Analysis of the Infrared Line Sensor Data

- To see a change in the data coming from the **infrared line sensor**, place the robot over the **grayscale** test strips below so that the sensor's emitter/receiver LEDs are about 1-5mm above the **black strip**. Keeping the sensor's height above the strip constant, monitor the sensor's output. Its value should be *HIGH*, because the black color will absorb most of the IR light. (A large sensor reading indicates that very little infrared light is received by the sensor.) When the sensor is placed over the lighter-colored gray strips, the sensor values should decrease. (If the surface has a glossy or reflective surface, this may affect the results.)

Infrared Line Sensor Grayscale Test Strip:

In Figure 21.15 on page 791, my IR line sensor data is shown by the **red** data series. Can you *imagine* what might have created that graph? Here's what *actually* happened: I started with the sensor over the white test strip above and I gradually moved it upward, detecting the gray and black strips, and ending once again on the white one.

Try this (Effect of color): How does color affect the line sensor's readings? Place the sensor over each of the **color** strips below and observe the sensor's readings. (If you do not have a color copy of this textbook, you can download this page from my website at www.pcrduino.com/downloads/ and print it yourself.) Be sure to keep a constant sensor height! (If you are using a black and white version of this text, you can use a colored paper (red, yellow, green, blue, violet, e.g.), tabletops of different colors, or even a Rubik's cube.) You may be surprised to learn that the color hardly affects the line sensor's readings. (If the surface has a glossy or reflective surface, this may affect the results.)

Infrared Line Sensor Color Test Strip:

Try this (Effect of sensor height): Place the line sensor over a piece of white paper and slowly elevate the robot so that the distance between the sensor's IR LED emitters and the paper increases. What happens to the sensor's readings? Thanks to the new geometry, you should find that the sensor values *increase* because less and less of the emitted IR light is scattered back into the IR receiver. (Remember, a large sensor reading indicates that very little of the scattered infrared light is received.) In this way, the line sensor can act as a **short-range proximity detector**. Unlike the Sharp 2Y0A21 IR sensor, which can measure the *distance* to an object up to 80cm away, the line sensor can only detect the *presence* of an object, and only if it is very nearby. (Of course, a black object may absorb all of the infrared light and may remain invisible to this type of detection.) In this way, the IR line sensor can serve as a handy way to tell if one of your robot's wheels is near the edge of a table, as demonstrated in the next "Try this" experiment.