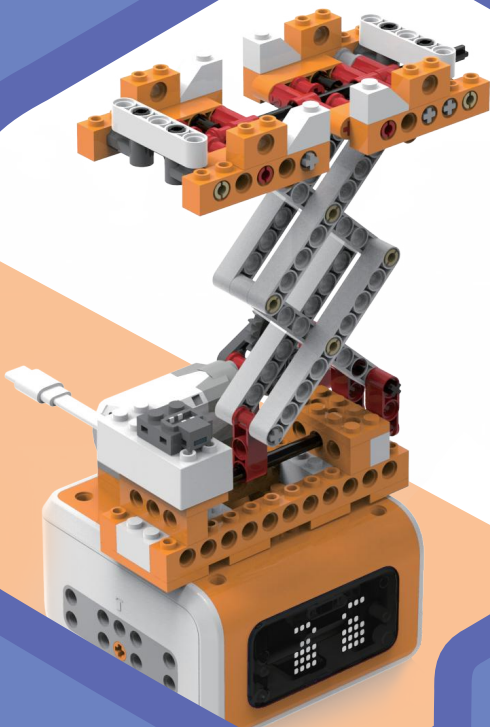


Building, Coding *and* Robotics

for VinciBot & Creator Kit



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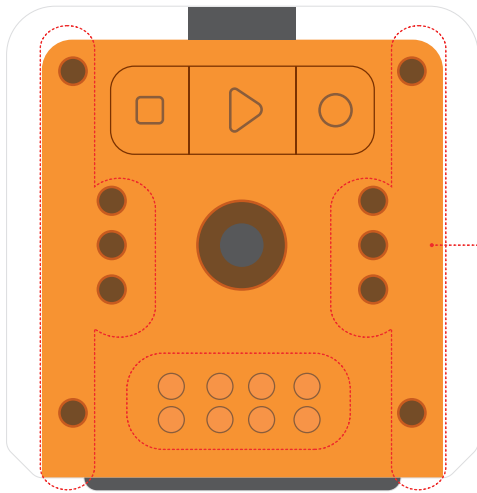
Lessons

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Extension Activities

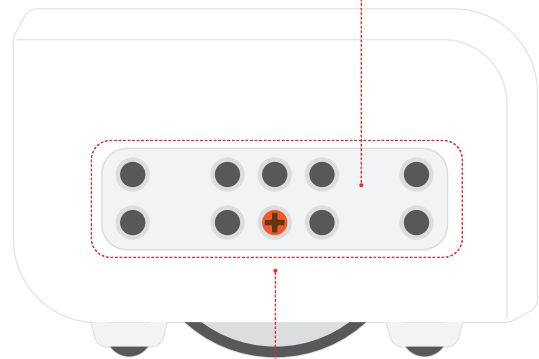
Teacher Guide

Why VinciBot is compatible with the building bricks?



Highly compatible with LEGO bricks

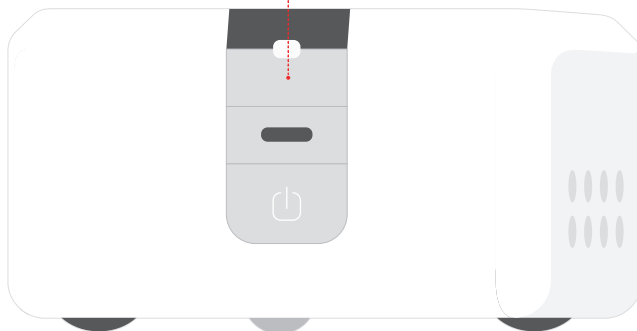
There are 9 holes on the left and right sides of VinciBot, highly compatible with LEGO bricks.



Both left and right sides of VinciBot have a high-precision programmable transmission output shaft.

Extension interface [Type-C]

(Expansion modules supported: motor modules, light strips, etc.)



Creator Kit for VinciBot Overview

What is Creator Kit?

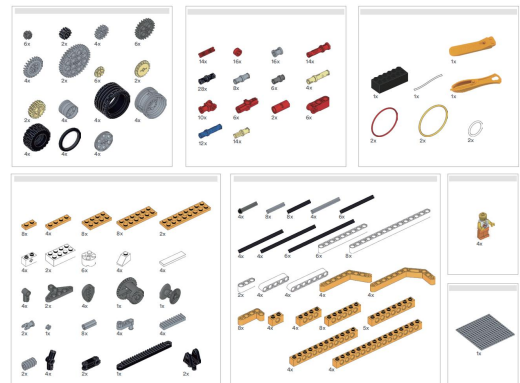
The "Creator Kit" from VinciBot is an expansion pack that includes a building guide, a user manual, an extension motor, an adapter, and various building blocks. It caters to diverse model-building needs.



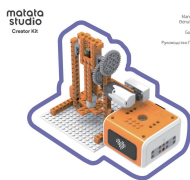
Instructions



Building Guide



Bricks(separate packages by type)



User Manual



Motor



Adapter

How to use the extension motor and the adapter



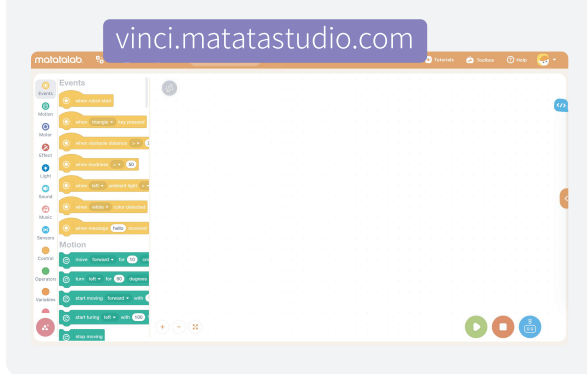
Note: Compatible with LEGO 9686 motor.

Caution: Using unofficial electrical motor may cause VinciBot to automatically shut down or the motor not to function.

