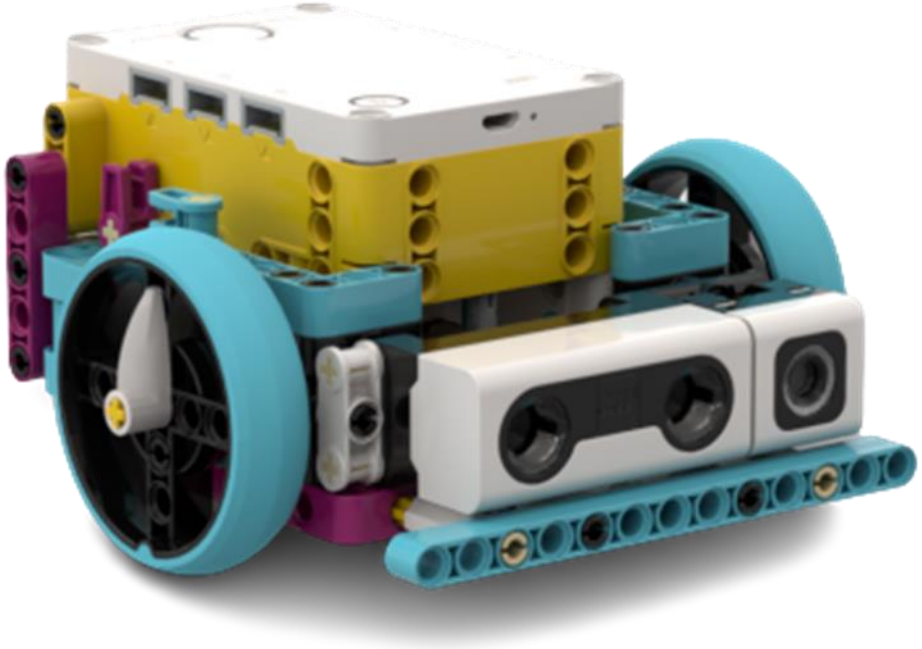
Distance Sensor



Distance Sensor

Learning Goals

- Build knowledge about coding and robotics by coding a sensor and making a robot move.
- Read, debug, and alter code featuring conditional statements to use sensor input to determine how a robot should move.
- Have FUN learning!

Distance Sensor

Do you need to review the Getting Started document?

Do you have the Robocar with Spike attached?
Is Spike turned on?

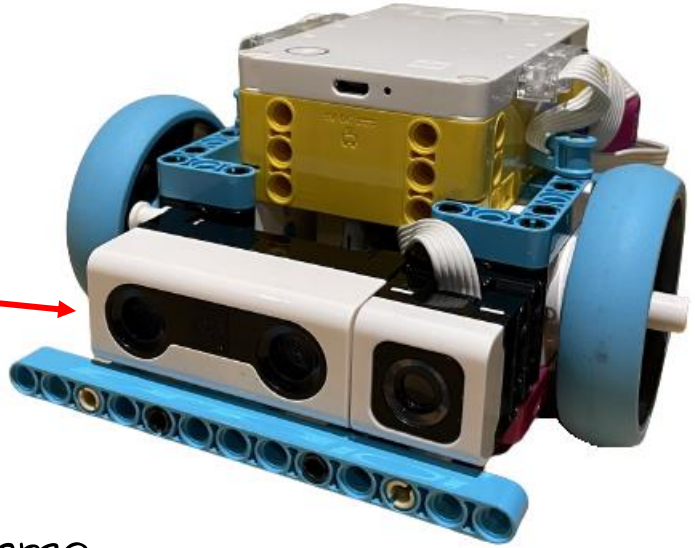
Is the LEGO Spike Classroom app open and on screen?
Is Spike connected and ready to use?

Do you know how to download programs to Spike and select programs from Spike?

Do you know how to move and steer the Robocar?

