my robot time

MRT3 Series

- MRT3 curriculum is developing for helping students(age 6 - 13+), through robotics, learn essential STEM (science, technology, engineering, and math) concepts.
- Step by step and systematic building instructions for MRT3 educational robot kits.

3 Intermediate Level

1 Foundation Level

2 Beginner Level

4 Advanced Level

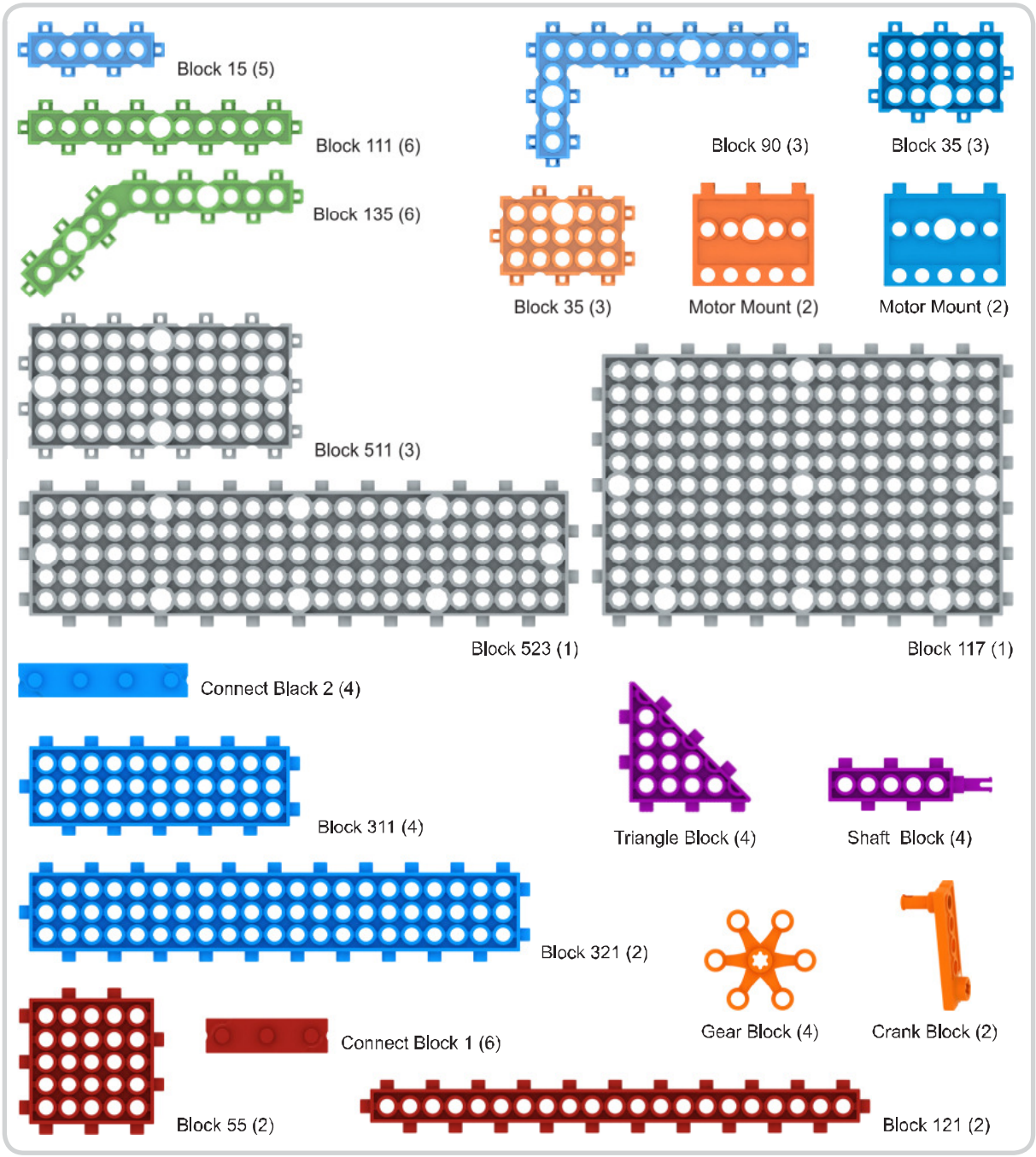
MRT3-3. Intermediate Leve

CONTENTS

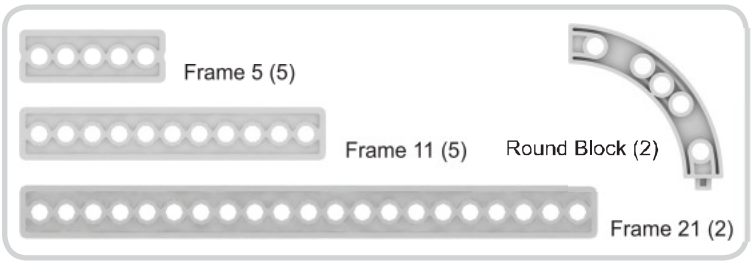
Part list

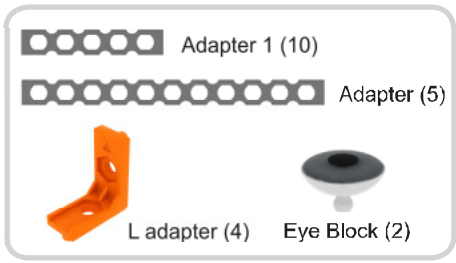
Block

※ The form and color of some parts may be different when compared to actual parts due to continues improvement of production quality.

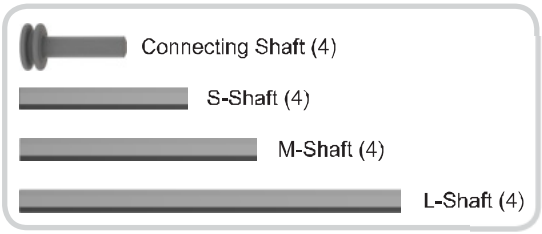


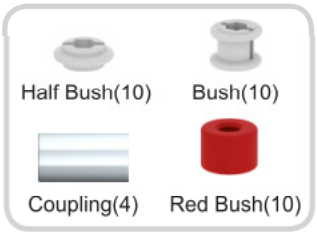
Frame / Adapter

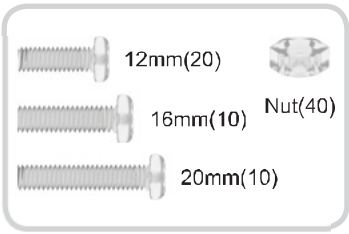




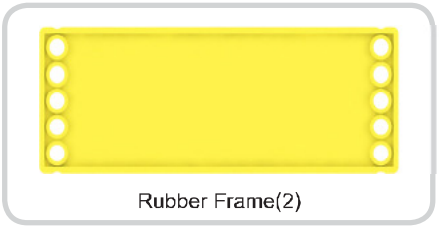
Shaft / Bush

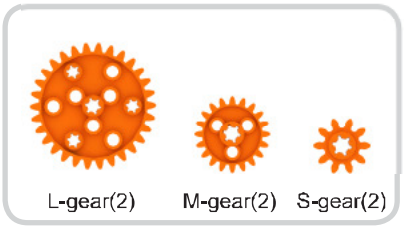


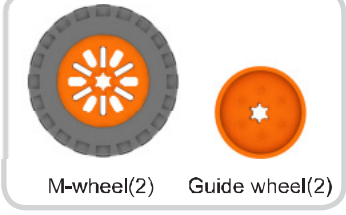




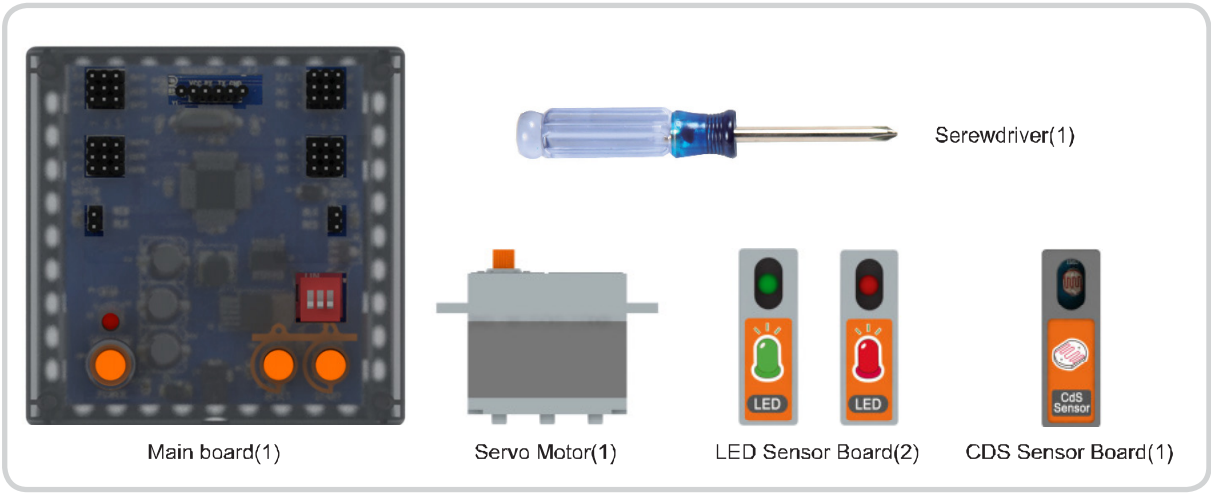
Gear / Wheel







Electronic Parts



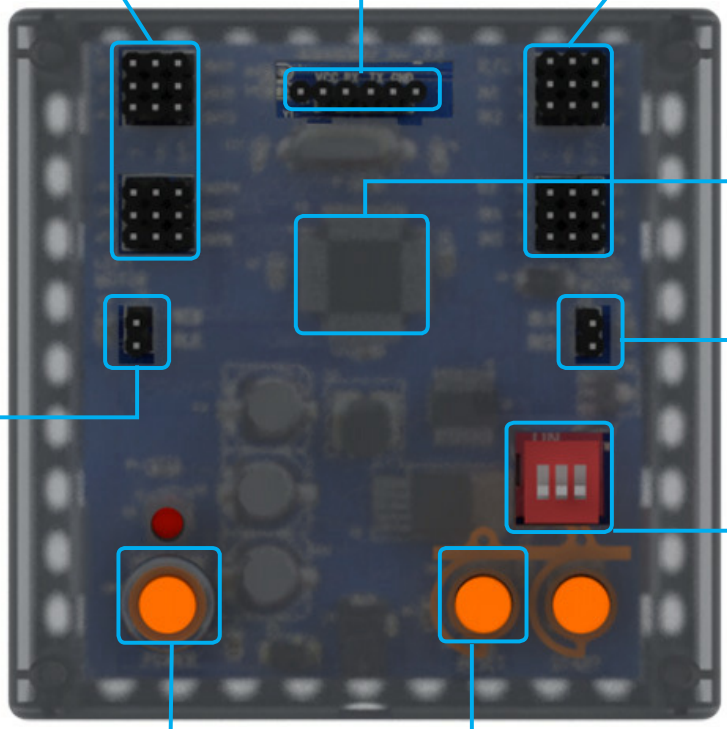
Technology How to use the electronic parts?

Mainboard assembly/Funcion of each feature

OUT-PUT connector
The result is processed and written by the program and sent to a LED, Buzzer or a servo motor.

Download connector
After your program is downloaded from your PC to this port, your robot will move as you programmed.

IN-PUT connector
This part receives input value by connecting with switches and various sensors here.



MCU IC is responsible
for the saving and running program. (Acts in the role of the brain.)

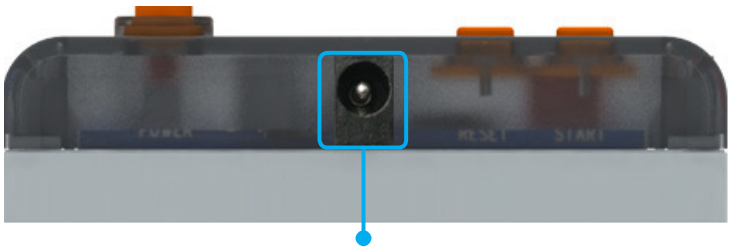
Right DC Motor connector
The output that coordinates the functions of the right motor.

Left DC Motor connect
The output coordinates the functions of the left motor.

Modifying Remote Control ID Switch
This part is for setting remote control ID.

Power Switch
Power on/off switch.

MODE Settings
Modify modes of program.



Power Connector
Connects to the 6V battery packs.

LED Sensor

"Send" light
An infrared signal is sent to the object. If there is a reflection, the information is sent to the 'receive' light part.

CDS Sensor

Light Sensor
Light is received and affects the behavior of the sensor.

Setting remote control ID

① Turn on the robot.

② Connect RC receiver board to R/C connector.

③ Press CH button while holding ↵ button. The A panel ID LED turns on and shows you what mode you chose.

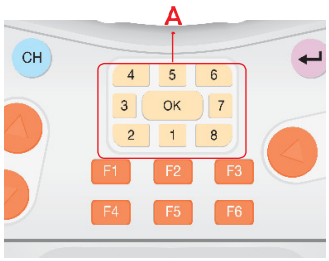
④ Press CH button while holding ↵ button and choose your ID. (Number 1~8)

⑤ After selecting ID, if you release ↵ Button and press CH button, ID will be selected.

⑥ The LED on the mainboard will blink 3 times and it will turn off automatically.
That means the ID Selection is finished.

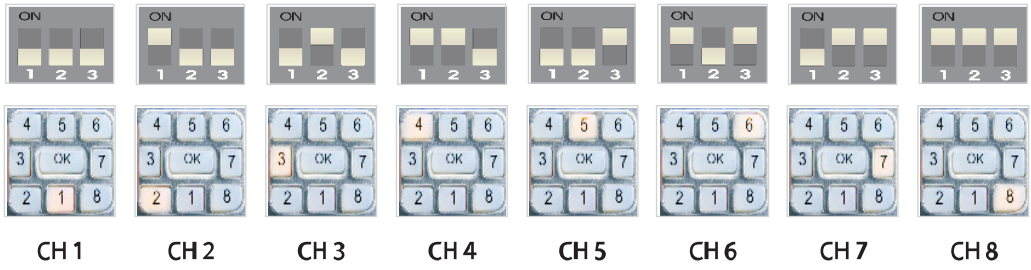
⑦ If you press ↵ button, you can see your selected ID.

※ If there is a problem, repeat steps 1-7 carefully.

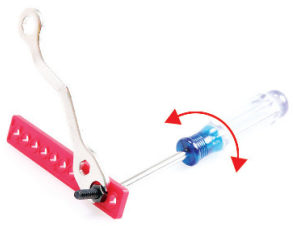


How to set up communication ID

※ The maximum number of channels can be set as shown below without interference.
Use the picture to assign the channels to the communication ID.



How to use a screwdriver and a spanner?



1. When holding a screwdriver; Turn right to tighten and turn left to loosen.

2. When tightening or loosening a bolt, hold it firmly to keep the nut in place.

Technology Engineering — How to use the basic MRT program

Creating an educational model for the basic program

1

Connect servo motor and DC motors to ¯block117 ¦ , then insert medium gears to the shaft of DC motor.

2

Attach remote control receiver board and various sensors.

3

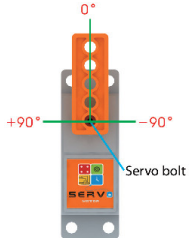
The mainboard is attached on the top of DC motor.

4

Connect battery cases to mainboard.

Servo Motor-Zero Point Adjustment

1. Connect the servo motor to the mainboard. You can write the program in the following way.

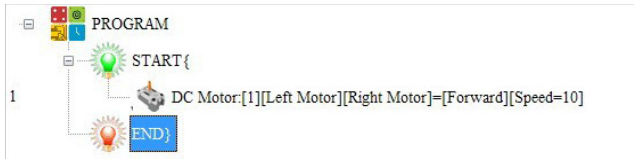


2. After downloading the program, power off and on again.
3. Fix servo motor horn to the servo motor with a small servo bolt as illustrated in the picture .

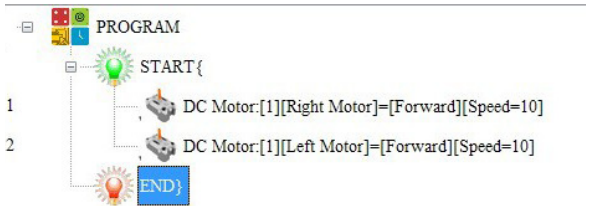
How to operate the DC motor

Left motor and right motor move forward at speed level 10.(Maximum speed)

1.



2.



No.1 and No.2 are exactly the same programs. However, program No.1 is used to control the two motors together, and program No.2 is used to control the motors separately. Let's try to change the program to the mainboard in different ways.

How to operate the Servo motor

Servo motor connected to the OUTPUT port 1 is rotated by 90 degrees.

To adjust zero point of the servo motor connected to OUTPUT port 1

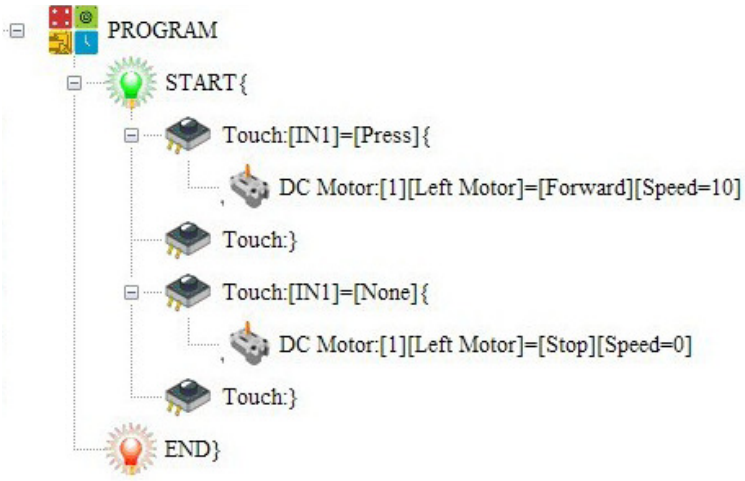
Servo motor connected to the OUTPUT port 1 is rotated by -90 degrees.

※ **Let's change the degree of servomotor by modifying the program.**

Creating Conditional(IF/END)

1. Creating a conditional sentence for sensor

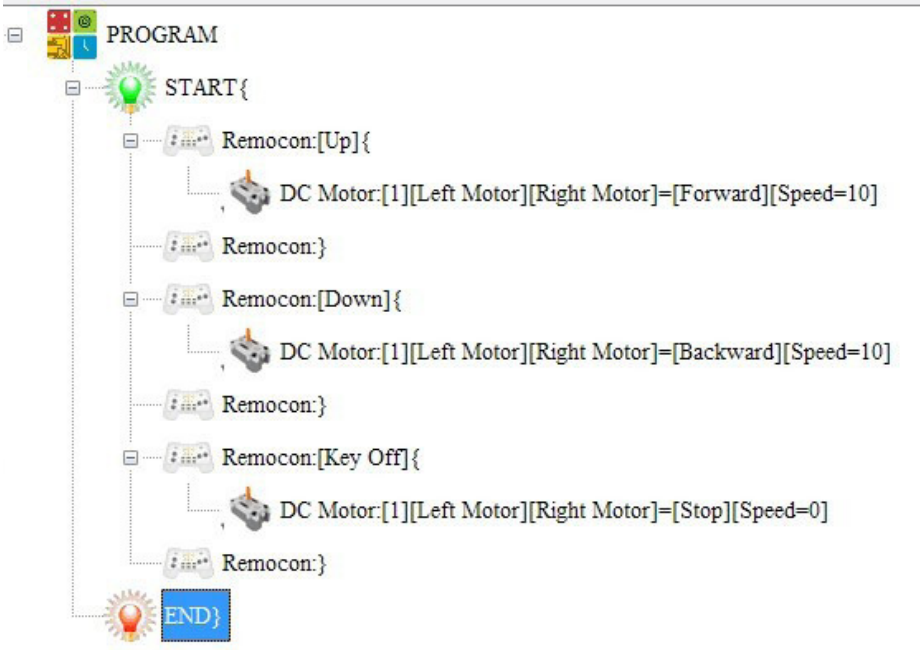
- When pressed touch sensor connected to INPUT port 1, left DC motor will work. When not pressed, the left DC motor will not move.



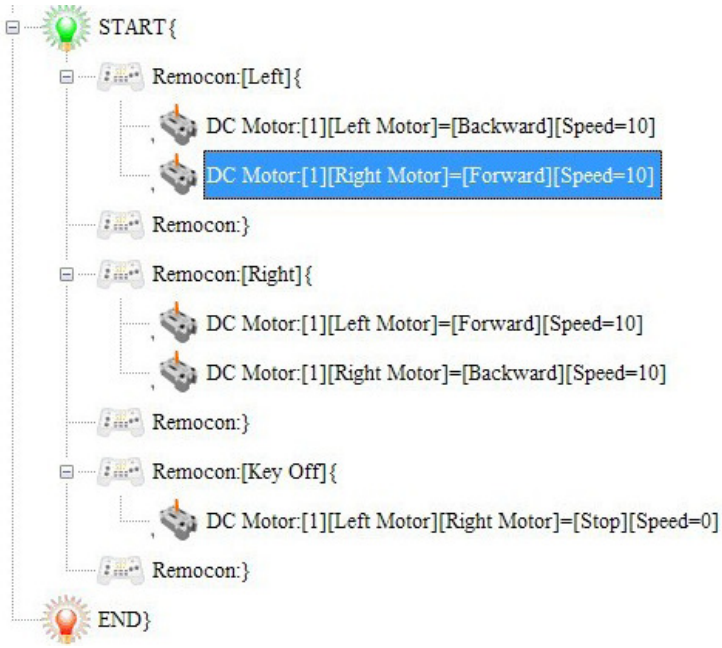
♣ Let's change the program of the Infrared sensor and CdS sensor in the same way.

2. Creating a conditional sentence for remote control

- If one press the directional keys(∧∨) of the remote control, both DC motors will move back and forth.



- If one press the directional keys(◁ ▷) of the remote control, both DC motors will move opposite directions from each other.

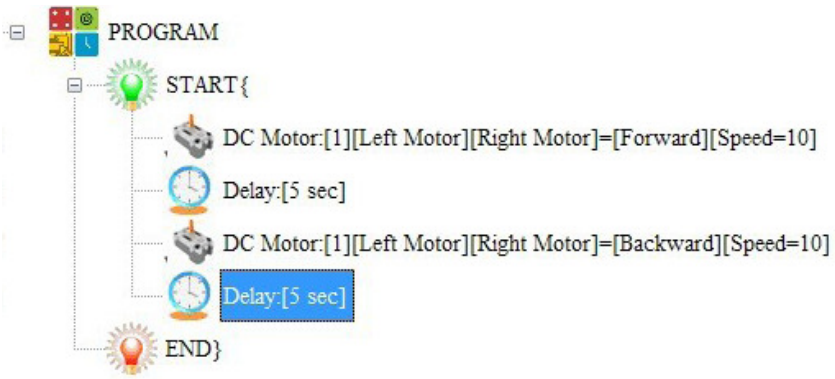


※ **Note: When creating remote control conditional sentences, it is necessary to enter 'KEY OFF' conditional sentence, then the robot will operate smoothly.**

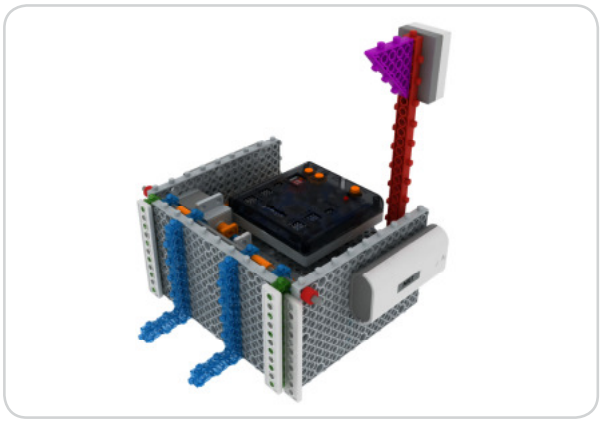
♣ **Let's create various programs by using remote control FUNCTION keys (F1/F2 ~ ~)**

Creating a time delay

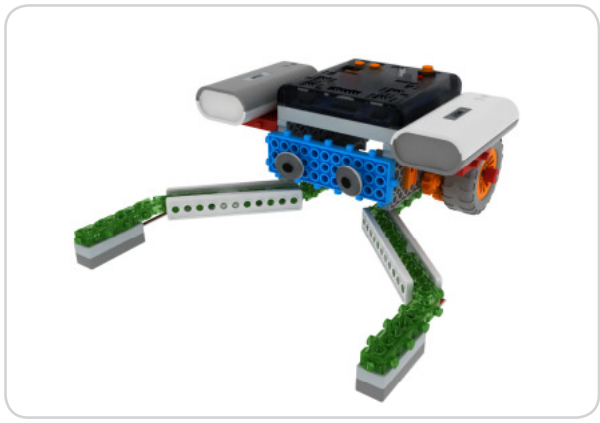
- DC motors move forward for 5 seconds , then go into reverse.



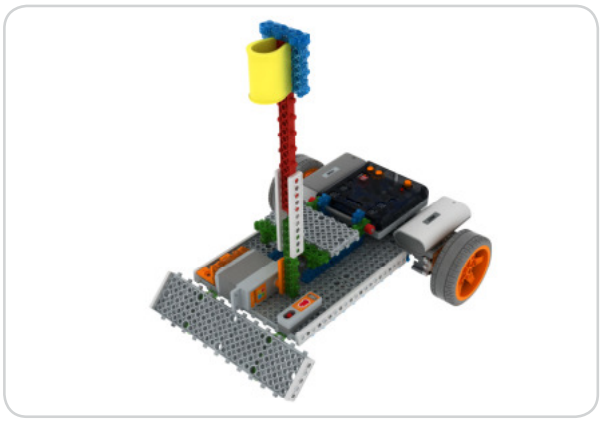
What robots are we going to assemble?



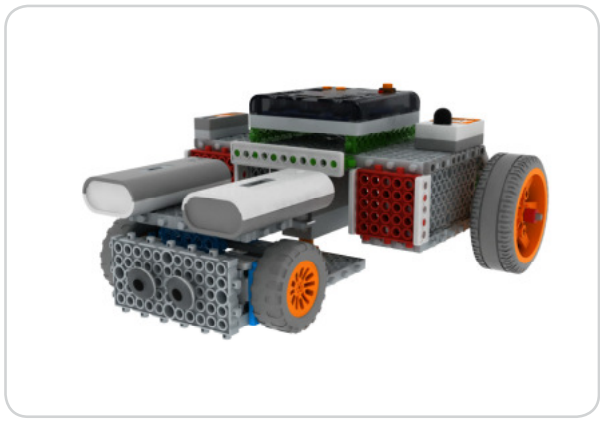
1. Soccer Robot



2. Hemiptera



3. Touch Battle Robot

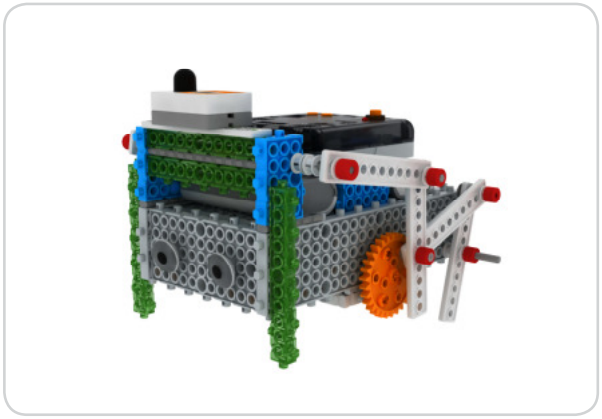


4. The little car 'Bumboo'

5. Fencing Robot

6. Catapult

7. Forceps Robot



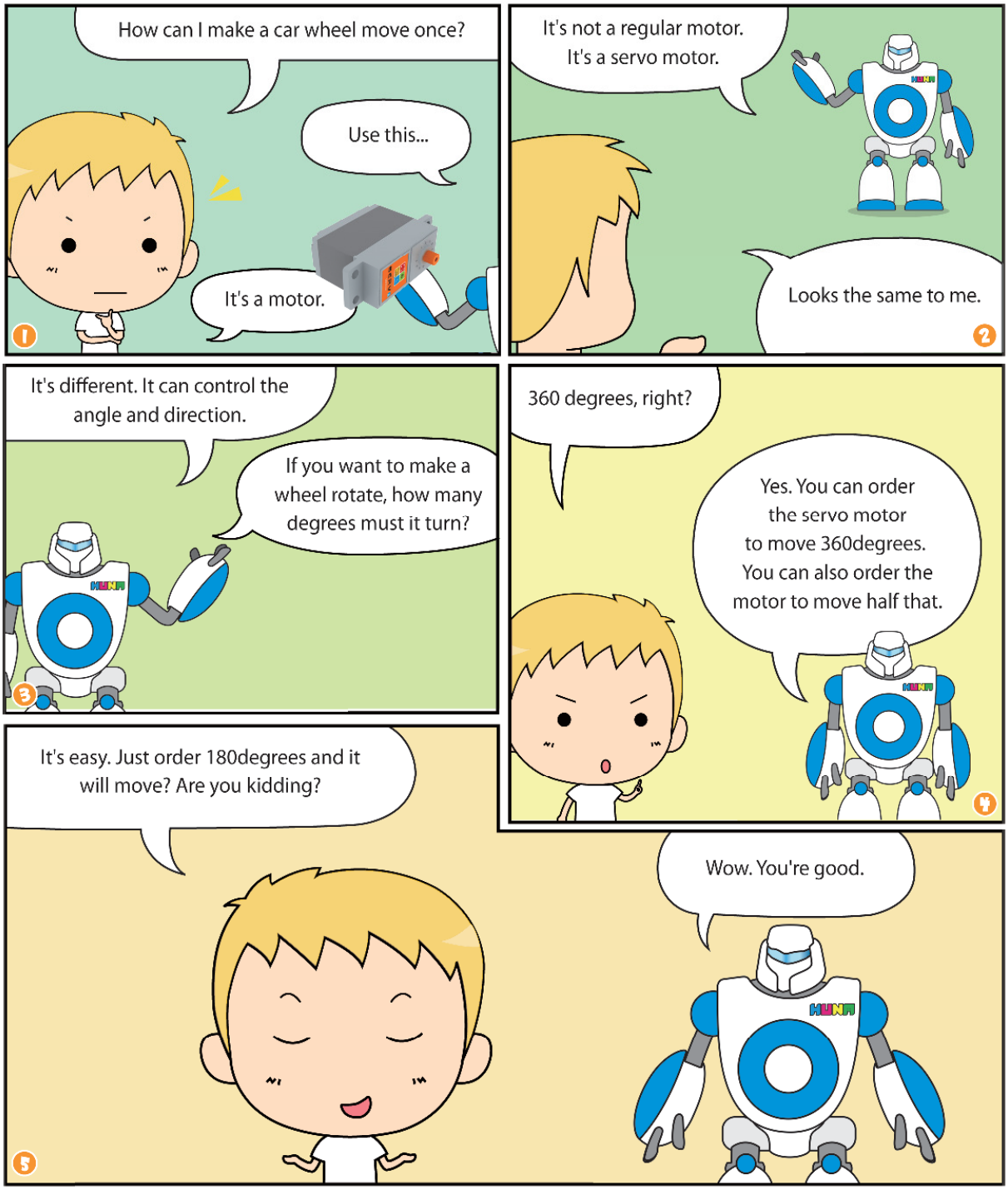
8. Bug Battle Bot

9. Cleaner Bot

10. Dump Truck

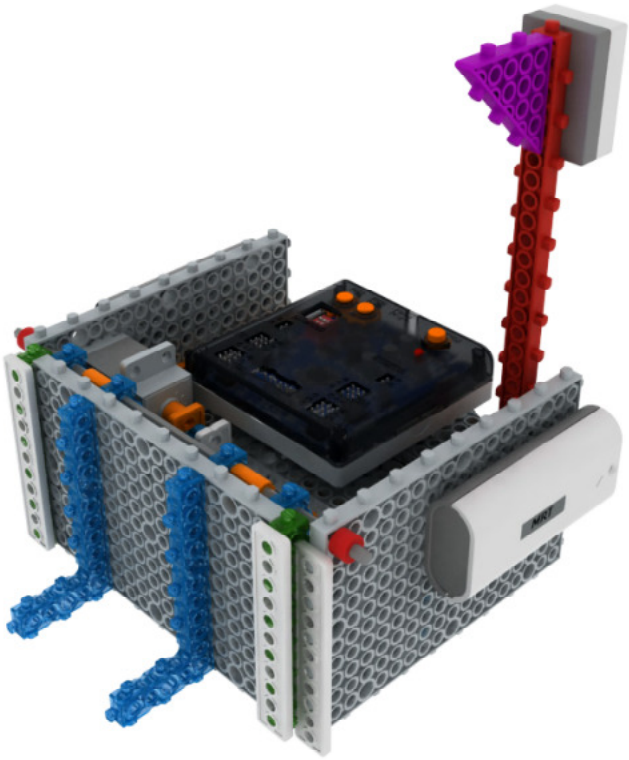
Technology

STEM 1. Servo Motor



Technology

Robot Making1-Soccer Robot



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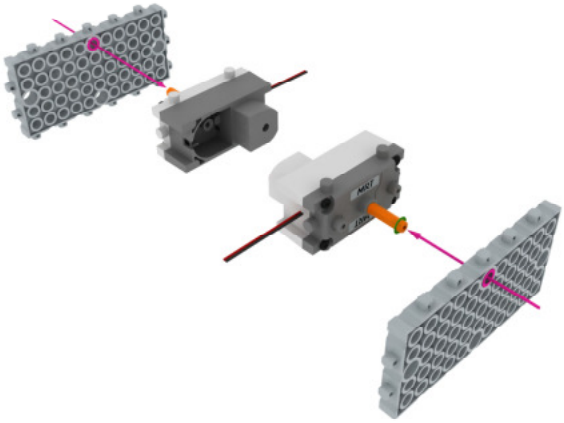

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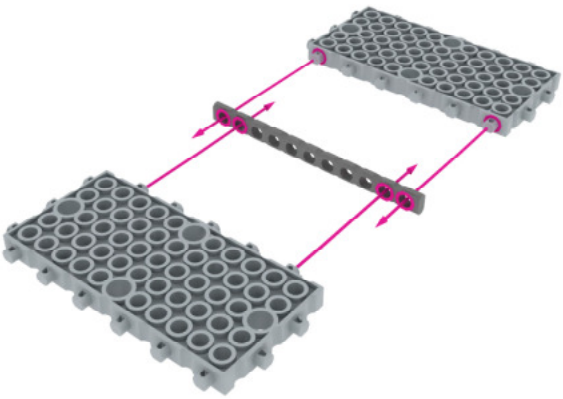

