Programming Exercise:
Voyager Temperature Sensor Controlled Scratch Teapot

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Introduction

Here is a project that will challenge your students' skill in interfacing PocketLab Voyager with Scratch Programming. With reference to Figure 1, the challenge is to program the five bubbles to start bubbling upwards in the teapot—one bubble at 90°C, two at 92°C, three at 94°C, four at 96°C, and five bubbles at 98°C. When the temperature of the teapot has reached 100°C, the phrase **Full Boil** should appear. See the movie accompany this lesson for clarification of the intended result. When the burner under the teapot is turned off and cooling begins, bubbling should go away in reverse order from which bubbling began, at the above mentioned temperatures.

Figure 1

Students can program/debug their project using temperatures of 25°C, 26°C, 27°C, 28°C, and 29°C rather than those for real boiling water. In this case, the boiling point can be taken as 30°C. Simply by holding the thermister end of the Temperature Probe between the student' thumb and forefinger, the required programming can be accomplished without the use of boiling water and concerns for scalding. When they get their programs completely debugged, they can make minor adjustments to the program for real boiling water, if desired. *To avoid scalding burns, students should be cautioned to use extreme care when using boiling water.* A *pfd* file of the teapot and flame accompanies this lesson. The image in this file can be captured and imported as a Scratch sprite for use in this lesson.

The Author's Approach to this Scratch Program

Figure 2 provides a snapshot of the author's approach to the Scratch Program of this lesson. The five ball sprites, representing the bubbles, were obtained by using the ball in the Scratch Sprite Library. The Scratch Code for one of the balls is shown to the right. The value of a variable called *currentTemp* is captured and processed within a *forever* loop. The code for the other four balls (bubbles) is similar but does not capture the temperature probe's temperature. Instead, these other four balls make use of the variable *currentTemp*, which was declared available *for all sprites*. The value of *currentTemp* appears in the bottom right corner of the Scratch canvas.
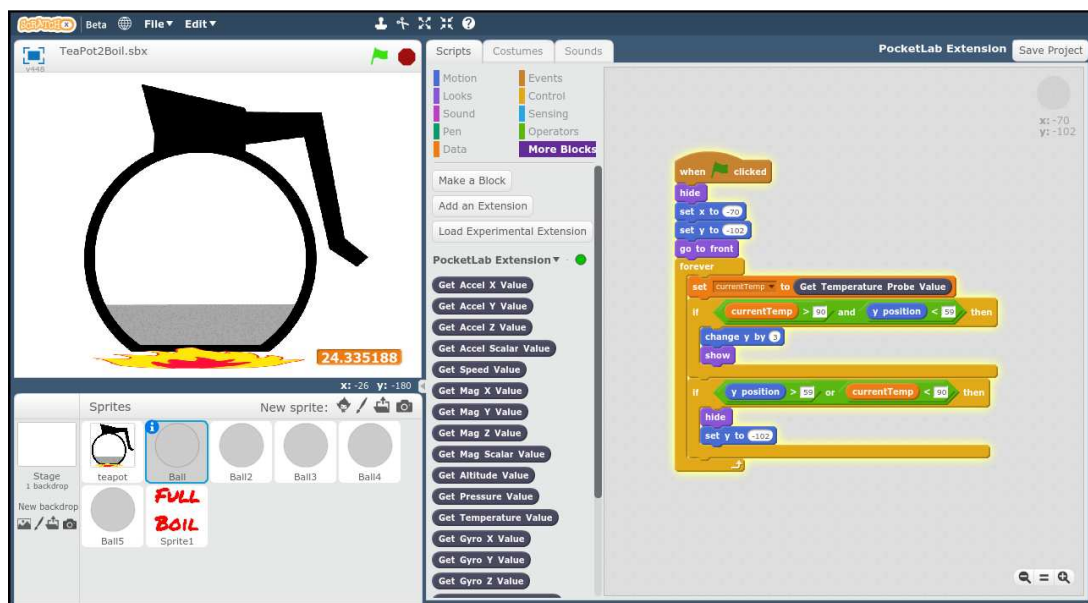

Figure 2