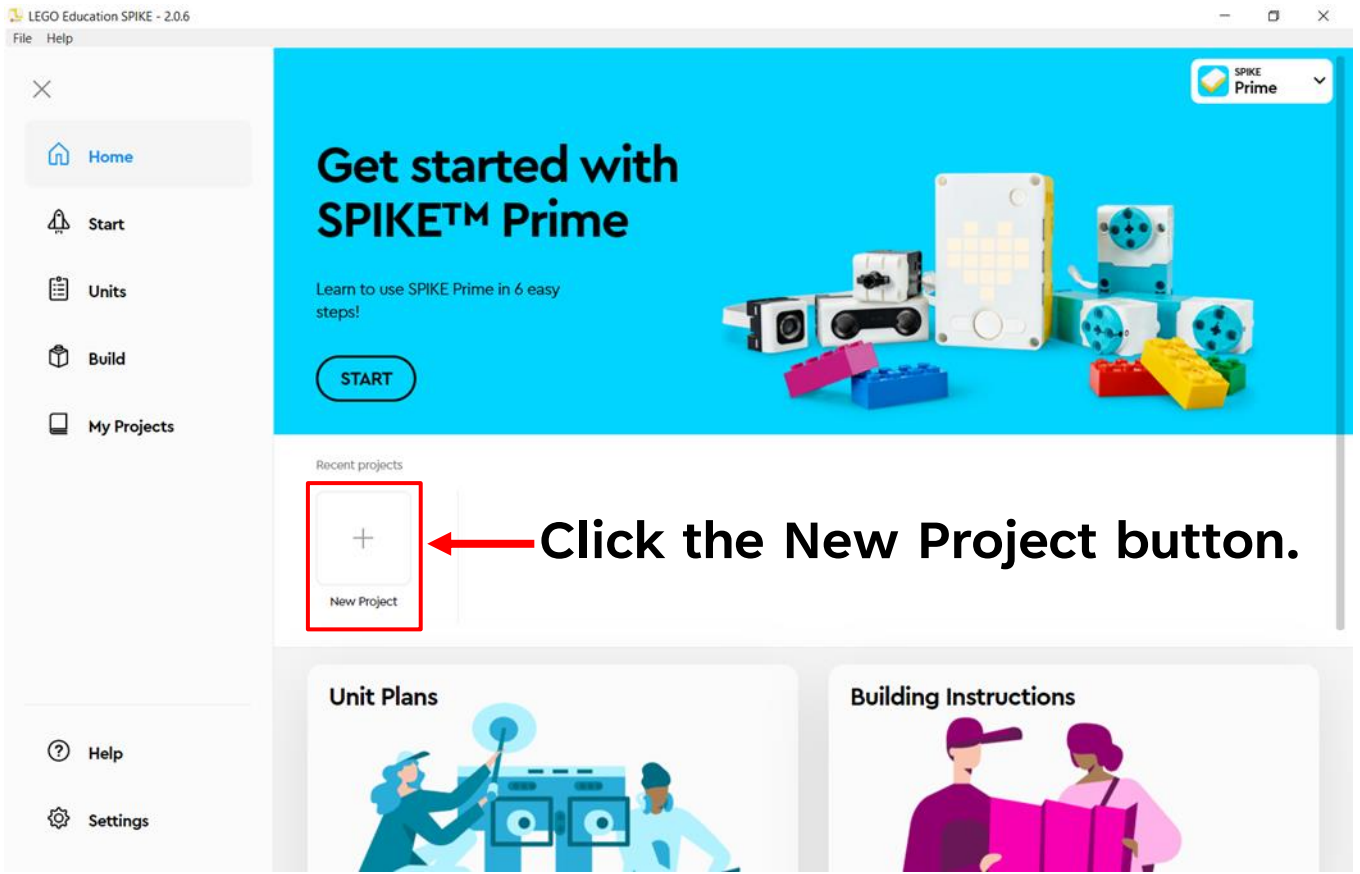
Distance Sensor

This is the LEGO Spike distance sensor.

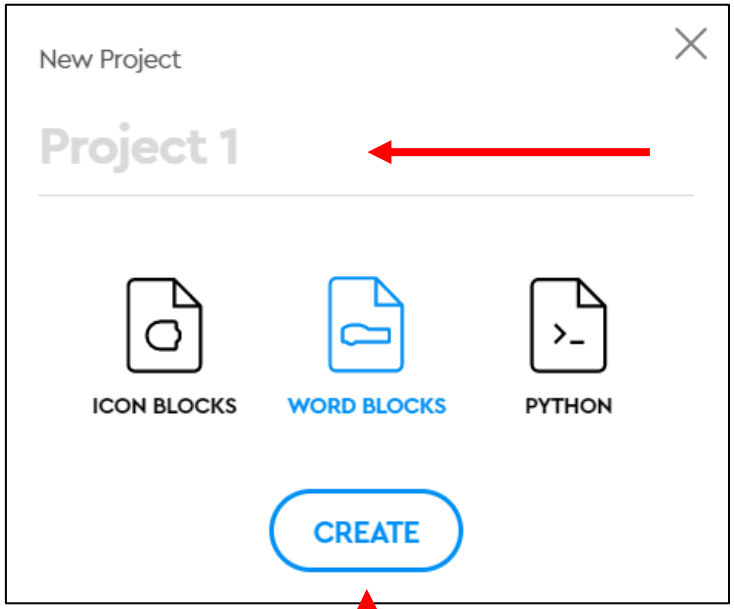


The distance sensor uses ultrasonic sound frequencies to detect objects and determine their distance in the same way that some animals use echo-location.