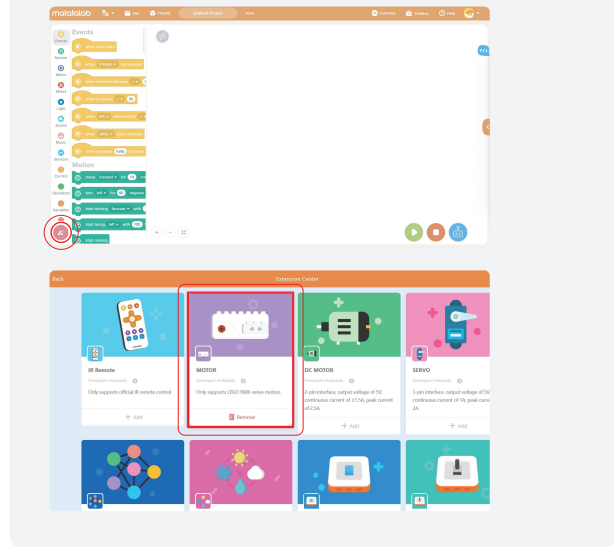
Attention: The motor speed should be set between 70% and 100%, otherwise it may not be able to drive.

The first time your VinciBot uses a Motor extension, you must load the driver program into VinciBot. Directions are as follows:

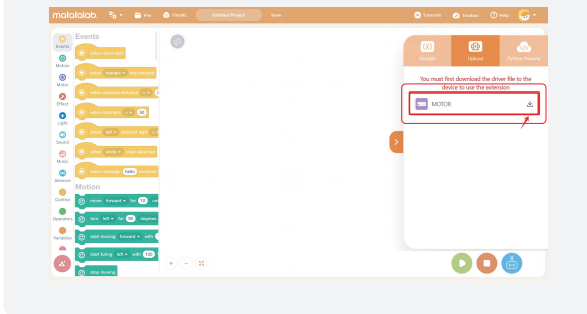
a. Open MatataCode;



b. In the Extension Center add the Motor extension;



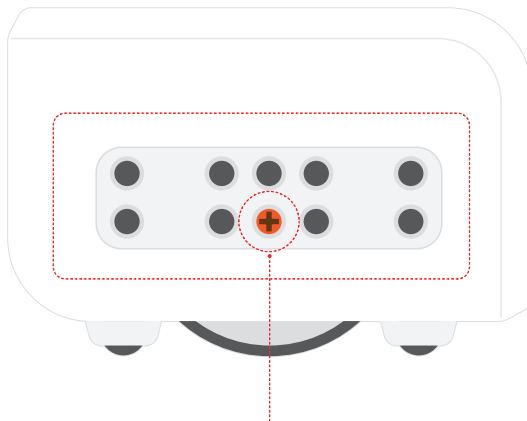
c. In the side menu select "burn" and download the Motor driver program into VinciBot.



Note: With the latest VinciBot firmware, the burning step is not required.

VinciBot's Motor or the Extension Motor?

VinciBot comes with two built-in motors for power. You can also add an extra extension motor to expand your building options, making VinciBot models more diverse and complex.

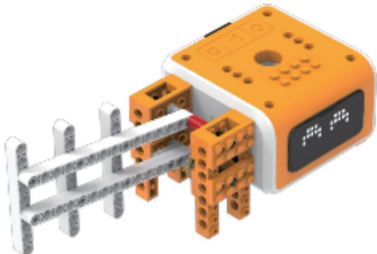



Two built-in motors



Motor

The following two cases can help you understand how the built-in and extension motors are used.

VinciBot Model Name	Model Image	Motor Usage
Induction door		<p>A built-in motor is used in this model provide power. When the motor rotates, the vertical gear drive and the parallelogram structure work together to raise and lower the door.</p>
Gyroscope transmitter		<p>A built-in motor and an extension motor is used in this model to provide power. The extension motor uses a two-stage acceleration gear to spin the gyroscope. The built-in motor uses a cam to help the gyroscope detach from the launcher. Together, these forces make the launcher work effectively.</p>

Lesson 1

⌚ 45min

Soar High

Overview

This lesson is designed to help students understand how the linkage mechanism works and how to build such a mechanism. It will also guide them in building a "Soar High" model according to the provided drawing and writing a program to make the model move.

Structure used

Linkage mechanism

Learning objectives

- Understand how the linkage mechanism works and how to build such a mechanism.
- Build a "Soar High" model using the linkage mechanism.
- Write a program to make the wing move up and down when the VinciBot motor rotates.

Materials

VinciBot, Creator kit, PC/Pad



Instructions for Students

Linkage mechanism

A linkage mechanism connects a driving part to a driven part. It changes motion and transmits power, and further converts circular motion into back-and-forth motion.

There are many types of linkage mechanisms, with the planar four-bar linkage being the most basic and widely used. The planar four-bar linkage consists of a frame (A), a crank (B), a connecting rod (C), and a rocker (D). As shown in the Figure 1-2 below, when the crank rotates like a clock hand, it moves the connecting rod, which causes the rocker to swing back and forth.

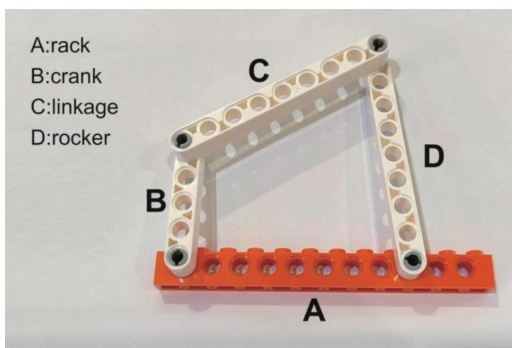


Figure 1-1

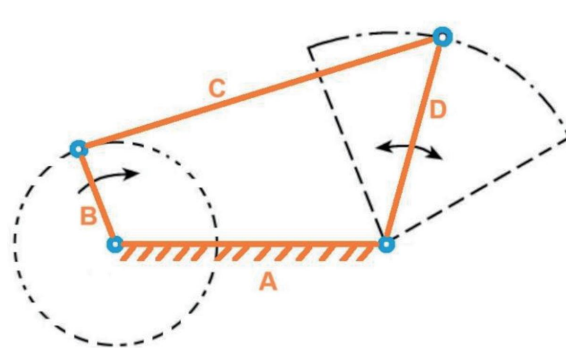
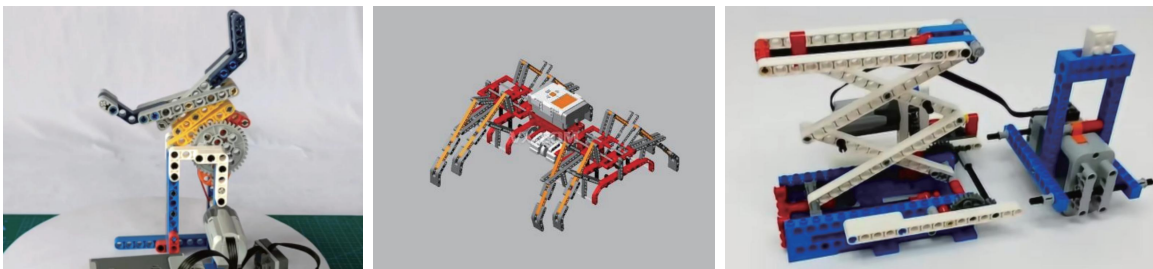


