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Create a dimmable lamp with QuadBot

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Difficulty rating: 3

Fun Rating: 3

Time taken: 25 mins

Supporting activity - QuadBot Colour

Dimmer Control

Master analog input and LED control to create a dimmable lamp with QuadBot.



There’s a handy dial on QuadBot that we can program to control any of features. In this activity you’ll program the dial to control the brightness of LEDs. First let’s look at analog input.

**Analog Input**

QuadBot can sense analog voltages between 0 volts and 5 volts using its onboard microcontroller. Coincidentally, the dial onboard QuadBot outputs a voltage between 0 volts and 5 volts depending on the position it is in. That means we can use the dial to send different voltages to QuadBot’s microcontroller, allowing us to input a varying value.



The microcontroller reads this voltage as a number between 0 and 1023. 0 volts means 0, and 5 volts means 1023. This might seem a bit strange, and it’s down to how microcontrollers store the voltage information.

Why does a microcontroller read an analog voltage as a number between 0 and 1023? Read our Input and Output tutorial.

Now we know that let’s look at how to actually use this…

**Reading the dial**

We can use the readDial() function from the QuadBot.h library to return the current value of the dial, like this…

#include <QuadBot.h> *//Include the QuadBot Library*

int dial; *//Declare a variable to store the value of the dial*

void setup(){

QuadBot.begin() *//Initialize QuadBot*

}

void loop(){

dial = QuadBot.readDial() /*/Read the value of the dial and store it in “dial”*

}

The readDial() function returns the value from the dial (between 0 and 1023) We can use this variable in our code to make decisions.

To use this value to control the LED brightness, we’ll need to give the value into the QuadBot.setLEDs(R,G,B) function.

There’s a problem though. We know that readDial() returns a value between 0 and 1023, however we know that setLEDs() expects values for R,G and B between 0 and 255! To solve this problem we can use the map() function...

**The Map Function**

The Map function is one of those sort of functions you just can’t live without. It’s built into the Arduino environment and you can read about it in detail Arduino’s page [here](https://www.arduino.cc/en/reference/map). The map function takes one number from one range, and scales it into another number from another range.

To understand this, let’s take an example. Say I’ve got a grade of 0.73 out of a range between 0 and 1. How can I express that as a grade between 0 and 100. This is simple, we can just multiple the original grade by 100. So 0.73 between 0 and 1 is equivalent to 73 between 0 and 100. That’s a very simple mapping.

But how can we do this for more complicated mappings?

* Map 34 from range 5-85 to range 0 to 100
* Map 0.1 from range -4 to 4 to range 80 to 90
* Map 512 from range 0 to 1023 to range 0 to 255

We could go through the math, but we don’t have to, we can use the Arduino map() function. The function takes five inputs and returns the new, mapped value. We use it like this…

int newVal = map(oldVal, oldLow, oldHigh, newLow, newHigh);

So to map value “dial” in the range of 0 to 1023, to the range of 0 to 255 we do the following.

map(dial, 0, 1023, 0, 255);

**Combining what we know**

Let’s bring it all together to create our dimmer switch. Let’s read the dial, map the value, then use it to set the LEDs…

#include <QuadBot.h> *//Include the QuadBot Library*

int dial; *//Declare a variable to store the value of the dial*

int level; // Declare a variable to store the brightness value

void setup(){

QuadBot.begin() *//Initialize QuadBot*

}

void loop(){

dial = QuadBot.readDial() *//Read the value of the dial and store it in “dial”*

level = map(dial, 0,1023, 0,255); //map the value to bet

setLEDs(level, level, level); //Set the brightness according to the level

}

And hurrah! You’ve now created a white dimmer lamp with QuadBot. Try using some maths to increase/decrease the brightness values for R, G and B. That way you can create a colored dimmer lamp!

**Conclusion**

Now you’re getting somewhere! Well done, you’ve combined input with output and are ready to move on to some more advanced concepts, go you!