Distance Sensor



Distance Sensor



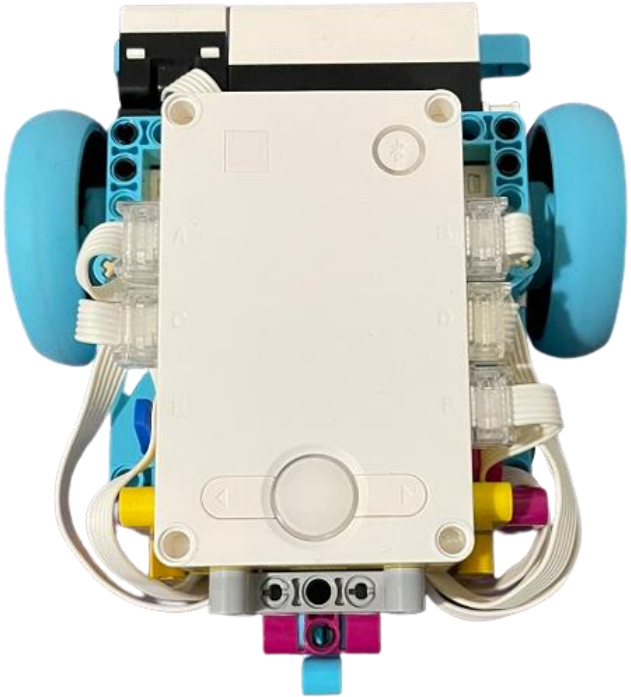
Click WORD BLOCKS and then the CREATE button.

OR

Name your program.

- Click the three dots OR click in the New Project window.
- Name your project: Distance-_____ (your names).

Distance Sensor



The Robocar motors are connected to ports A and B. The distance sensor is connected to port D and the force sensor is connected to port F.

If for some reason any of these devices are not connected to the proper ports, please let Mr. Desmond know so that the proper adjustments can be made.

Distance Sensor

Distance Sensor - Exploration 1

Activity Goals

1) To explore how to use the distance sensor to allow the robot to independently respond to environmental situations using input information from the sensor to direct robot actions.
2) To demonstrate precision of movement of the robot while using the distance sensor.
3) To understand coding using the wait until conditional statement in combination with the distance sensor.

Distance Sensor

Distance Sensor - Exploration 1

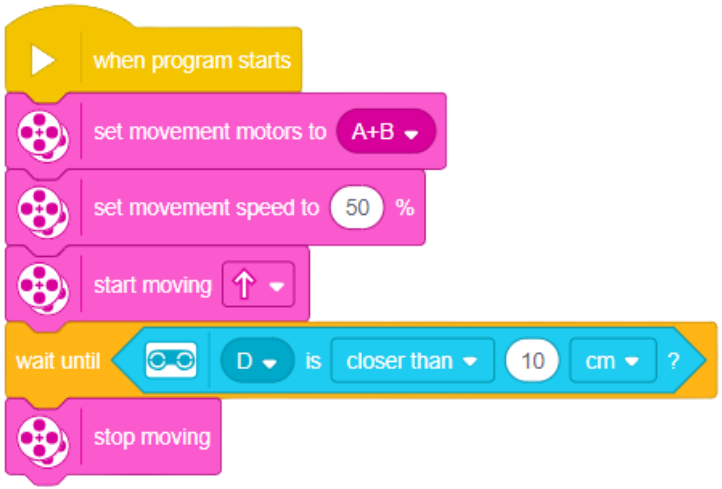
Activity Steps

1) Create the Go There code sequence to move the Robocar and test how the distance sensor works. Go There
2) Learn about the wait until conditional statement. Code Explained
3) Create the Sense and Turn code sequence. Sense and Turn
4) Answer questions and explain your ideas. Explain

Distance Sensor

Distance Sensor - Exploration 1 - Go There

Create a code sequence to have the Robocar move toward a large wooden block and use the distance sensor to stop 10 cm from the block.



Do not download your code yet.