Figure 1-2

Using the linkage mechanism

What can the linkage mechanism do in models? The linkage mechanism can produce different motions in models, like the gripping action of a robotic arm, the walking movement in animal models, and the lifting actions in crane models.



The wing structure in the "Soar High" model also uses the linkage mechanism.

As shown in Figure 1-3, when the driving part gear (A) rotates, it moves the connecting rod (B), which then makes the driven part (C) swing up and down like a bird flapping its wings.

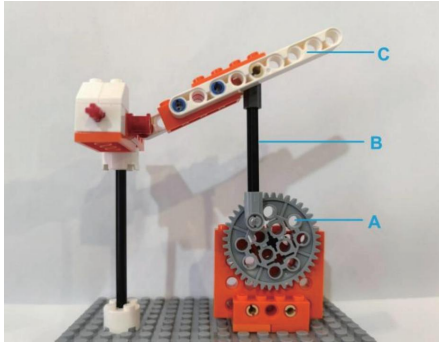


Figure 1-3

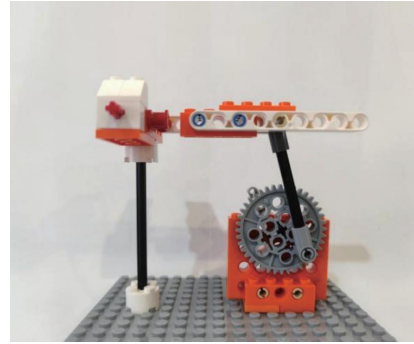


Figure 1-4

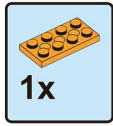


Building the Soar High model

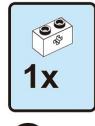
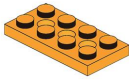


Parts List

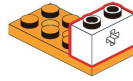




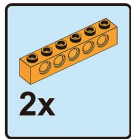
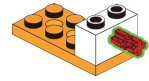
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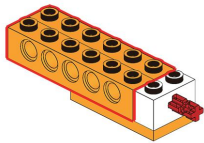
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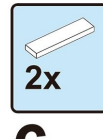
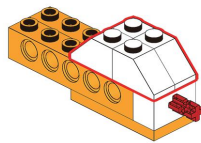
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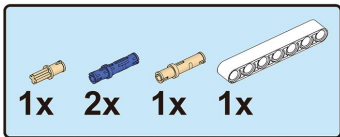
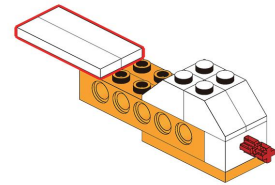
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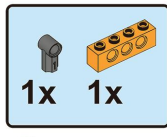
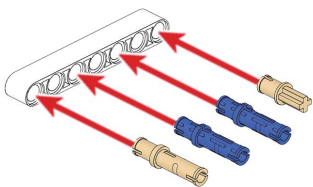
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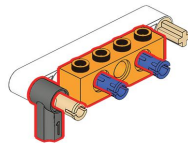
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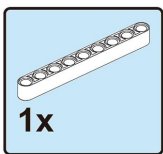
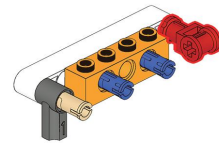
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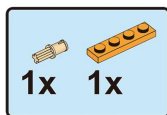
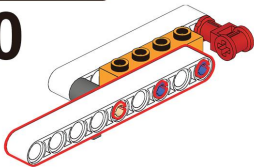
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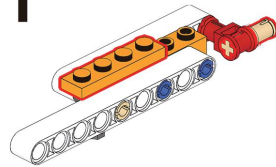
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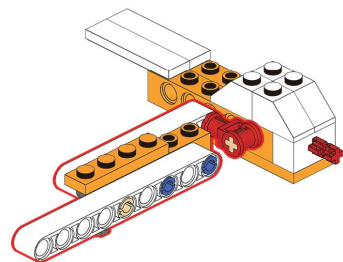
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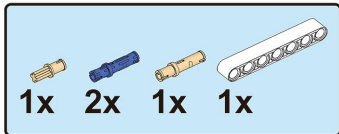


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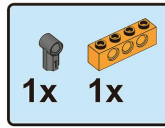
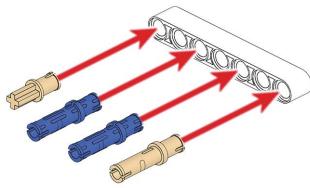


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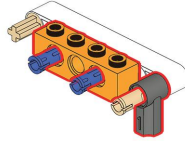