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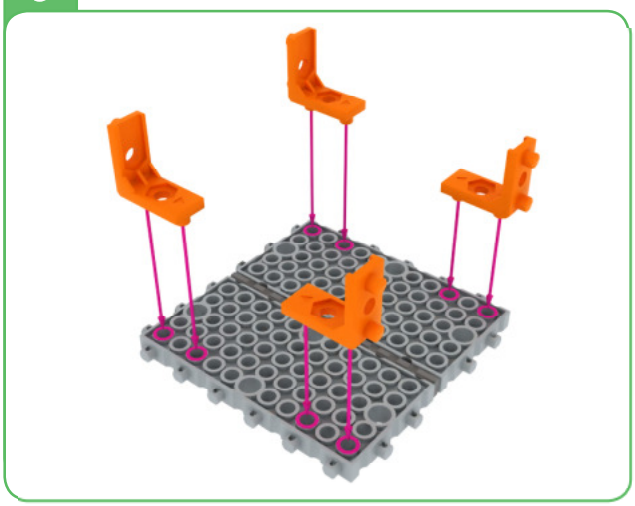

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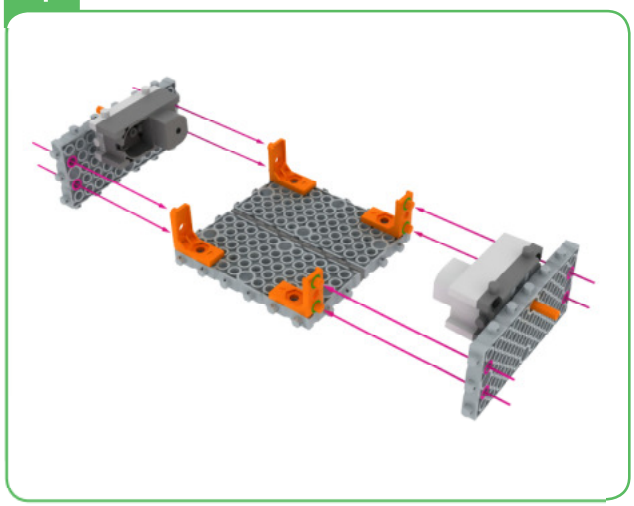

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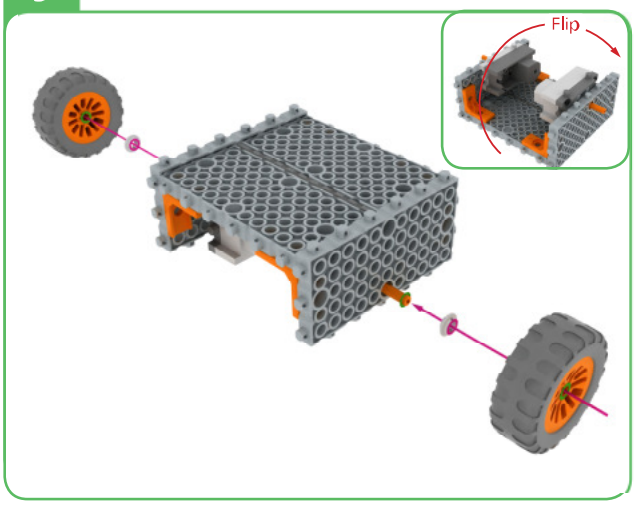

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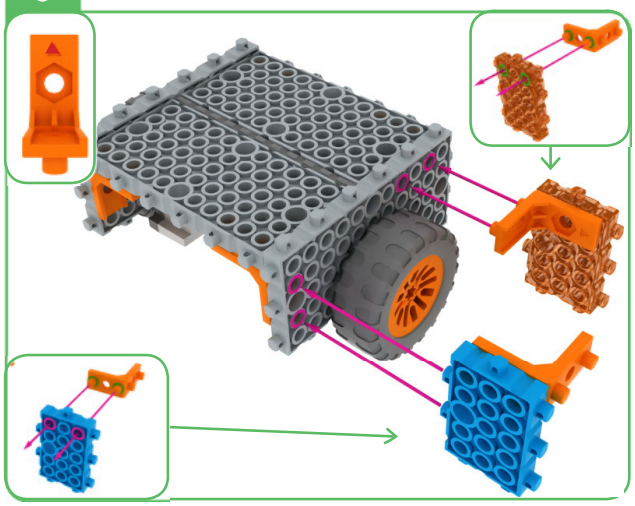

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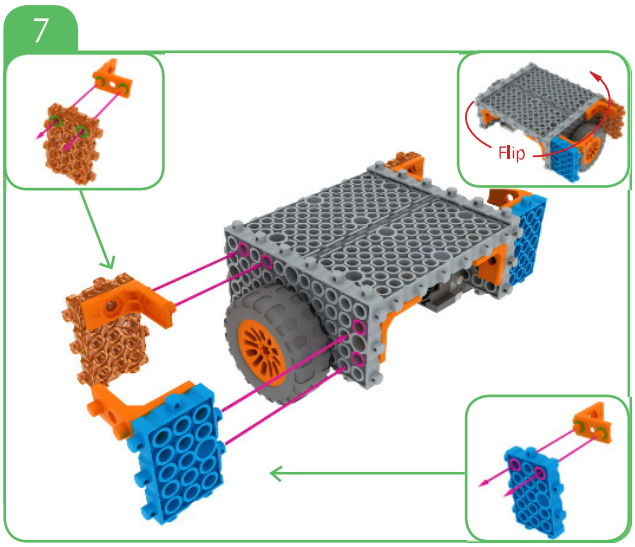

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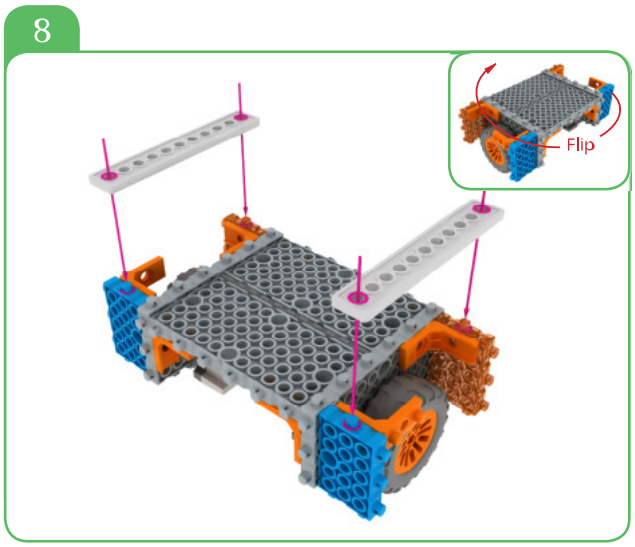

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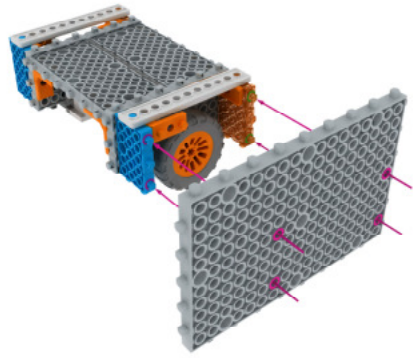

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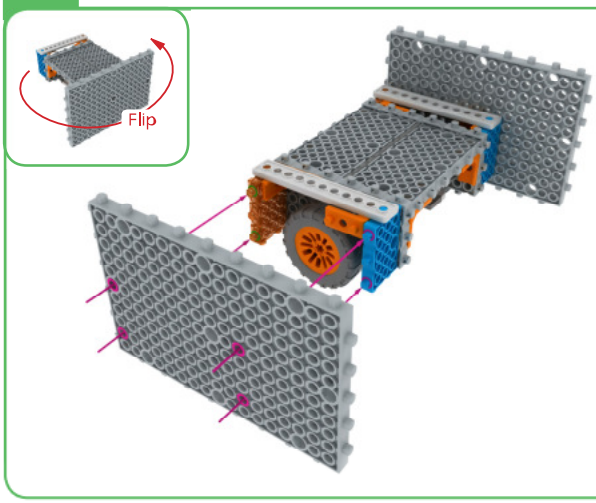

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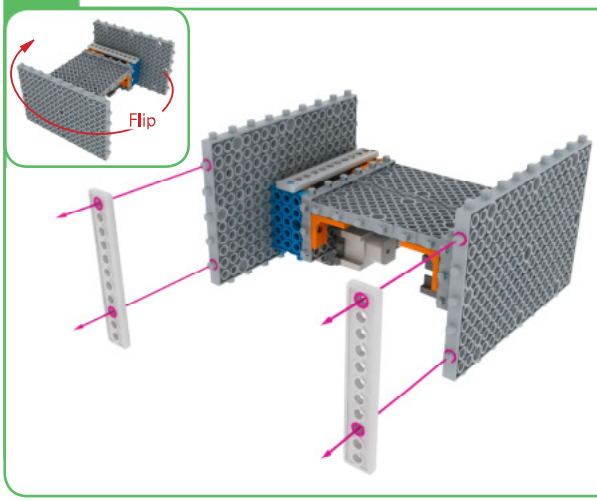

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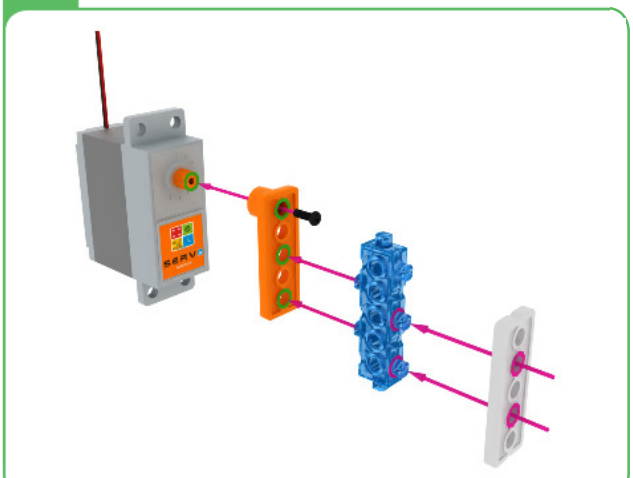

Servo Motor-Zero Point Adjustment

1. Connect the servo motor to the mainboard. You can write the program in the following way.

2. After downloading the program, power off and on again.
3. Fix servo motor horn to the servo motor with a small servo bolt as illustrated in the picture .

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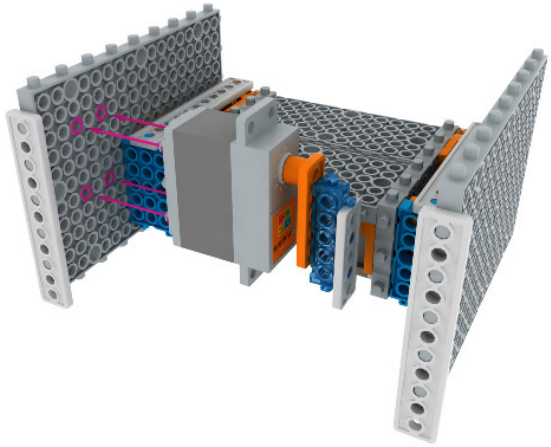

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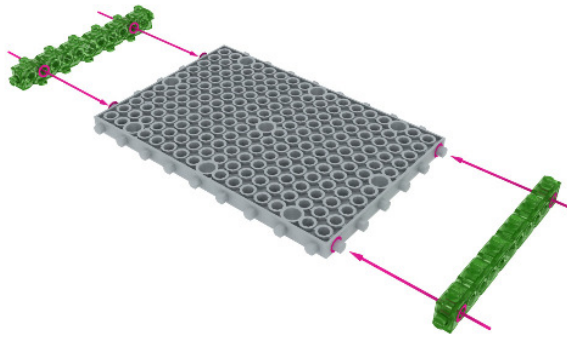

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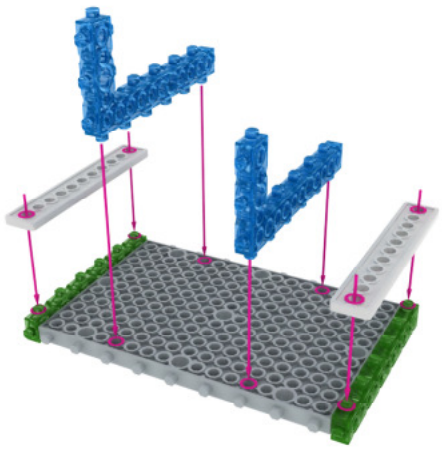

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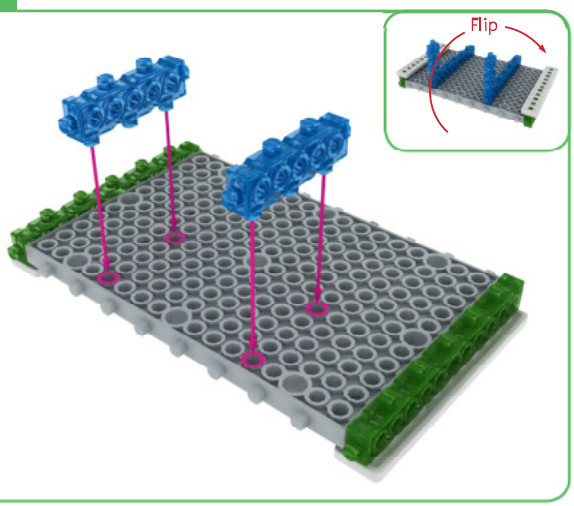

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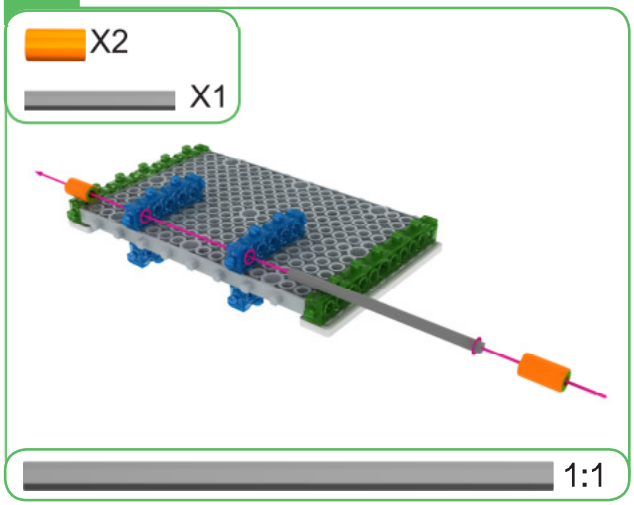

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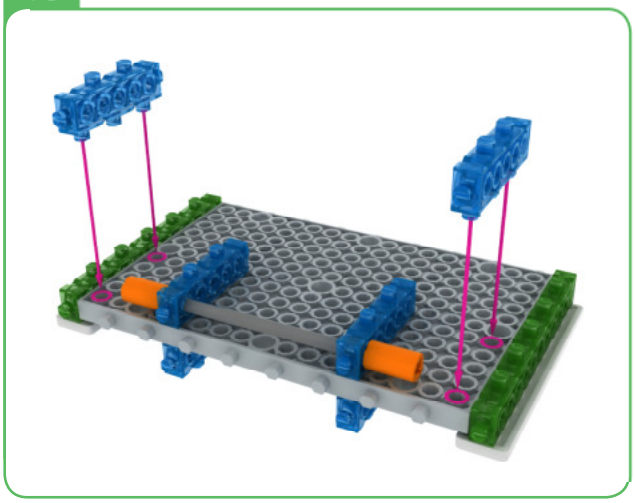

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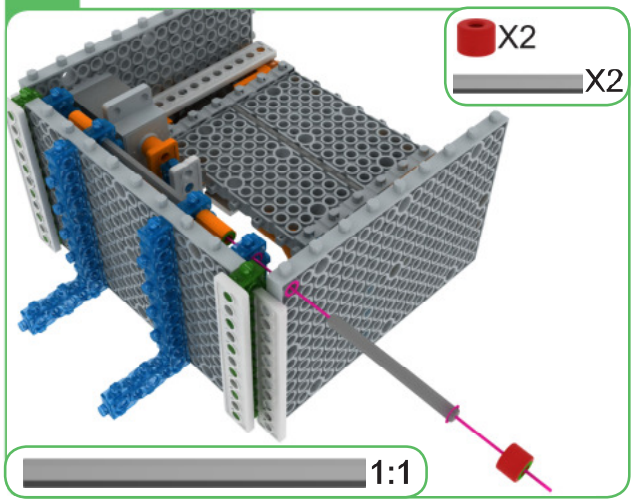

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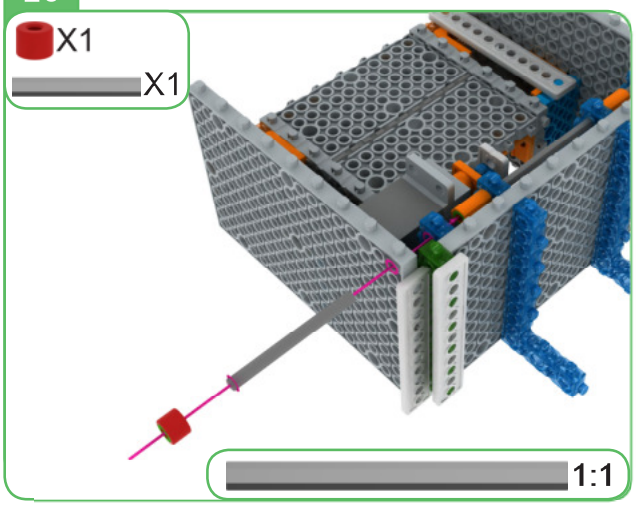

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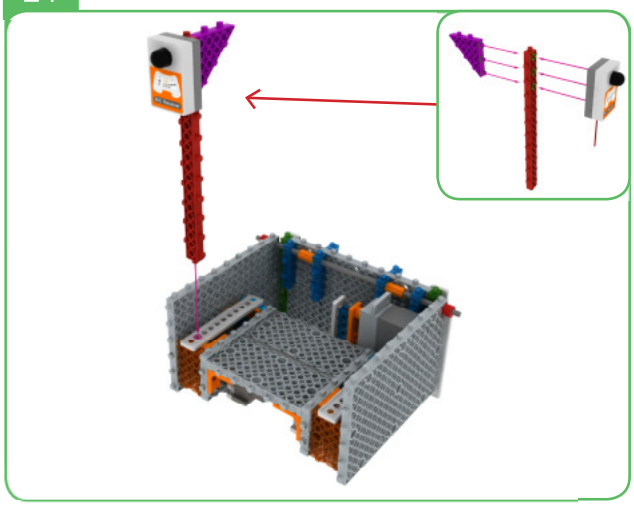

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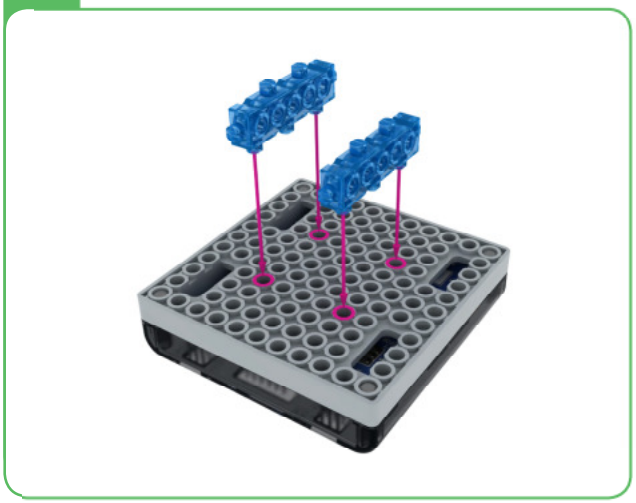

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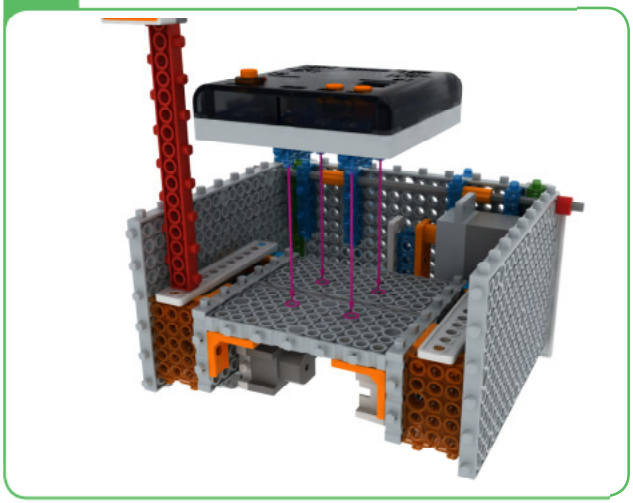
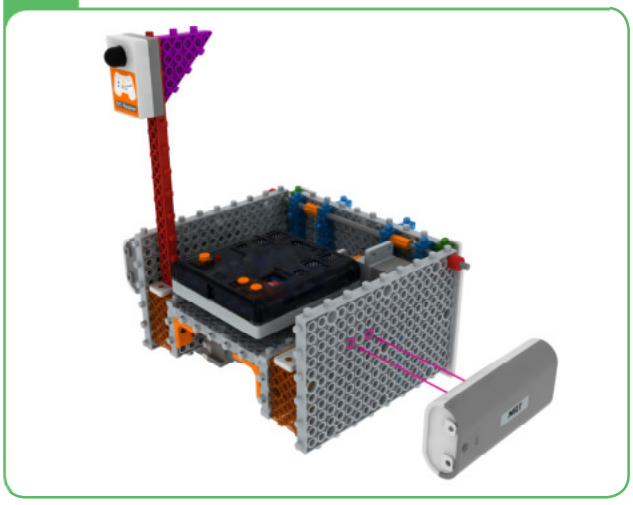


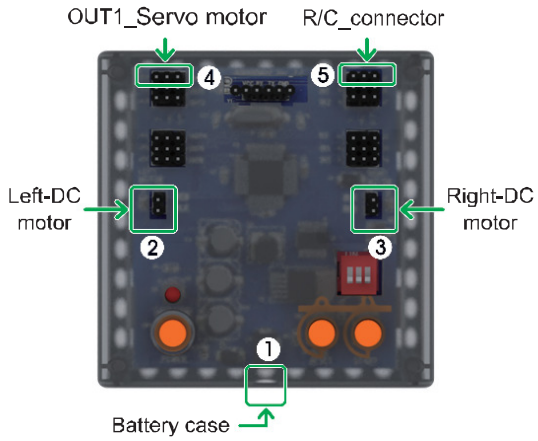
24

End



How to operate the Soccer robot2

Connecting the main board

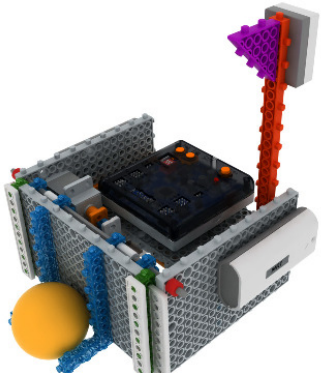


Connect in this order.

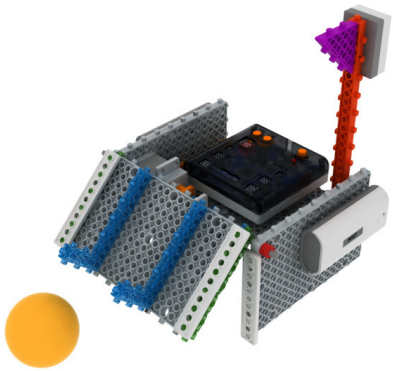
1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect Servo motor to OUT1 of OUTPUT connector.
5. Connect RC receiver board to R/C connector.

Motion Pattern/Program

Ball Dribling



Ball Dribling

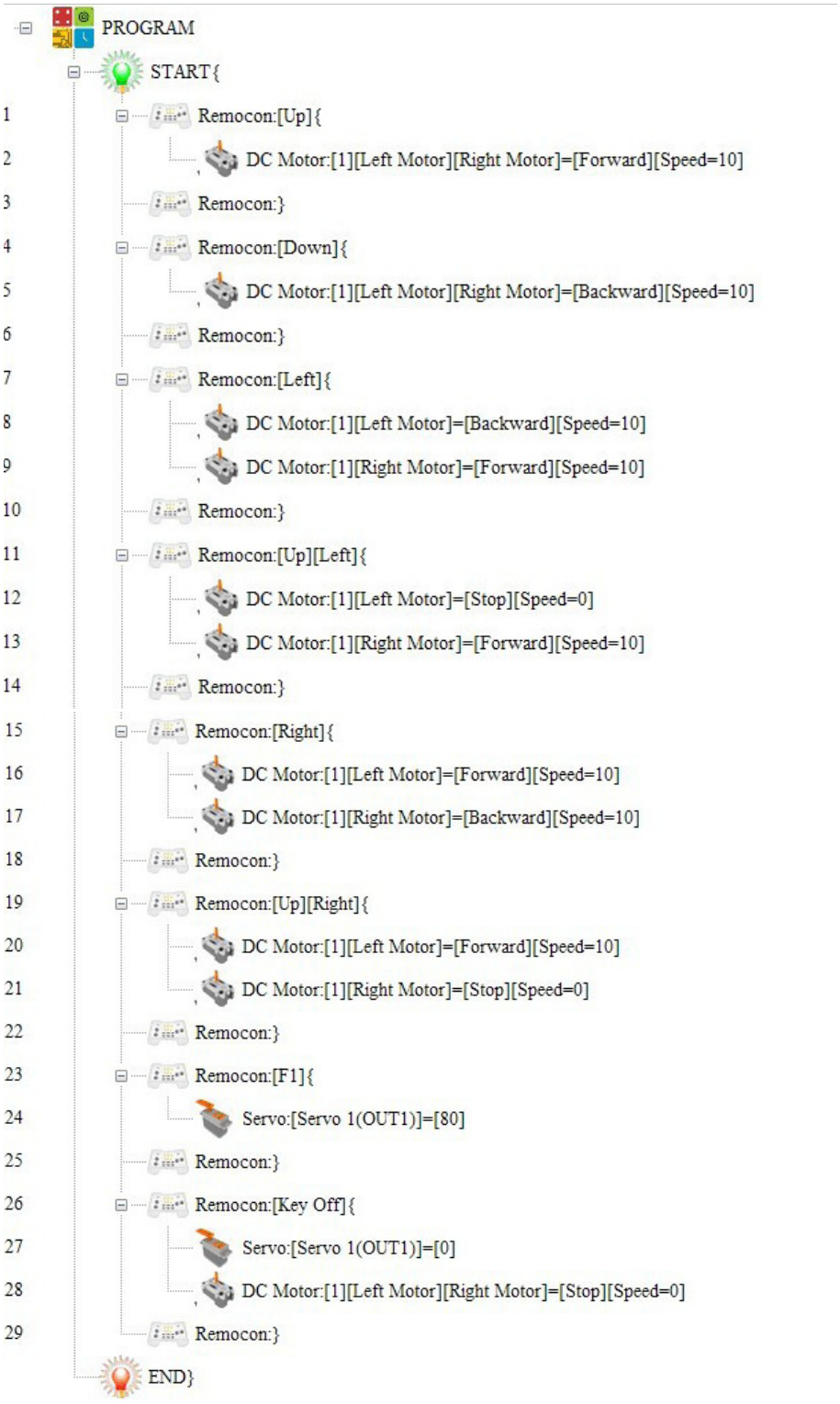


※ - Using the motion patterns as reference, let's write the program.

Program Download

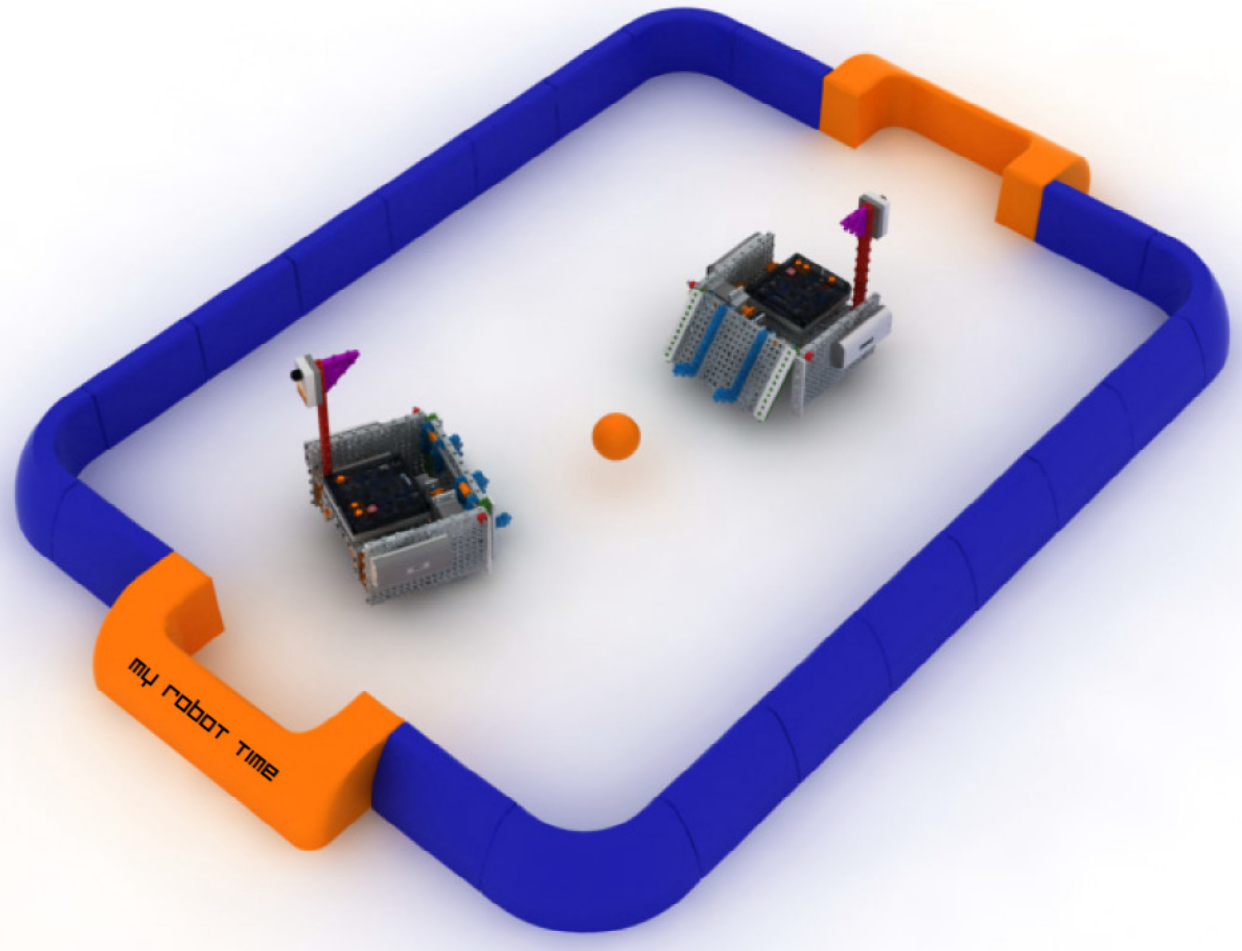
1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

Program Example

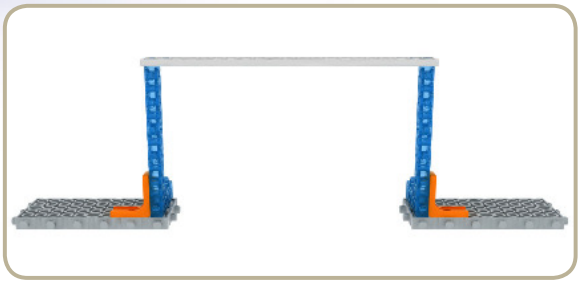


Art ***Assemble Soccer Robot and two soccer goal post, let's make a soccer competition with your friends***

