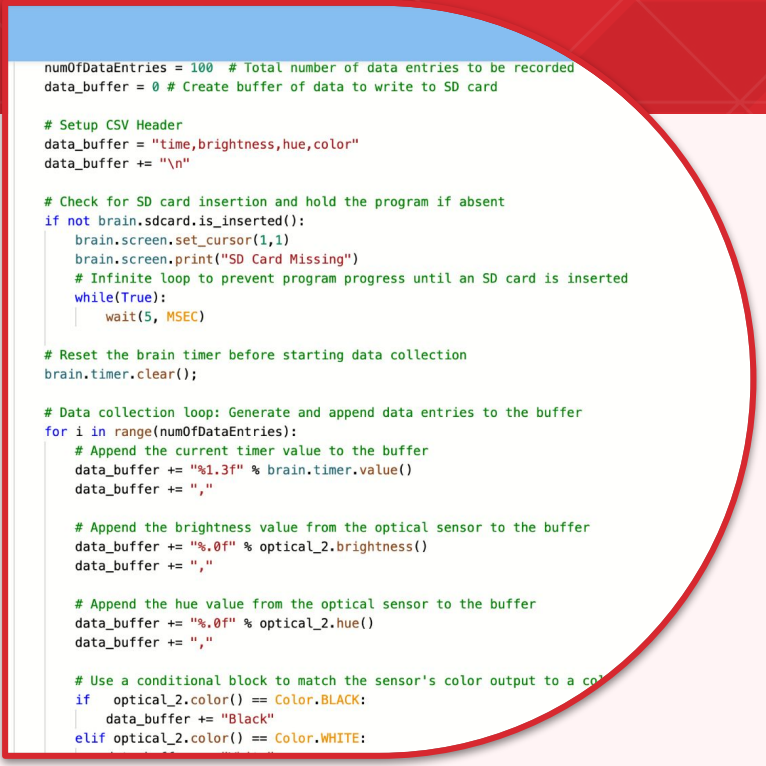


Exploring Data Science Using Python with VEX EXP / V5

Alaina Haws
Senior Education Developer, VEX Robotics

VEX EXP

Workshop Goals

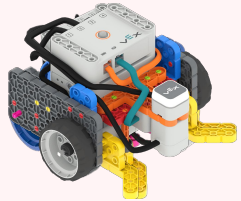
- Collect Optical Sensor data using VEXcode V5 Python.
- Organize and graph data from a CSV file.
- Identify patterns in hue, brightness, and color readings.
- Compare data across different test conditions.
- Use data to make decisions about sensor use in robotics.