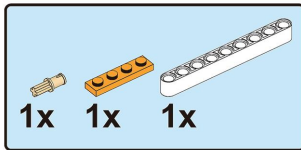
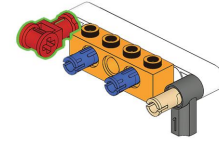
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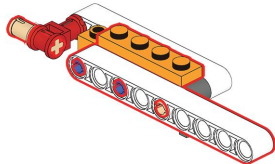
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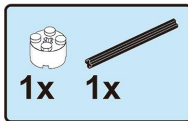
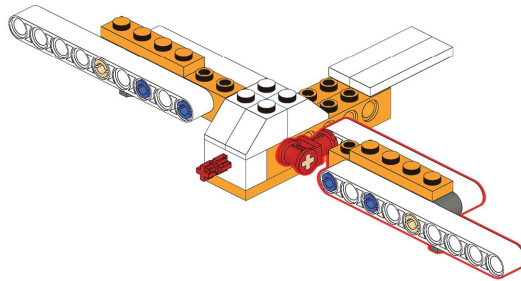
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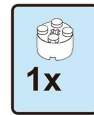
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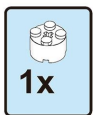
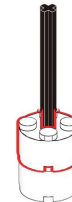
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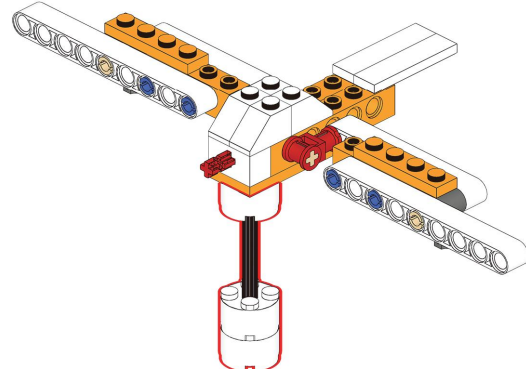
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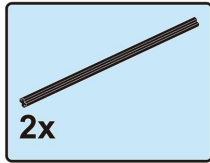


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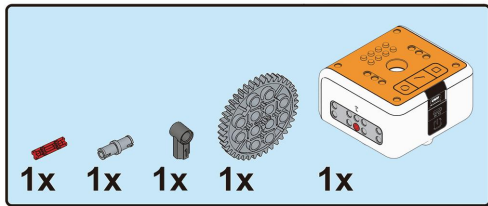
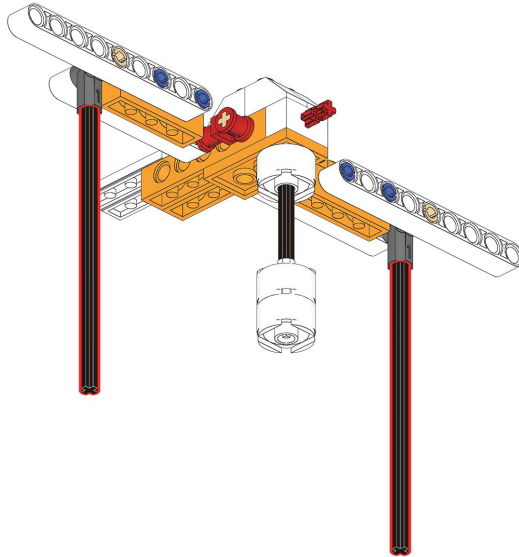


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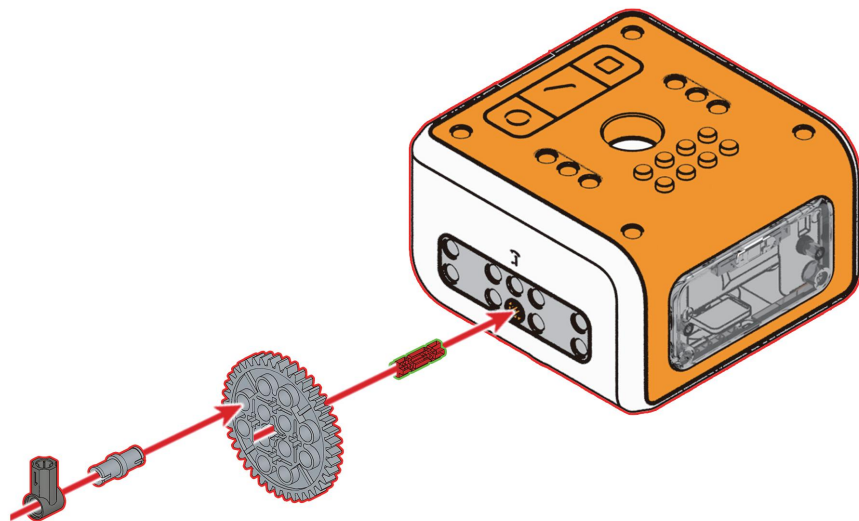


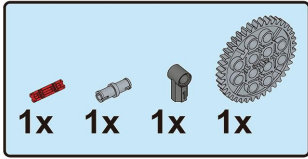


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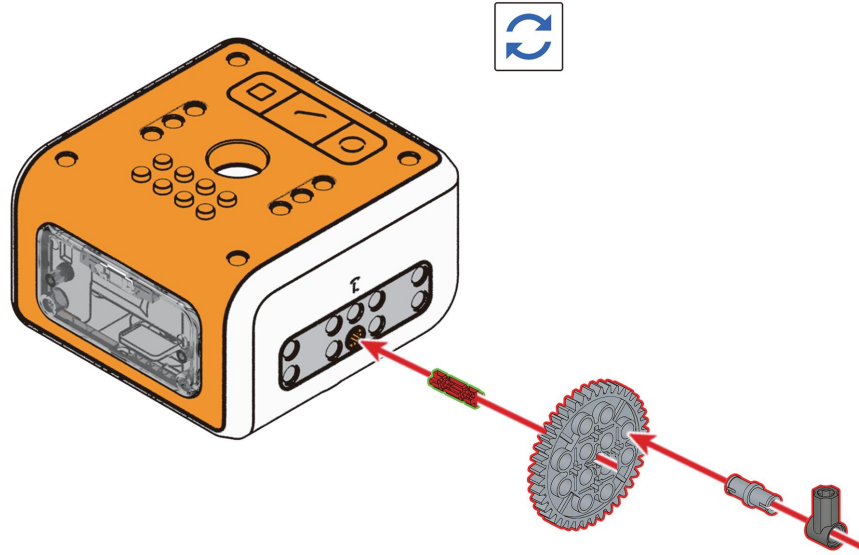