Assemble a soccer goal post

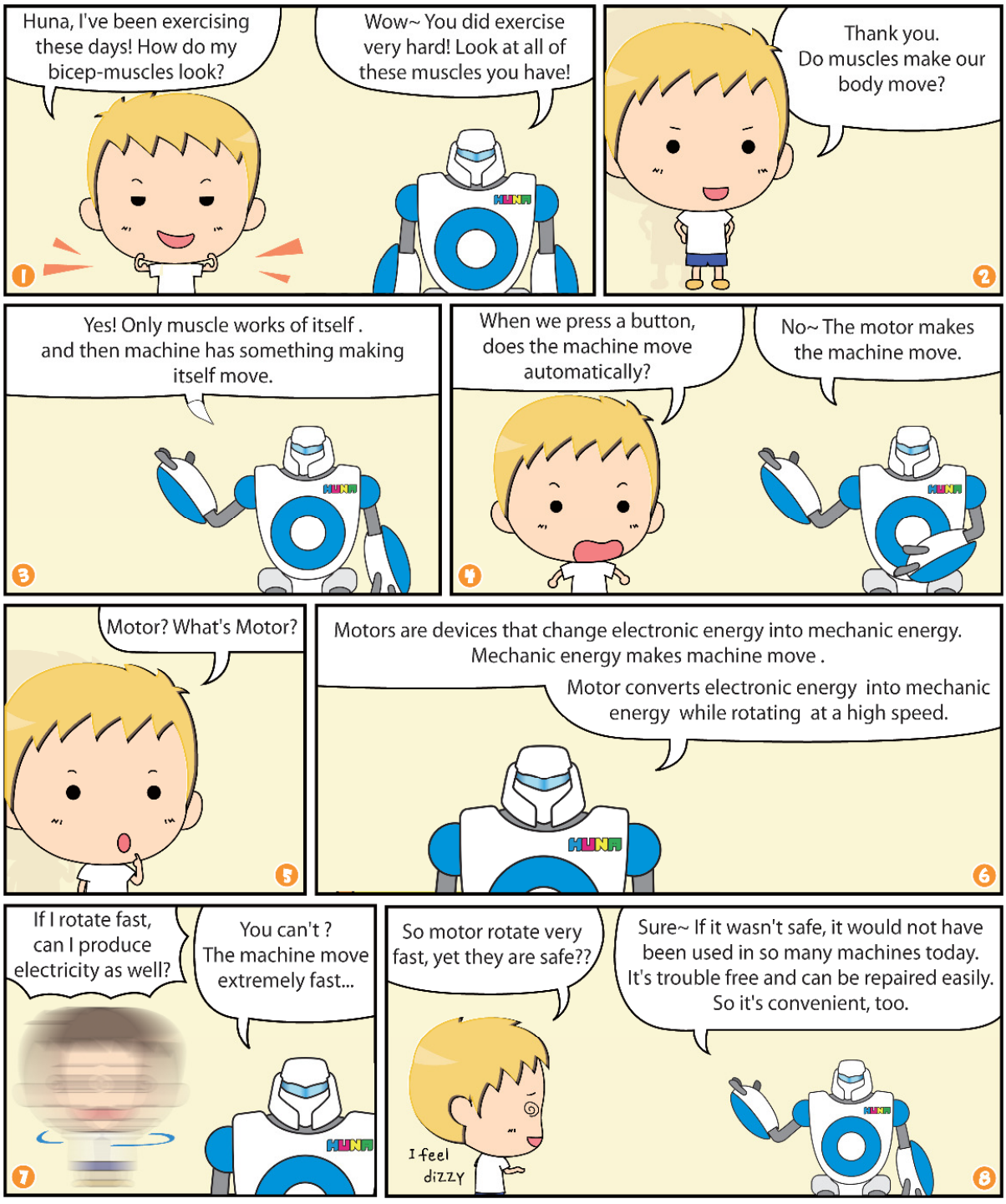


※DIY SOCCER STADIUM

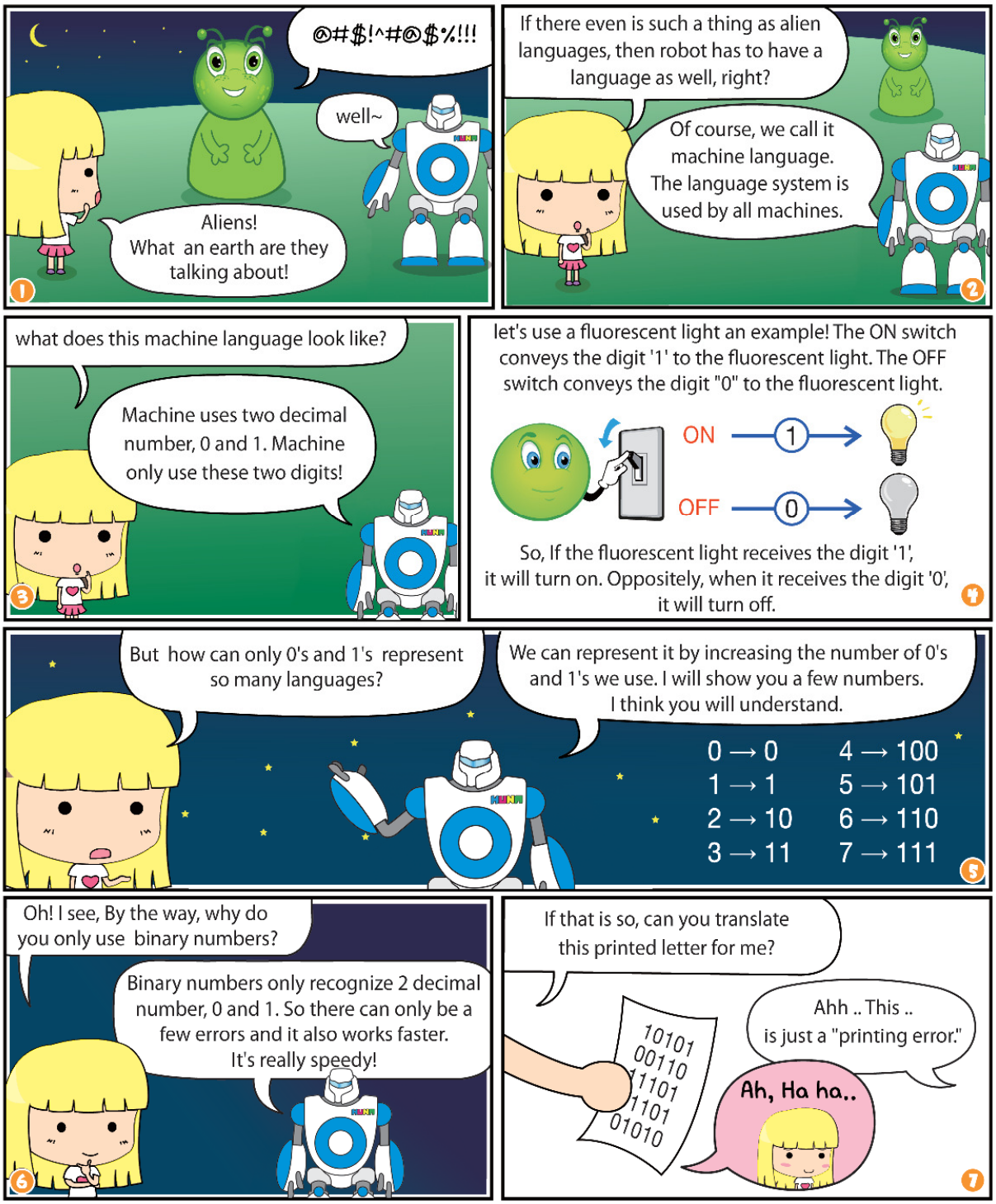


Science Engineering

STEM 2. How muscles make us move just Like machines!-Motor2

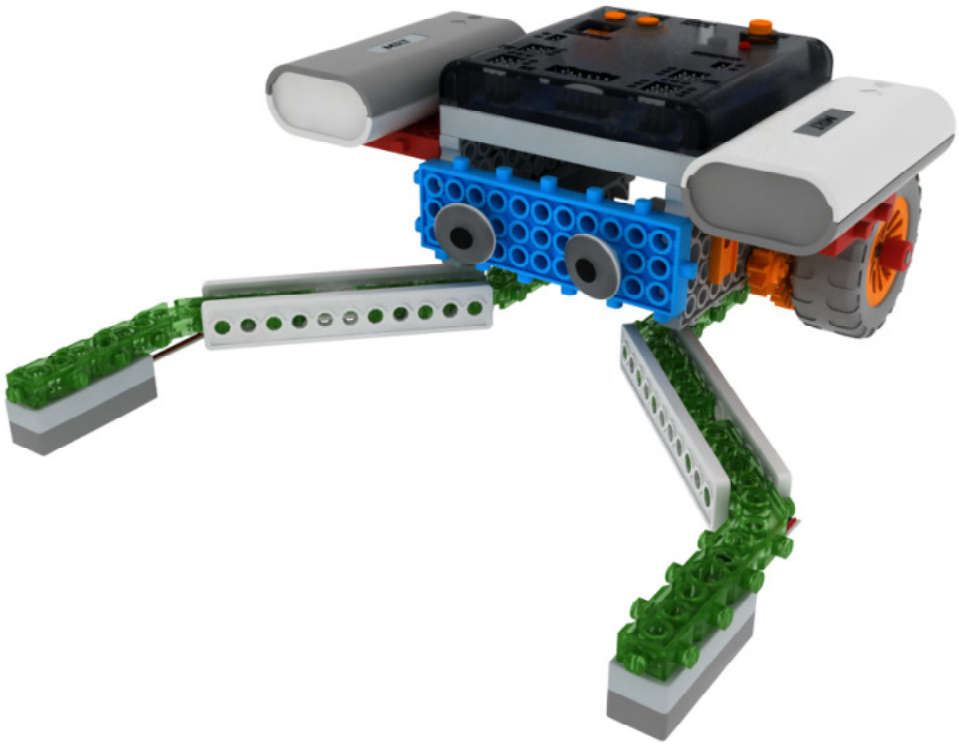


Technology Mathematics STEM 3. The robot's brain-The binary numbers (Light ON / OFF)



Technology Engineering

Robot Making2-Hemiptera



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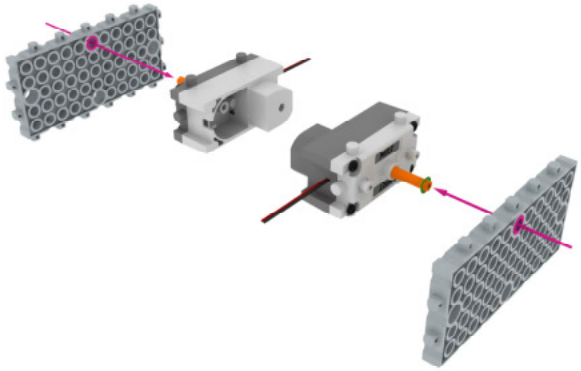

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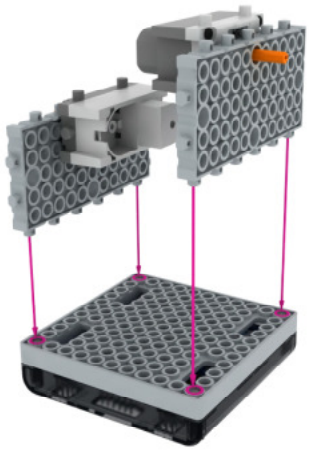

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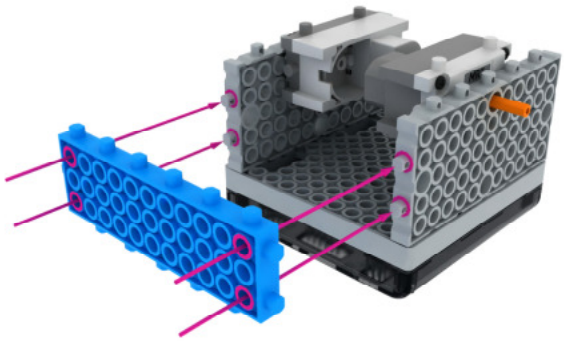

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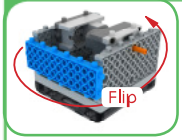

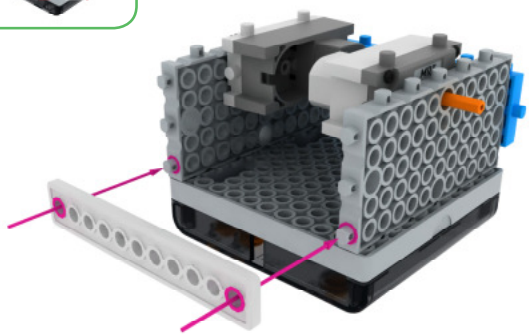

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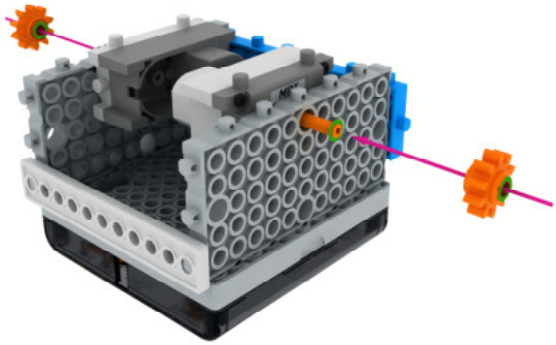

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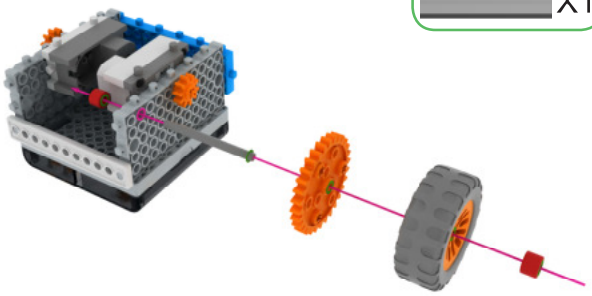

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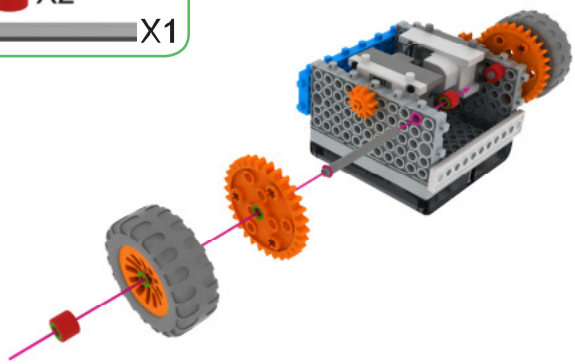

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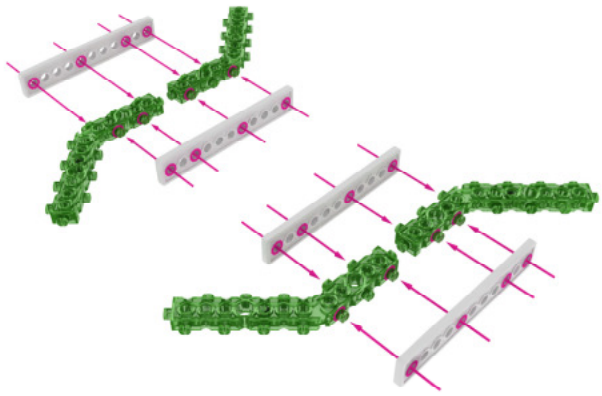

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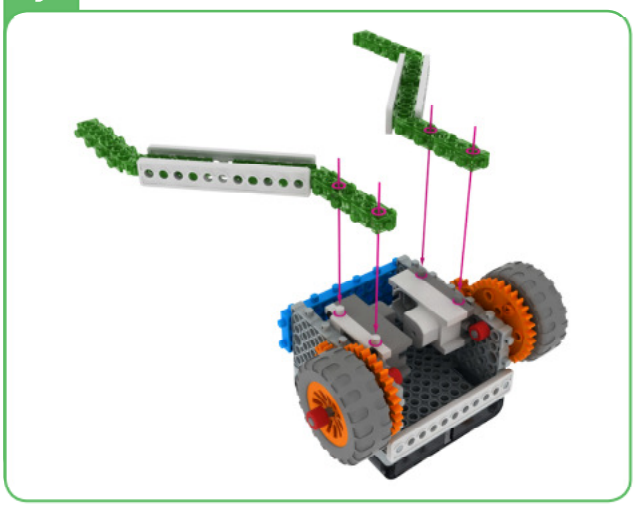

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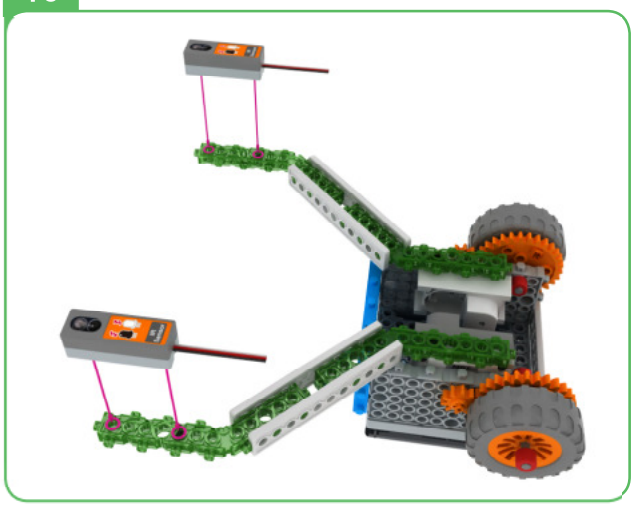

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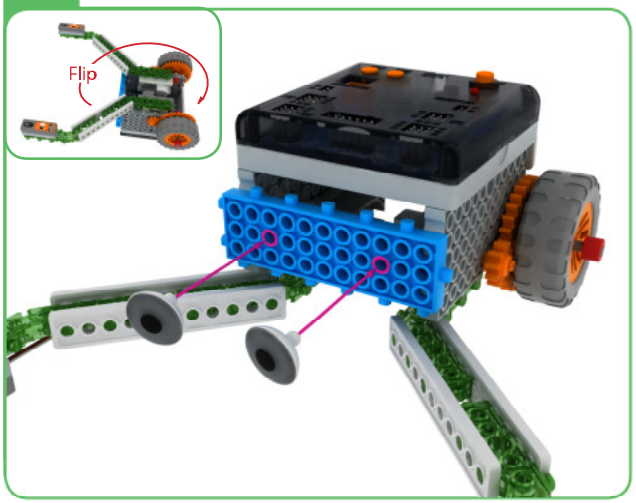

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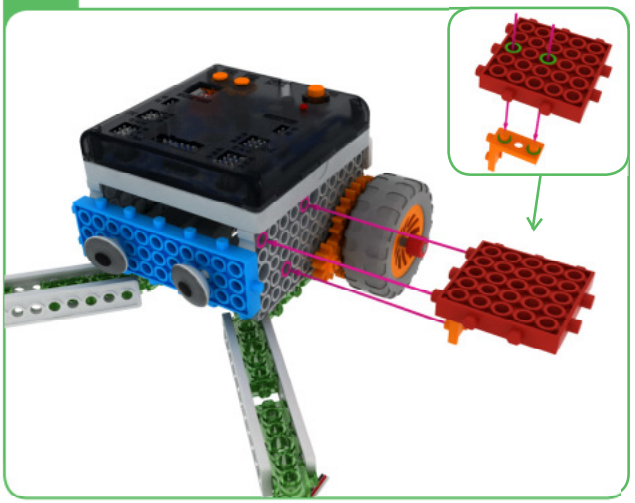

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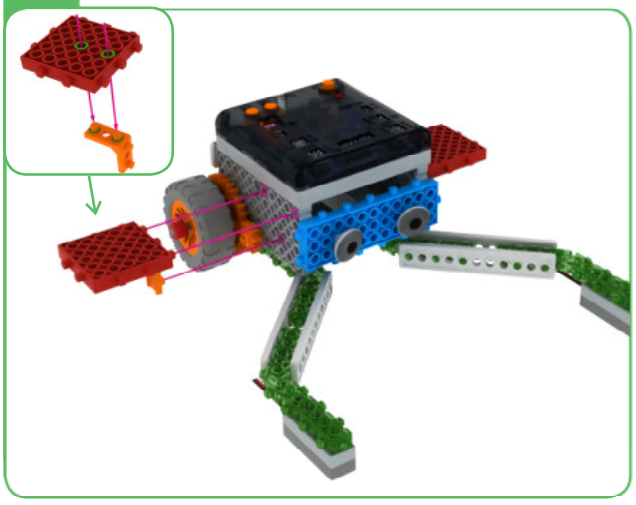

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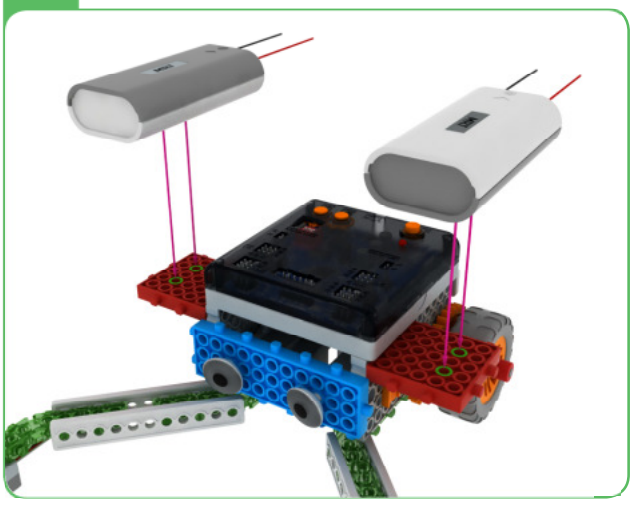
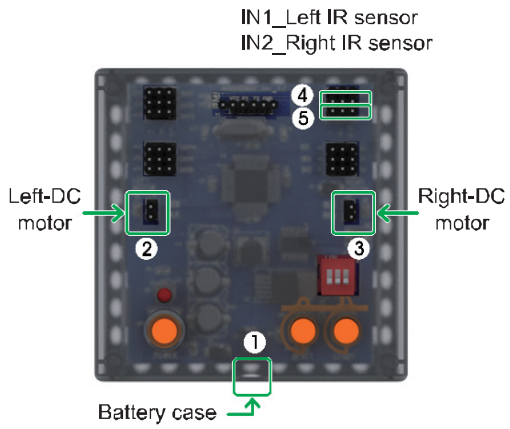


How to operate the Hemiptera

Connecting the main board

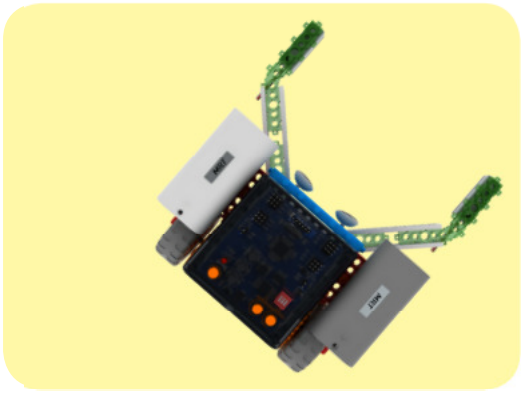


Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect Left IR sensor to IN1 of INPUT connector.
5. Connect Right IR sensor to IN2 of INPUT connector.

Motion Pattern/Program

※ A bright colored table



1. When left side Infrared sensor perceive a cliff, It will move backward. It will make a right turn and will go straight forward.

2. when right side Infrared sensor perceive a cliff, It will move backward. It will make a left turn and will go straight forward.

※ - Using the motion patterns as reference, let's write the program.

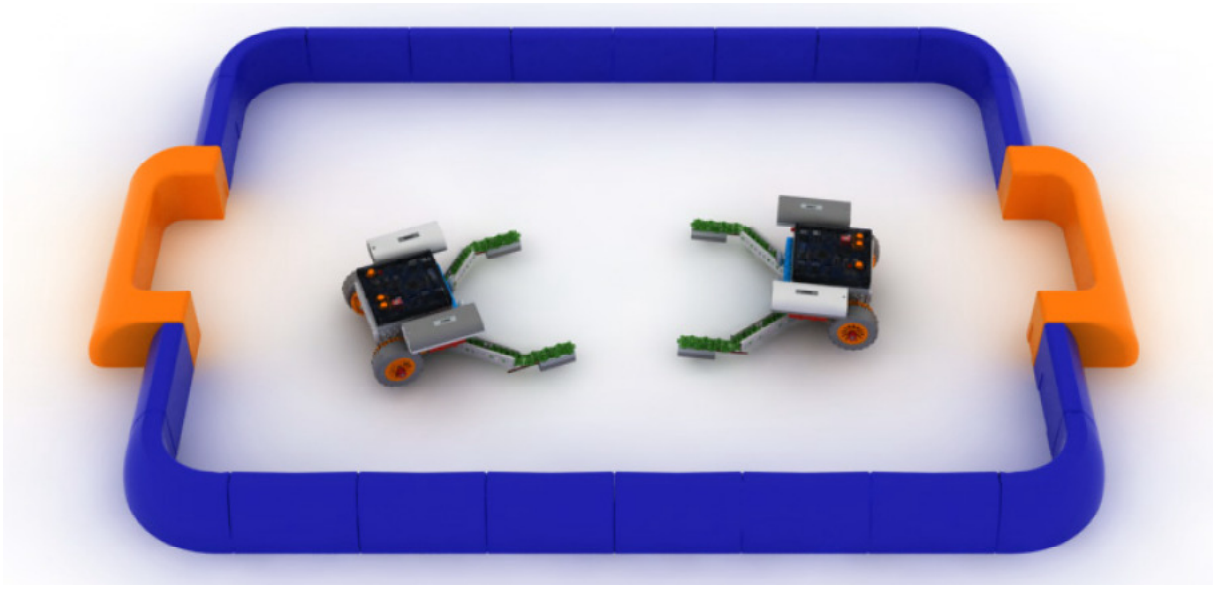
Program Download

1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

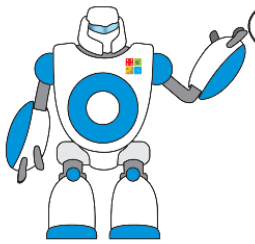
Program Example

```
1   IR:[IN1]=[Sense][IN2]=[Sense]{
2       DC Motor:[1][Left Motor][Right Motor]=[Backward][Speed=8]
3   IR:}
4   IR:[IN1]=[Sense][IN2]=[None]{
5       DC Motor:[1][Left Motor][Right Motor]=[Forward][Speed=8]
6       Delay:[0.5 sec]
7       DC Motor:[1][Left Motor]=[Forward][Speed=8]
8       DC Motor:[1][Right Motor]=[Backward][Speed=8]
9       Delay:[0.5 sec]
10  IR:}
11  IR:[IN1]=[None][IN2]=[Sense]{
12      DC Motor:[1][Left Motor][Right Motor]=[Forward][Speed=8]
13      Delay:[0.5 sec]
14      DC Motor:[1][Left Motor]=[Backward][Speed=8]
15      DC Motor:[1][Right Motor]=[Forward][Speed=8]
16      Delay:[0.5 sec]
17  IR:}
    END}
```

Art — Let's organize your own team for hockey competition



Technology Mathematics STEM 4. Repalacing the numbers with binary numbers



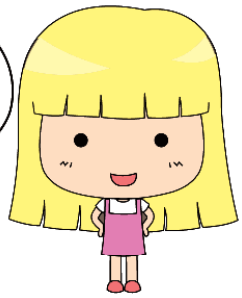
When modifying numbers with binary numbers , use the following rules.

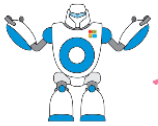
1) Divide the number to be replaced by 2 decimal with 2, write the rest down.
2) Quotient is divided by 2, divided by 2 again,then write the remainder down.
3) Keep on dividing by 2 until the result is 1. Repeat the process.
4) When the division is done, write the bottom share and the remainders in the order as it was calculated.

2)13
2) 6 ··· 1
2) 3 ··· 0
1 ··· 1

$13 = 1101_{(2)}$

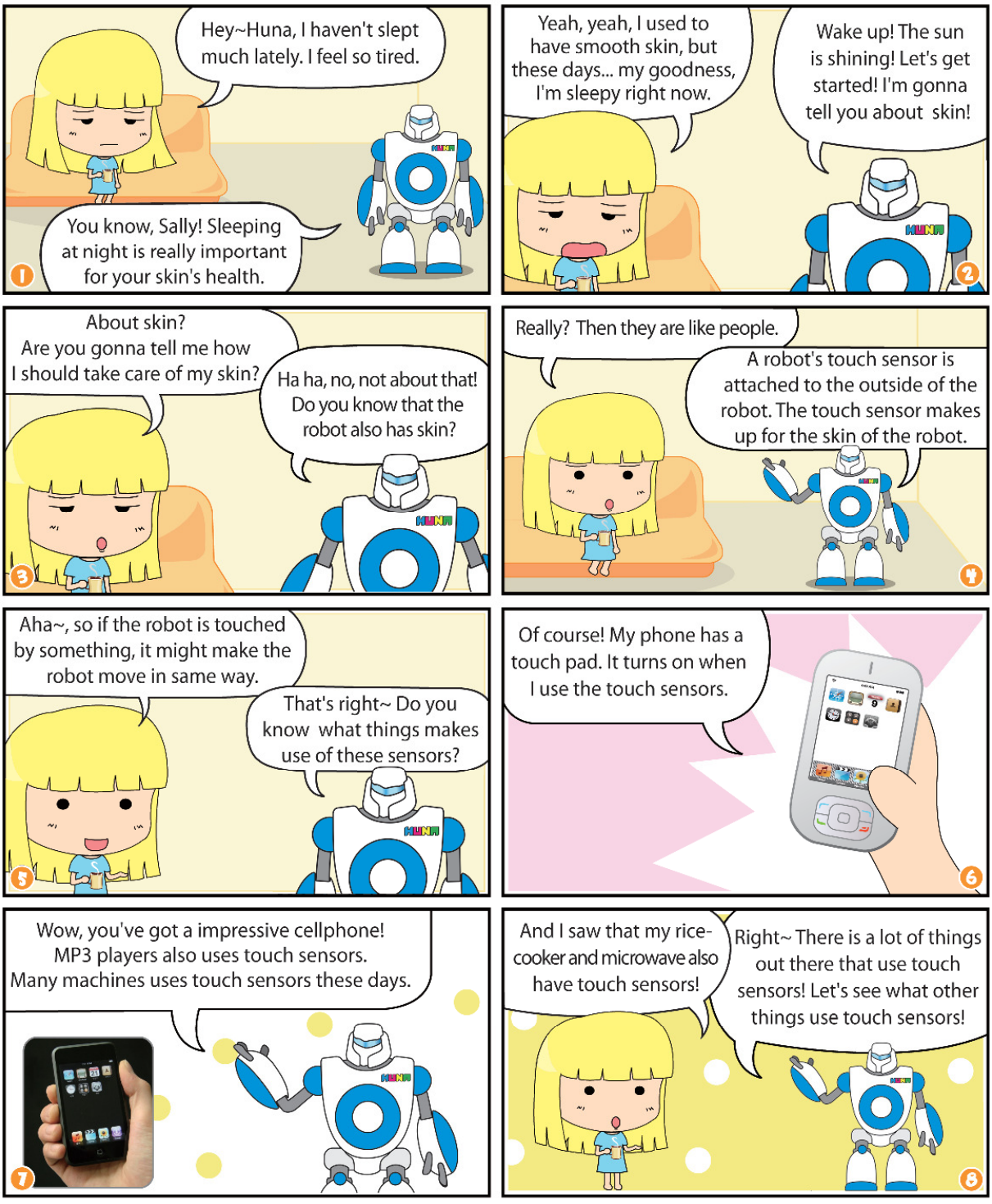
To distinguish between the general number 1101 from 1101 binary number, a decimal is used. For instance 1101(2), Just add the decimal marker (2) behind the binary number.





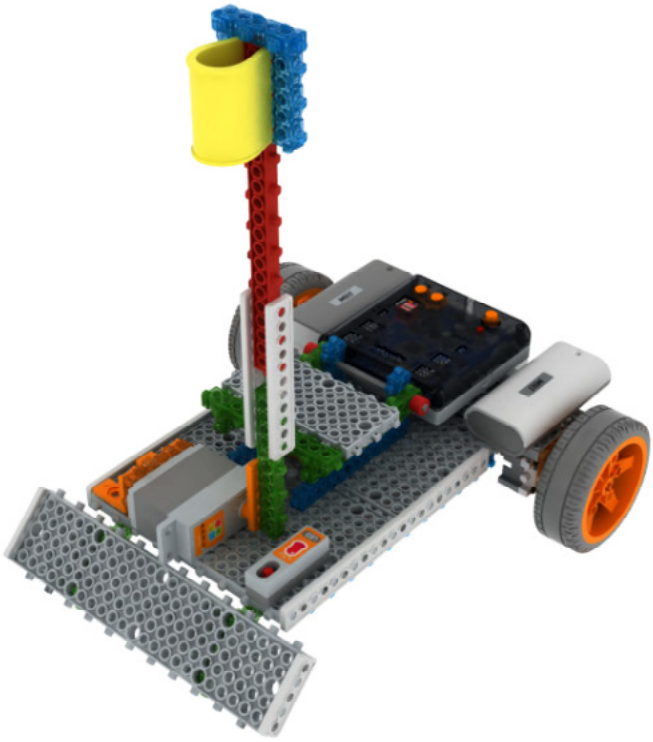
Please select one 2 digit number and convert the number into 2 decimal numbers.

