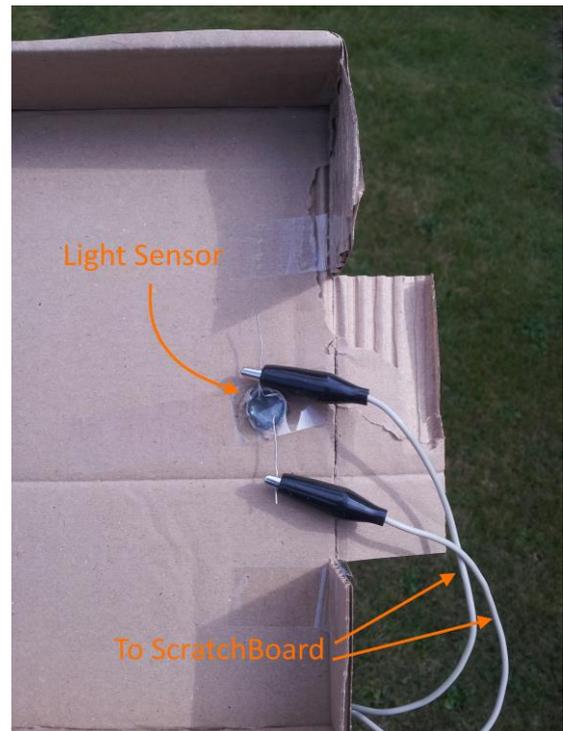


How to use a Wind Direction Sensor

Introduction:

The Wind Direction Sensor has a light sensor with two metal pins (legs) coming off it. To connect it first get your crocodile clip lead and plug it into one of the external sensor sockets of the Picoboard / Scratchboard. For this worksheet I'll assume you plugged it into socket A. Then take these crocodile clips and attach them to the two different legs of the light sensor. You have now successfully connected your sensor to the Picoboard, now let's learn how to use it.



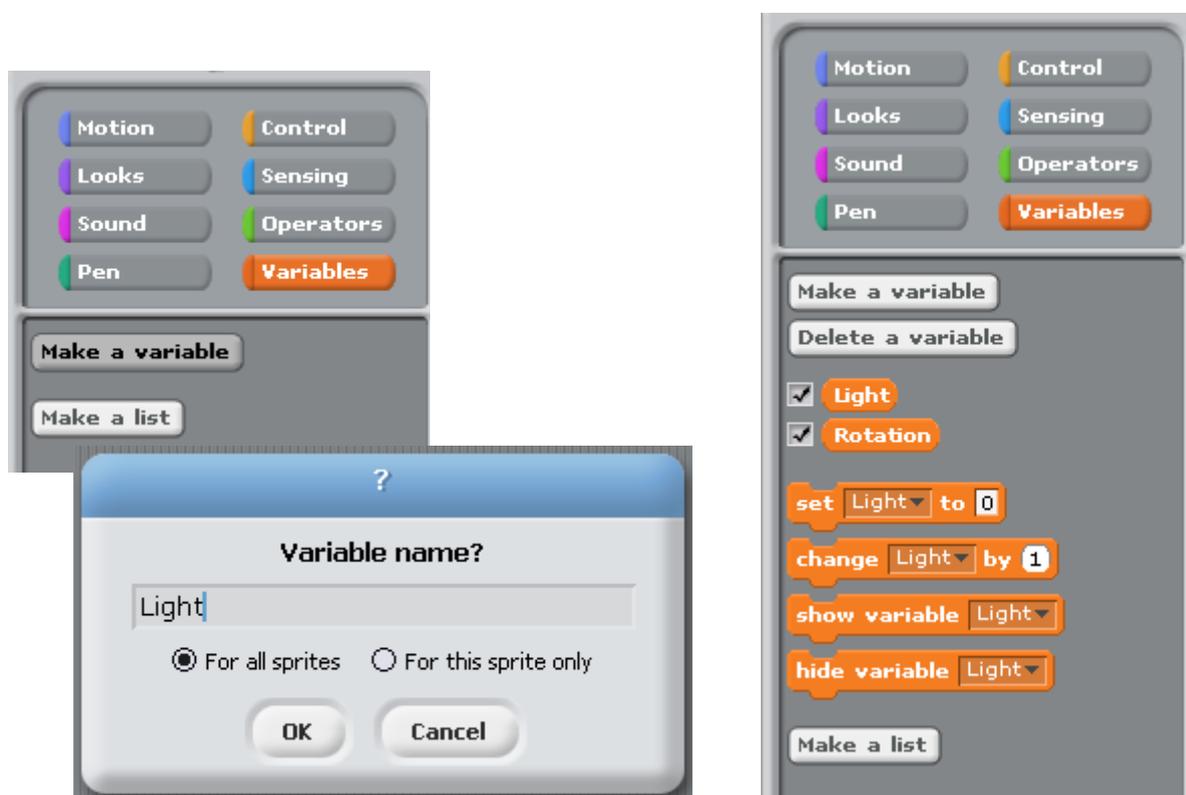
How It Works:

The light sensor attached to your Wind Sensor gives a value between 0 and 100 depending on how much light falls on it. We use our shade wheel on top of the light sensor to limit the amount of light it receives depending on what colour is on top of the light sensor. The darker the colour is above the sensor the more light we block from it and hence the lower the number it will return. Therefore black returns a low number, white a high number and a shade in between returns a number in between the numbers returned by the black and white. In this way we can detect which direction the vane is pointing it as we have a different shade for each direction: North, East, South, West.

Safety: Please note that you use these resources at your own risk. Correct use of some components requires care.

Step 1: Start Scratch and get the Picoboard working correctly with Scratch

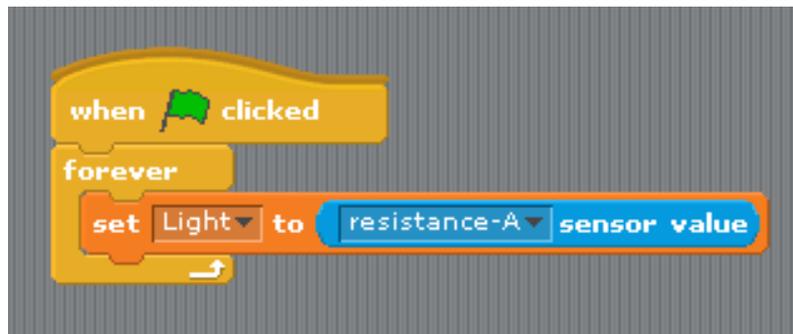
Step 2: Make two new variables, one called Light (we will set this to contain the 0-100 light sensor value mentioned above) and the other called Rotation (Which will be the clockwise rotation from North so North=0, East=90°, South=180°, West=-90°). To create a variable go to the Data tab (Variables tag in Scratch V1.4), click 'Make a Variable', type in a name and make sure 'For all sprites' is selected, then click OK (as demonstrated in pictures blow).



Step 3: Make sure that the Light and Rotation variables have ticks next to their names as in the picture to the right above.

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Step 4: Create the following block in the Stage sprite. You will find the blocks in 'Events', 'Control', 'Data' and 'More Blocks' tabs. ('Control', 'Sensing' and 'Variables' in Scratch V1.4)



Step 5: Now it is time to calibrate our sensor. Press the Green Flag to start. You should now see the live values from your sensor in the Light value box on your stage. See the image to the right below. Move your wind vane through each direction: North, East, South, West and note down the value shown in the Light value box for each direction. I for example got the values below, yours should follow the same pattern but may not be exactly the same:

North (white above sensor) - **87**

East (grey above sensor) - **65**

South (Darker grey above sensor) - **50**

West (Black above sensor) – **34**



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Step 6: As the numbers we got in step 5 are not exact and can change depending on room conditions we give each direction a range of values around the one we got in step 5 that will still count as that direction.

With the values I got we work out the value roughly half way between 87(North) and 65(East), which is about 70 so we say that if we detect a value between 100 and 70 it is North. We now calculate the value roughly half way between 65(East) and 50(South) which is about 57, so we say a value between 69 and 57 is East. Similarly a value between 56 and 41 is South and a value between 40 and 0 is West.