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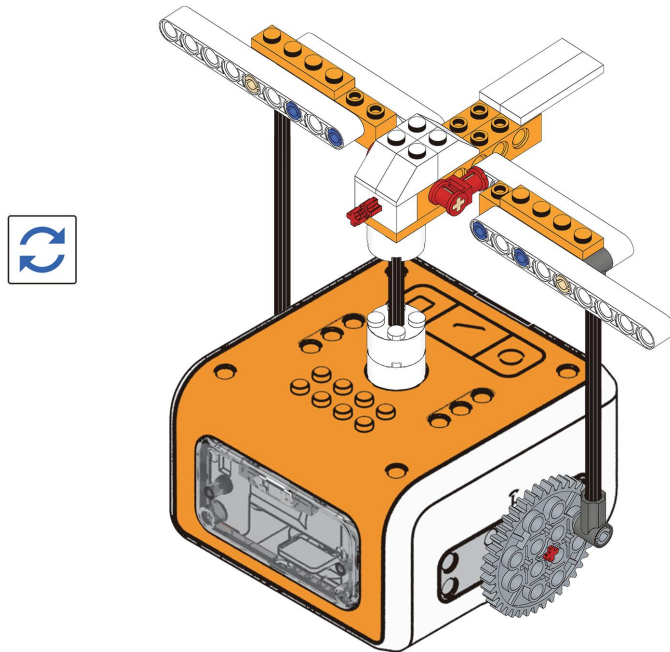




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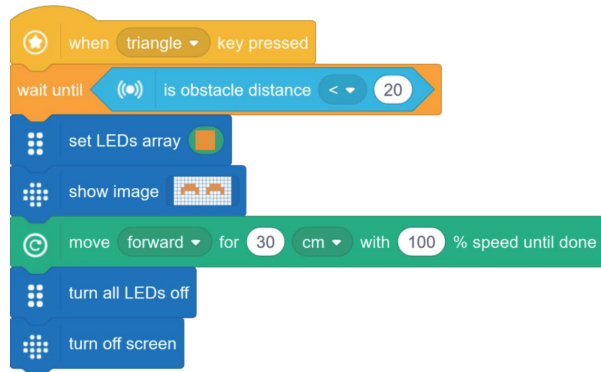




Activity

Activity 1: Use VinciBot and Creator Kit to build the "Soar High" model by following the step-by-step instructions.

Activity 2: Program the model so that when it detects an object less than 20 cm away, it lights up a blue LED and shows the smiling eyes pattern. Then, it flaps its wings and moves forward 30 cm at full speed. Finally, it turns off the LED and the screen display.



Students Discuss - Create - Share

1. How does the linkage mechanism work?
2. Where is the linkage mechanism used in the "Soar High" model? What result does it achieve?
3. Write a program so that the model flaps its wings and make a bird sound when it detects a noise louder than 70 decibels. After 5 seconds, the model stops moving.

Lesson 2

⌚ 45min

Induction Door

Overview

This lesson is designed to help students understand how the vertical gear drive works and how to build it. It will also guide them in building an induction door model according to the provided drawing and writing a program to make the model move.

Structure used

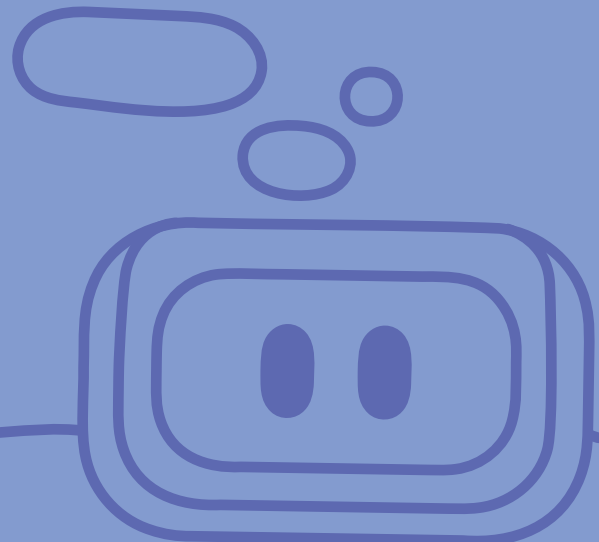
Vertical gear drive

Learning objectives

- Understand how the vertical gear drive works.
- Build an induction door model using the vertical gear drive.
- Write a program to control the lifting and lowering of the induction door via the VinciBot ToF distance sensor.

Materials

VinciBot, Creator kit, PC/Pad



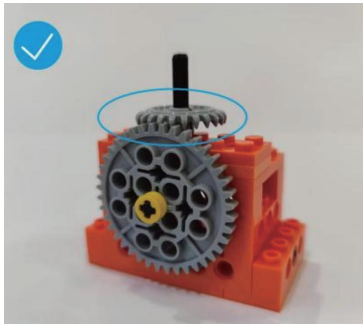


Instructions for Students

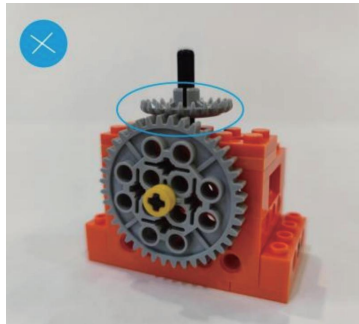
Vertical gear drive

Gear drive uses the interlocking of gears to transfer power. Vertical gear drive is one of the most common types of gear drive.

Vertical gear drive refers to the meshing of two gears on different planes. It is used to transfer power and change the direction of motion. Proper gear meshing is crucial. If the gears do not mesh properly, the direction of transmission cannot be changed.