The VEX Continuum

VEX 123

Coding Starts Early

Ages 4+



VEX GO

STEM Starts Early

Ages 8+

VEX AIM

Real World Coding

Ages 8+

VEX IQ

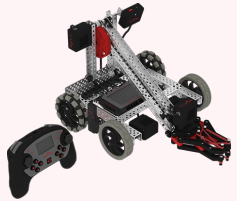
Applied STEM Learning

Ages 11+

VEX EXP

Real World STEM for Classrooms

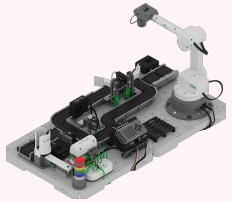
Ages 14+



VEX V5

Real World STEM for Competition

Ages 14+



VEX CTE

Workforce Readiness

Ages 14+

VEX AIR

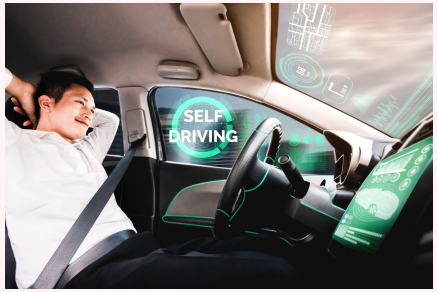
STEM Skills Take Flight

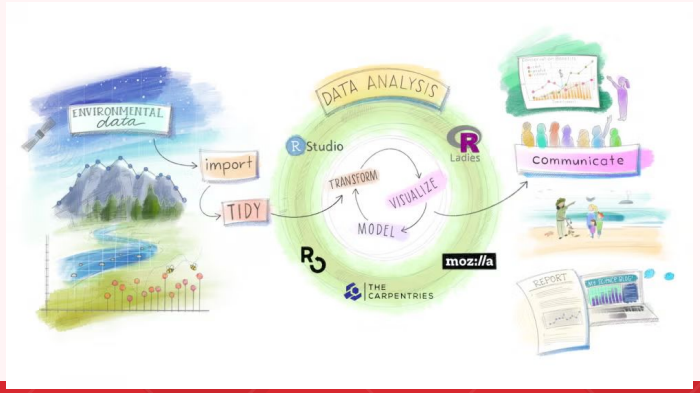
Ages 14+

VEX CODE VR

Virtual Robot Coding

Ages 8+





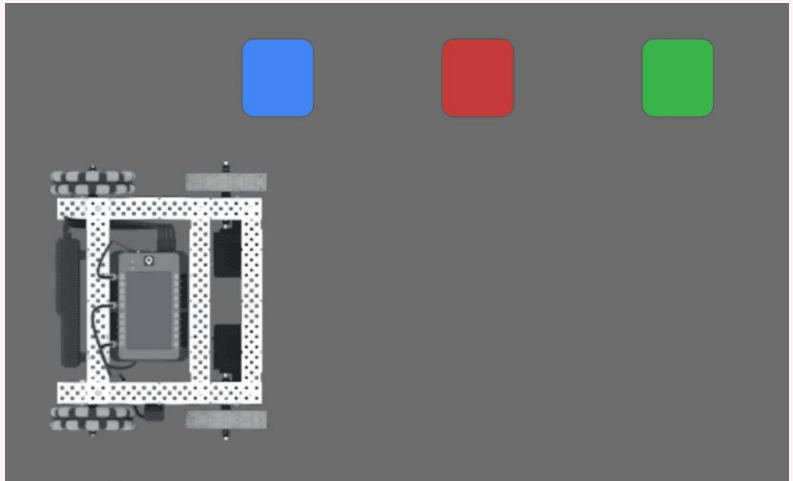
Why Data Science?

Data turns observations into actionable insights.

Collect → Graph → Interpret → Compare → Decide

Collect Data

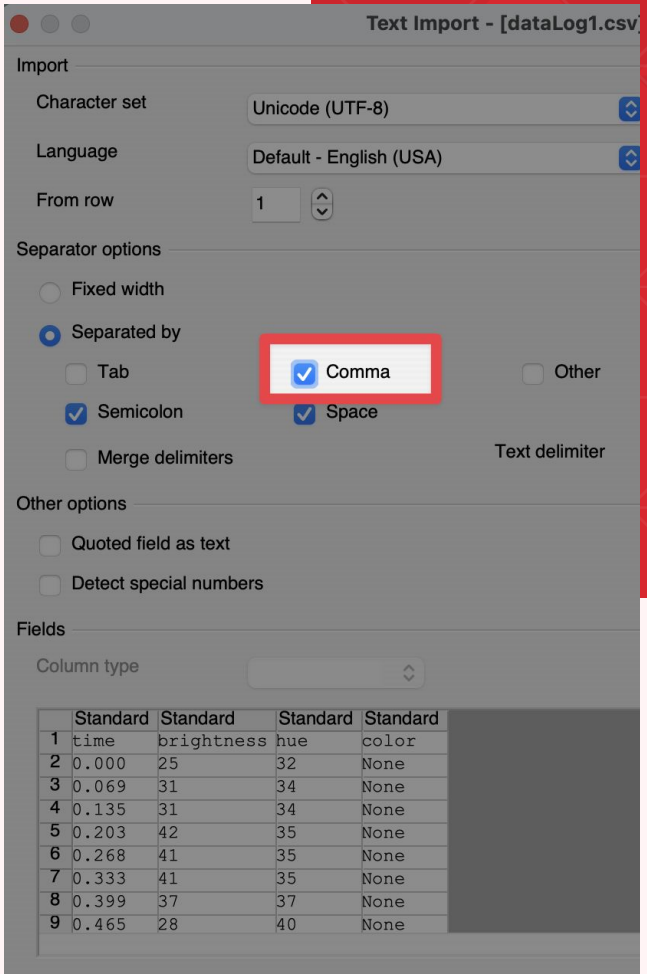
1. Insert microSD cards into the V5 Brain.
2. Set up 3 Cubes along the side of the robot.
3. Run the ***Data Visualization*** project on the Brain. The robot will drive forward for 600mm. Stop the project once the robot is done moving.