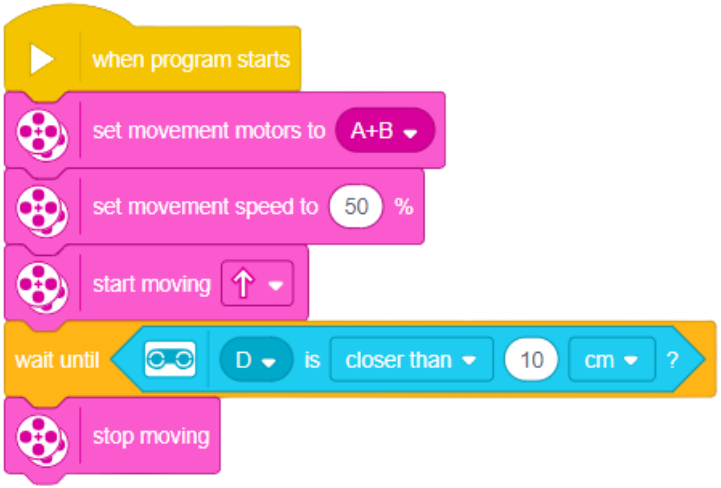
Distance Sensor

Distance Sensor - Exploration 1 - Go There

Download the program to Spike.

Run the program from Spike.

Observe how the Robocar moves.

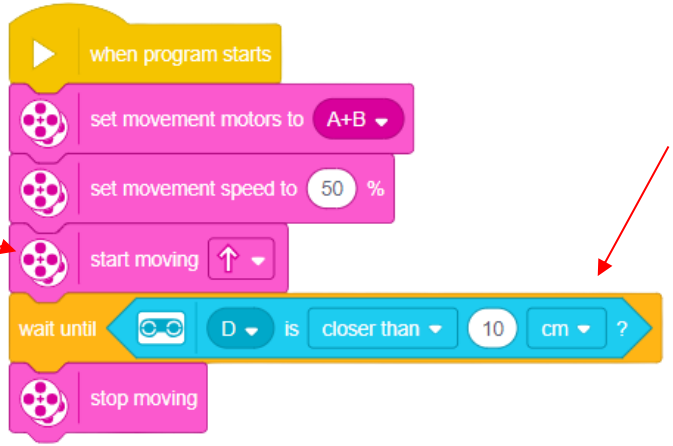


Distance Sensor

Distance Sensor - Exploration 1

The "wait until" command is a conditional statement that monitors what the distance sensor is doing. The "wait until" code block allows the commands prior to it to perform until the distance sensor senses an object a specified distance in front of it. Only then will the coding sequence continue.

This means move - the duration is not defined. The duration is unlimited: it could be any value value above zero to infinity.

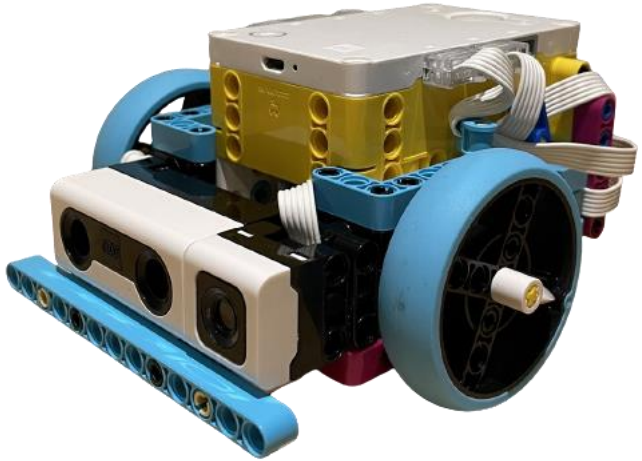


The "wait until" condition is equivalent to saying "always check to see if the distance sensor senses an object closer than 10 cm to it, if true then run the next command".

Distance Sensor

Distance Sensor - Exploration 1 - Sense and Turn

Modify your code to have the Robocar move toward an object and use the distance sensor to stop 5 cm from the object. Have Spike move backward and then complete a 180⁰ turn.



Download the program to Spike.

Run the program from Spike.

Observe how the Robocar moves.

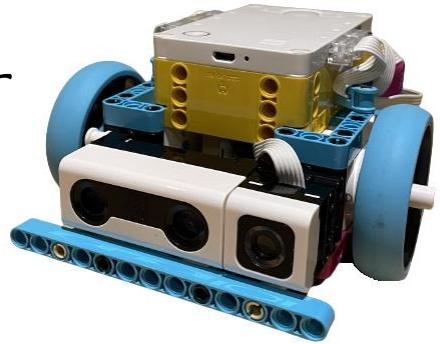
Distance Sensor

Distance Sensor - Exploration 1

Think about it, discuss your ideas as a group, and then write down your answer on a sheet of paper.