Technology STEM 5. The Robot's Skin -The Touch Sensor

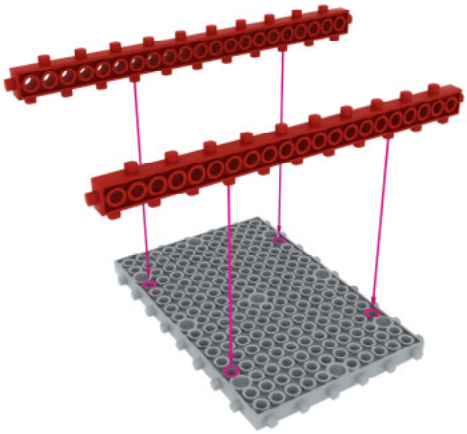


Technology Engineering

Robot Making3-Touch battle Bot



1



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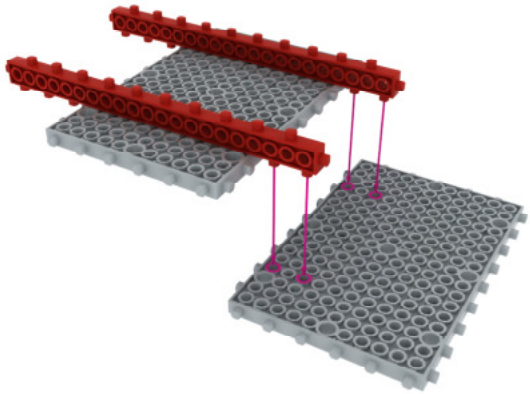

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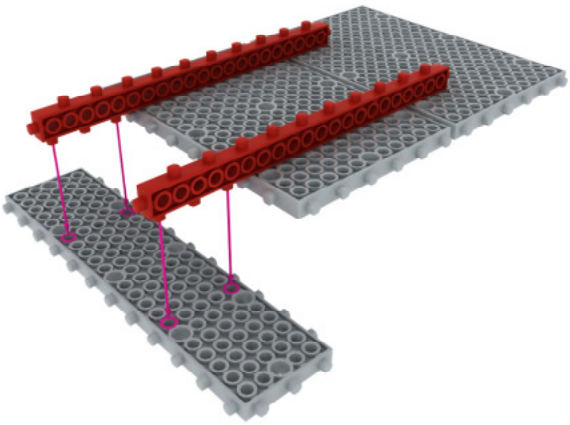

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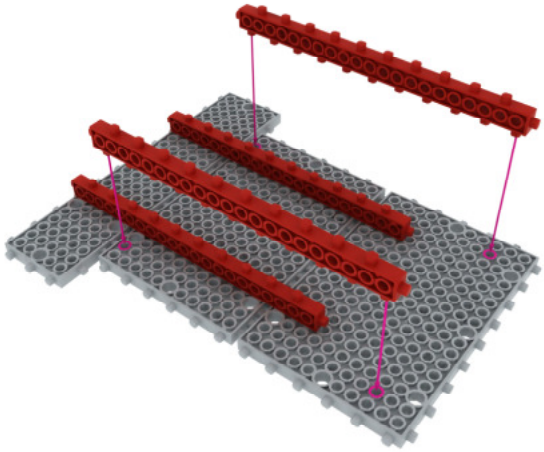

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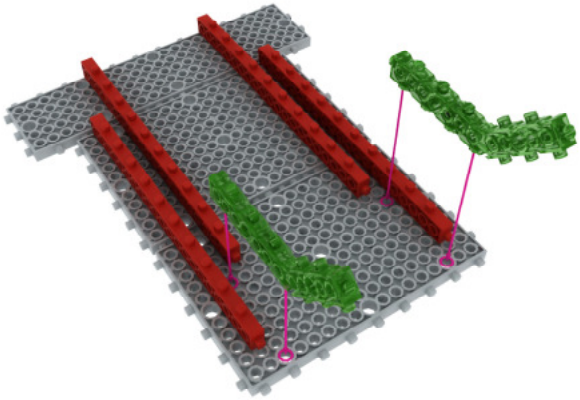

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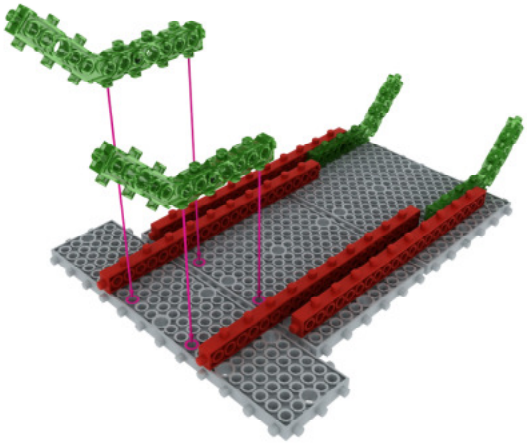

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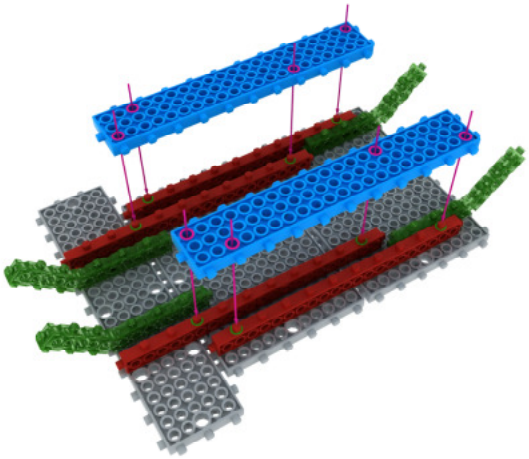

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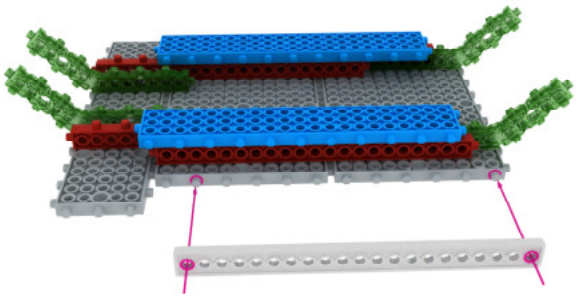

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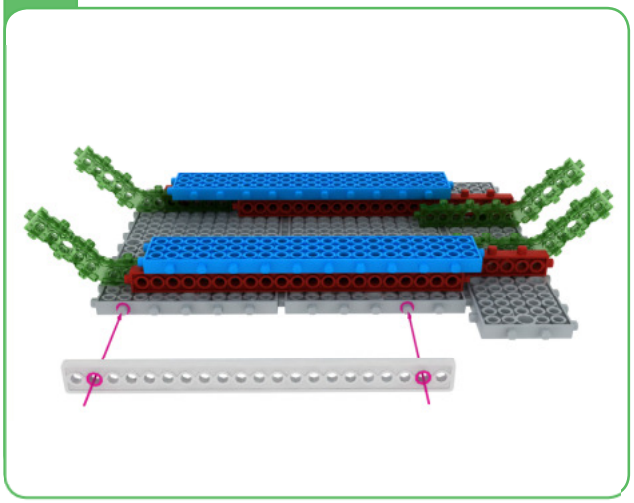

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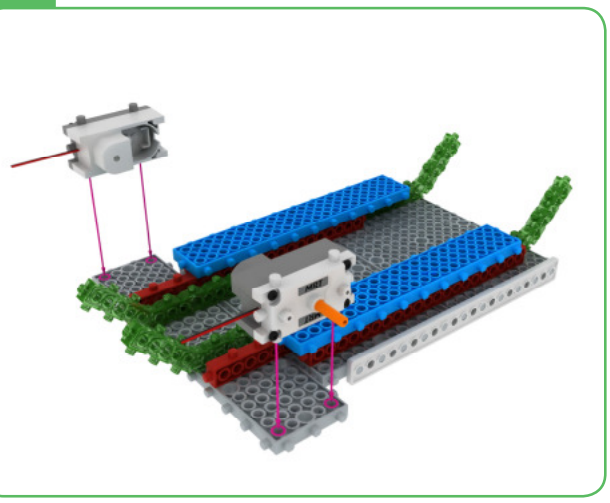

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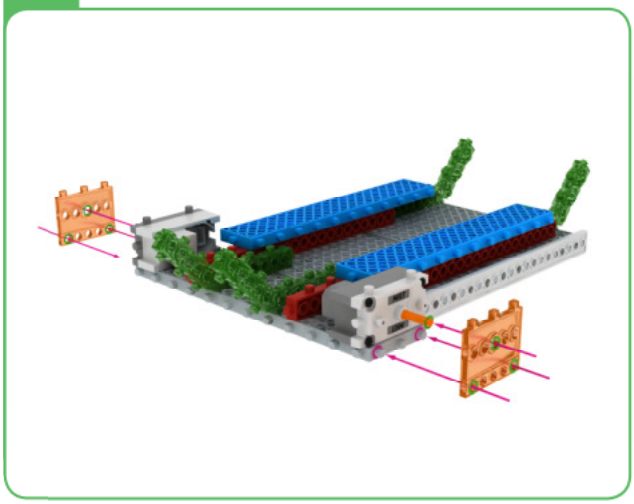

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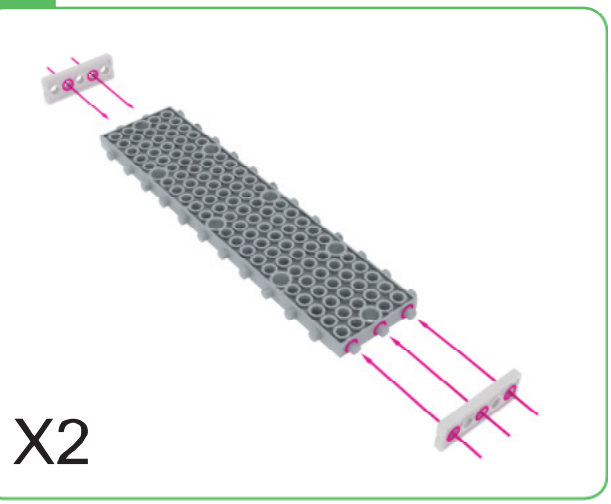

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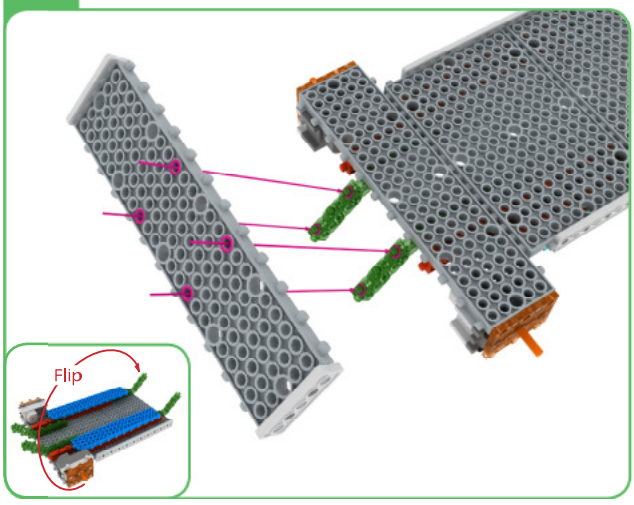

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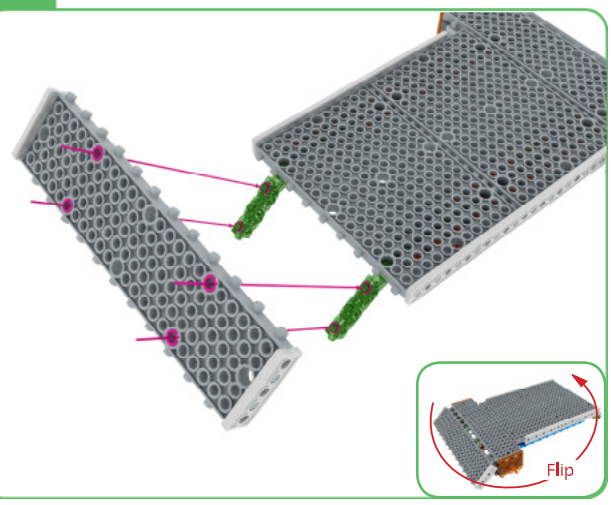

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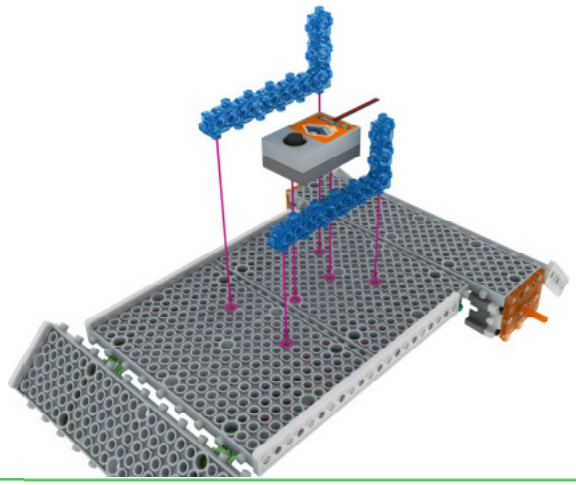

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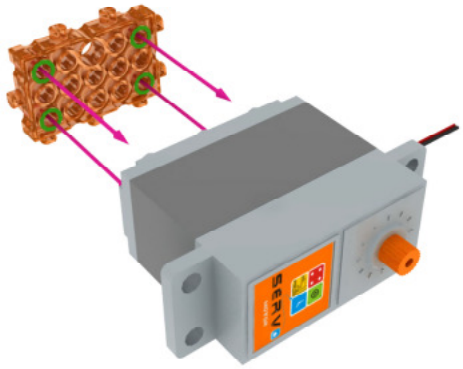

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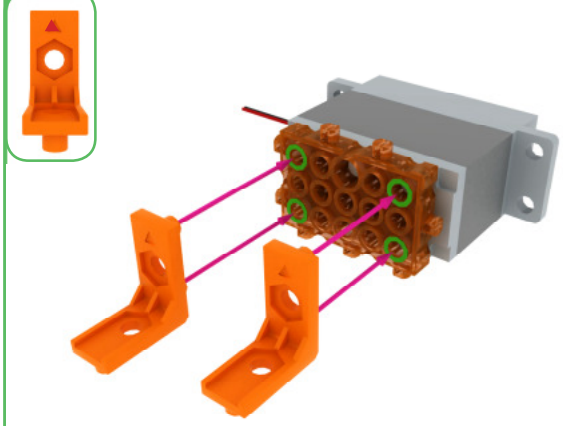

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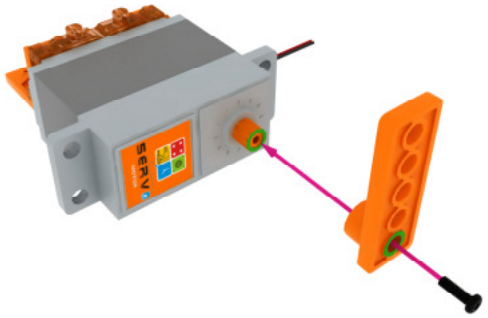
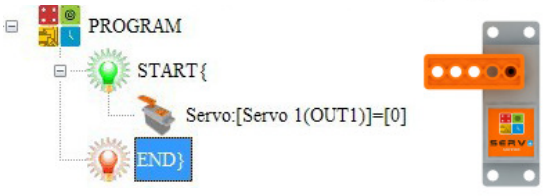


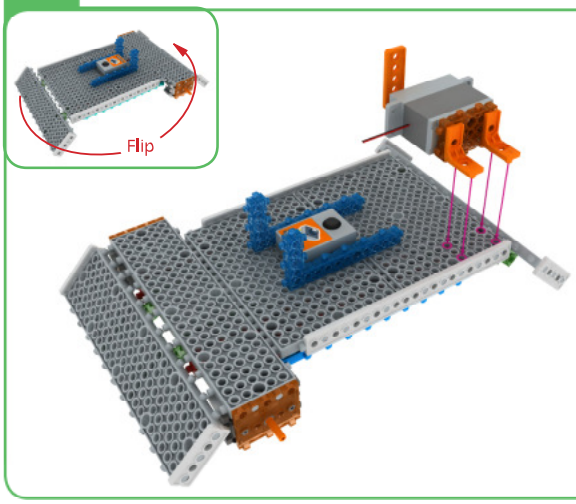
Servo Motor-Zero Point Adjustment

1. Connect the servo motor to the mainboard. You can write the program in the following way.



2. After downloading the program, power off and on again.
3. Fix servo motor horn to the servo motor with a small servo bolt as illustrated in the picture .

19



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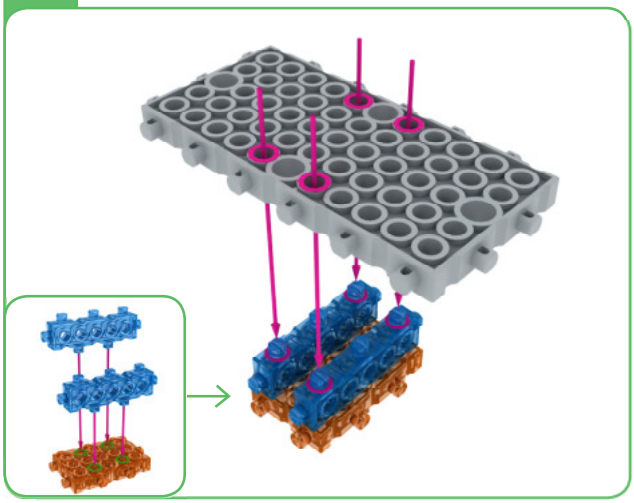

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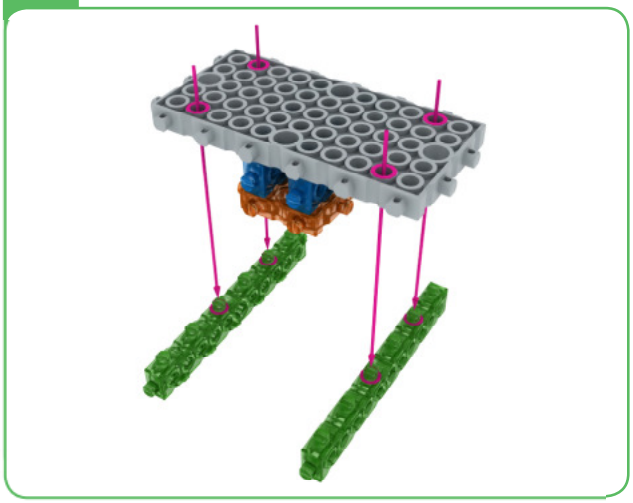

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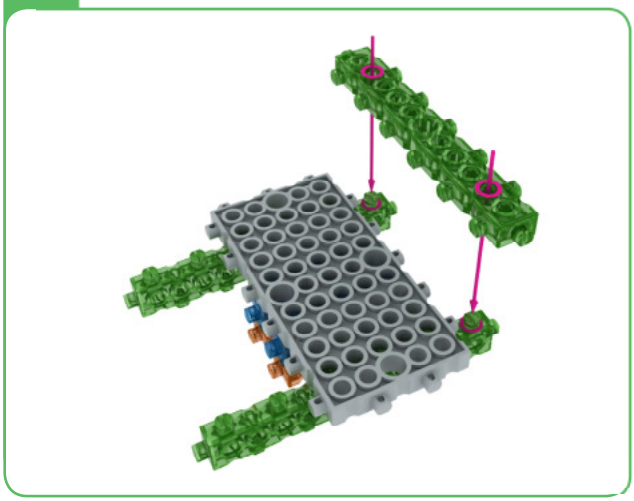

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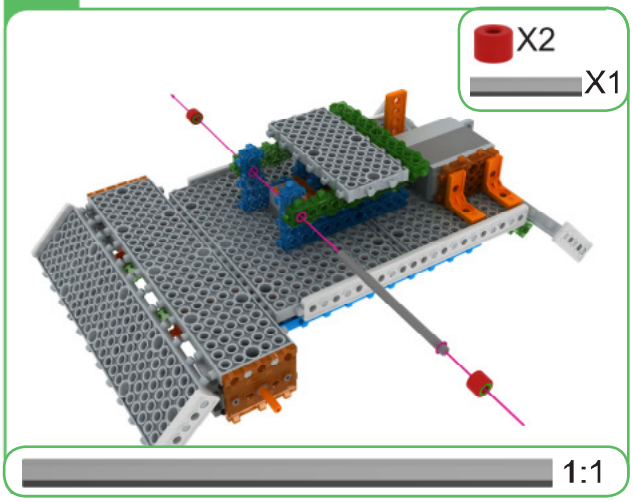

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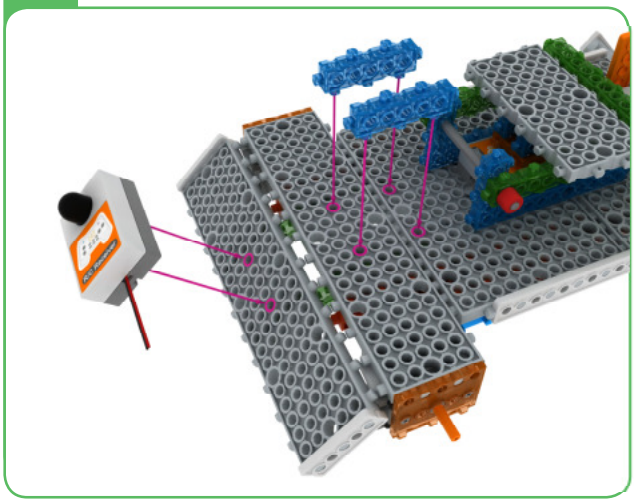

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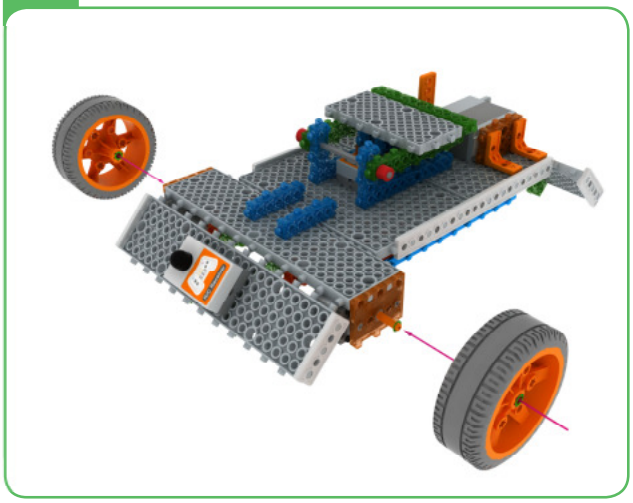

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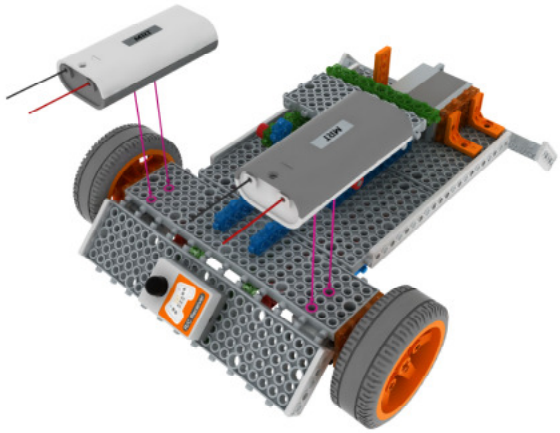

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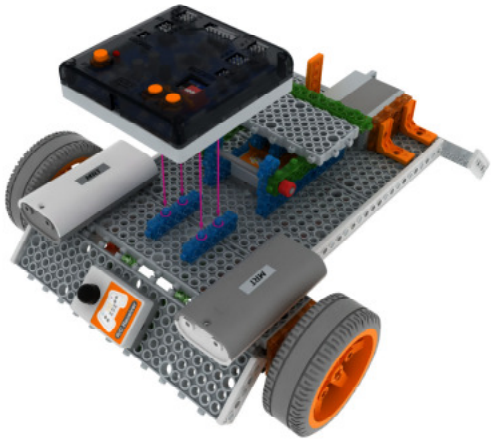

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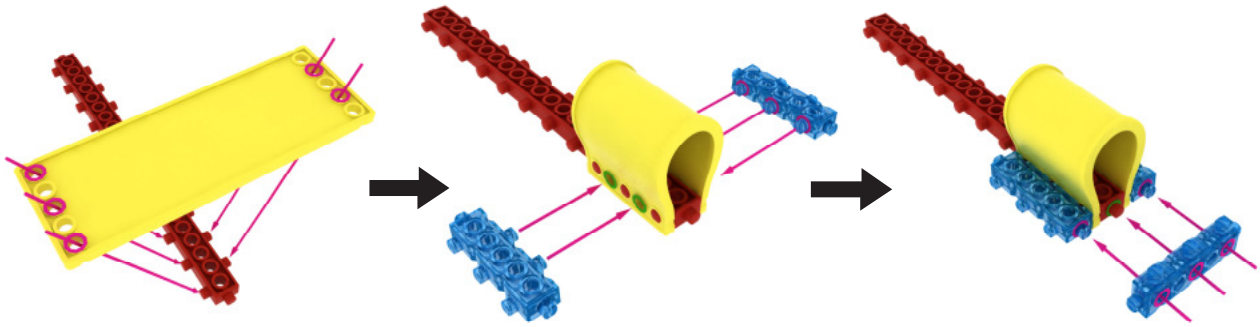

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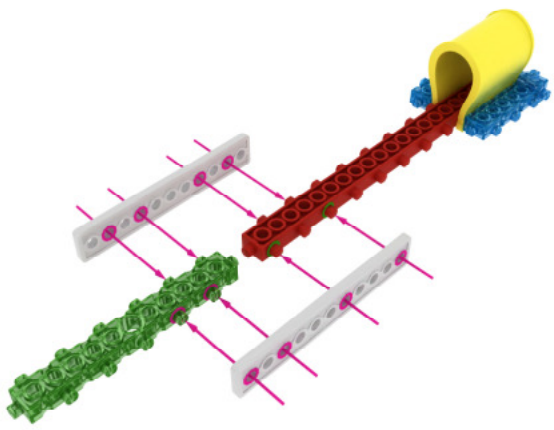

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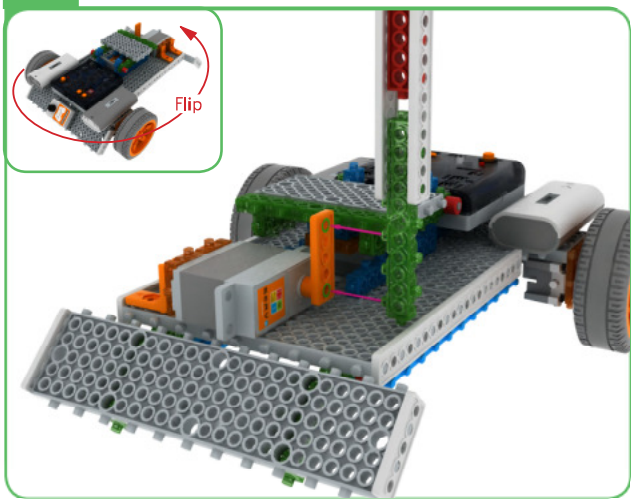

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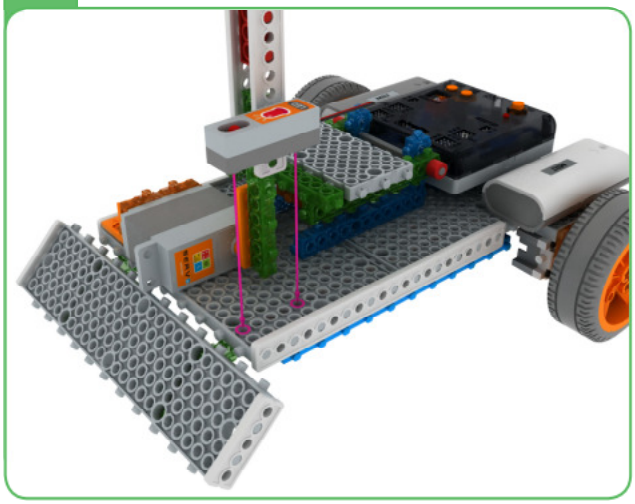

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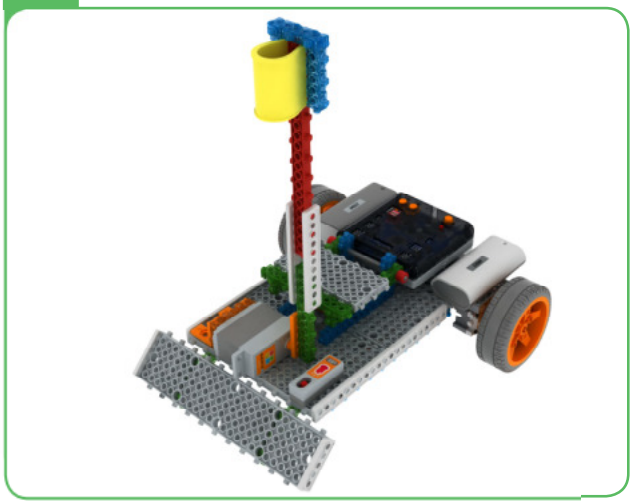
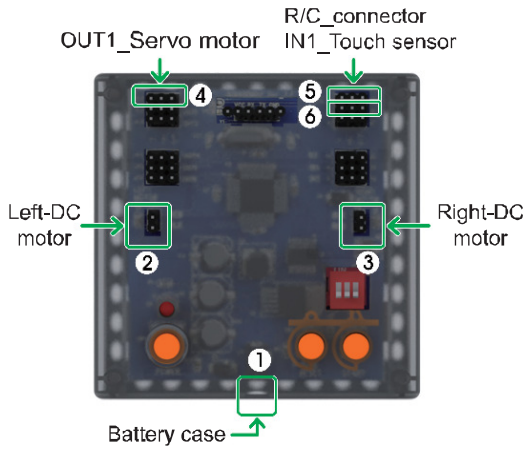


How to operate the Touch Battle Bot

Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect Servo motor to OUT1 of OUTPUT connector.
5. Connect RC receiver board to R/C connector.
6. Connect Touch sensor to IN1 of INPUT connector.

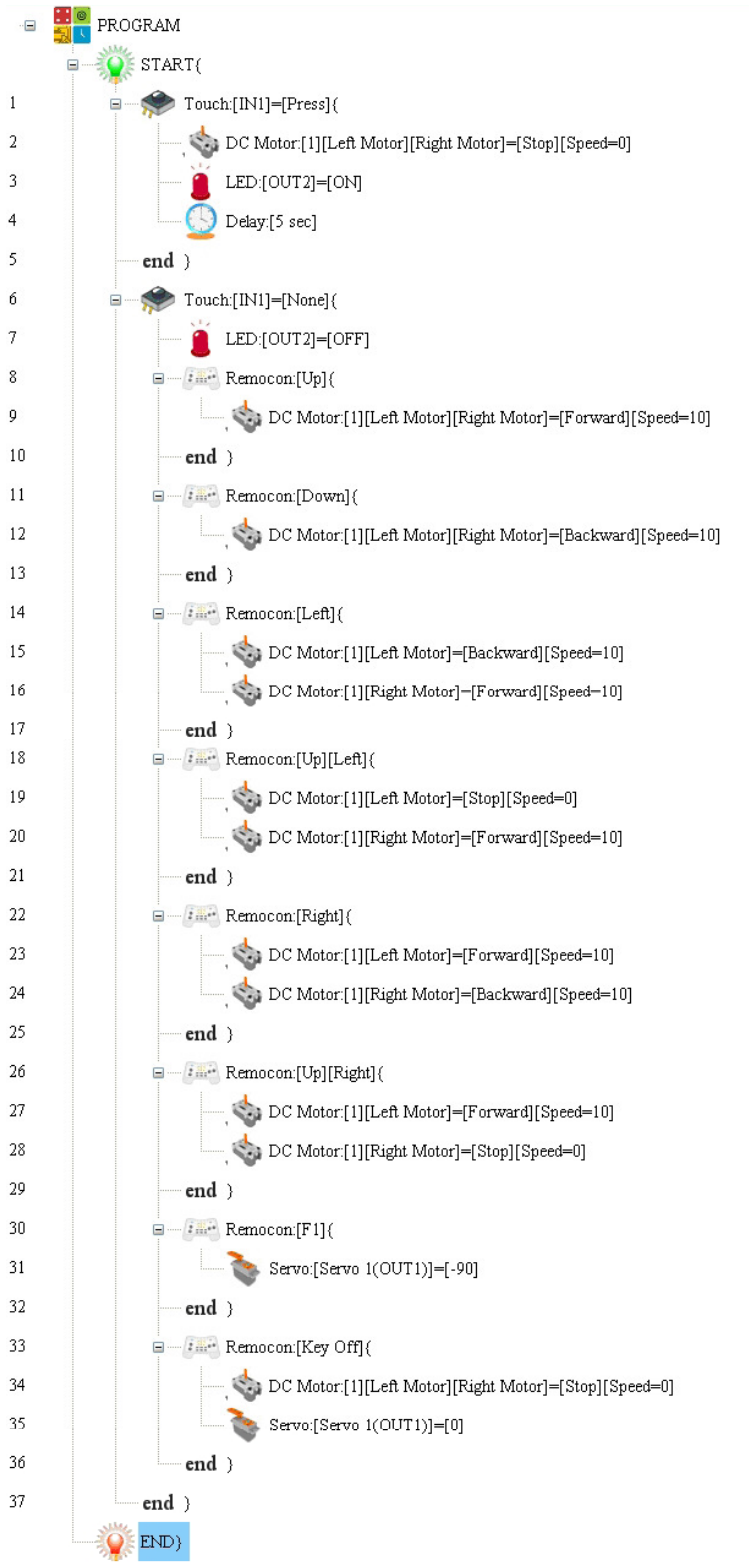
Motion Pattern/Program

※ - Using the motion patterns as reference, let's write the program.

Program Download

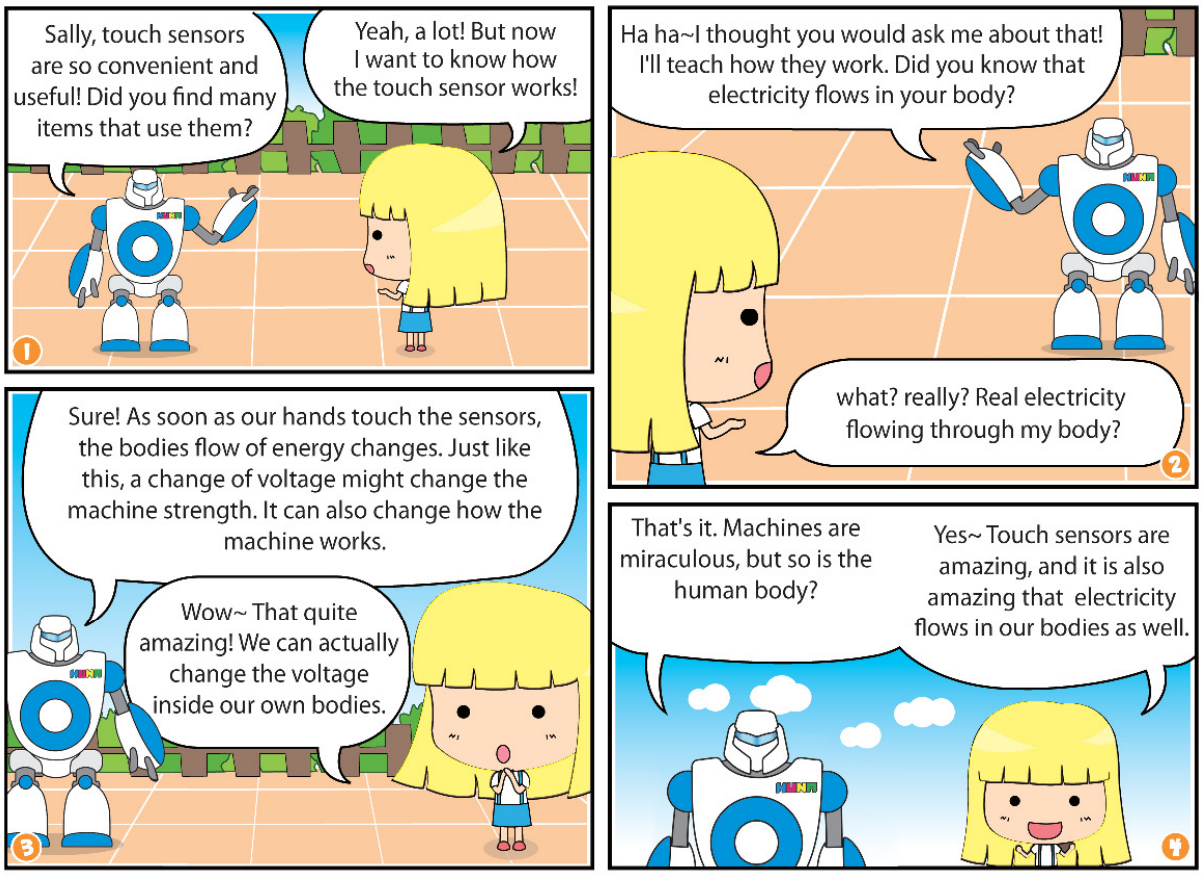
1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

Program Example



Technology

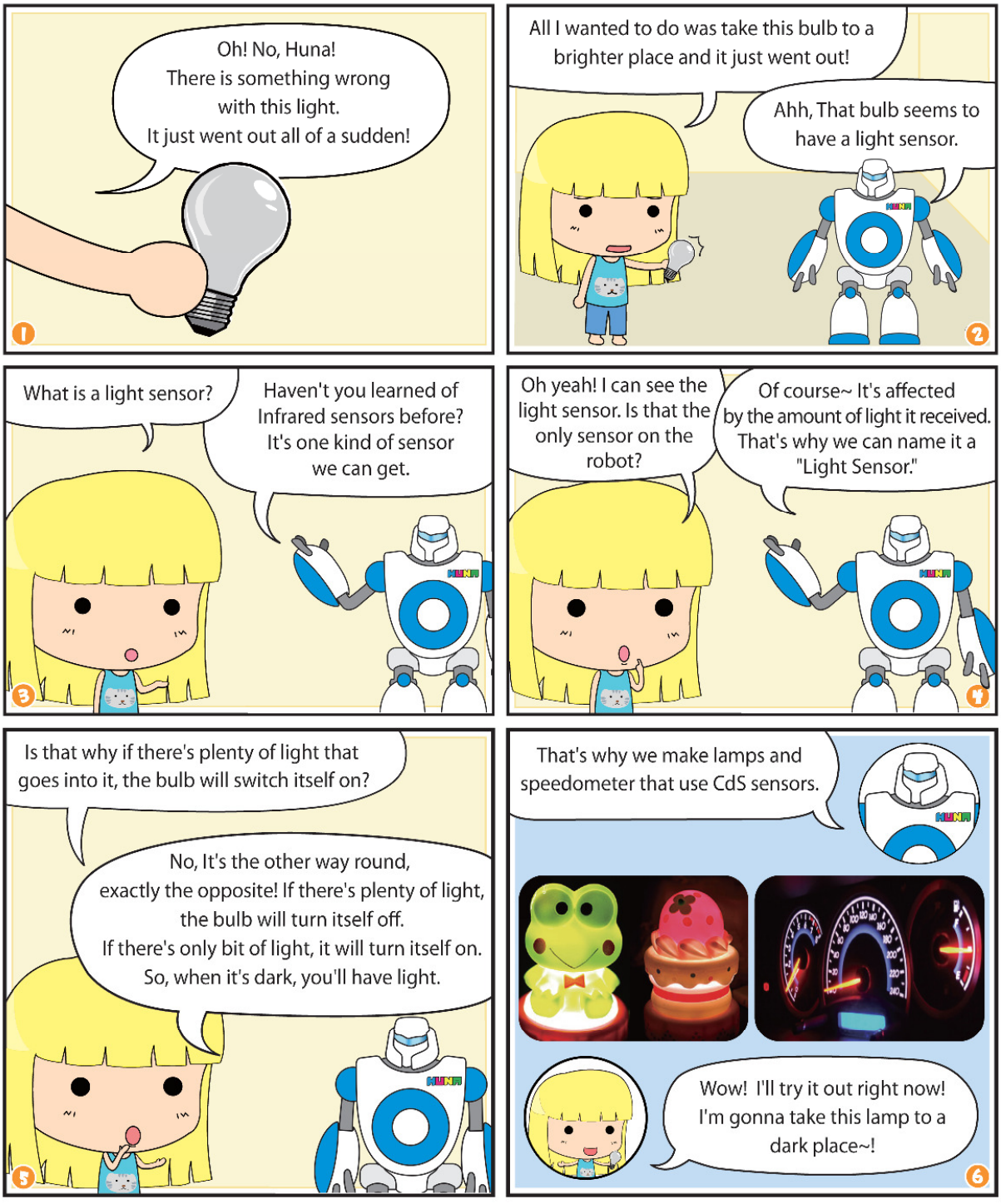
STEM 6. How does the touch Sensor work?