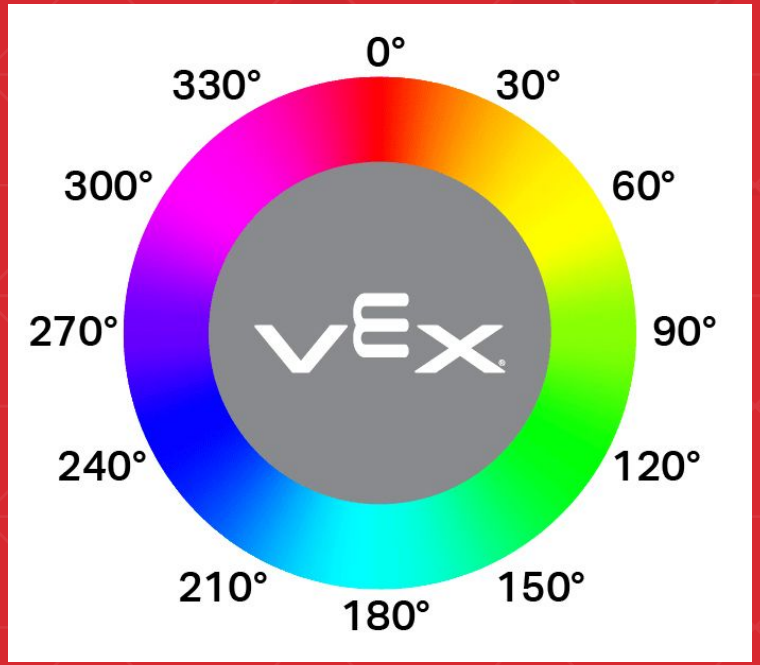


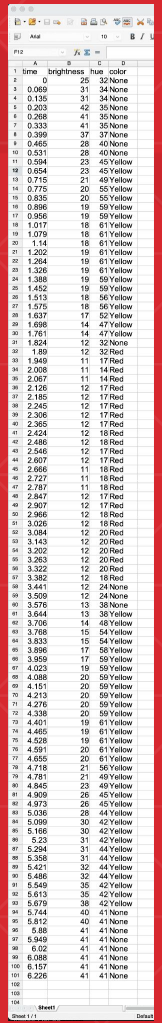
Visualize Data – 1

1. Remove the microSD cards from the Brain and insert into the reader
2. Launch Open Office Calc.
   a. File → Open
3. Navigate to the dataLog1.csv file.
   a. Make sure Separated by: Comma is checked
   b. Preview should show 4 columns

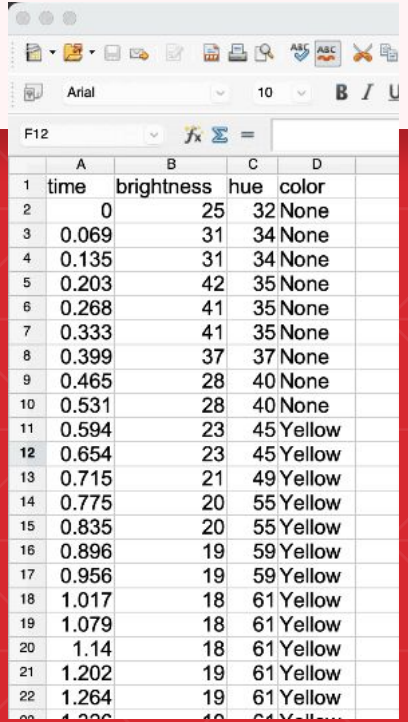
If prompted, open a copy. You want to be able to edit the file!