1) How is the function of the force sensor different than the distance sensor?

Show Mr. Desmond your coding and the Robocar in action using the distance sensor to stop the Robocar within a certain distance of an object.



Be prepared to explain what is happening with the Robocar and the distance sensor and why.

Distance Sensor

Distance Sensor - Exploration 2

Activity Goals

1) To explore how to use the distance sensor to allow the robot to independently respond to environmental situations using input information from the sensor to direct robot actions.
2) To demonstrate precision of movement of the robot while using the distance sensor.
3) To understand coding using the if then conditional statement in combination with the distance sensor.

Distance Sensor

Distance Sensor - Exploration 2

Activity Steps

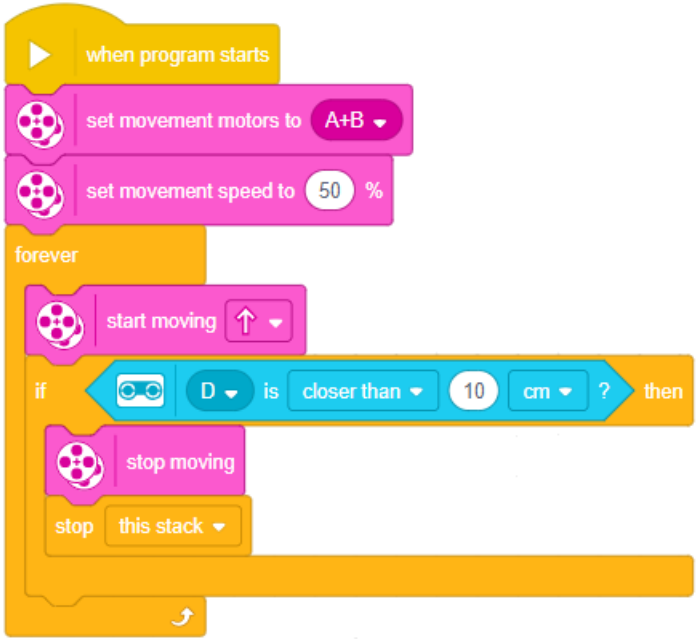
1) Create the Go There Again code sequence. Go There Again
2) Learn about if then conditional statements. Code Explained
3) Create the Go There and Spin code sequence.

   Go There and Spin
4) Answer questions and explain your ideas. Explain

Distance Sensor

Distance Sensor - Exploration 2 - Go There Again

Create a code sequence to have the Robocar move toward a large wood block and use the distance sensor to stop 10 cm from the object.



Download the program to Spike.

Run the program from Spike.

Observe how the Robocar moves.

Distance Sensor

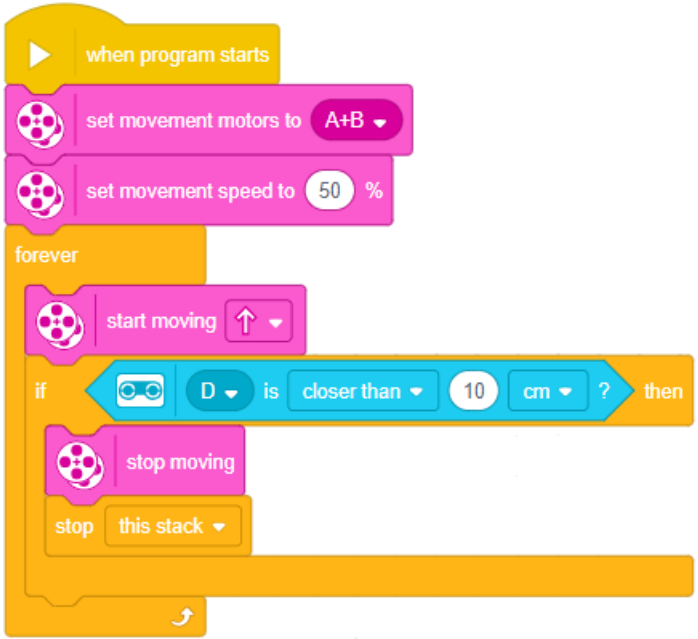
Distance Sensor - Exploration 2

"If then" is a conditional statement. Without thinking about it you use it all the time.

If my hands are dirty, then I will wash them.