What other electronical equipment has touch sensors?

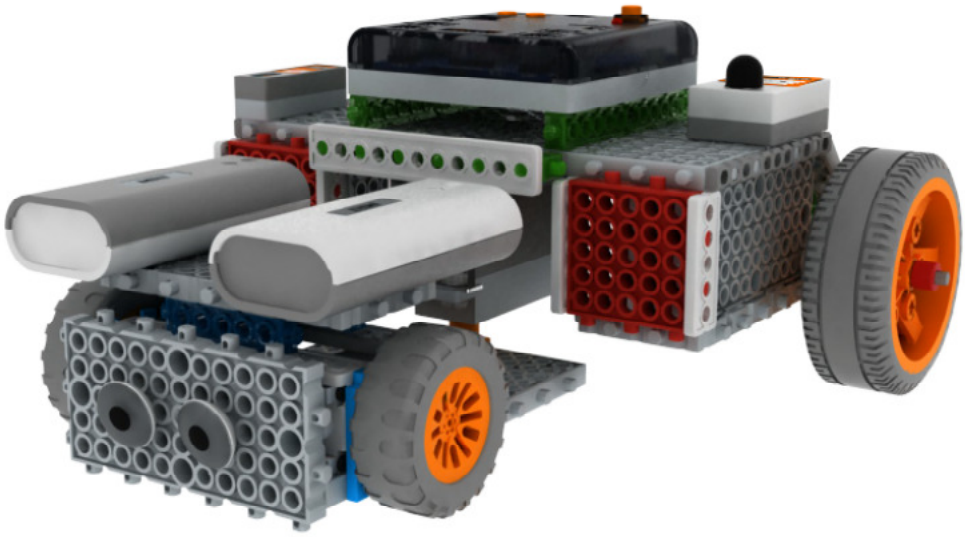
Science Technology

STEM 7. The robot's eyes -The light sensor



Technology Engineering

Robot Making4-The Little Car "Bumboo"



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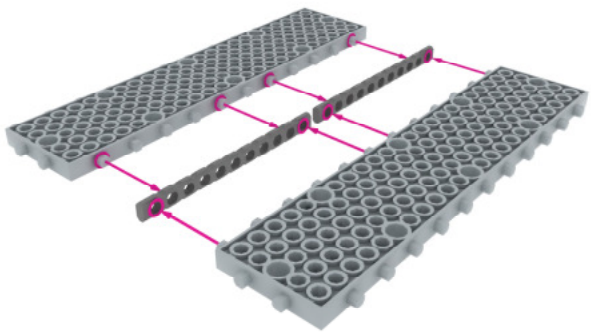

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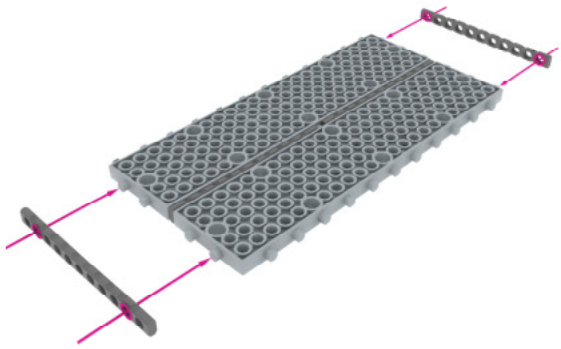

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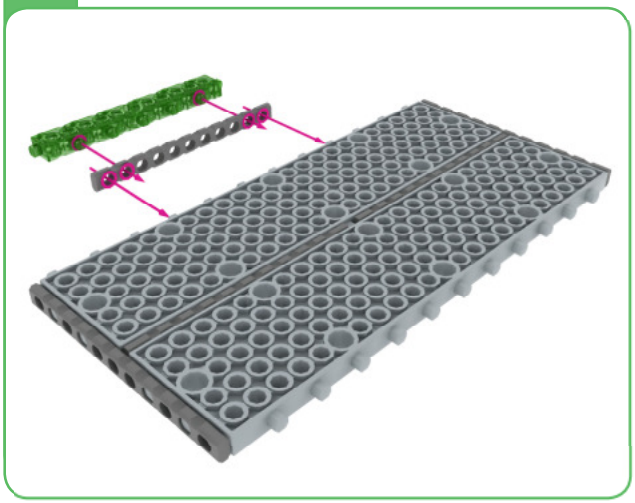

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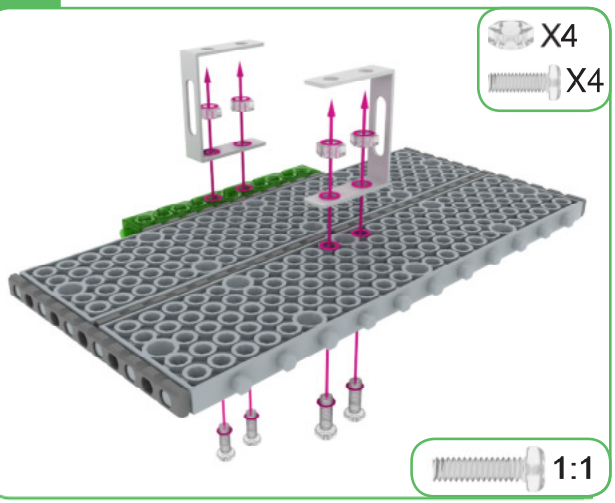

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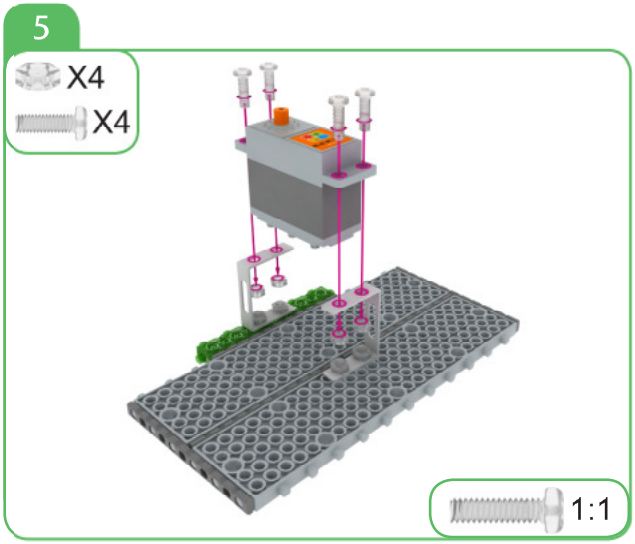

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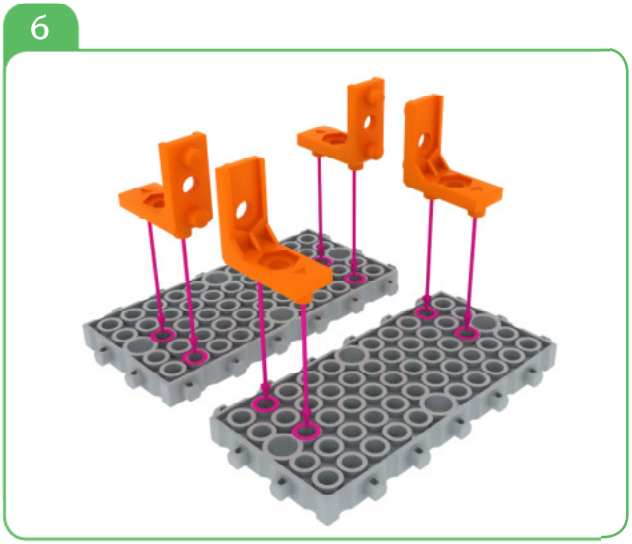

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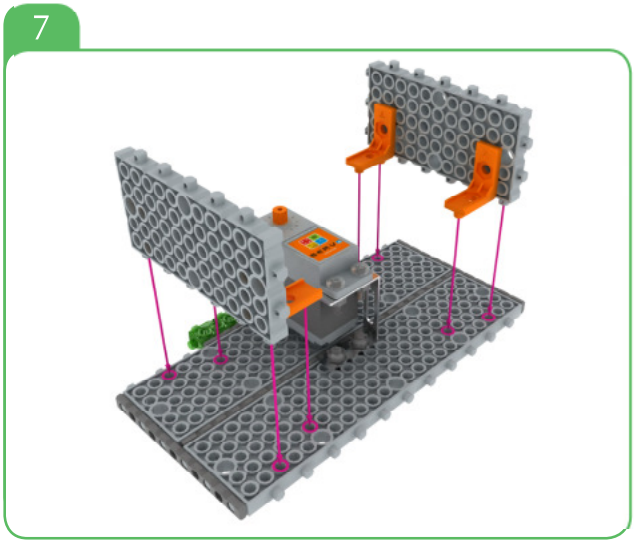

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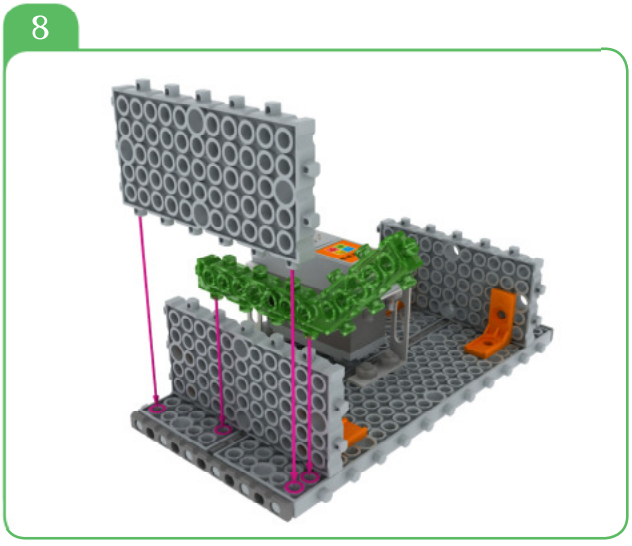

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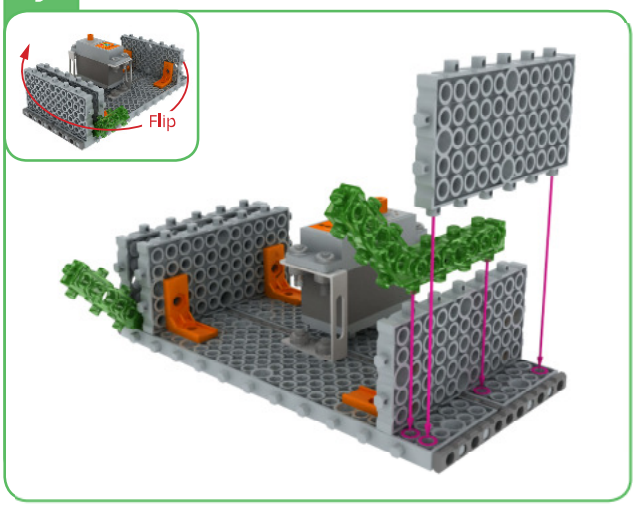

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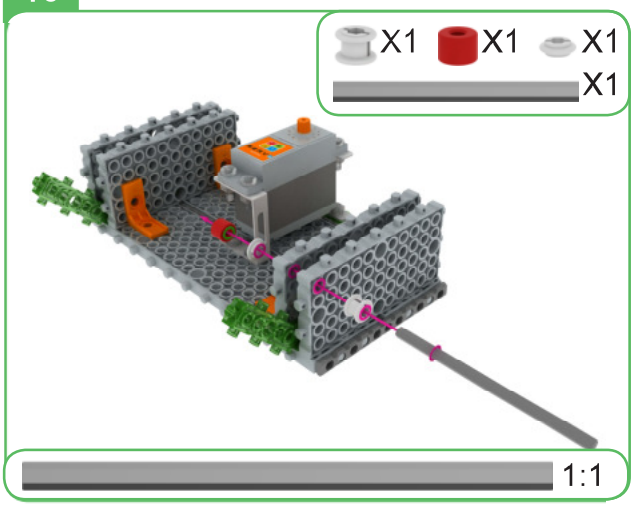

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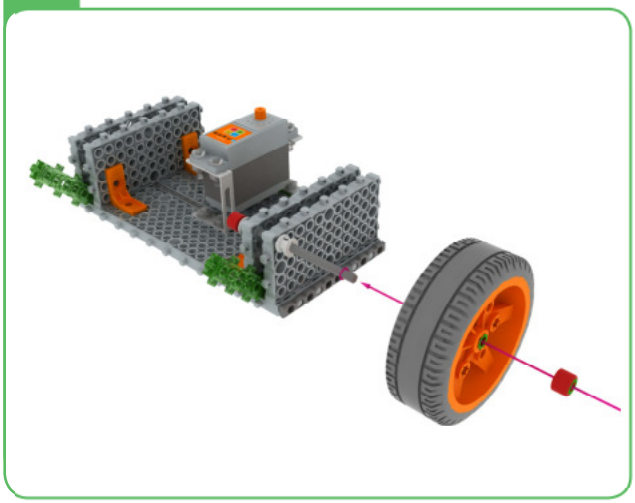

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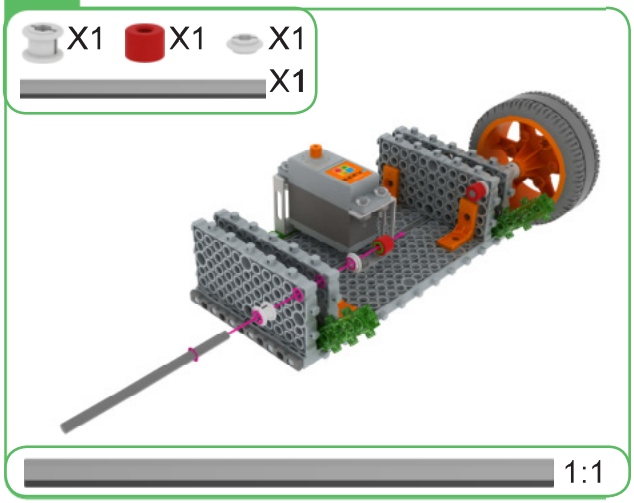

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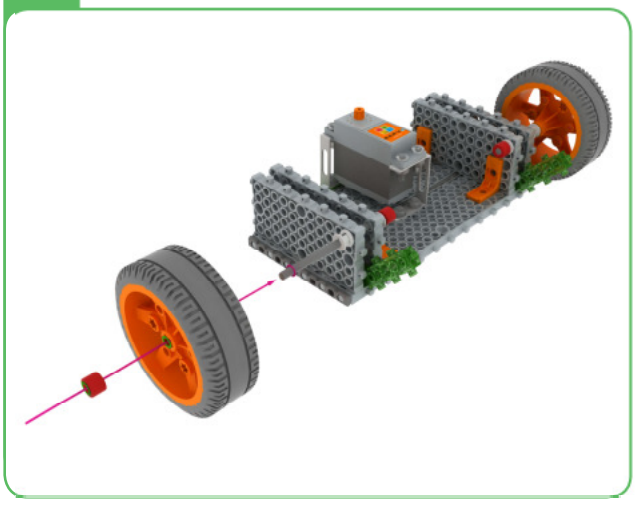

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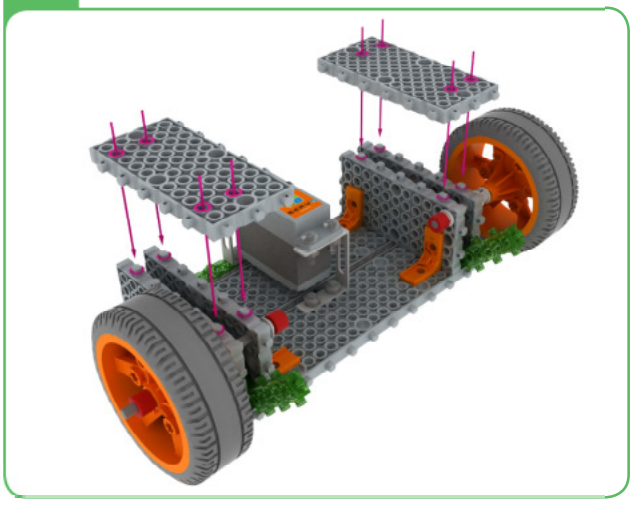

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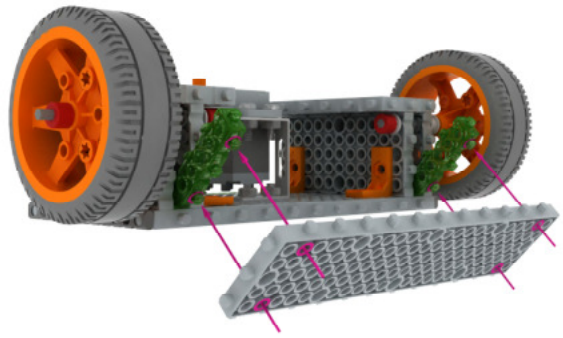

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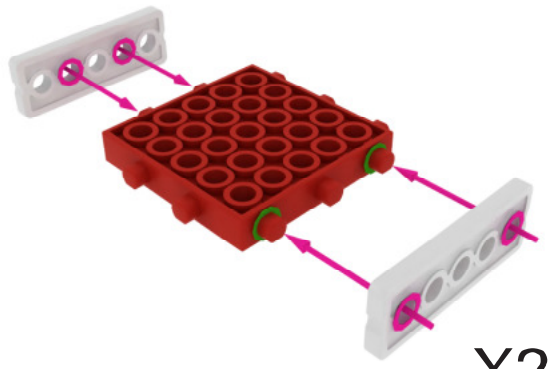

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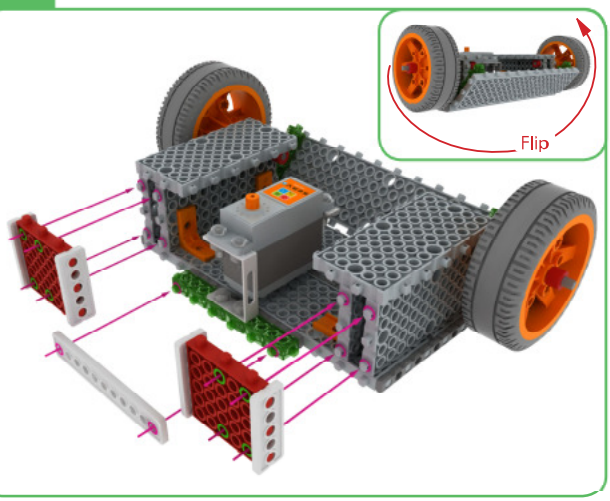

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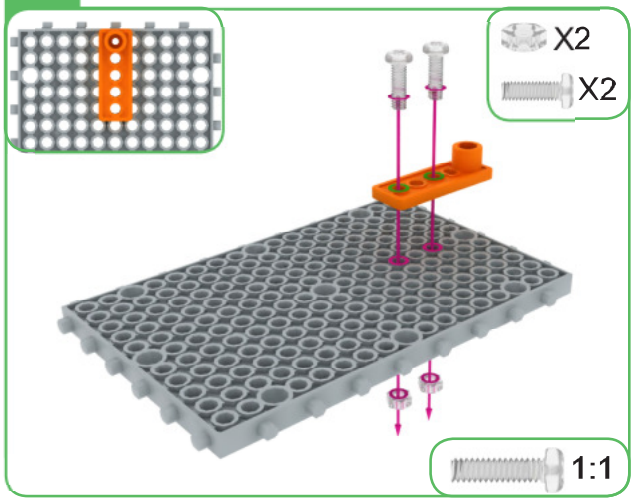

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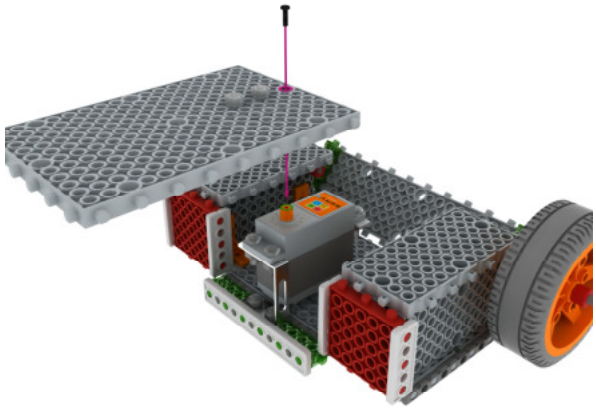
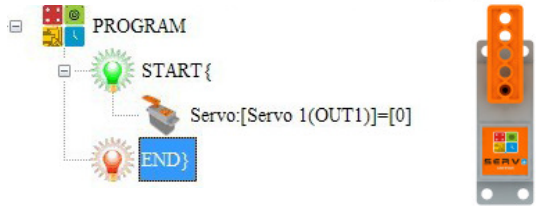


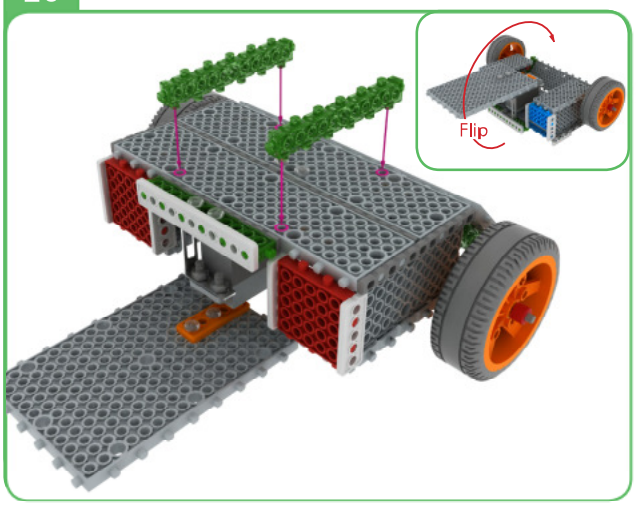
Servo Motor-Zero Point Adjustment

1. Connect the servo motor to the mainboard. You can write the program in the following way.



2. After downloading the program, power off and on again.
3. Fix servo motor horn to the servo motor with a small servo bolt as illustrated in the picture .

20



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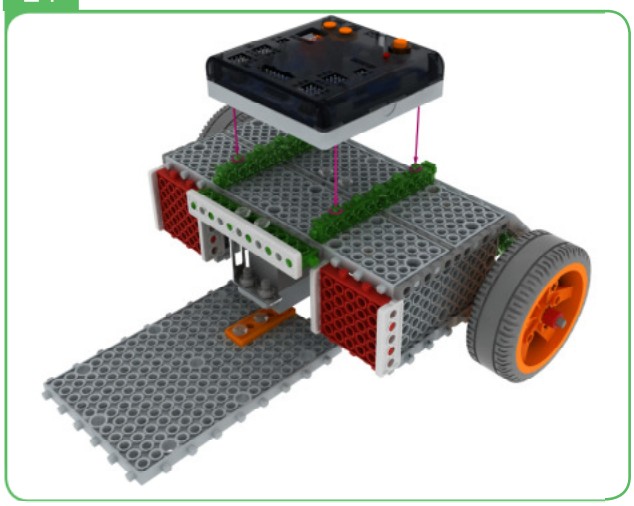

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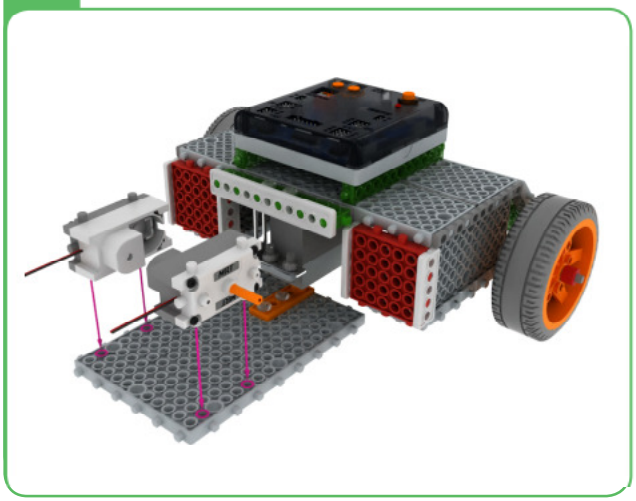

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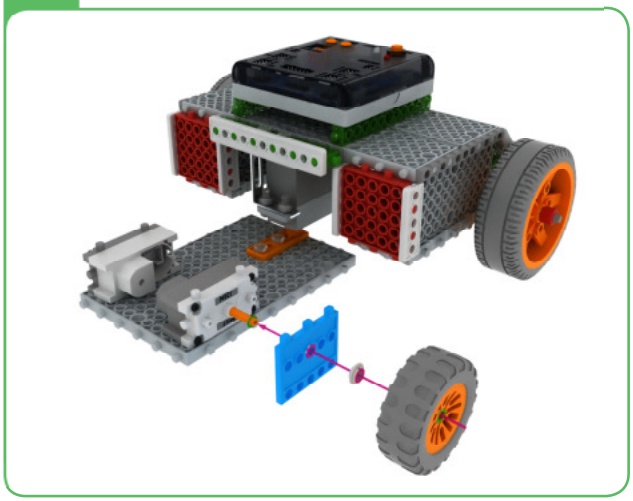

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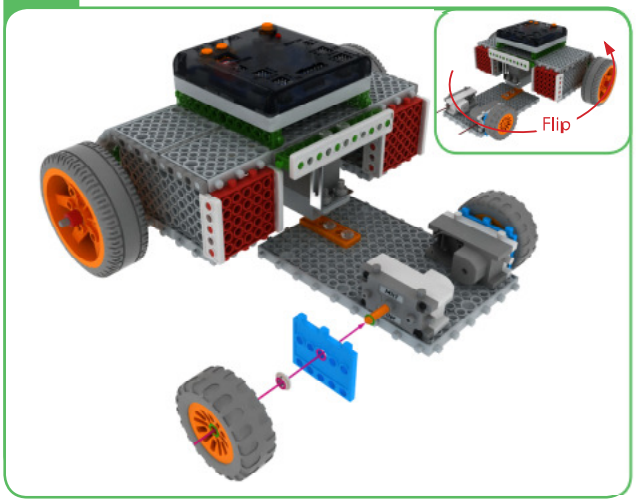

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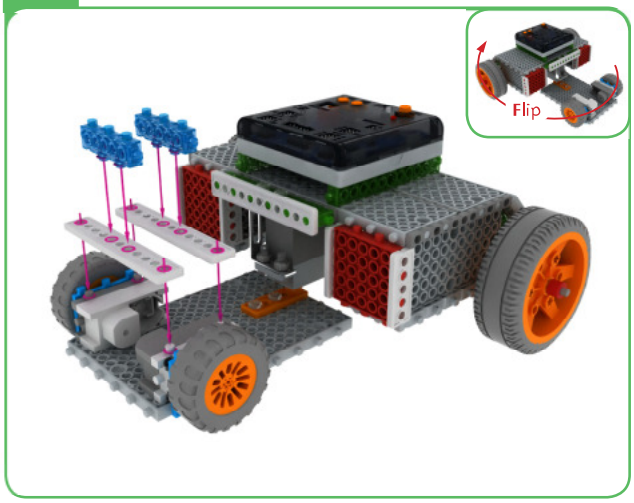

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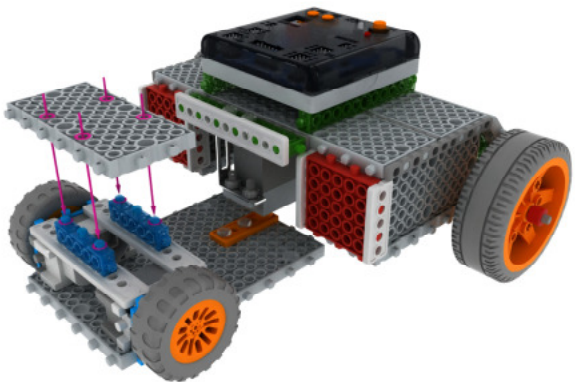

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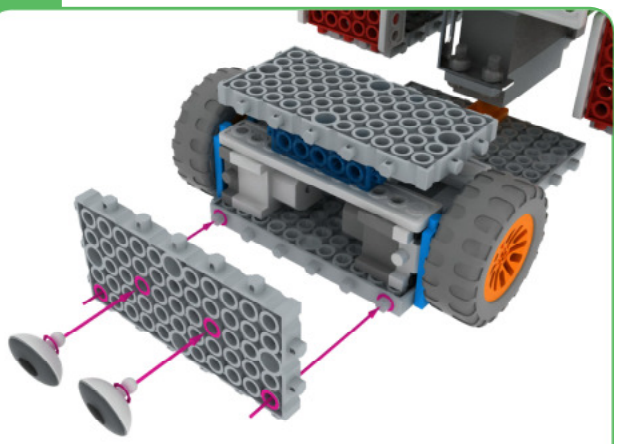

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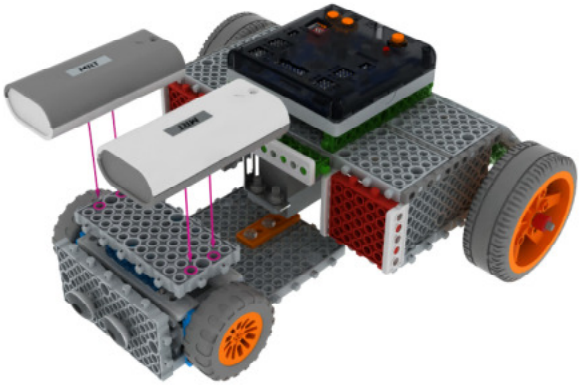

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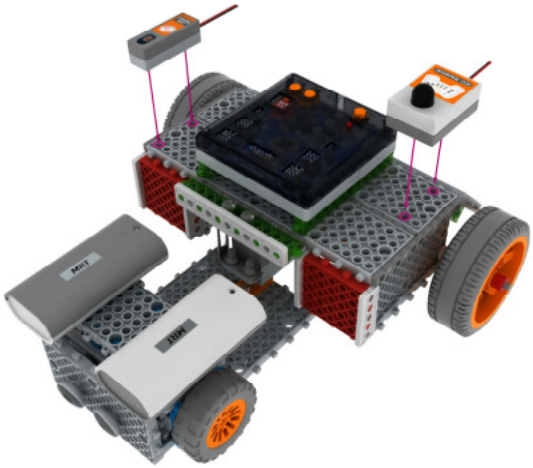

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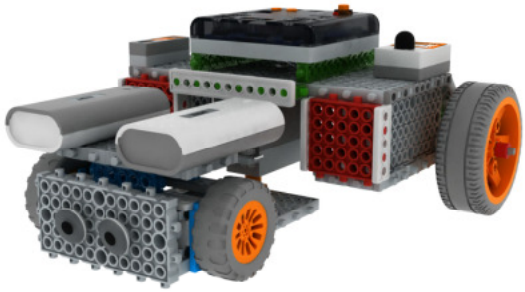

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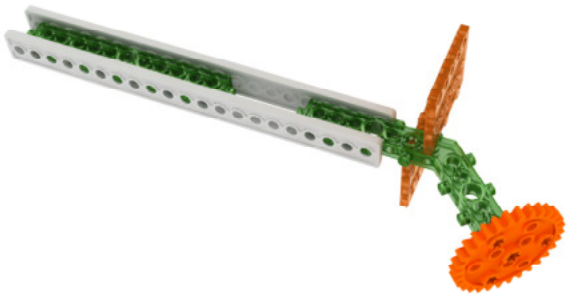
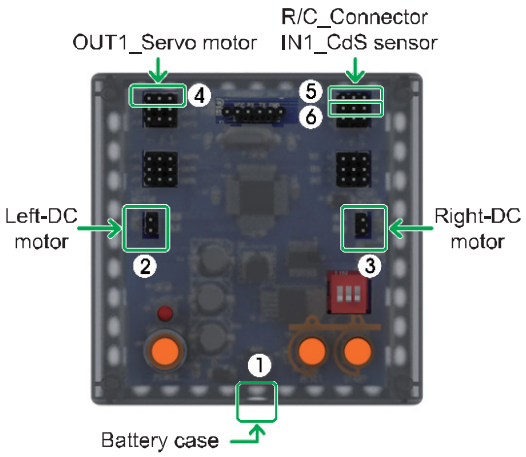


How to operate the Little Car"Bumboo"

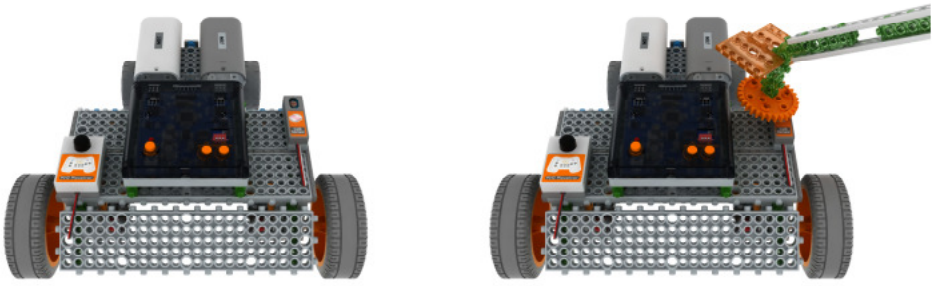
Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect Servo motor to OUT1 of OUTPUT connector.
5. Connect RC receiver board to R/C connector.
6. Connect CdS sensor to IN1 of INPUT connector.

Motion Pattern/Program



Hint 1. Speed is slow at ordinary time
Hint 2. Up the fragrance of flower can make it speed up

※ - Using the motion patterns as reference, let's write the program.