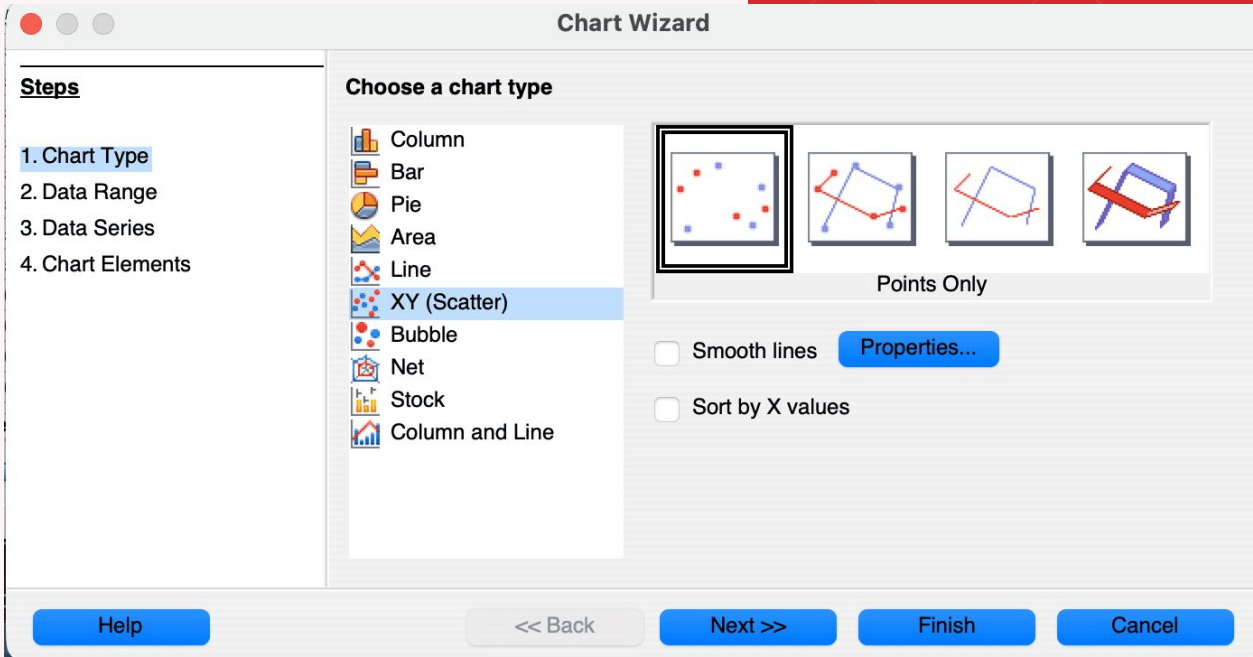
So many data points!