Proper meshing



Improper meshing

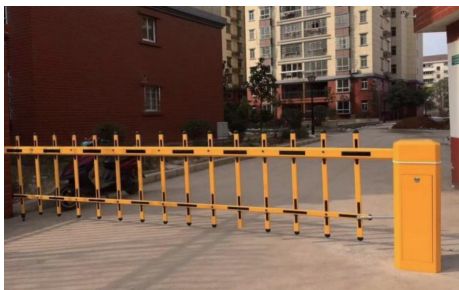


No meshing due to far distance

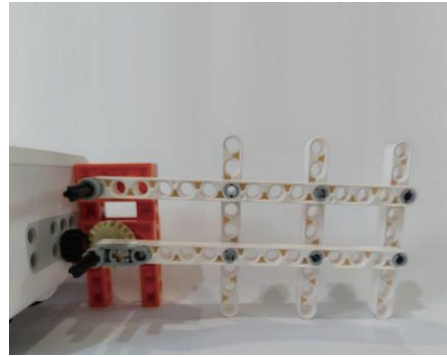
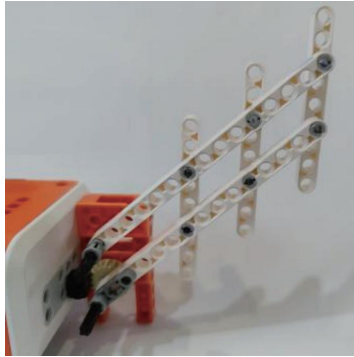
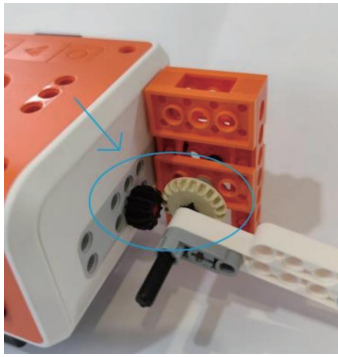
The vertical gear drive is used in various models that need different types of vertical movement, such as four-wheel-drive cars, robotic sweepers, and drumming figures.

Using the structure

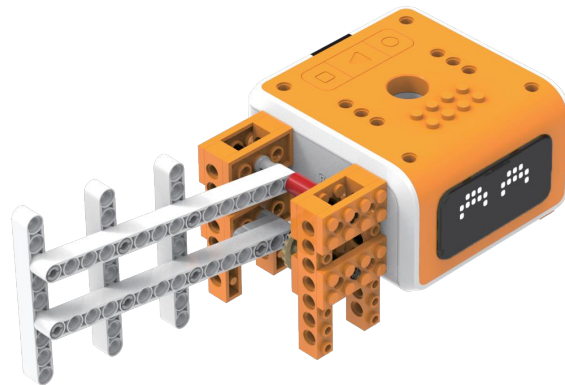
Let's build an induction door model. Think about the shape of the induction door at a parking lot entrance. What shape is it? That's right, it's a parallelogram. A parallelogram is unstable and can easily deform. By using this feature, we can design a structure that allows the door to rise and fall through the bending and straightening of the structure.



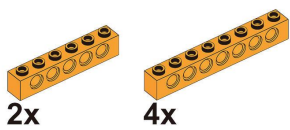
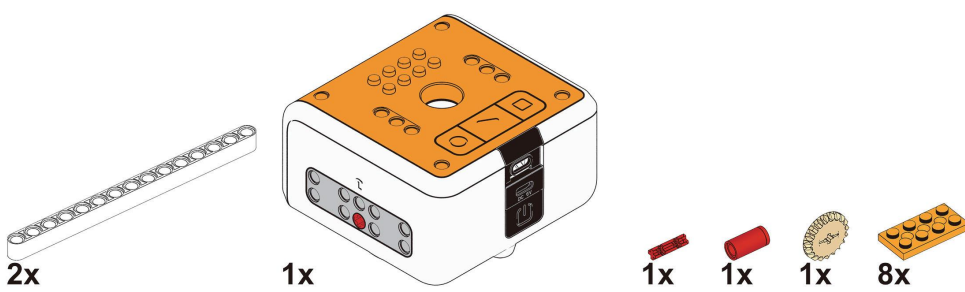
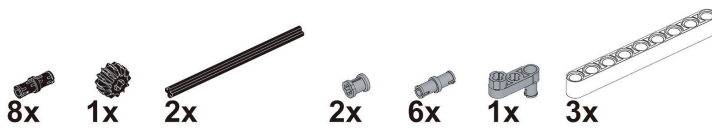
In this model, we use the vertical gear drive to change the motor's rotation direction and the parallelogram structure to build the induction door. When the motor starts, the vertical gear drive moves the door either up or down.

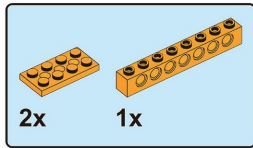


 **Building an induction door model**

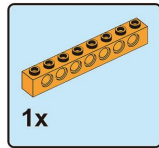
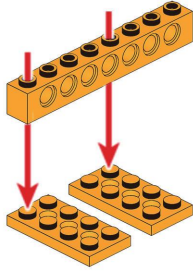


Parts List

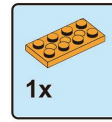
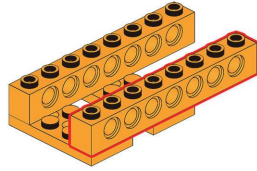




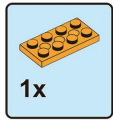
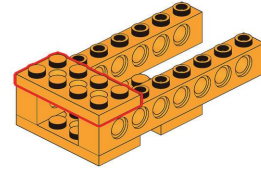
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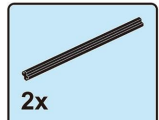
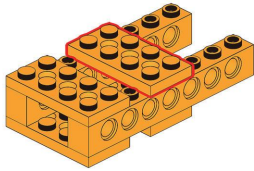
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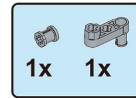
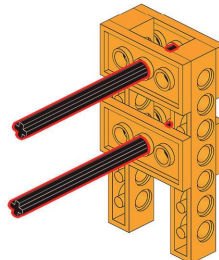
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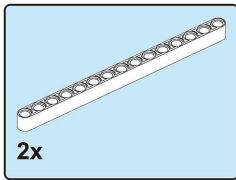
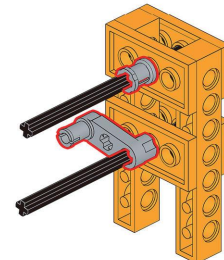
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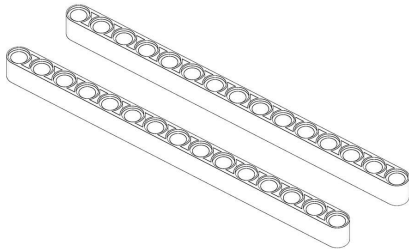
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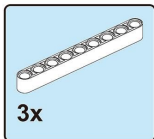
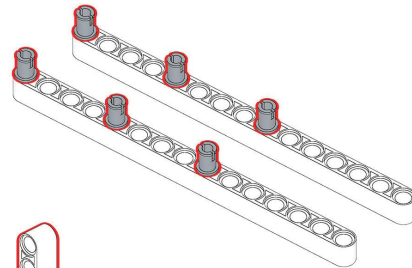
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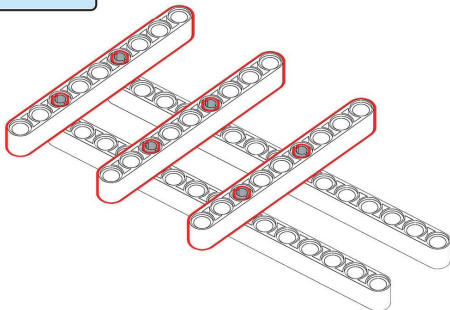
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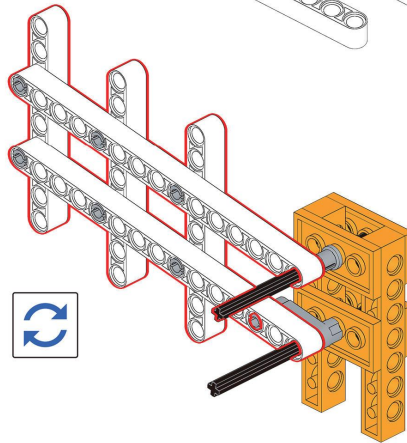
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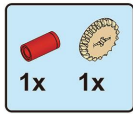


