

5.6P Robotics Project : “Make a Colour Detector”

Aim: To design, build and test an instrument or robot that will use colour to change the output signal.

Task Information:

By using a light sensor or meter reading reflections, a number of each colour can be found (See 5.3 *Investigating Light Reflections*). You need to convert that number into a signal that the robot can output such as a sound, movement or a number display.

Equipment:

NXT or other controller

Light sensor

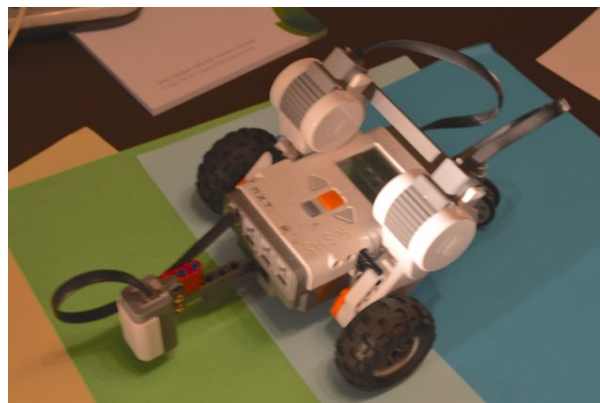
Speaker (inbuilt to NXT) or motor

Coloured paper.

Assessment

This will be based on:

- a. Success of the design based on rating by other students who act blind.
- b. Your report on how its uses light for the conversion to a signal that can be detected.



Method

1. Change the floor colour using various coloured papers.
2. Build a colour detector. You can use a hand held one like a measuring instrument or robot with light sensor attached. (You can build a robot from Construction worksheet **5.9 Simple 2 motor car**)
3. The light sensor will reflect different amounts of light (0-100), depending on the colour of the floor and its shade.
4. Decide the output signal of the Colour detector you would like to make (e.g. light to sound convertor, light to motion convertor, light to digital display.
5. Program the robot or hand held NXT and light sensor using one of the following:
 - a. Using Sound – you can convert the light numbers to sound frequencies in the NXT Program (see Programming example 1).
 - b. Using Motion you can convert the light numbers to power levels of the motor/s attached to the NXT (see Programming example 2).
 - c. Using Digital display- you can put the readings on your NXT’s display. (see Programming example 3)
6. Run the program on the device and test the output signal.
7. Repeat for other colours and look for differences in the output signal.

Results

1. Did you notice differences in the signals.
2. What difference did colour make?
3. What difference did shade make?
4. Did you have to do any adjusting to make the signal better?

Further – Building a Useful Colour Detecting Machine

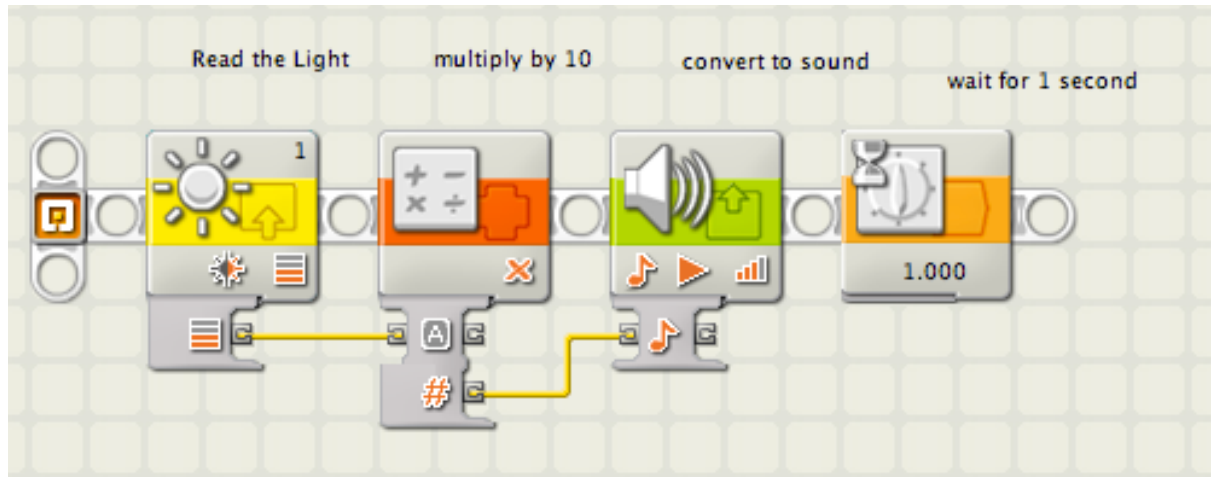
Of course, a “colour detecting” device is meant to be useful, so how can you use the colour convertor to make some thing useful or interesting?