So the results we get are

North	70-100
East	57-69
South	41-56
West	0-40

Now as Scratch only has less than and more than blocks we have to edit these values slightly. If we want any value in 70-100 we could try the following logic block:



But you'll see that this doesn't work for the two extreme values 70 and 100 because 70 is not greater than 70 and 100 is not less than 100. So we reduce the greater than value by 1 and increase the less than value by 1 and get:



Now the block is true for any value in our 70-100 range.

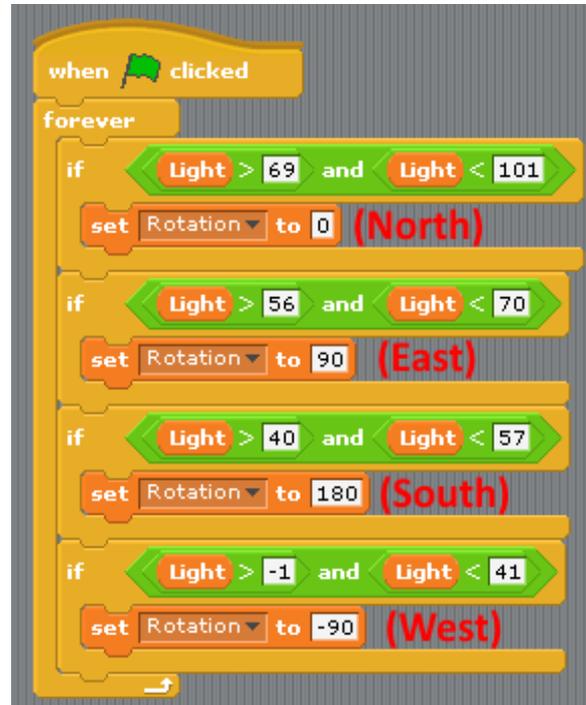
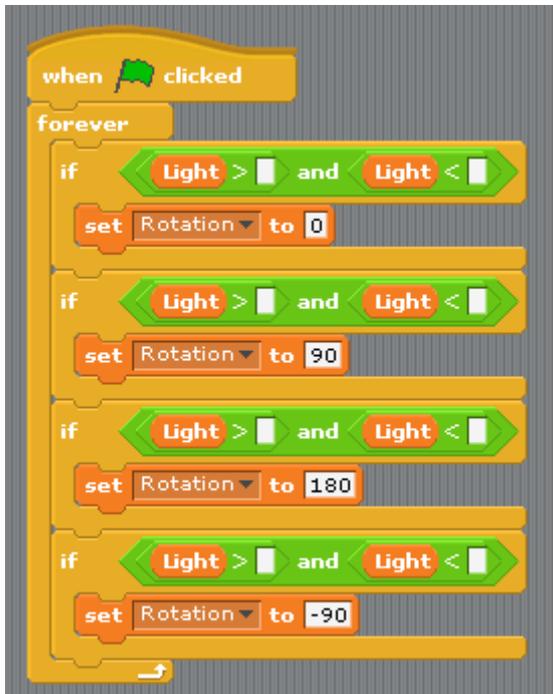
So we edit our table slightly:

North	>69 and <101
East	>56 and <70
South	>40 and <57
West	>-1 and <41

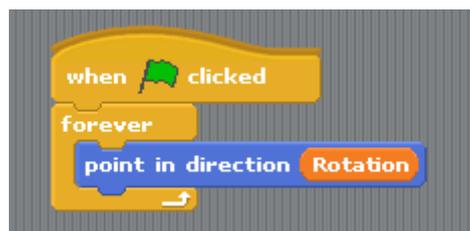
So now no matter what value our sensor returns between 0-100 the value fits into one of the directions listed in the table.

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Step 7: Next we use the values we got in step 6 to allow Scratch to detect Wind Direction. Create the blocks in the left picture below in your stage sprite. Now fill in the values that you calculated in the last part of step 6 into the empty spaces in the block we created. See the right picture for the block with my values.



Step 8: Now the variable 'Rotation' gives us our Wind direction 0=North, 90=East, 180=South, -90=West. Create a new sprite and create the following block for it:



Click on the Green Flag and now your sprite will now point in the same direction as the Wind. I'll leave you to fill in the rest of details for your new game or project using the Wind Sensor.

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