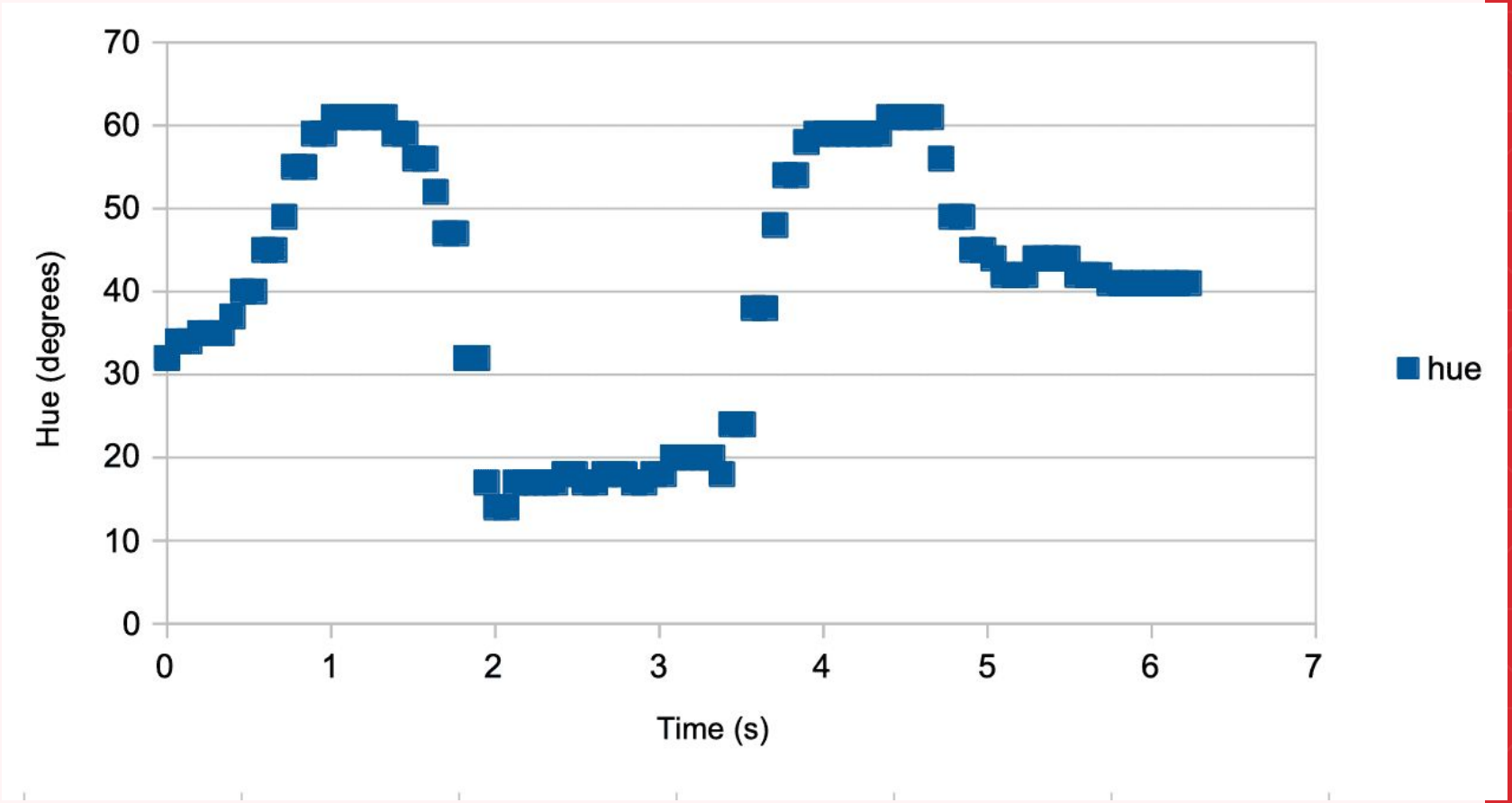
	A	B	C	D
1	time	brightness	hue	color
2	0	25	32	None
3	0.069	31	34	None
4	0.135	31	34	None
5	0.203	42	35	None
6	0.268	41	35	None
7	0.333	41	35	None
8	0.399	37	37	None
9	0.465	28	40	None
10	0.531	28	40	None
11	0.594	23	45	Yellow
12	0.654	23	45	Yellow
13	0.715	21	49	Yellow
14	0.775	20	55	Yellow
15	0.835	20	55	Yellow
16	0.896	19	59	Yellow
17	0.956	19	59	Yellow
18	1.017	18	61	Yellow
19	1.079	18	61	Yellow
20	1.14	18	61	Yellow
21	1.202	19	61	Yellow
22	1.264	19	61	Yellow

Visualize Data – 2

4. Highlight the time and hue value columns.
5. Select Insert ➔ Chart ➔ XY (Scatter).
6. Can go to Next to add labels to the axes or choose Finish to see the chart.