Program Download

1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

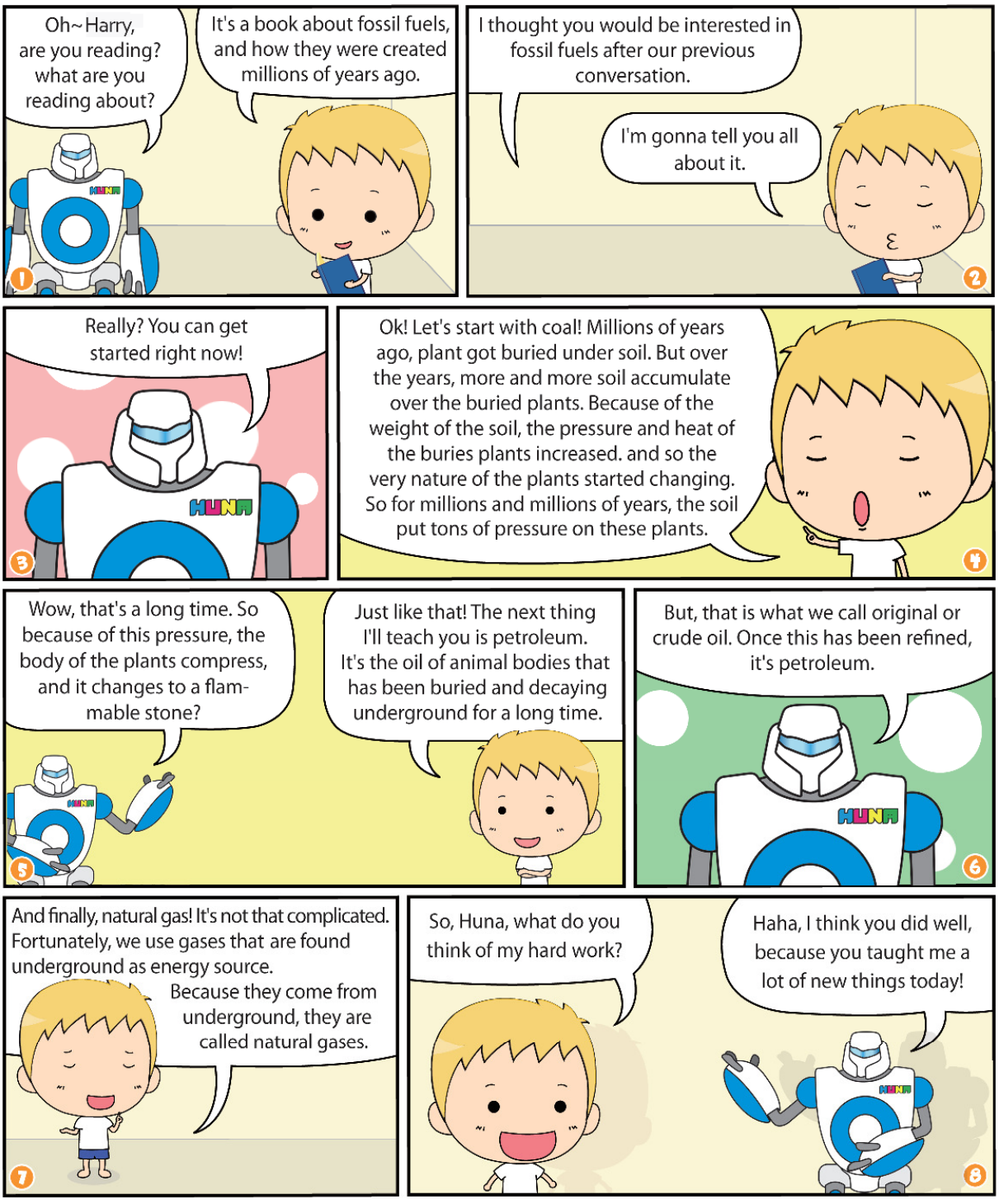
Q Can you make your robot run normally? can be flexible change of direction ?
What is the problem?
Consider together with your teacher and classmates ,then good finish your robot.

Hint. center of gravity (try to change the place of battary pack.)

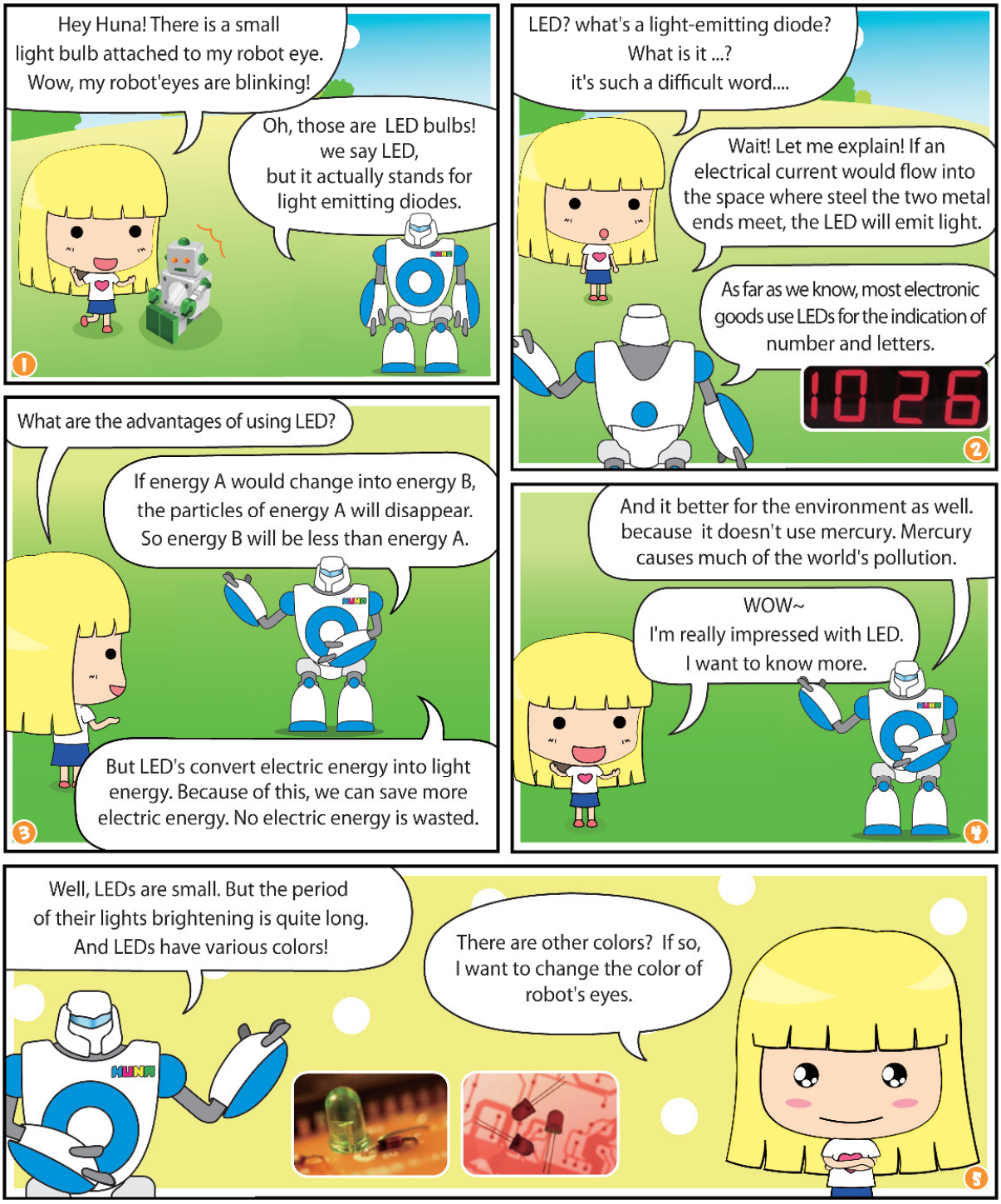
Program Example

Science

STEM 8. Fossil Fuels,they are ancient



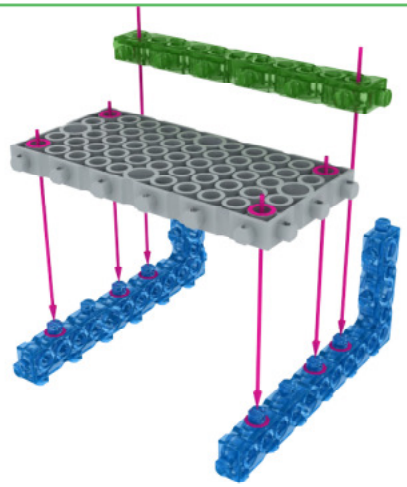
Science Technology STEM 9. Let's talk about LED



Engineering Art

Robot Making5-Fencing Robot

1



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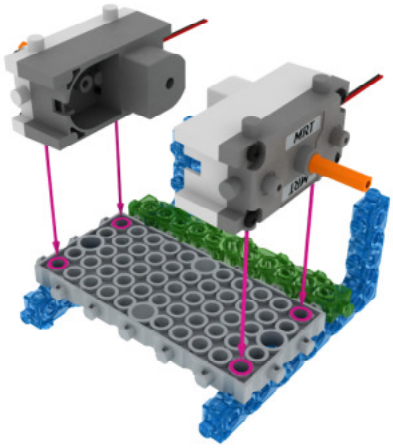

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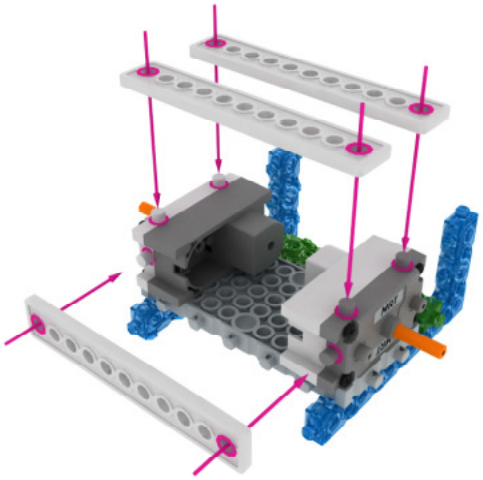

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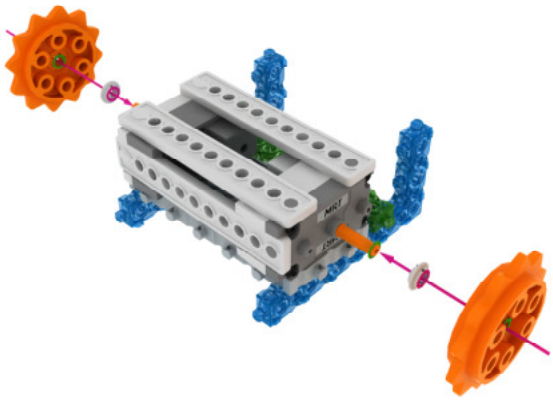

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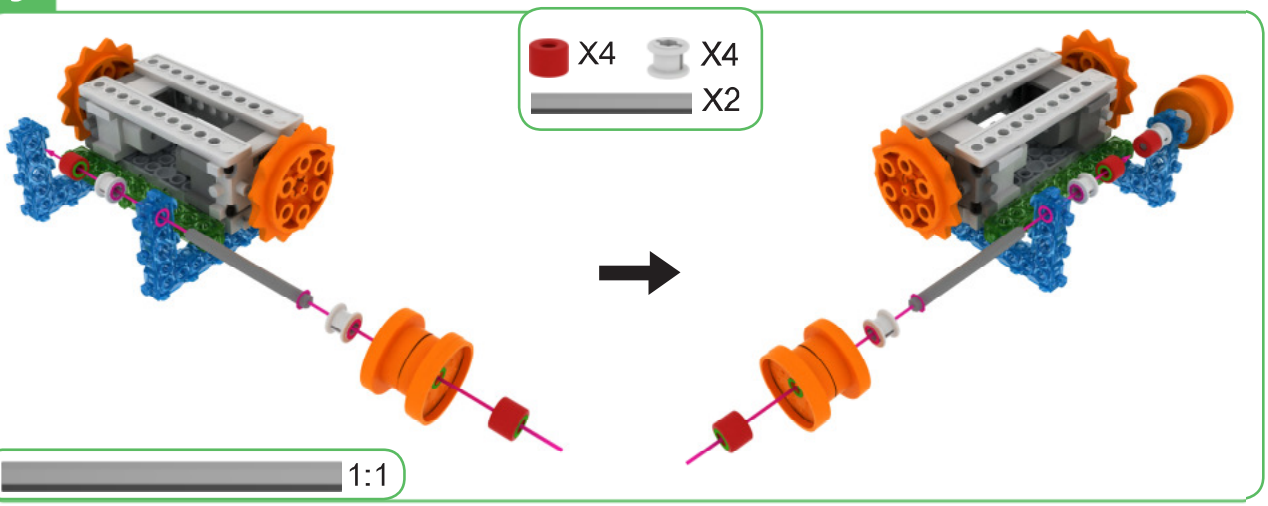

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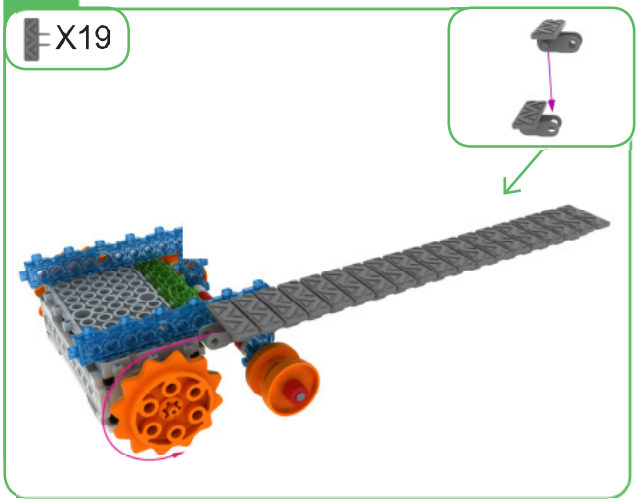

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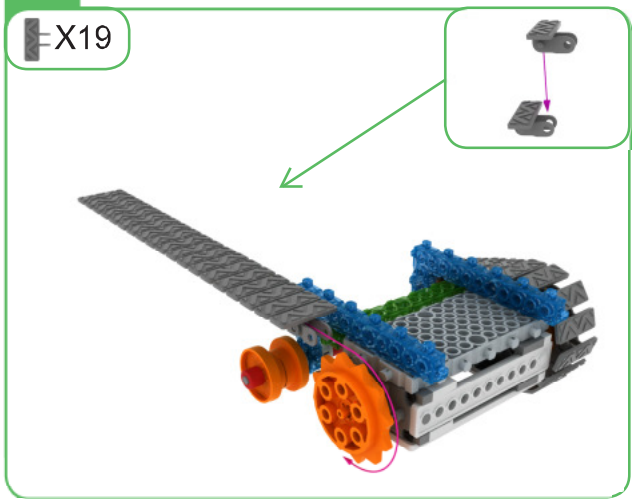

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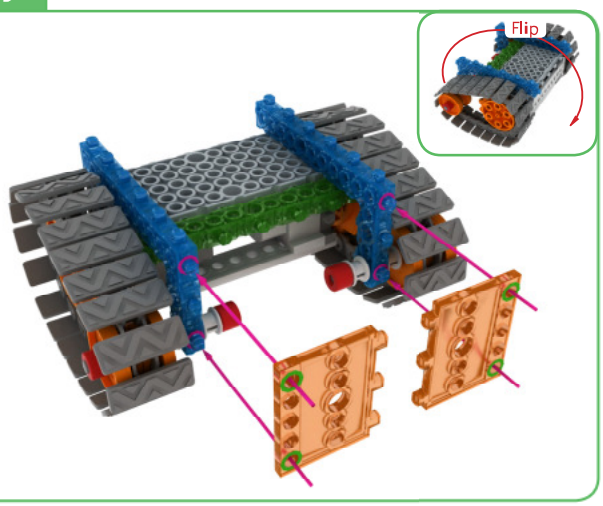

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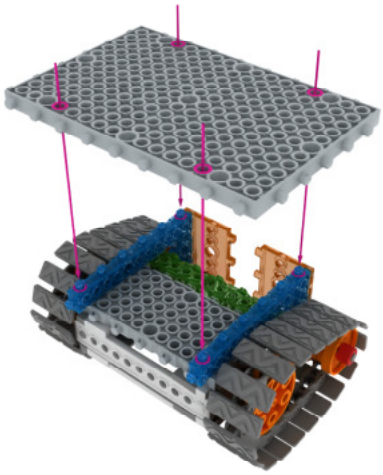

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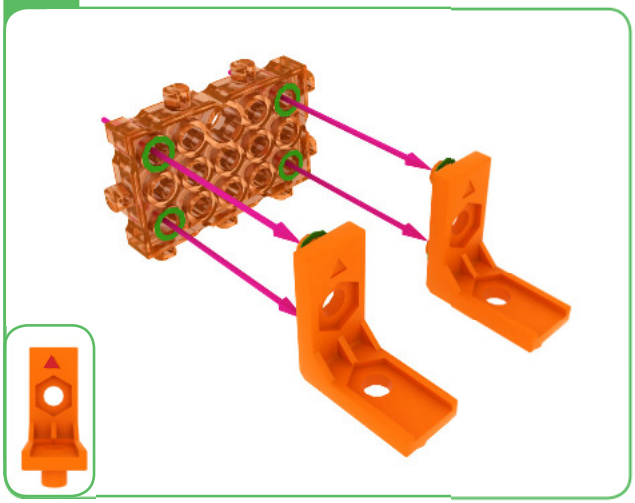

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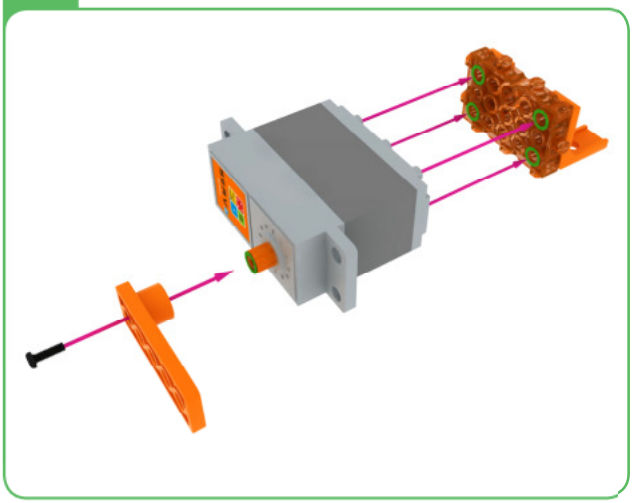
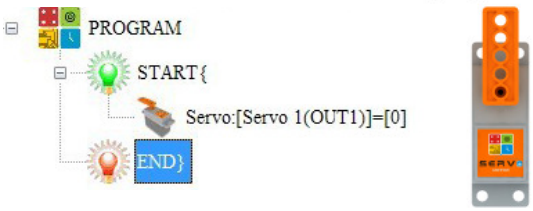


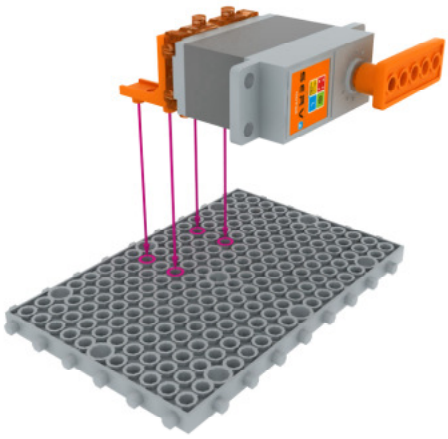
Servo Motor-Zero Point Adjustment

1. Connect the servo motor to the mainboard. You can write the program in the following way.



2. After downloading the program, power off and on again.
3. Fix servo motor horn to the servo motor with a small servo bolt as illustrated in the picture .

13



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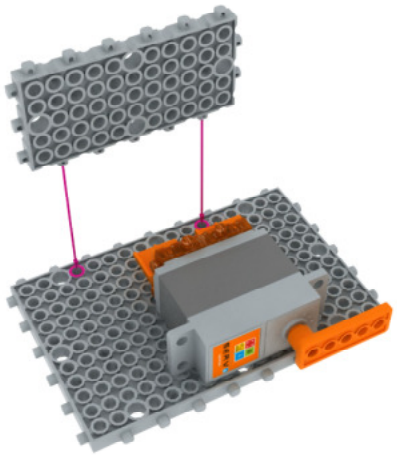

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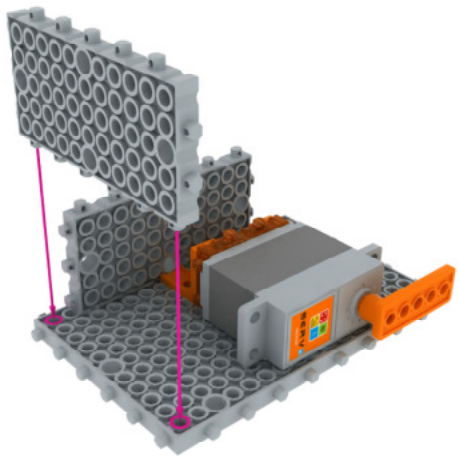

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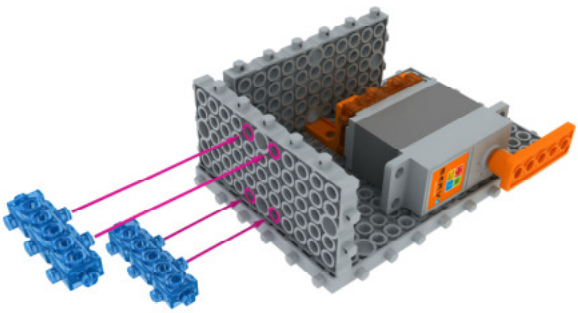

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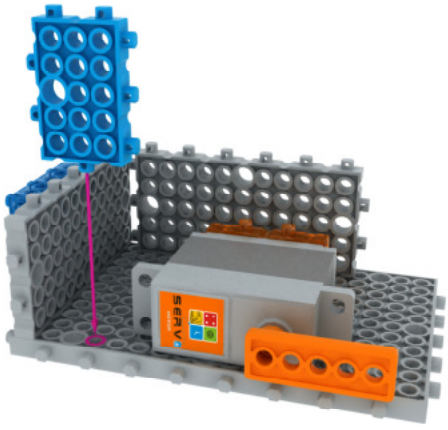

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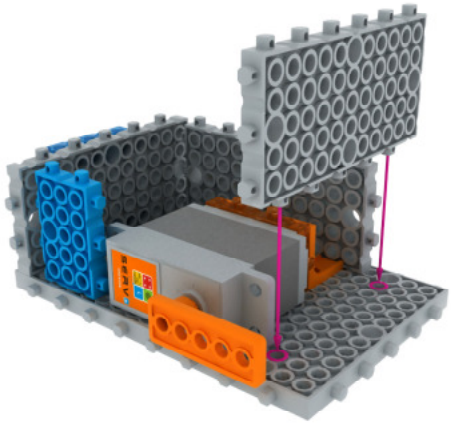

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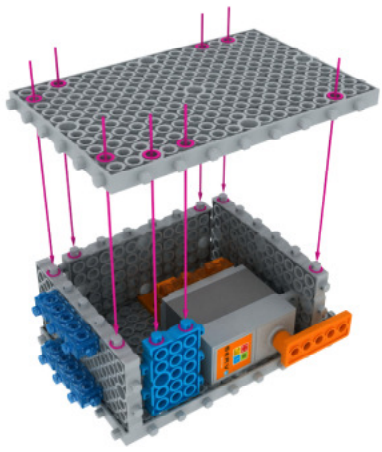

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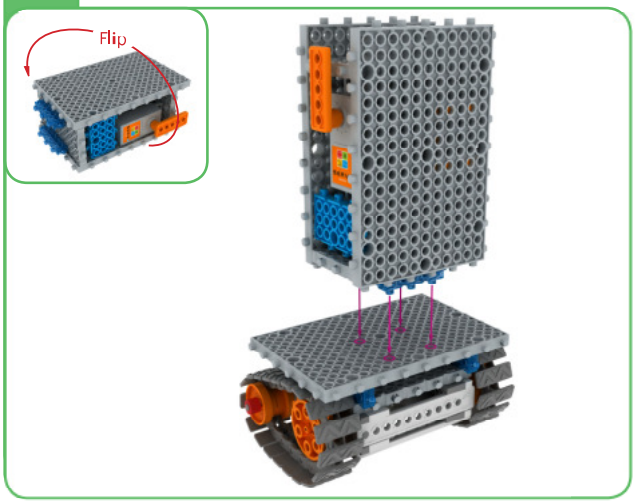

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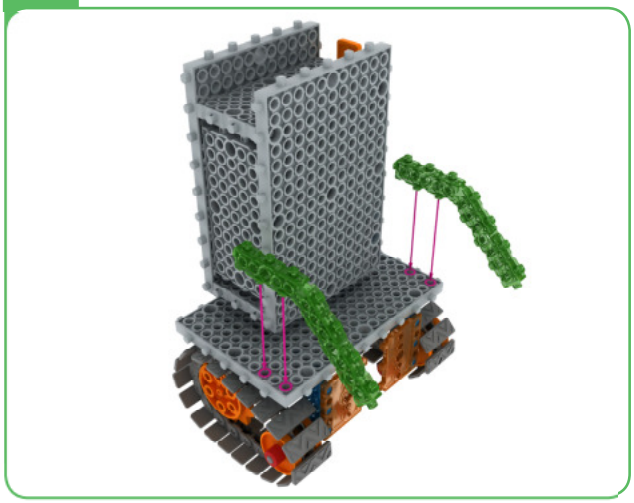

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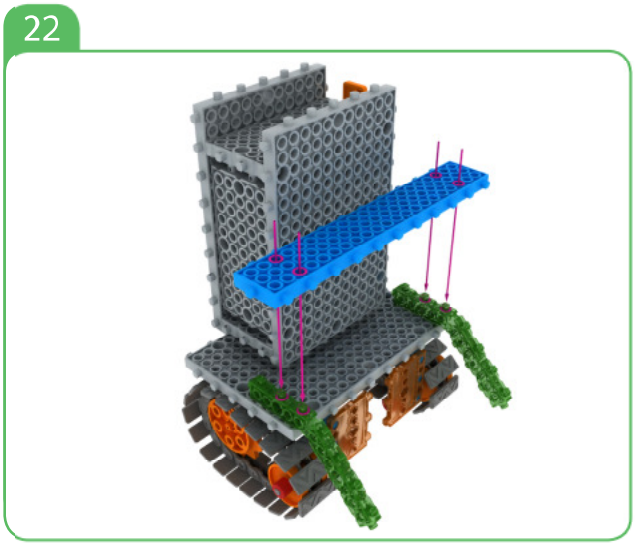

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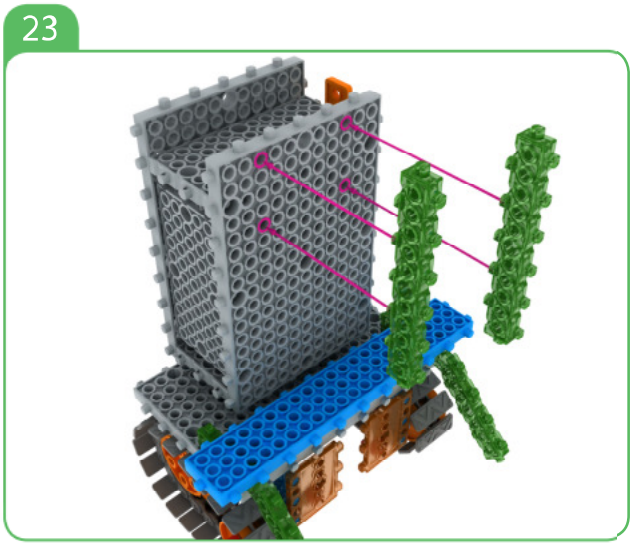

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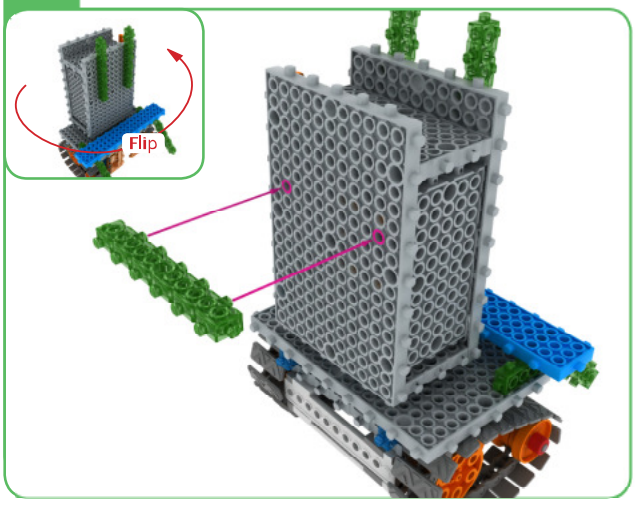

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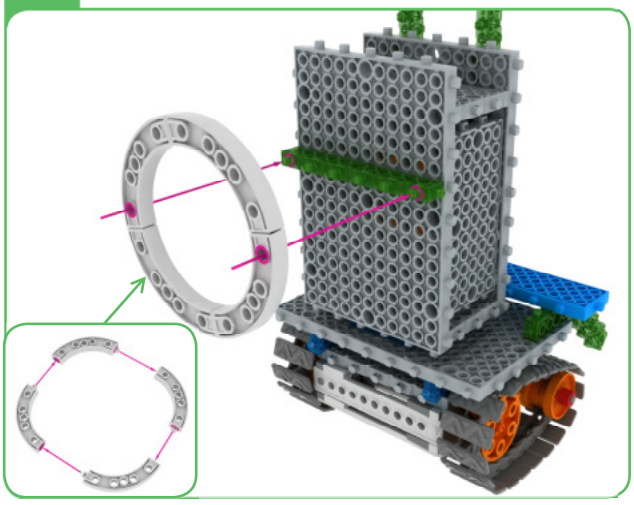

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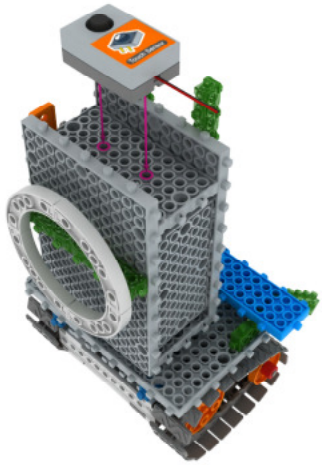

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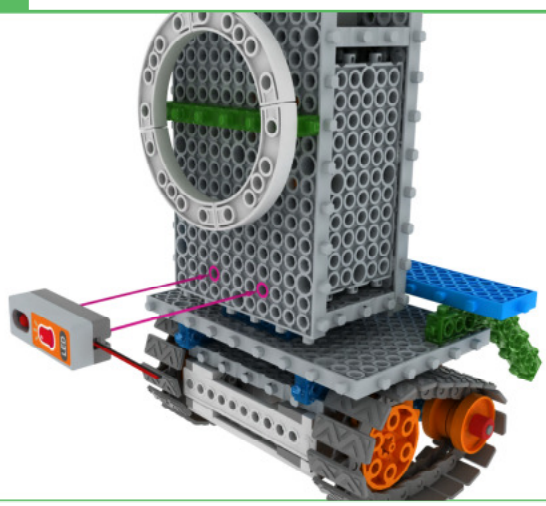

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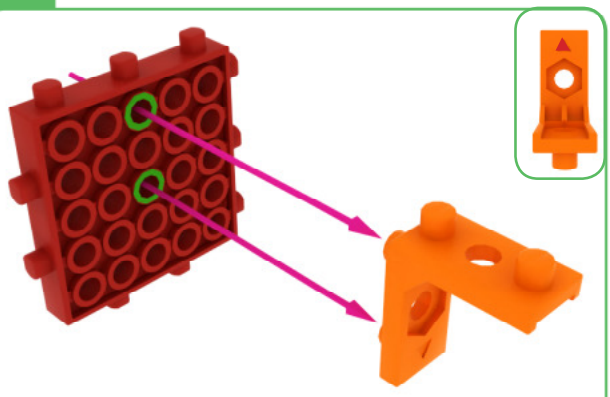

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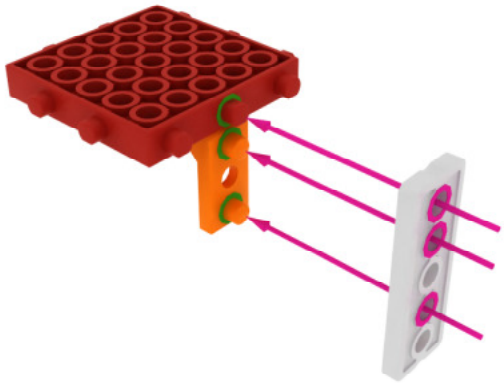

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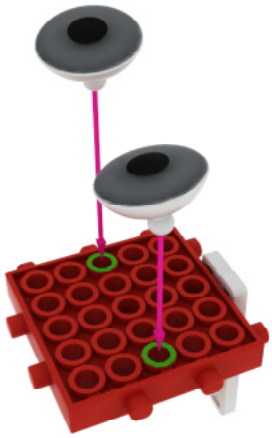

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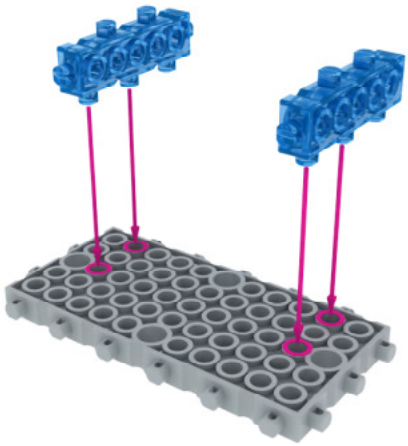

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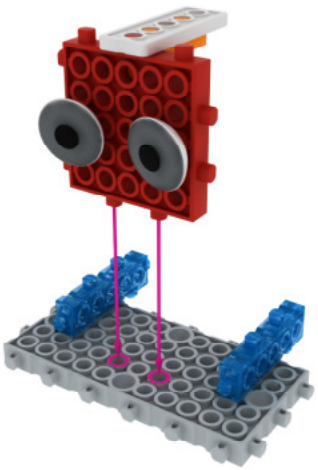

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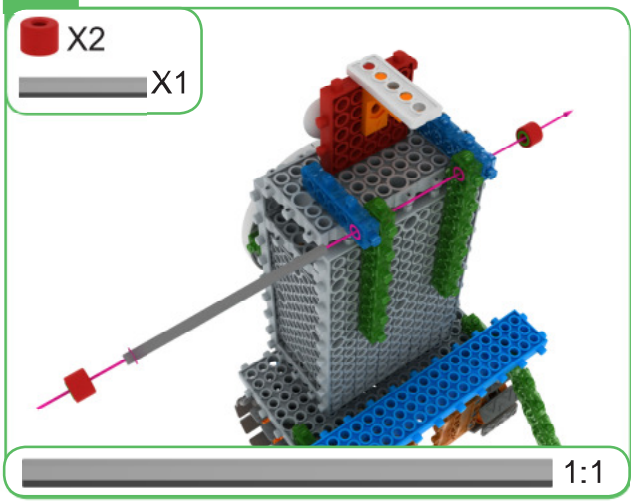