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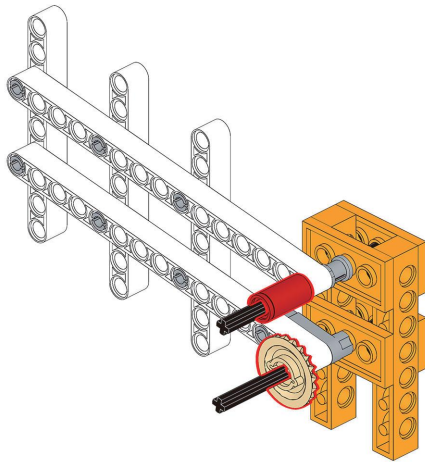


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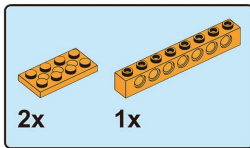
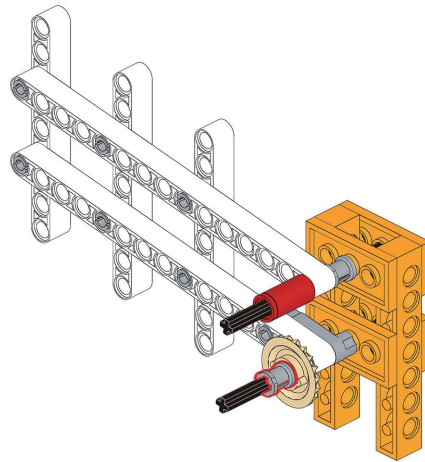




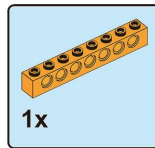
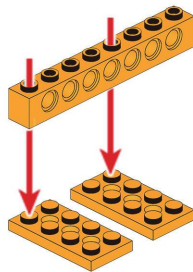
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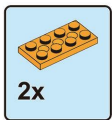
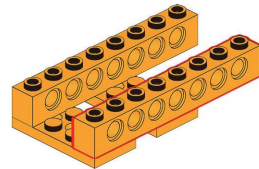
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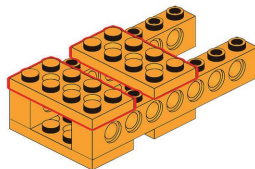
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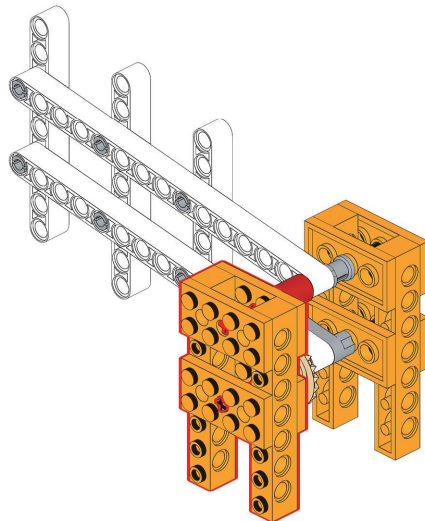
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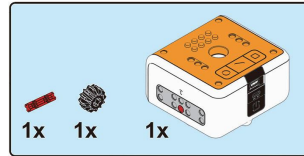
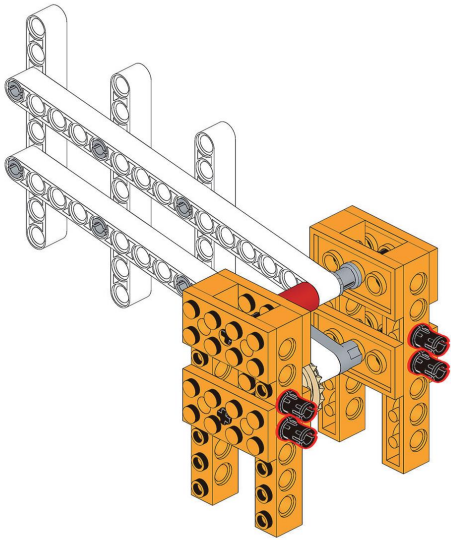


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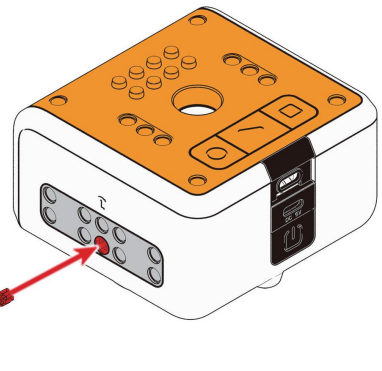