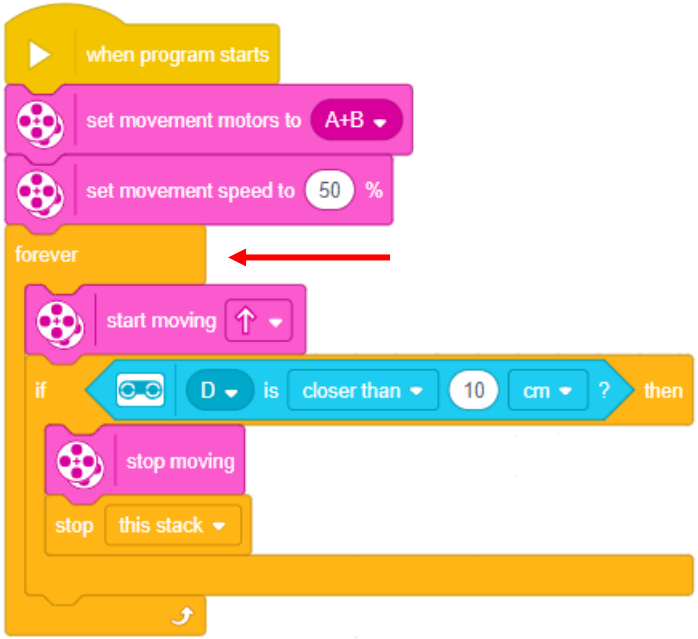
If I am cold, then I will put on a coat.

In this code sequence if the distance sensor senses an object closer than 10 cm then the motors will stop moving.



Distance Sensor

Distance Sensor - Exploration 2



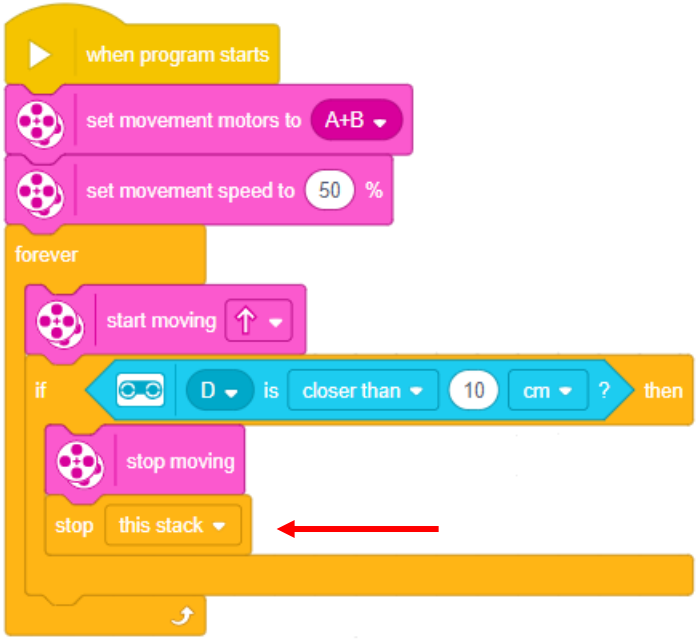
Adjust the code sequence.
Remove the "forever" block (make sure to re-connect all the blocks that were inside the "forever" block).

Download and run the program.

Observe and make note of what happens.

Put the "forever" block back.

Distance Sensor - Exploration 2



Adjust the code sequence.
Remove the "stop this stack" block.

Download and run the program.

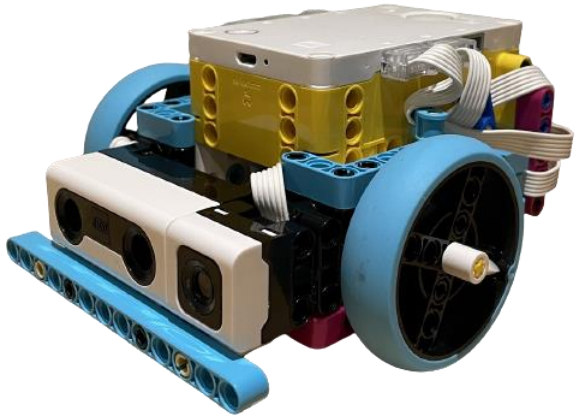
Observe and make note of what happens.

Put the "stop this stack" block back.

Distance Sensor

Distance Sensor - Exploration 2 - Go There and Spin

Create a code sequence using the "if then" condition to have the Robocar move toward an object and use the distance sensor to stop 5 cm from the object. After the stop have the Robocar move backward and then complete a fun robot spin maneuver.



Download the program to Spike.

Run the program from Spike.