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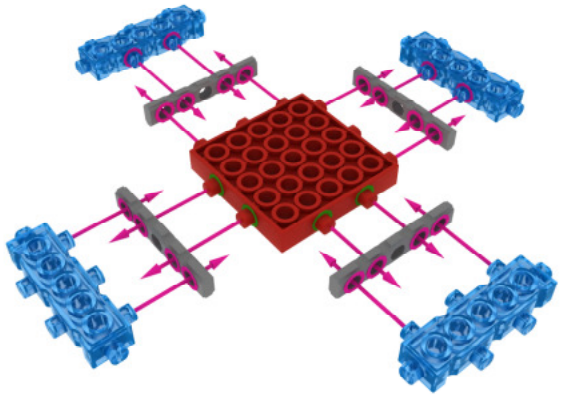

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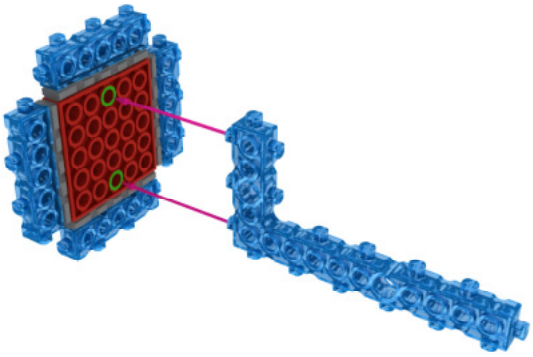

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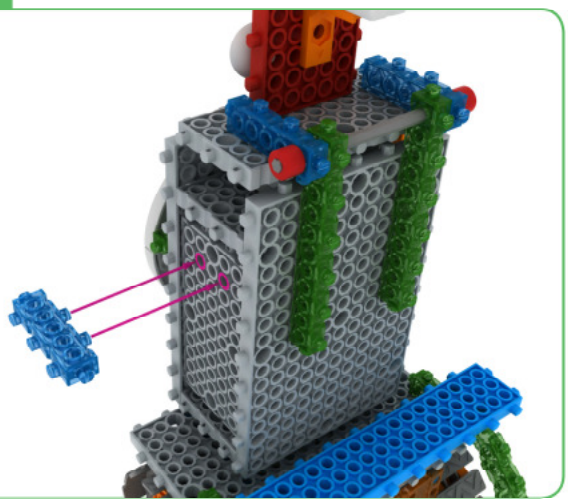

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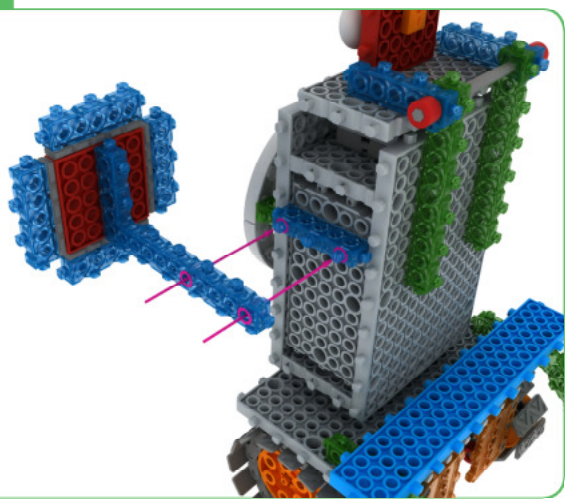

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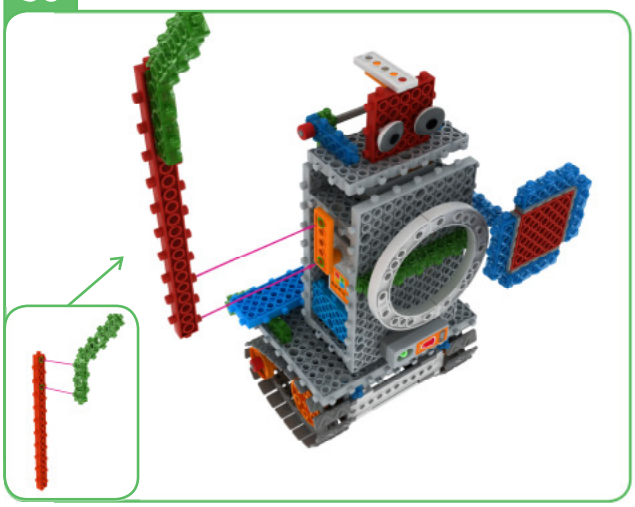

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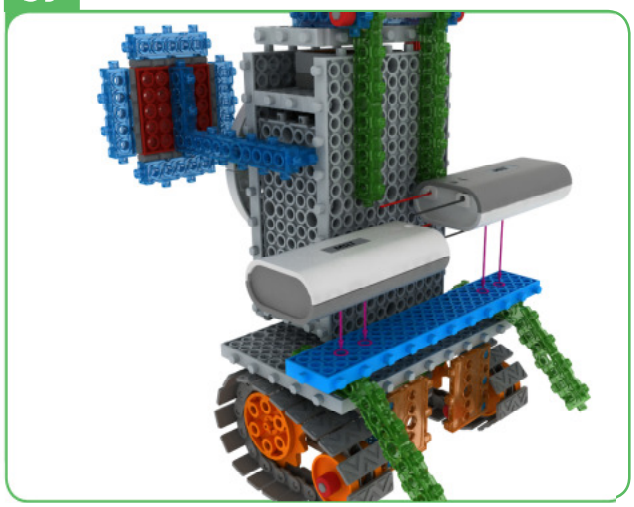

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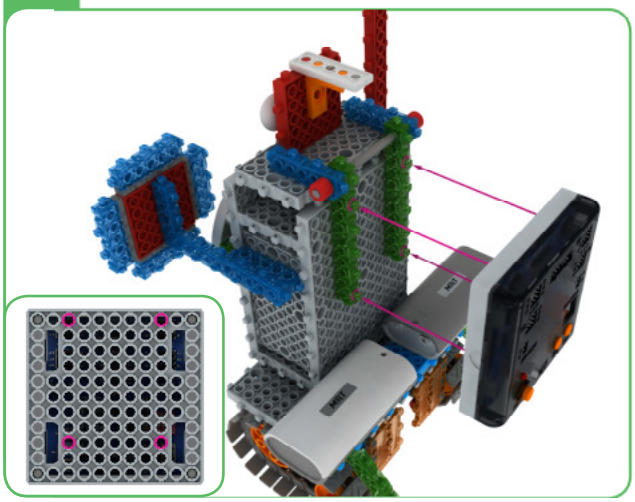
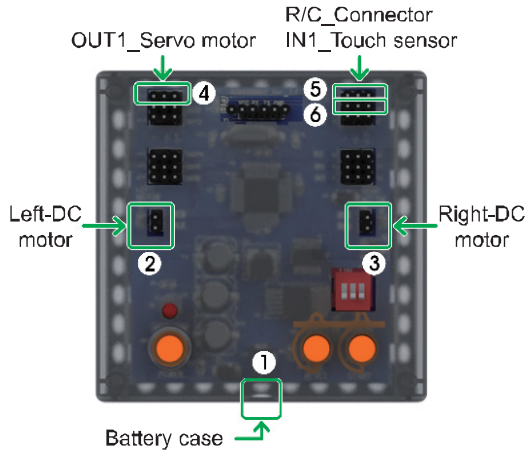


End

How to operate the Fencing Robot

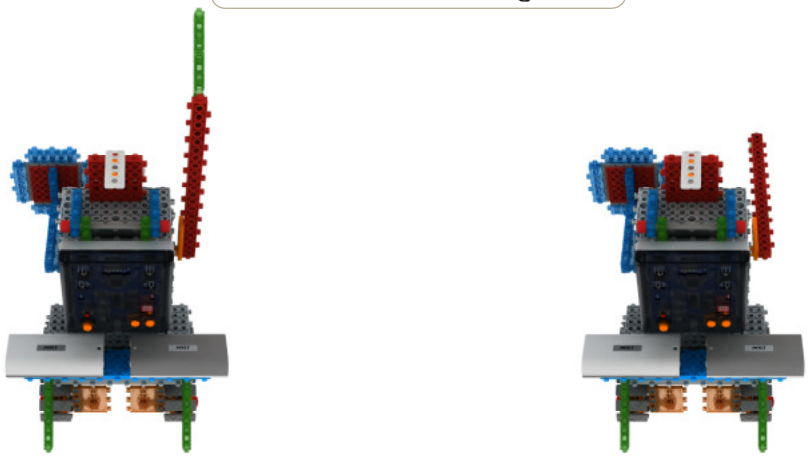
Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect Servo motor to OUT1 of OUTPUT connector.
5. Connect RC receiver board to R/C connector.
6. Connect Touch sensor to IN1 of INPUT connector.

Motion Pattern/Program



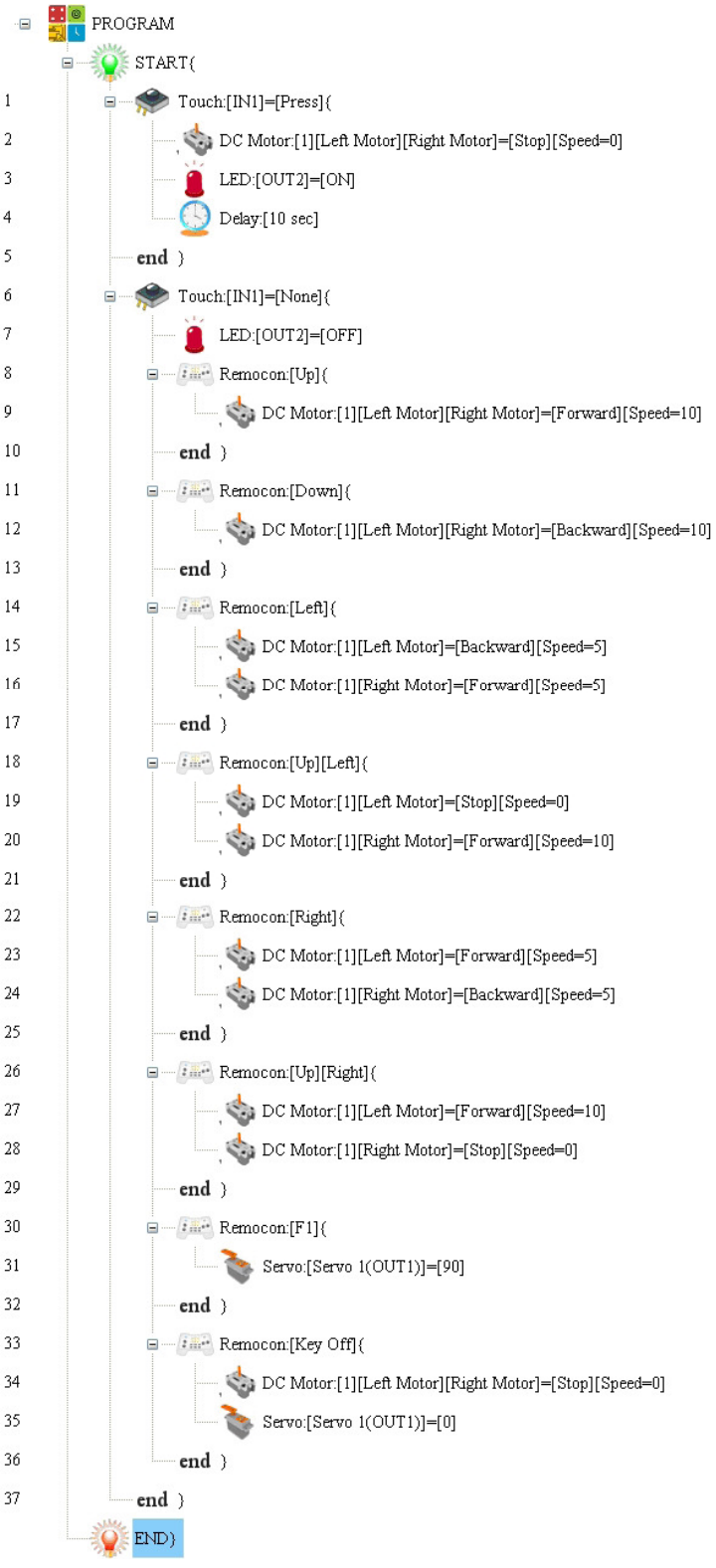
Hint 1. Servo motor attack.
Hint 2. Touch sensor will temporarily stop 10 seconds after sensed signals.

※ - Using the motion patterns as reference, let's write the program.

Program Download

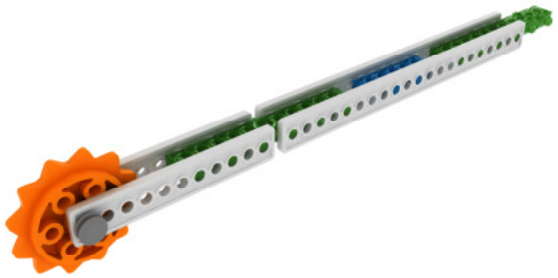
1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

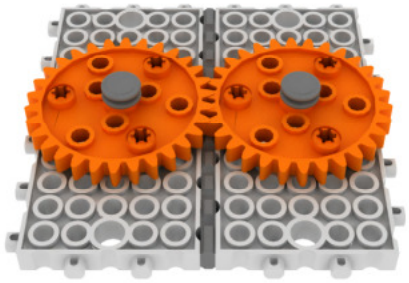
Program Example

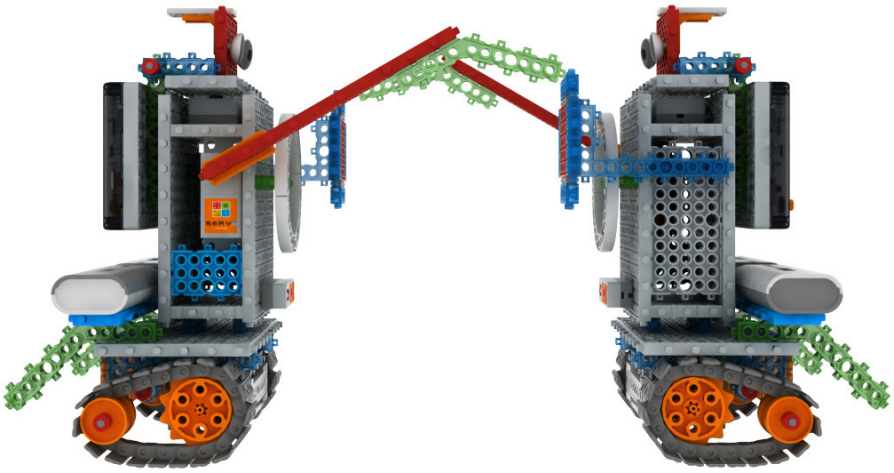


Engineering Art — Let's make interesting games with Fencing Robot

Make My weapon(Fencing)



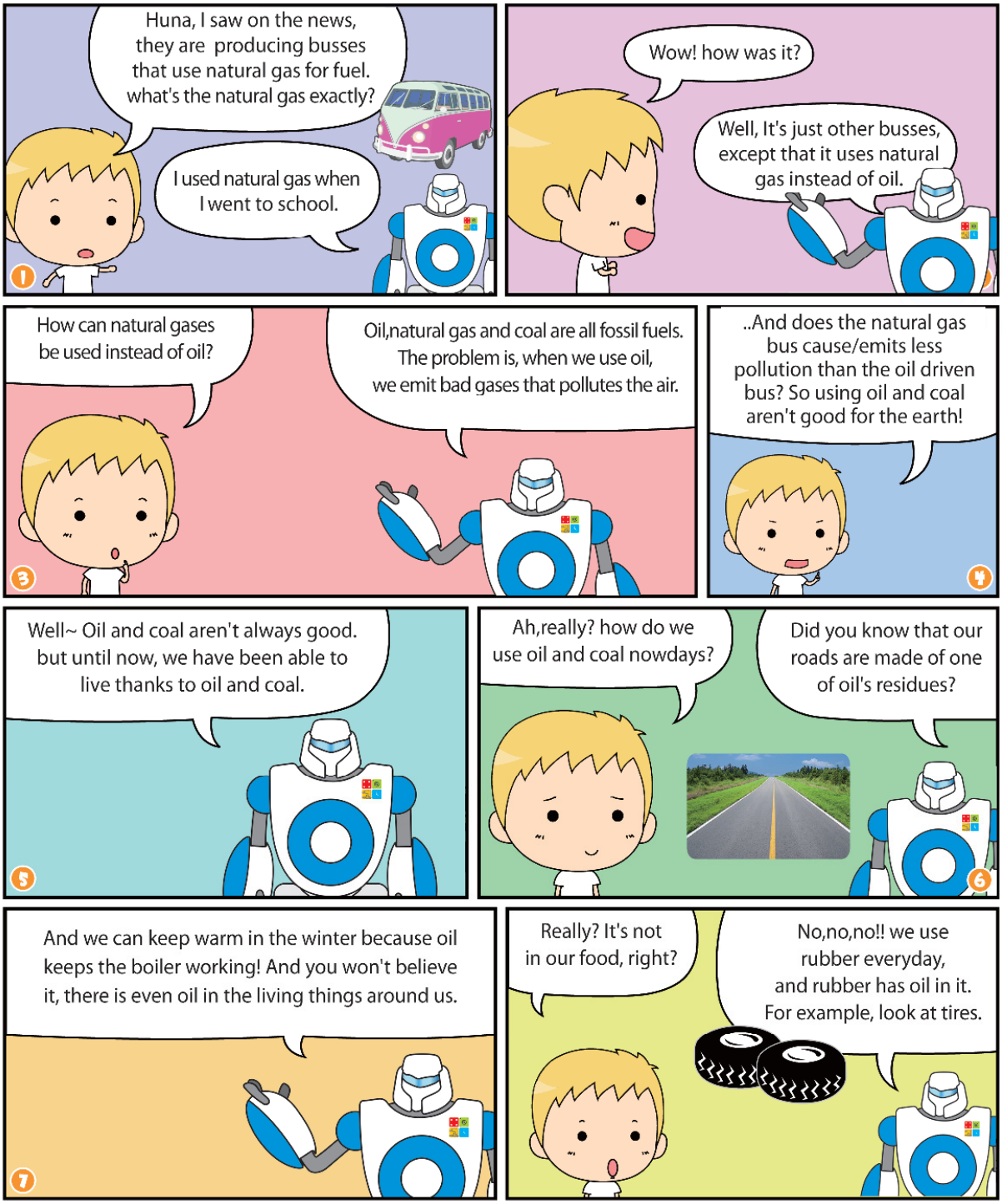


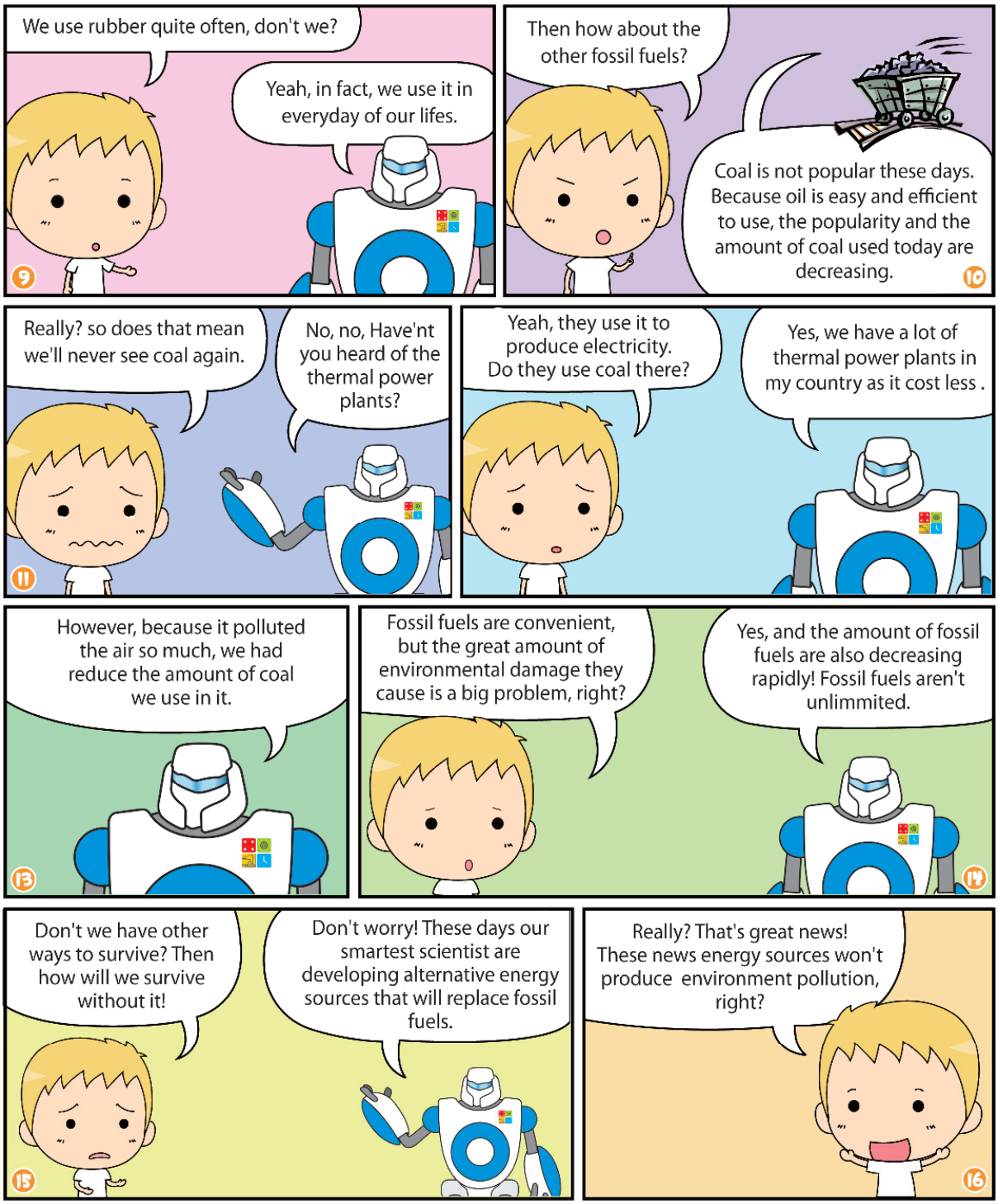


When your attack to the other robot's head success,the other robot should be stopped 10 sec,after 10 sec,LED turn on and it moves again. Can you program your robot too? Two programmed robots make a fencing competition to attack the other robot's head.

Science Engineering

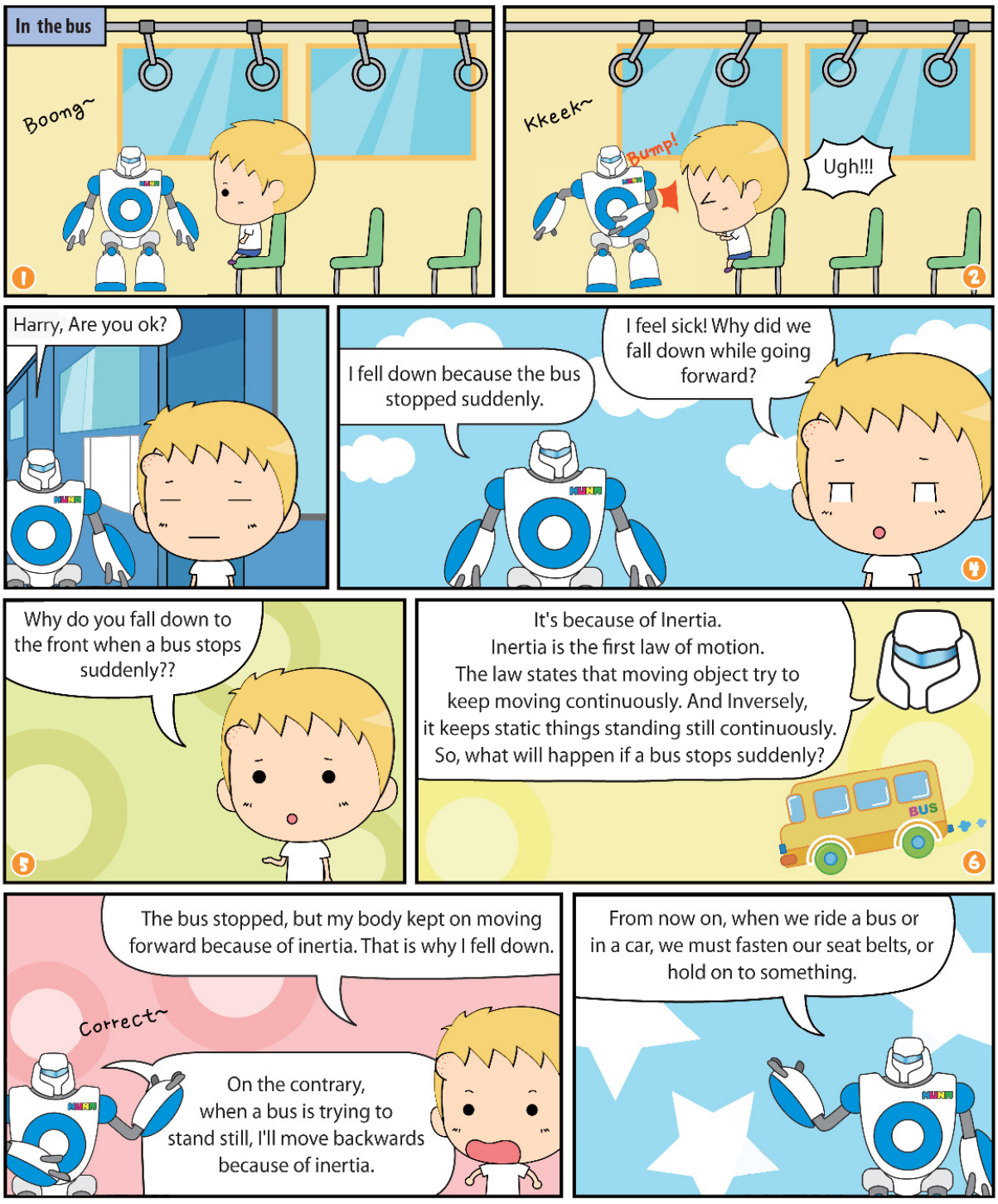
STEM 10. It's really difficult to live without this-fossil fuels




We use rubber quite often, don't we?
Yeah, in fact, we use it in everyday of our lifes.
9
Then how about the other fossil fuels?
Coal is not popular these days. Because oil is easy and efficient to use, the popularity and the amount of coal used today are decreasing.
10
Really? so does that mean we'll never see coal again.
No, no, Have'nt you heard of the thermal power plants?
11
Yeah, they use it to produce electricity. Do they use coal there?
Yes, we have a lot of thermal power plants in my country as it cost less .
However, because it polluted the air so much, we had reduce the amount of coal we use in it.
13
Fossil fuels are convenient, but the great amount of environmental damage they cause is a big problem, right?
Yes, and the amount of fossil fuels are also decreasing rapidly! Fossil fuels aren't unlimmited.
14
Don't we have other ways to survive? Then how will we survive without it!
Don't worry! These days our smartest scientist are developing alternative energy sources that will replace fossil fuels.
15
Really? That's great news! These news energy sources won't produce environment pollution, right?
16

Science

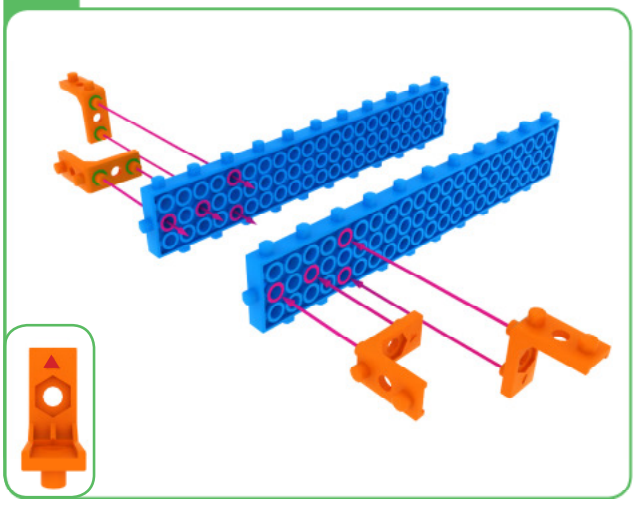
STEM 11. The first law of motion-Inertia



Science Engineering

Robot Making6-Catapult

1



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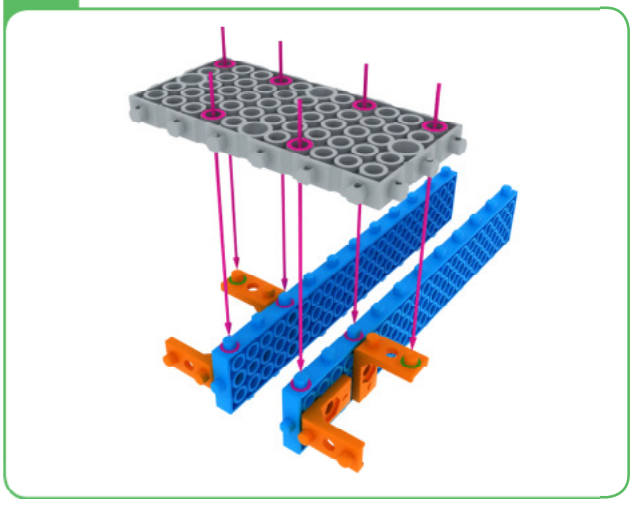

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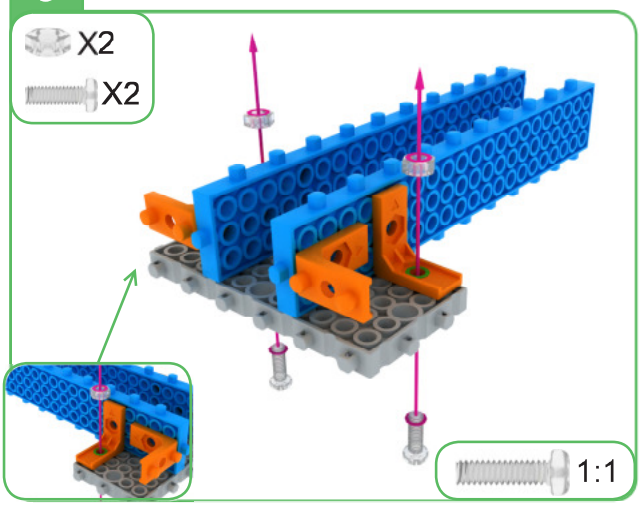

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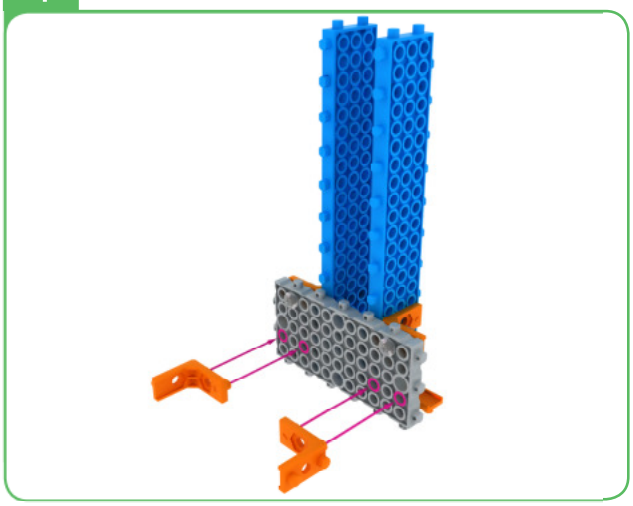

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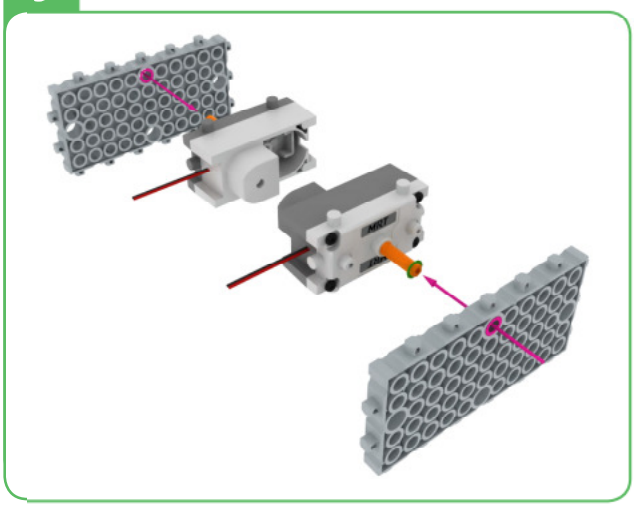

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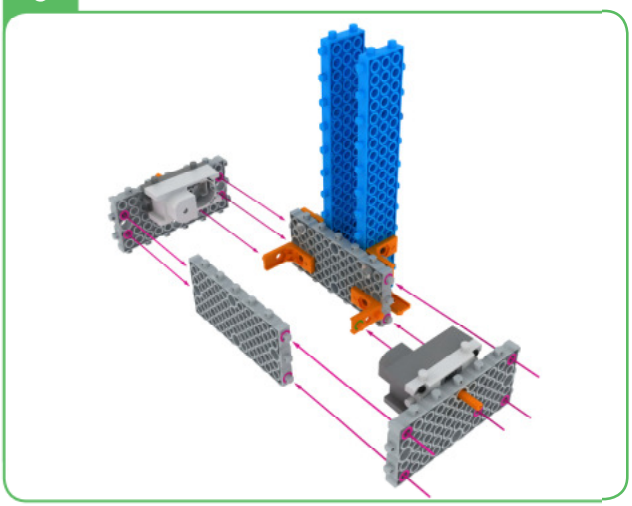

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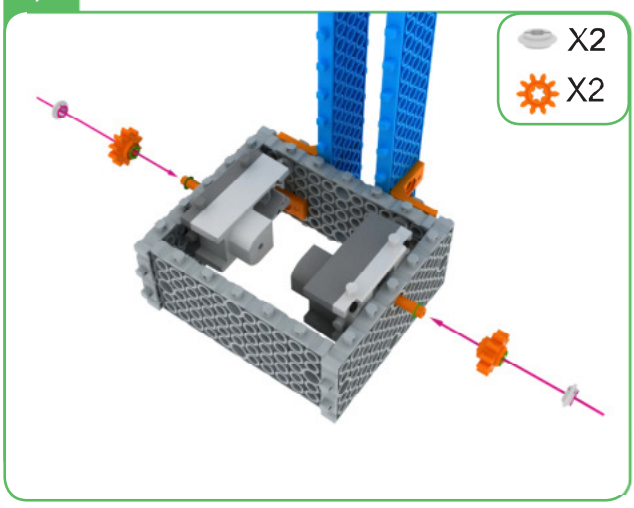

