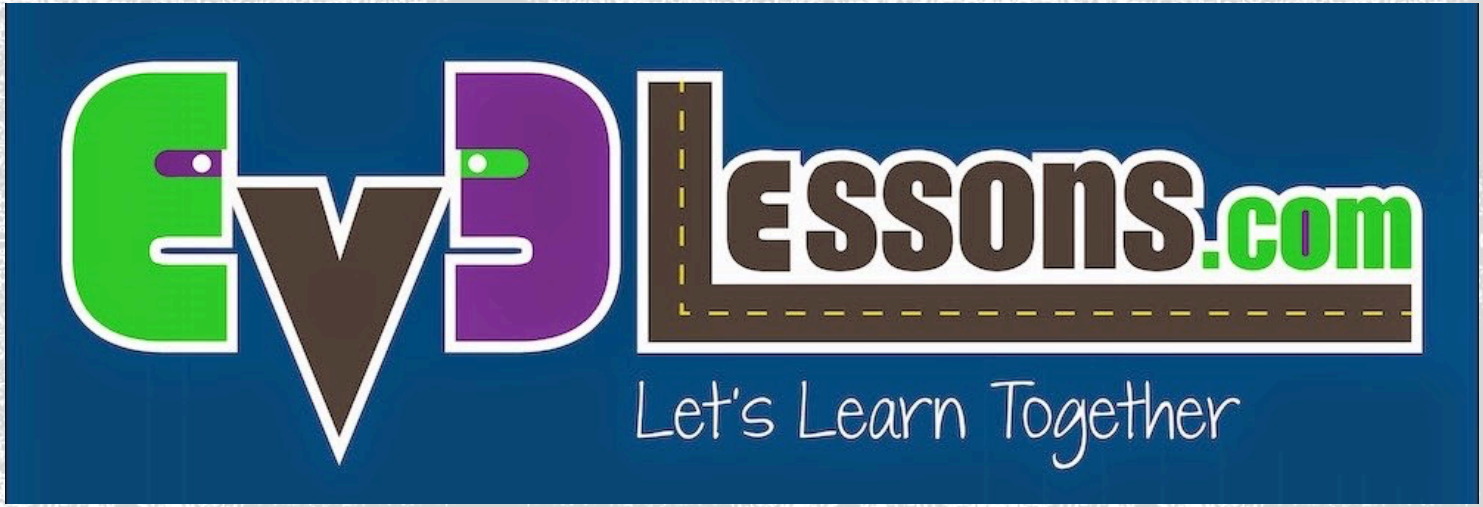

COMPARING EV3 & HITECHNIC COLOR SENSORS

By Sanjay and Arvind Seshan

WRO™
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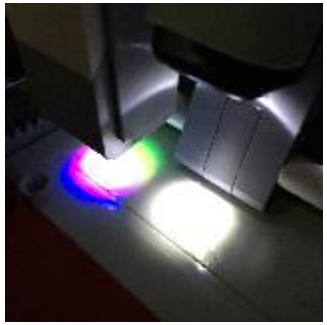
LESSON OBJECTIVES

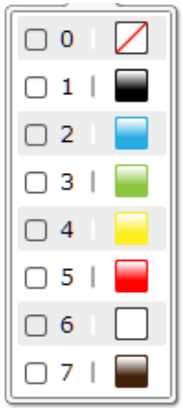
- Learn the differences between the HiTechnic and LEGO Color Sensors

HOW THEY WORK



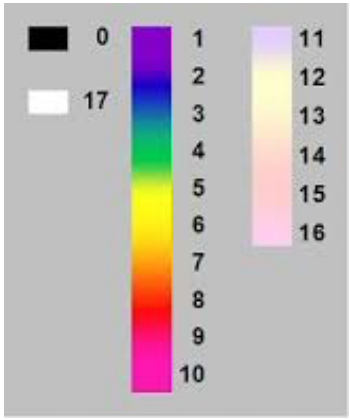
EV3 Color Sensor

- Digital sensor detects color intensity of the light that
- Color Mode – 7 colors, no color
- Reflected Light Intensity and Ambient Light Intensity modes



HiTechnic Color V.2

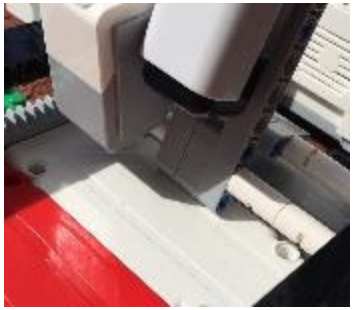
- A single white LED (light emitting diode) to illuminate the target and
- *Color Mode with 18 colors*
- *RGB, Passive and Raw modes*



POSITION AND ANGLE

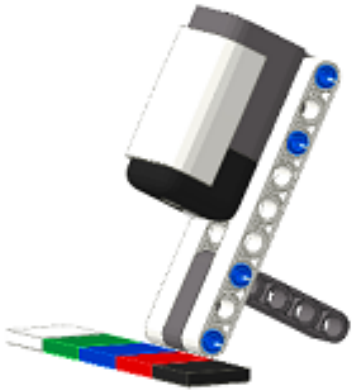
EV3 Color Sensor

- Sensor must be positioned at a right angle to surface it is examining
- According to EV3 documentation, Color Sensors work best between 4-12mm (1/2 - 1 1/2 studs) off the surface you are detecting
- Any higher or lower and the readings are not as accurate