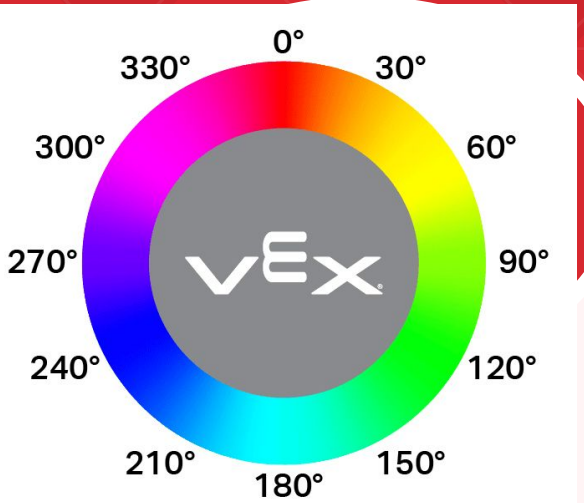
Hue Value Over Time

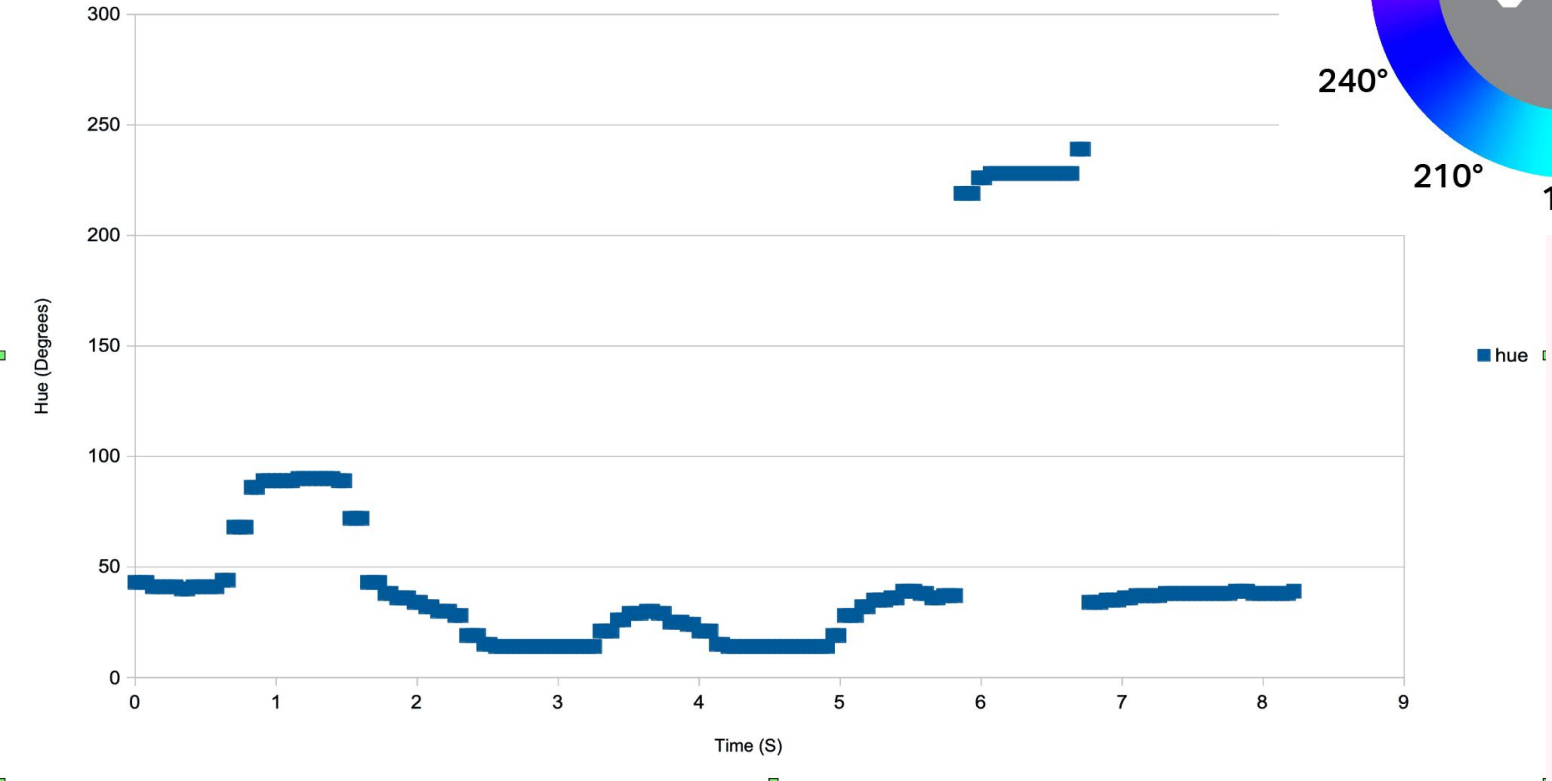


Let’s take a look at the code ….

Interpret Data – Challenge

Using this chart, can you recreate the setup?