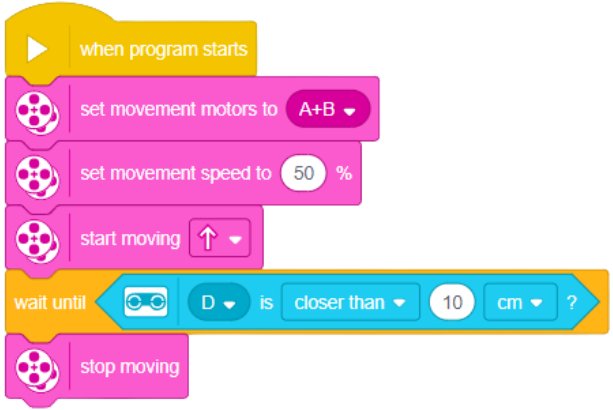
Observe how the Robocar moves.

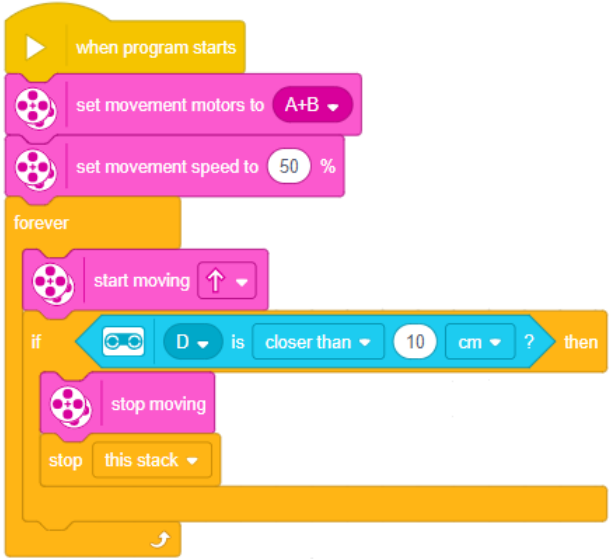
Distance Sensor

Distance Sensor - Exploration 2

Think about it, discuss your ideas as a group, and then write down your answers on a sheet of paper.

1) How are these two code sequences the same?
2) How are these two code sequences different?



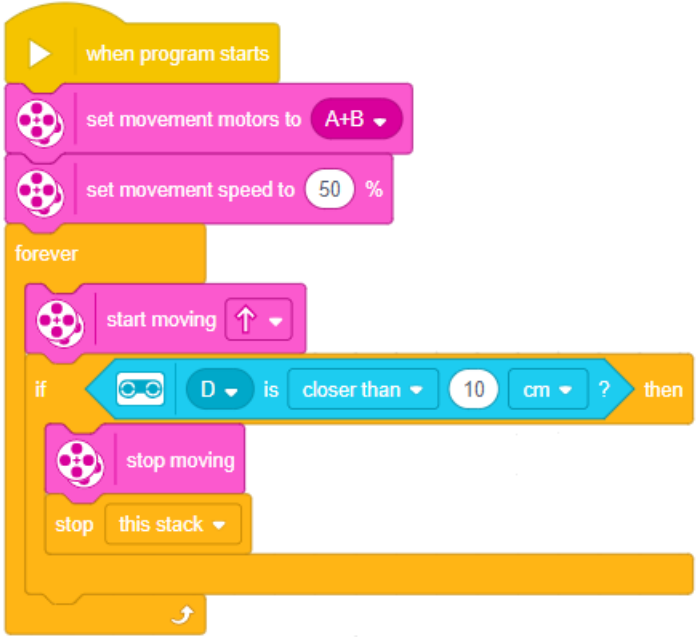


Distance Sensor

Distance Sensor - Exploration 2

Think about it, discuss your ideas as a group, and then write down your answers on a sheet of paper.

3) What is the purpose of the "forever" block?
4) What is the purpose of the "stop this stack" block?



Distance Sensor

Distance Sensor - Exploration 2

Think about it, discuss your ideas as a group, and then write down your answer on a sheet of paper.

5) Why are conditional statements like "wait until" and "if then" paired with sensors?

Show Mr. Desmond your "if then" coding and the Robocar in action using the distance sensor to stop the Robocar when it senses an object.

Be prepared to explain what is happening with the Robocar and the distance sensor and why.

Distance Sensor

Distance Sensor - Exploration 3

Activity Goals

1) To explore how to use the distance sensor to allow the robot to independently respond to environmental situations using input information from the sensor to direct robot actions.
2) To demonstrate precision of movement of the robot while using the distance sensor and a repeat block.
3) To deepen understanding of how to use conditional statements in combination with the distance sensor.