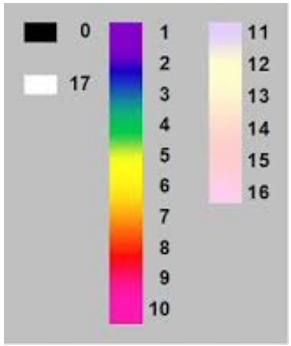
HiTechnic Color Sensor

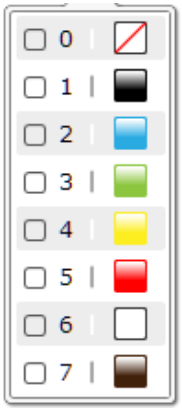
- The Color Sensor V2 works best when it is positioned higher
- It is recommended that you install the sensor at an angle (see image)



COMPARING STANDARD MODES

- Both Sensors in Color-Measure mode return a value for the color (a color number)
- The HiTechnic Sensor identifies 18 colors (values from 0-17)
- The EV3 Color Sensor identifies 7 colors plus no color (0-7)





Color Sensor HiTechnic Color

COMPARING RGB MODES

- To compare RGB values, we downloaded the EV3 RGB Block from David Gilday
- The HiTechnic Sensor identifies red, green, blue, and white values
- The EV3 Color Sensor identifies red, green, and blue
- The white output is similar to the reflected light intensity mode in the EV3 Color Sensor block.

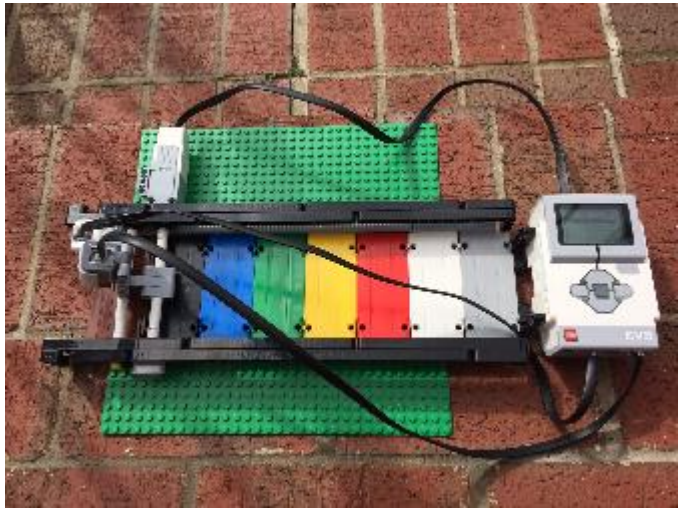
TESTS

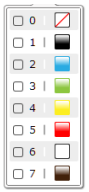
- Over the next few slides, we will go over some tests we conducted with both the sensors
- The results will help you understand which sensor to use in which condition
- We do not conduct any tests for angle and position as both LEGO and HiTechnic specify these in their documentation

LEGO Color Sensor RGB

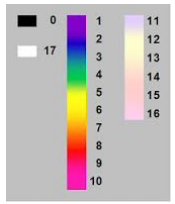
VS.

HiTechnic Color Sensor RGB mode



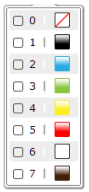


LIGHTING CONDITIONS: INDOOR LIGHTING

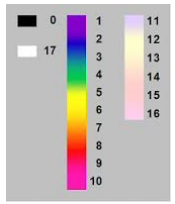


- The performance of the EV3 and HiTechnic sensors are not the same
- The RGB values with the EV3 are different compared to the HiTechnic Sensor. A possible reason for this is that the color sensor was designed to work best on LEGO colors.
- The HiTechnic color sensor did not accurately identify Brown LEGO

	EV3 Color Sensor				HiTechnic Color Sensor			
LEGO Color	**Color Number**	**Red**	**Green**	**Blue**	**Color Number**	**Red**	**Green**	**Blue**
White	6	161	183	127	14	125	124	103
Red	5	105	19	11	8	63	15	7
Yellow	4	140	94	21	6	116	85	15
Green	3	16	63	18	4	13	30	18
Blue	2	15	42	62	2	10	23	52
Black	1	11	15	10	0	6	7	8
Brown	7	24	15	10	14	20	12	8



LIGHTING CONDITIONS: OUTDOOR SUNLIGHT



- Neither sensor worked well in bright sunlight. They misidentified most colors

		EV3 Color Sensor					HiTechnic Color Sensor			
LEGO Color		**Color Number**	**Red**	**Green**	**Blue**		**Color Number**	**Red**	**Green**	**Blue**
White		0	0	0	0		0	0	0	0
Red		0	1	0	0		4	1	27	16
Yellow		0	2	1	0		2	0	0	31
Green		3, 1	17	68	21		4	12	28	16
Blue		0	0	1	1		2, 17	12, 55	23, 36	54, 56
Black		1	12	17	12		0	8	9	9
Brown		7	26	15	12		1, 7, 14	20, 23, 17	11, 12, 12	7, 8, 9

LESSONS LEARNED

- **Position:** The EV3 sensor works best when mounted horizontally and close to the target. If you need to sense something further away, the HiTechnic Sensor may be better.
- **Number of Colors Detected**: In Color Mode, the HiTecnic Sensor does detect a larger number of colors
- **Modes:** The HiTechnic Sensor offers some extra modes including an RGB and Raw Mode. To get RGB Mode for the EV3, you will have to install David Gilday's custom block.
- **Lighting:** Both the sensors were not great in sunlight.
- **LEGO Colors:** Overall, we felt that the EV3 Sensor was more accurate in detecting LEGO colors

CREDITS

- This tutorial was created by Sanjay Seshan and Arvind Seshan
- More lessons at www.ev3lessons.com