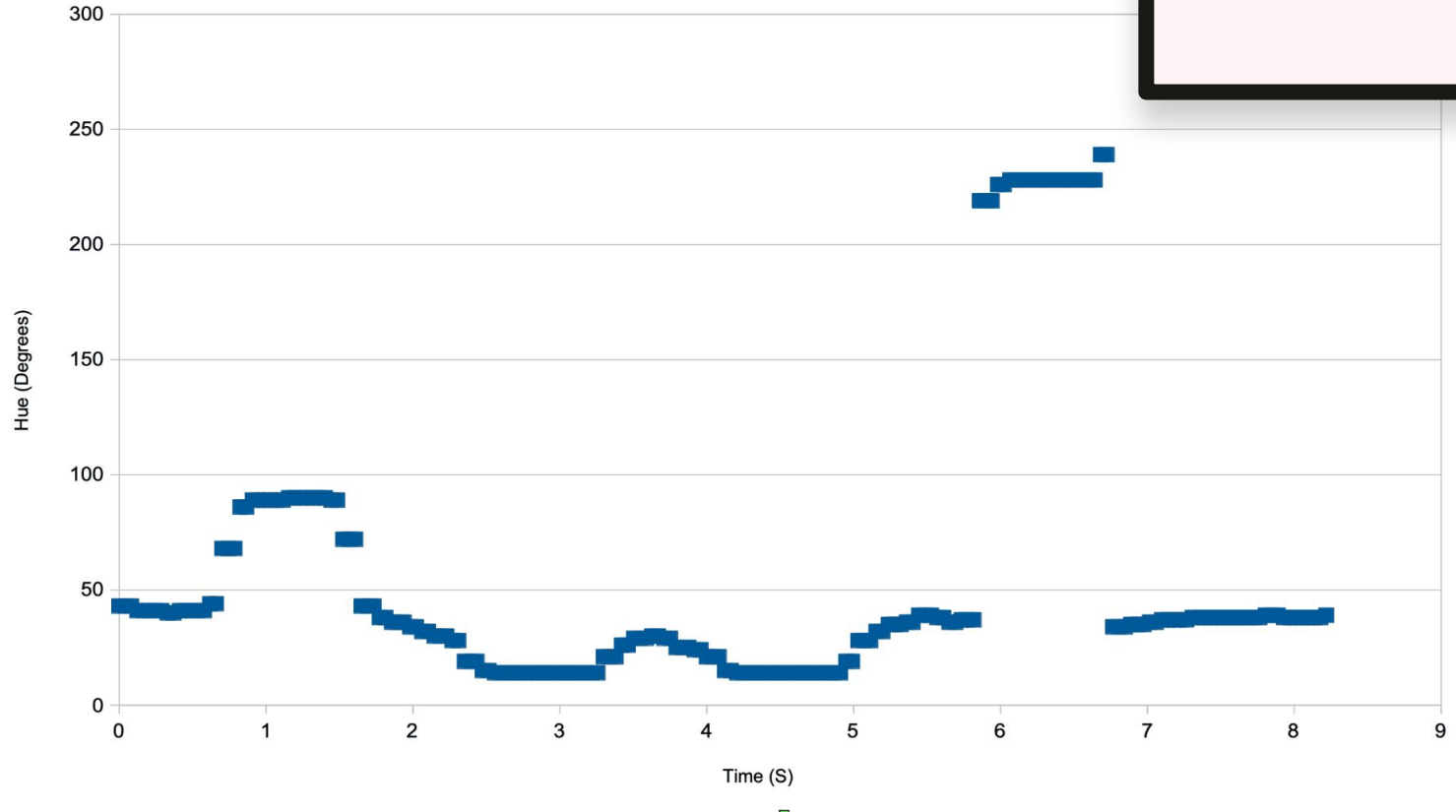


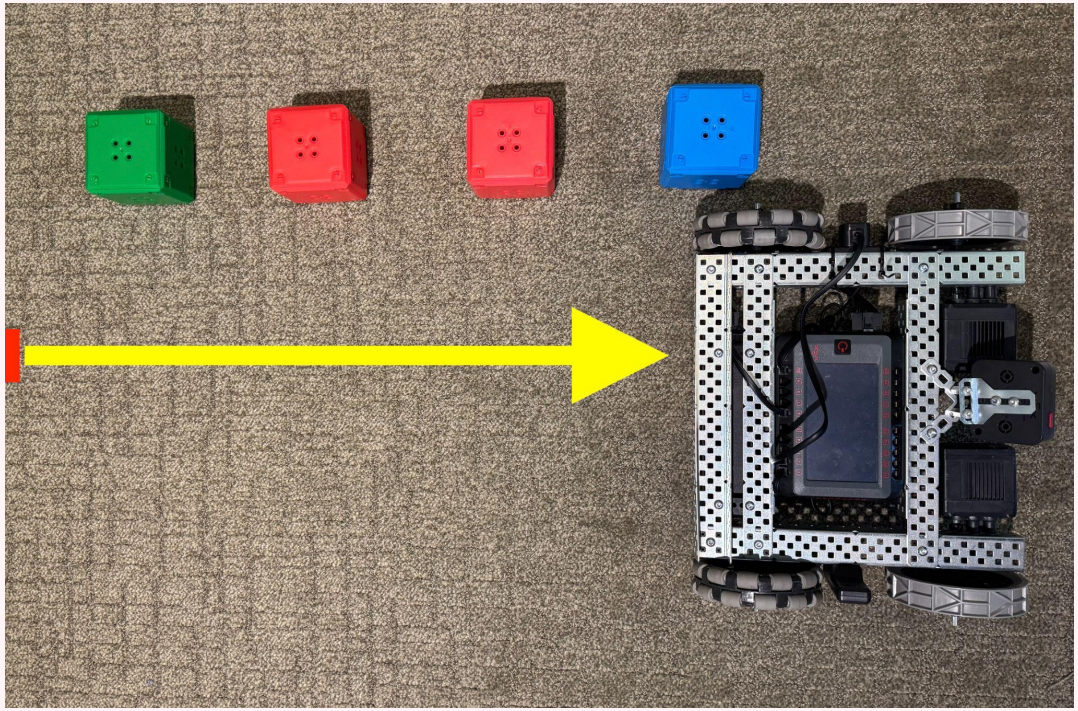


Steps

1. Set up the objects in the test space. Be sure to leave space between!
2. Insert the microSD card into the Brain.
3. Run the V5 Optical Data Logging project.
4. Stop the project once “Data Written” appears on the Brain.
5. Remove the microSD card from the Brain and plug it back into your computer.
6. Open the file in Open Office - Calc.
7. Using the Time and Hue columns, insert a XY (Scatter) chart.

How does your chart compare?





Make a Decision

- Based on your data so far, what range of hue values would you use to reliably detect a specific color?
  - Would you use the specific ranges built into VEXcode or your own?

- What recommendations would you give to students when using the Optical Sensor?

Test Other Conditions

- Collect another data set in a changed environment and compare results!

- Possible changes:
  - Move to a darker area of the room
  - Use a phone flashlight to make the light brighter
  - Use colored films to change the light over the sensor
  - Move the objects further away from the robot.

Stay Connected

Let's Connect!

Tag me in the **VEX PD+ Community!** @AlainaHaws

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