Distance Sensor

Distance Sensor - Exploration 3

Activity Steps

1) Create the Ping-Pong code sequence. Ping-Pong

2) Demonstrate your work and explain your ideas. Explain

Distance Sensor

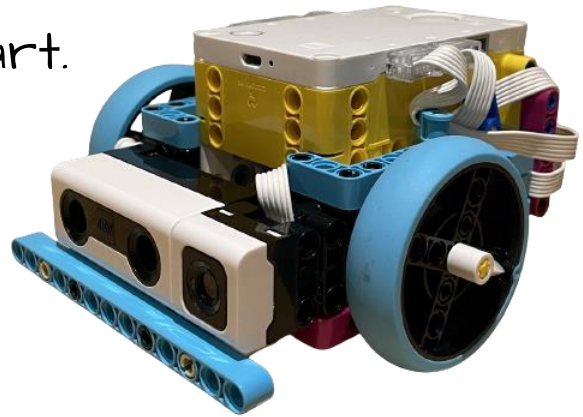
Distance Sensor - Exploration 3 - Ping-Pong

Create a code sequence to make the Robocar go back and forth between two wooden blocks three times using input from the distance sensor to determine when to turn around.

Pair the distance sensor with either the "wait until" condition or the "if then" condition in your coding.

Keep the wood blocks about 50 cm apart.

Precision of movement is required to keep the Robocar as straight as possible and not veer in different directions after each turn.



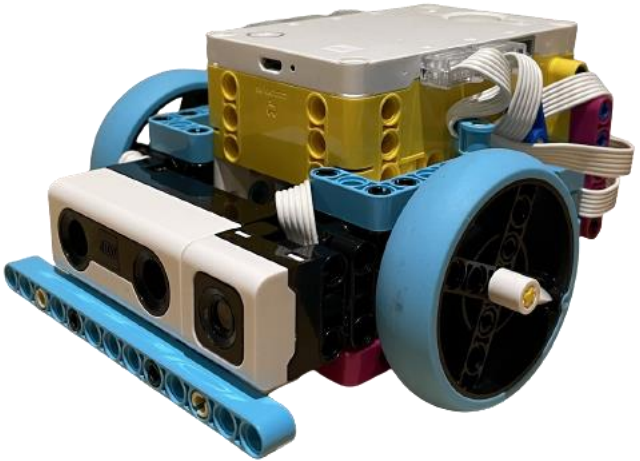
Distance Sensor

Distance Sensor - Exploration 3 - Ping-Pong

Download the program to Spike.

Run the program from Spike.

Observe how the Robocar moves and modify the program as needed.



Distance Sensor

Distance Sensor - Exploration 3 - Ping-Pong

Show Mr. Desmond your "ping-pong" coding and the robot in action using the distance sensor to make the Robocar repeatedly stop and change direction when within a certain distance of an object.

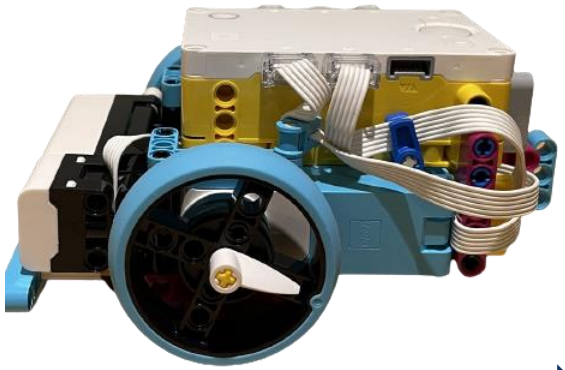
Be prepared to explain what is happening with the Robocar and the distance sensor and why.

Distance Sensor

Distance Sensor - Consider This

A sensor is designed to provide input information to the robotic system. As a form of artificial intelligence (AI) the robot will respond to the environmental circumstances noted by the sensor and take specific actions in response.

The coding provides the robotic system the ability to perform this feat of machine intelligence. Conditional statements are essentially true or false questions that provide the logic that allows the robot to read the sensor input and then make a decision (according to the code) based on what the information was.



Distance Sensor Challenge

Learning Goals

- Build knowledge about coding and robotics by coding a sensor and making a robot move.
- Independently create code featuring conditional statements to use sensor input to determine how a robot should move.
- Have FUN learning!

Distance Sensor Challenge

AMAZing Distance Sensor Challenge!

Create a maze of your own design. Create the code that will allow the Robocar to independently navigate the maze using the distance sensor to determine when to stop moving and turn.

You are expected to demonstrate your success to Mr. Desmond. Be prepared to show both the Robocar in action and your code.

*Placement of maze blocks must allow ample space for the Robocar to move forward and backward as well as to turn.