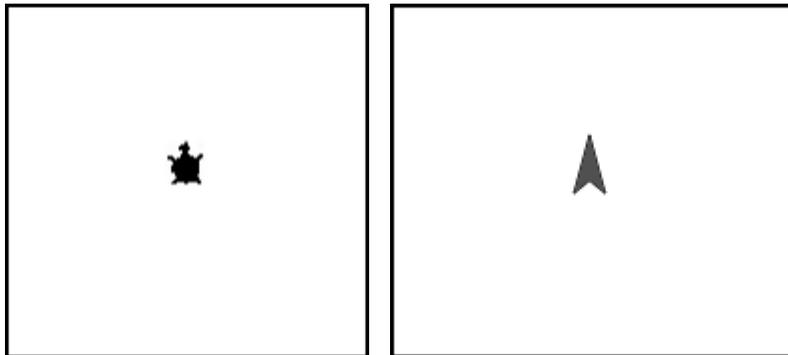
Seymour Papert developed *Logo*, the first computing language designed for children, in the MIT Artificial Intelligence Laboratory in 1966. An MIT team led by Mitch Resnick subsequently developed a web-based successor to *Logo* named *Scratch*. With support from the MIT team, a version of *Scratch* named *Snap!* was designed for adults by a team at the University of California at Berkeley led by Brian Harvey working in collaboration with developer Jens Moenig.

Papert's vision of computers in schools embodied the idea that *the act of programming a computer can facilitate the process of learning subjects such as mathematics and language arts*. Papert believed that children can learn by teaching the computer through programming.

The robot turtle is the best-known feature of *Logo*. Papert described the *Logo* turtle as a “computational object-to-think-with.” The early *Logo* turtles consisted of Plexiglas hemispheres that could be programmed to move about the floor. Later turtles included a pen that could be lowered to draw figures on rolls of paper.

Screen Turtles

The advent of video displays made it possible to create screen turtles in *Logo*. These turtles sometimes looked like an actual turtle (viewed from above) but often were represented by a triangle on the screen.



Examples of Screen Turtles

Securing a *Snap!* Account

A free account for *Snap!* can be obtained at the following web address:

<https://snap.berkeley.edu/snap>

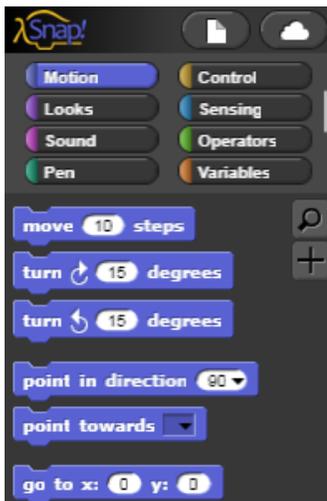
Secure a *Snap!* account before continuing. Try each command as you read about it. For a comprehensive guide to *Snap!* commands, please refer to the [online manual](#) at the following web address:

<https://snap.berkeley.edu/snap/help/SnapManual.pdf>

Turtle Commands

The Command Palette

The types of commands available in *Snap!* are displayed in a *Command Palette* at the top of the left-hand side of the screen. For example, the *Motion* commands are currently highlighted in the palette below. Other categories of commands include *Looks*, *Sound*, *Pen*, *Control*, *Sensing*, *Operators*, and *Variables*. Note that each category is a different color. For example, *Motion* commands are purple.



Click on each of the categories in the *Command Palette* to get a sense of the types of commands that are found under each category. Use commands by dragging them into the script space to the right of the *Command Palette*.

The Move Command

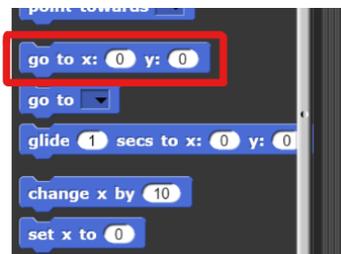
Drag the command **Move 10 Steps** the script space. Then click the code block. The turtle should move 10 steps forward (in the direction that the turtle is pointed) when this code block is clicked.



Try other values such as **100 Steps**. In this case, only one turtle is on the screen. However, it is possible to create multiple turtles. The term *Sprite* is also used as another name for a screen turtle.

Resetting the Turtle

If the turtle went off the screen in the last section, reset its position by clicking on the **Go To X_Y_** code block. You will use this frequently and may want to drag the command block into a corner of the command space for easy access.



The Turn Command

Then try the **Turn** command. Drag the **Turn Right 15 Degrees** code block into the script space. Enter the setting of 90 degrees into the code block.

Turn Right 90 Degrees

Click on the code block to execute the command. Watch the turtle rotate 90 degrees when the command is executed.



This example shows the *Turn Right* command. A *Turn Left* command is also available.

Combining Code Blocks

Combine the **Move** and **Turn** commands can by snapping the two code blocks together. Click any part of the combined code block to cause both commands to be executed in the order that they are listed (even though the order of the execution may not be obvious at this stage).



The name *Snap!* refers to the ability to snap code blocks together in the same manner as LEGO bricks. Practice snapping and unsnapping blocks together to become familiar with the mechanics of *Snap!* command blocks.

Pen Commands

The original floor turtle had a pen in its belly that could be raised and lowered. In a similar manner, **Pen Up** and **Pen Down** commands (found in the green *Pen* palette) enable the screen turtle to draw on the screen. Drag the **Pen Down** command into the script space. Click the **Pen Down** code block, and then click the **Move/Turn** block four times



Clearing the Command Space

Click the **Clear** command to erase any lines you have made. You will use **Clear** frequently and may want to drag the command block into a corner of the command space for easy access.