For example; In Industry a robotic device might indicate a warning to workers by blasting out a signal or turning a dial really fast.

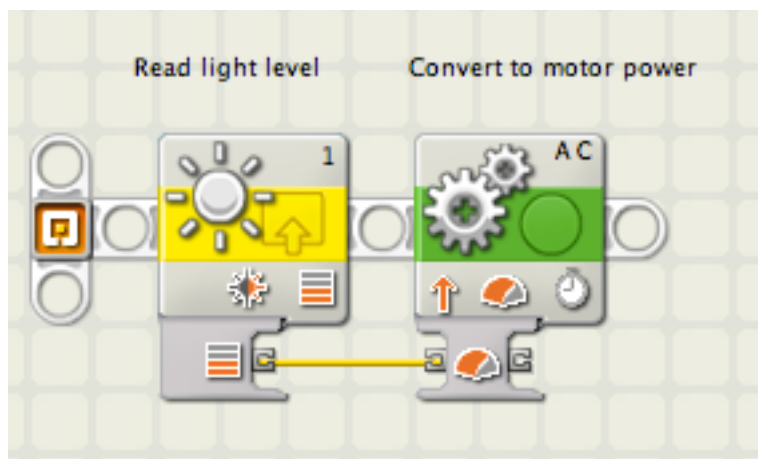
1. Explain to your teacher your ideas (you can draw, speak or show)
2. Once you have teacher’s approval, make your useful machine
3. Redesign if it doesn’t seem to work well.
4. Final test – Get others to rate your machine 1-10.

Programming NXT

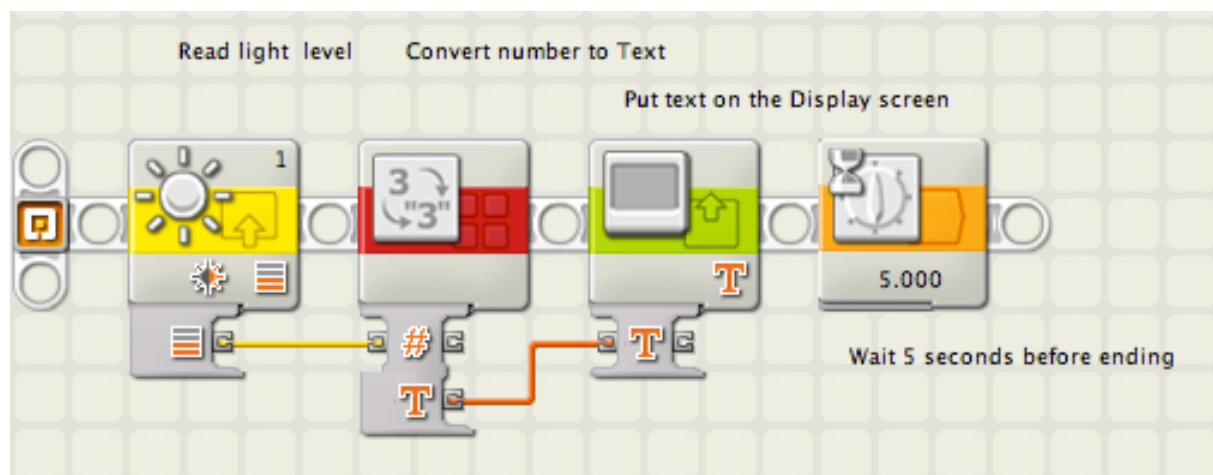
Converting Light to Sound



Converting Light to Power Level





Converting Light to Display Number



Note on Programming the NXT:

To convert signals from a light reading to sound or power outputs you need to connect **data hubs**.

Below each block is a hidden menu called a **data hub** where wires can go from one block to another to connect numbers or letters.

Just click the mouse when the cursor changes from a  to a  in the “ledge” just below the block and the hub drops down to reveal a choice of data.

For light reading use the yellow block and choose the intensity data wire.

For the output signal choose the sound (light green menu sound block), motor (green menu and move block) or display (light green menu display block). Wires can then join each blocks data hub. Number wires are yellow, Text wires are orange.

For Sound:

Because the light readings are 0-100 to be able to hear the sound, these numbers need to be converted to frequencies between 250 and 4000 Hz. This is why a “multiplication red block” needs to be used to change the scale. Students could try changing the scale factor by changing the multiplication number between 10 and 100.

For Motors:

Power levels also are between 0 and 100 so no scale factor is needed.

For Display:

Only Text can be put on the NXT display screen, so a red “number to text” block is needed, between data wires to connect the light reading number to text on the display screen.

Orange Wait for time Blocks are needed at the end for an output signal to stay on.

