

Electronic Chameleon

Guided Project Instructions

nPoints
BY NTS PRESS

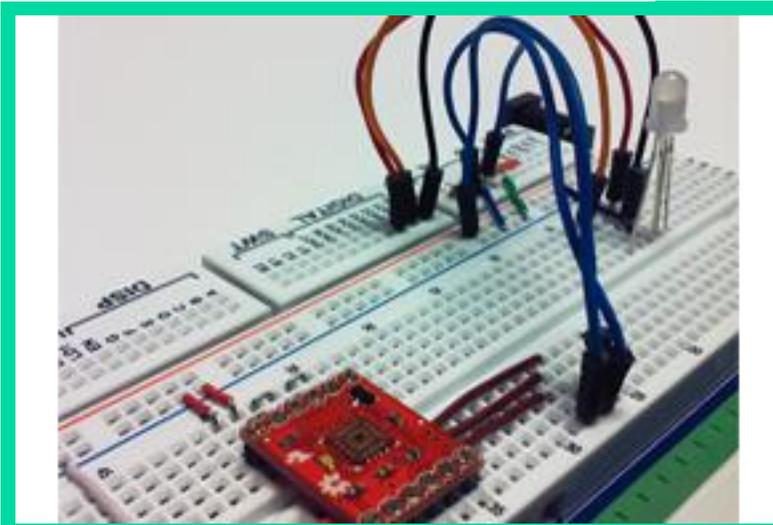


Figure 1 Example Electronic Chameleon

Related Core Concepts:

Build a Color Swatch

Lumens

Learn It!

The idea of being able to replicate a color based off of a color you have seen can be used in image reconstruction and fault detection systems. There are a multitude of products out now that combine a color sensor with a series of tricolored LEDs in order to recreate colors that are seen. The idea behind this application is an understanding of the ratio of light intensities seen by the color sensor. If this information can be correlated to the system being used to control

tricolored LEDs then the color can be replicated.

This module will aid you in the steps that should be taken in order to successfully read a color and recreate it using LEDs. The most basic approach will be detecting the highest light intensity and assuming that is the most prevalent color. This idea can be expanded to a higher level of control that allows for more fine tuned transitions between colors.

“There are a multitude of products out now that combine a color sensor with a series of tricolored LEDs in order to recreate colors that are seen.”

Build It!

Task 1: Connect a color sensor to your National Instruments Hardware using the wiring scheme discussed in the “Build a Color Swatch” core concept. You may use any 3 analog inputs at your disposal.

Task 2: Wire a tricolor LED to three digital lines of your National Instruments hardware; the three lines will correspond to the red green and blue colors of the LED, this can be seen in Figure 2.

Note: For this activity we can limit the resolution of colors we can recreate. With more control of the LED we will be able to produce more colors and shades but that would also increase the difficulty of our analysis. For simplicity we will only recreate the primary colors (Red, Green, and Blue) and the secondary colors (Magenta, Yellow and Cyan). Also keep in mind the configuration of your LED, you will need to output the proper signal in order to get the LED to come on. In common Anode, you output a LOW to let turn an LED on, in common cathode you output a HIGH.

Task 3: Create code that reads the incoming data from the color sensor and determines which color is returning the highest value. Your code should be able to determine if two colors are noticeably higher in value than the third since this is an indication of a clear mix of two primary colors to make one of the secondary colors.

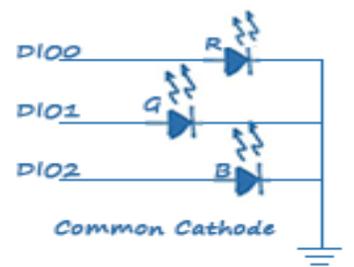
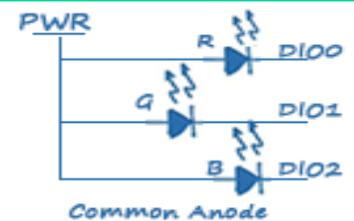


Figure 2 Tri-colored LED wired in common Anode and Cathode

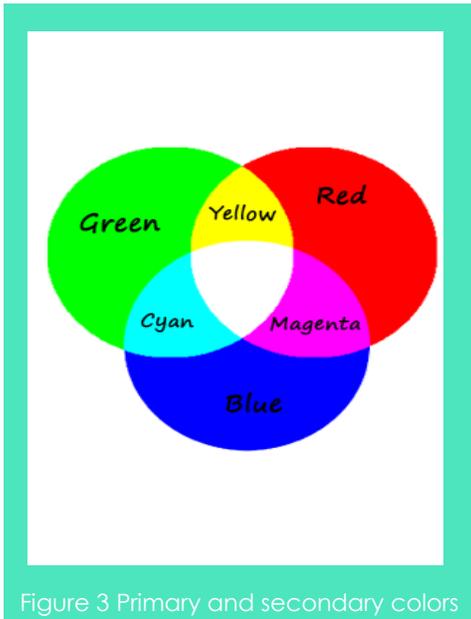


Figure 3 Primary and secondary colors

Task 4: Add a portion of code that will toggle digital lines high depending on which values are high in your data set. Include a string output that gives the name of the color being displayed.

Guiding Questions:

- There are multiple ways to change the intensity of a light source, discuss at least two methods and their pros and cons.
- Explain how you would control how quickly your program responds. If it was necessary to transition to multiple different colors can the update rate of the output tricolor LED be modified?

Task 5: Set up a test sequence with another tricolor LED and confirm you can replicate the color shown. Create code in LabVIEW that cycles through the primary and secondary colors of the LED and then checks to see if the proper color is reproduced.

Note: The color sensor is being hit by more than just the light that reflects off of objects you place in front of it. Try to limit the amount of light coming into contact with the sensor from things such as office lights and computer monitors by creating a guard out of paper to place around it.

Expand it!

- PWM can be used to increase the amount of color that can be output by the tricolor LED. The color sensor reading would then have to be modified to be capable of identifying those colors. If hardware allows, change the tricolor LED control to one that involves PWM and use ratios of Red green and blue to one another as an indication of the color being detected.

Research It!

Multicolored LEDs

<http://www.divilabs.com/2013/04/multi-color-leds-beginner-level-guide.html>

How Digital Cameras Work

<http://electronics.howstuffworks.com/cameras-photography/digital/digital-camera4.htm>