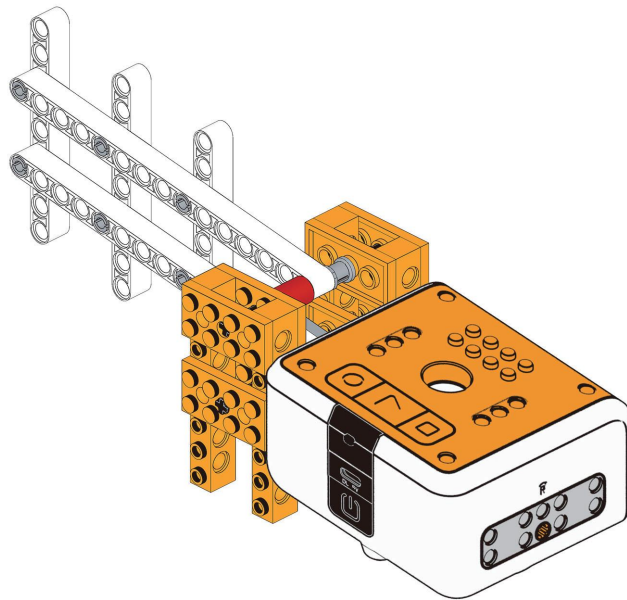
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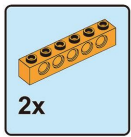
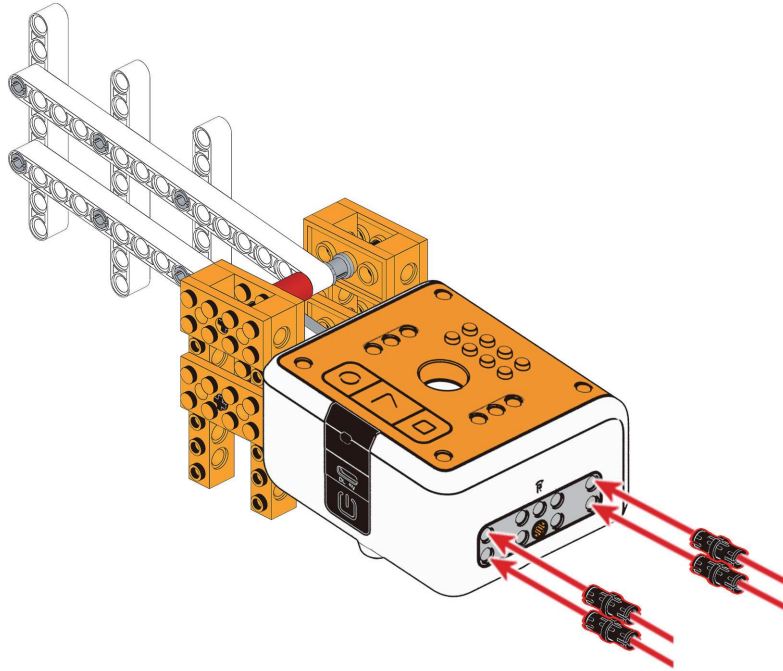


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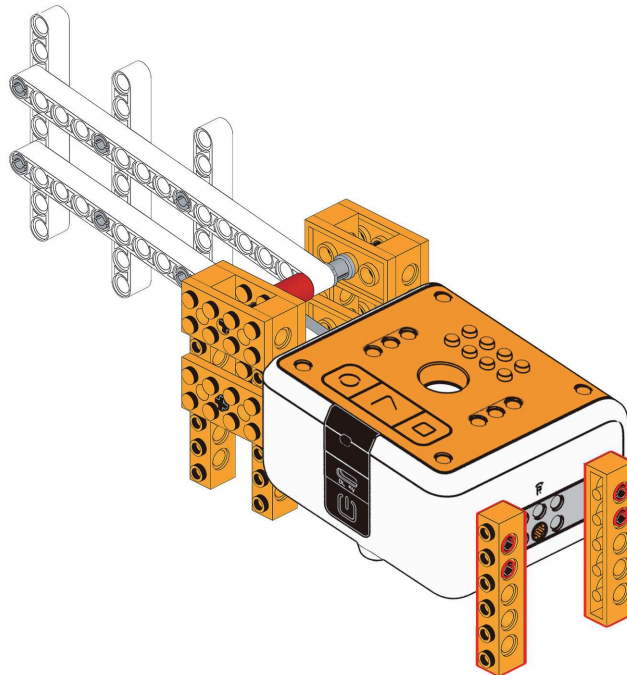




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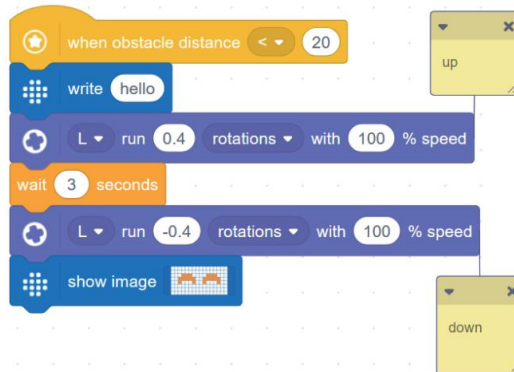




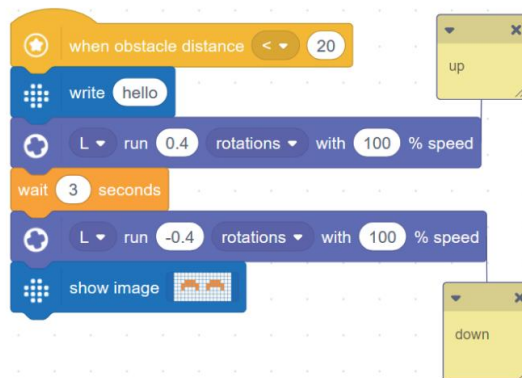
Activity

Activity 1: Use VinciBot and Creator Kit to build an induction door model by following the step-by-step instructions.

Activity 2: Program the model so that when the square button is pressed, the left wheel spins 0.4 turns forward at 100% speed and the door lifts. When the circle button is pressed, the left wheel spins 0.4 turns backward at 100% speed and the door lowers.



Activity 3: Program the model so that when it detects an object less than 20 cm away, the screen shows "hello" and the door lifts. After 3 minutes, the door lowers and the screen shows the smiling eyes pattern.



Students Discuss - Create - Share

1. How does the vertical gear drive work?
2. Where is the vertical gear drive used in the induction door model? What result does it achieve?
3. Program the model so that when green is detected, the door lifts, the screen shows "Welcome", and the green LED turns on. When red is detected, the door lowers, the screen shows "Bye", and the red LED turns on. After 2 seconds, the LED turns off.