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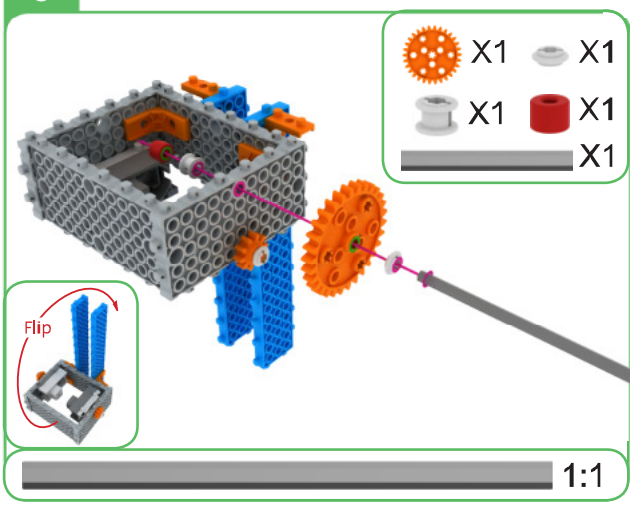

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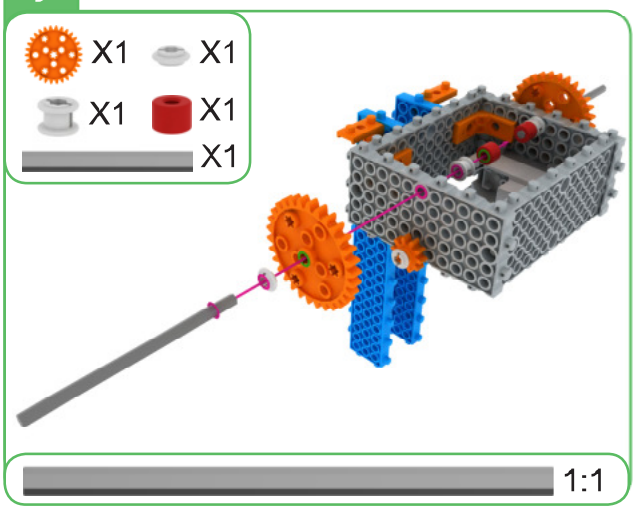

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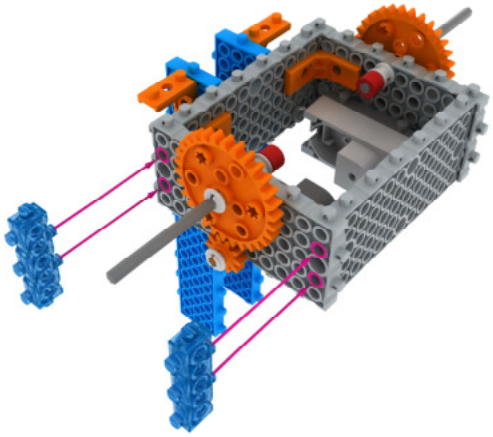

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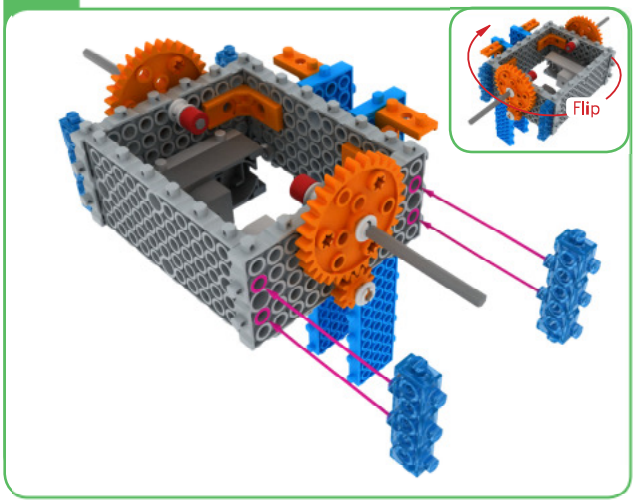

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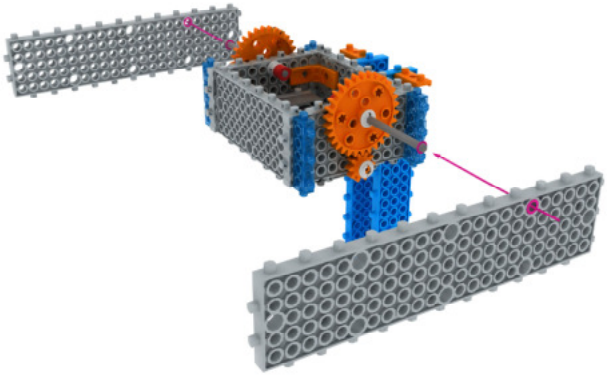

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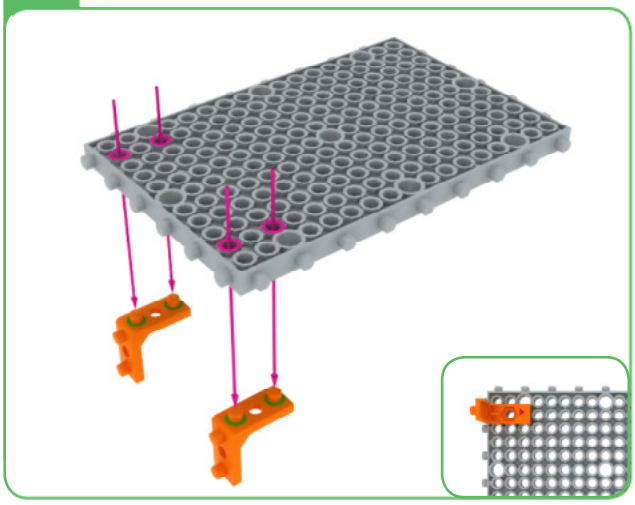

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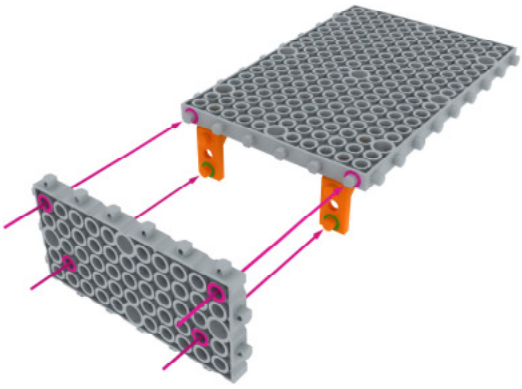

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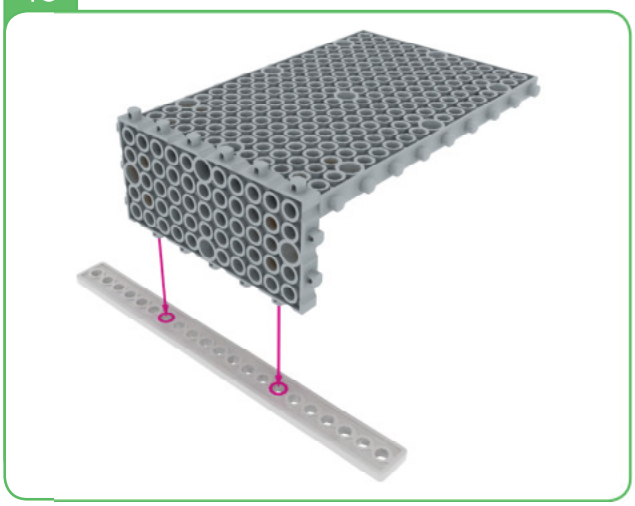

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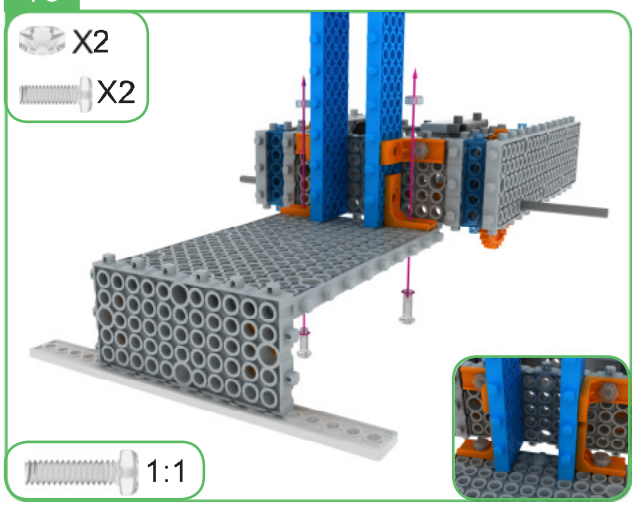

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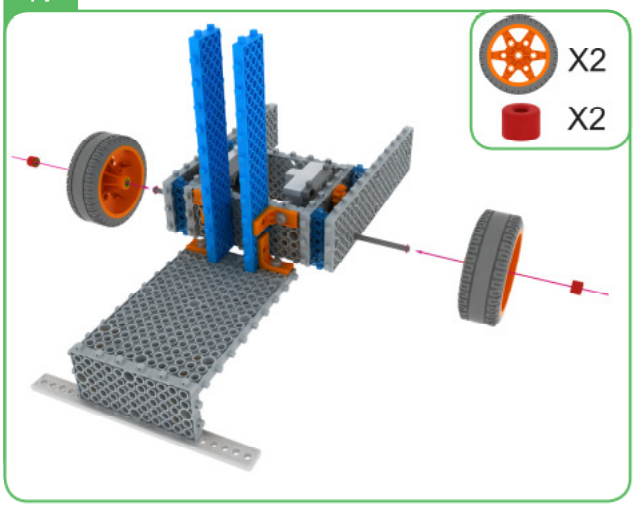

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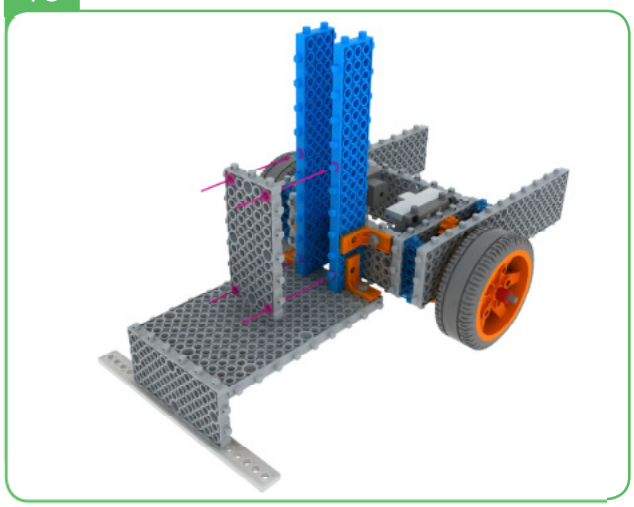

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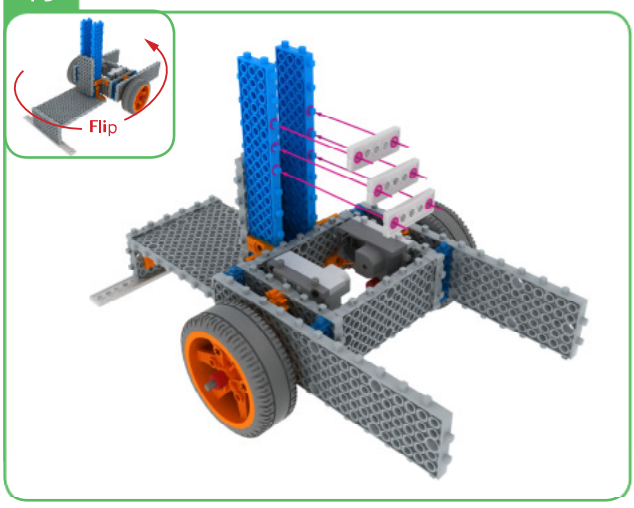

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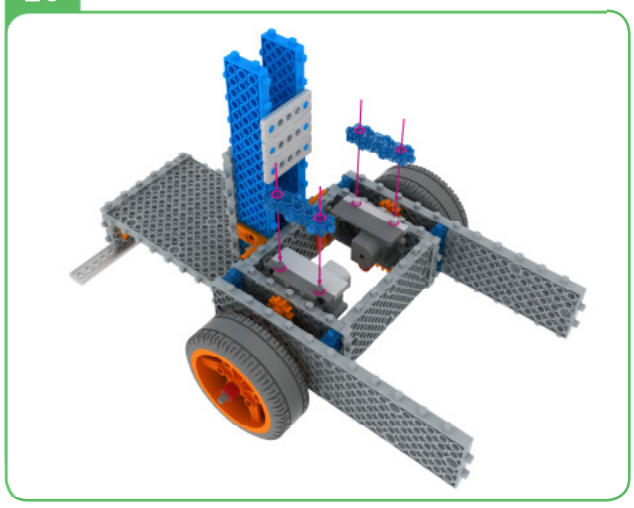

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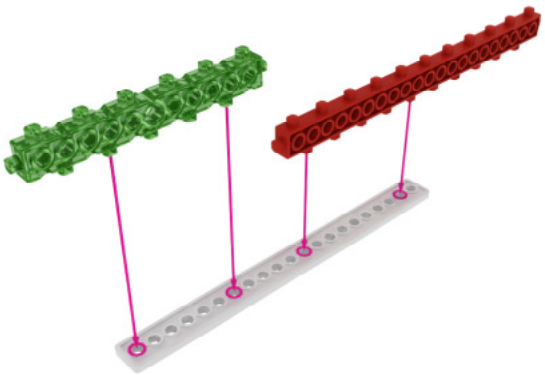

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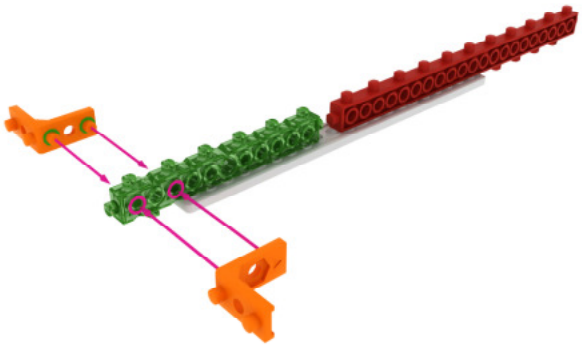

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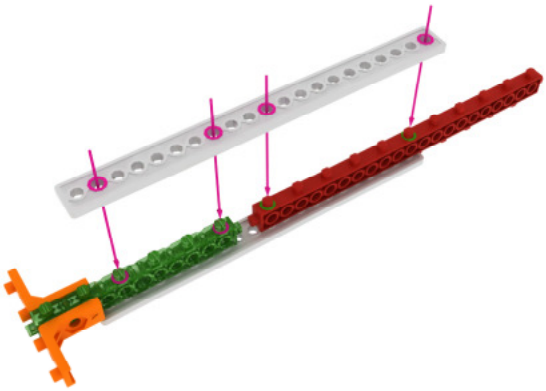

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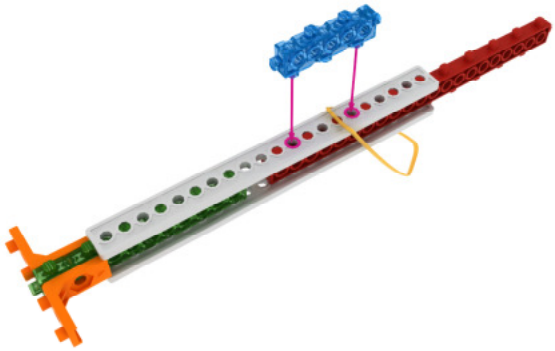

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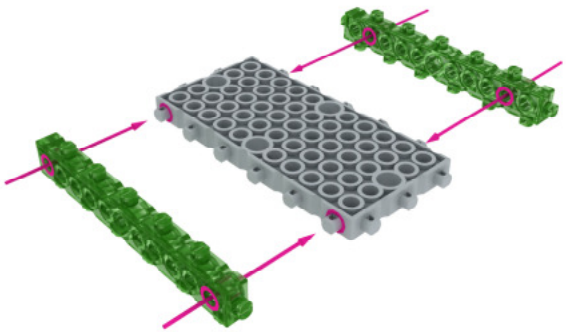

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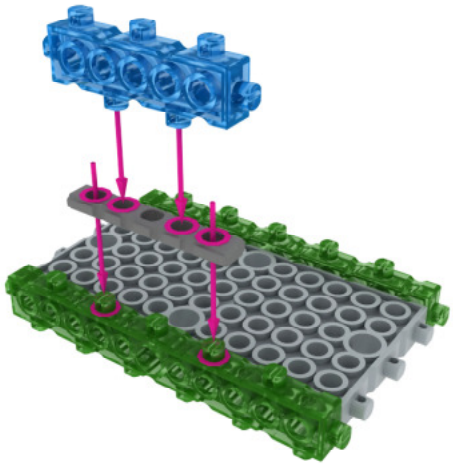

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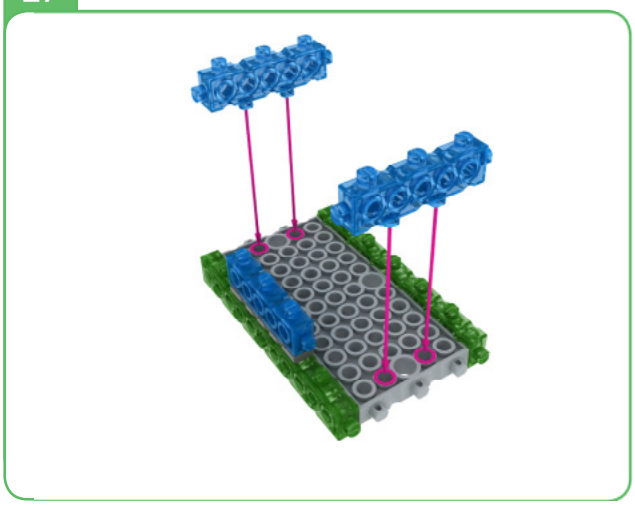

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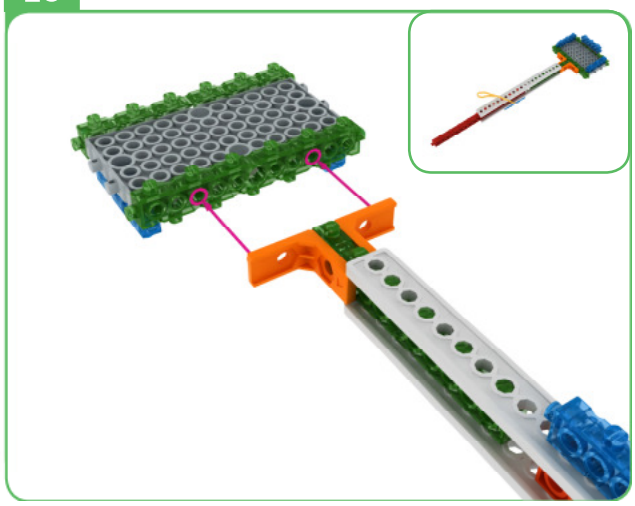

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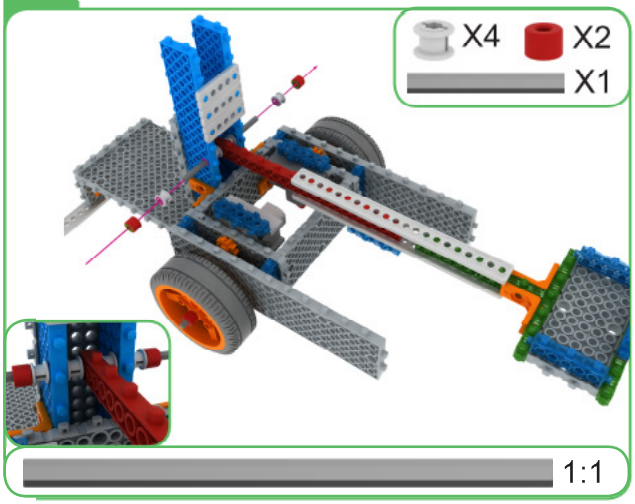

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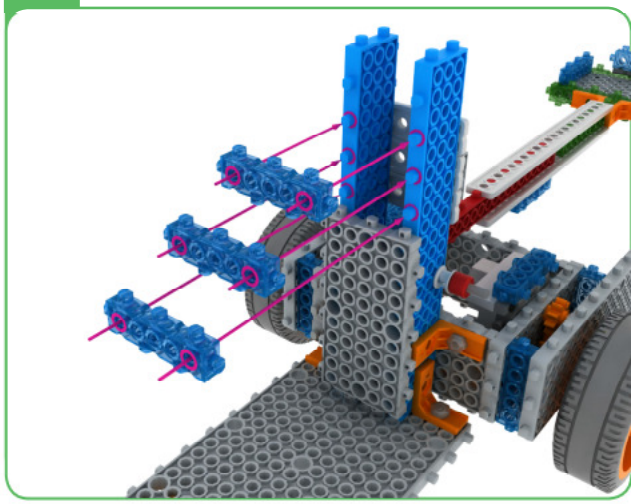

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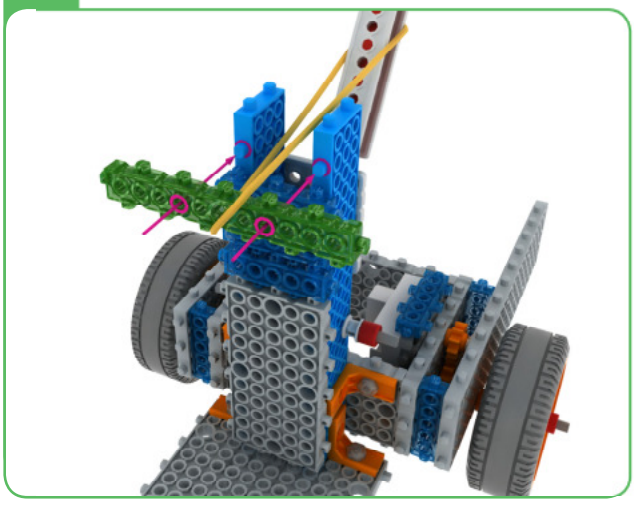

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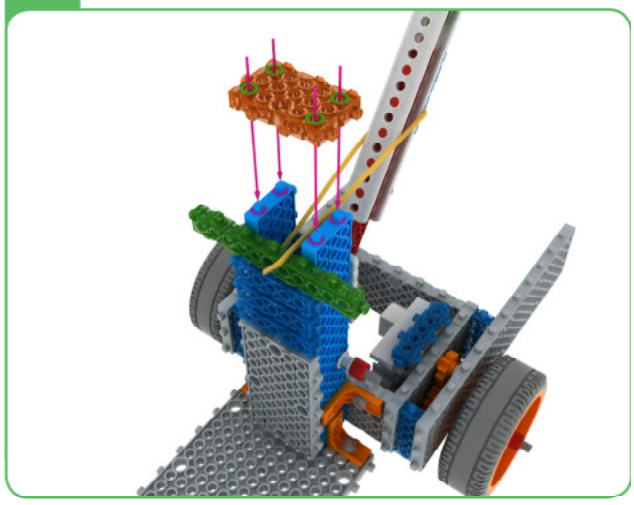

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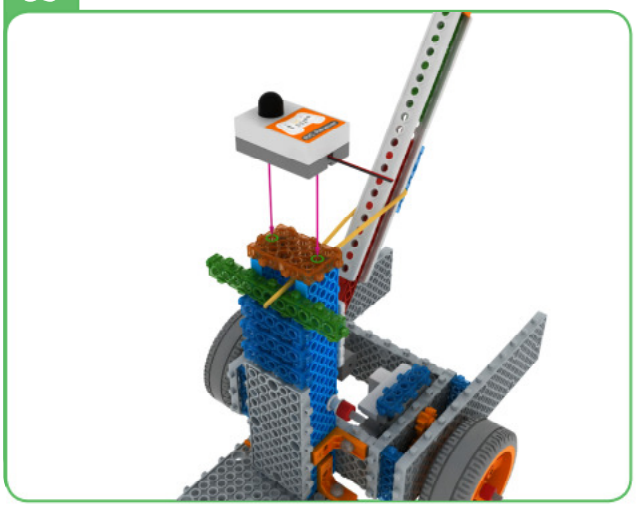

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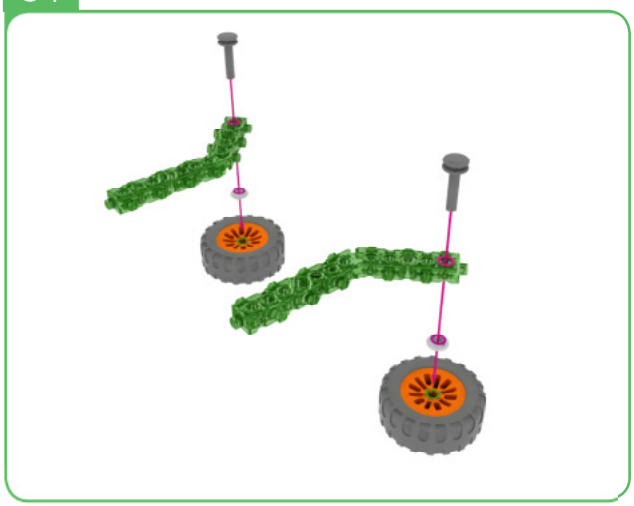

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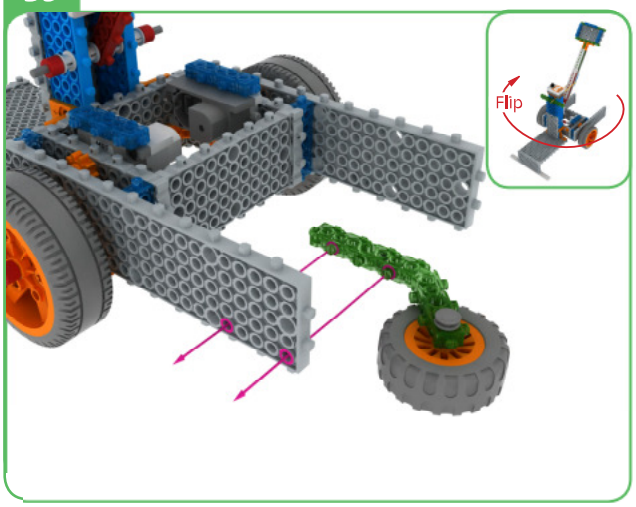

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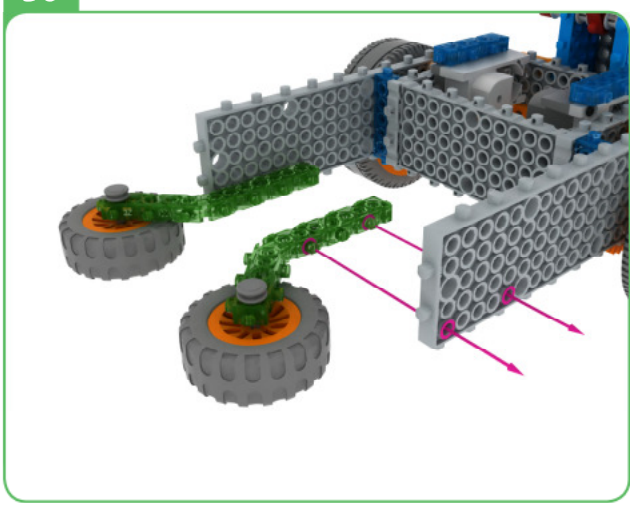

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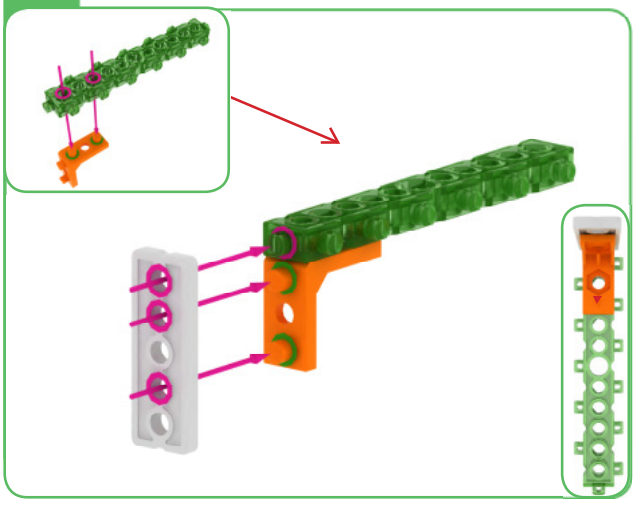

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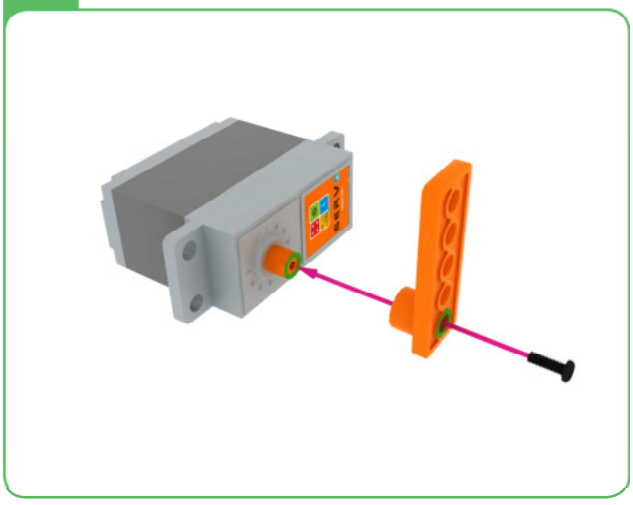
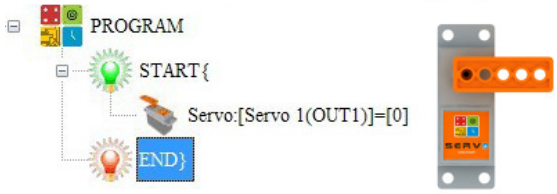


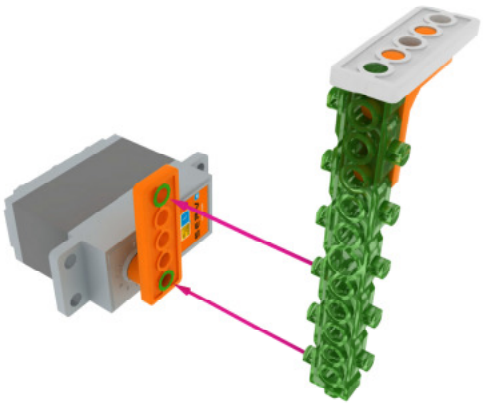
Servo Motor-Zero Point Adjustment

1. Connect the servo motor to the mainboard. You can write the program in the following way.



2. After downloading the program, power off and on again.
3. Fix servo motor horn to the servo motor with a small servo bolt as illustrated in the picture .

39



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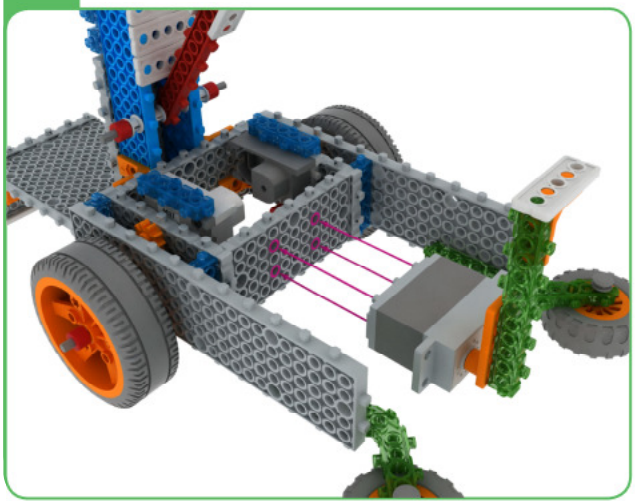

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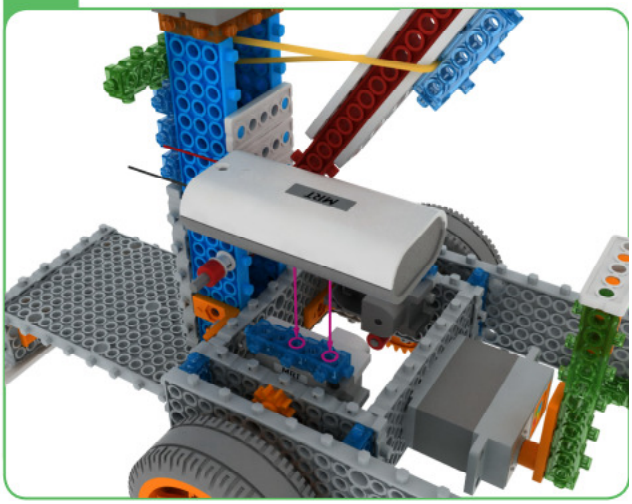

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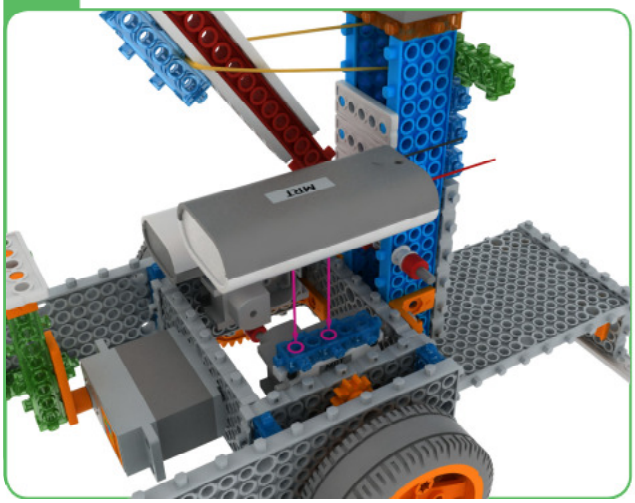
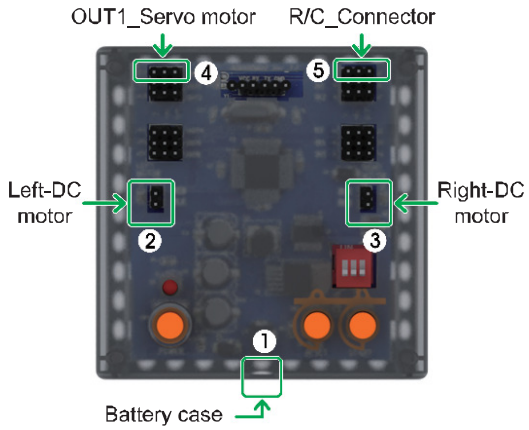


End

How to operate the Catapult

Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect Servo motor to OUT1 of OUTPUT connector.
5. Connect RC receiver board to R/C connector.

Motion Pattern/Program

1

2

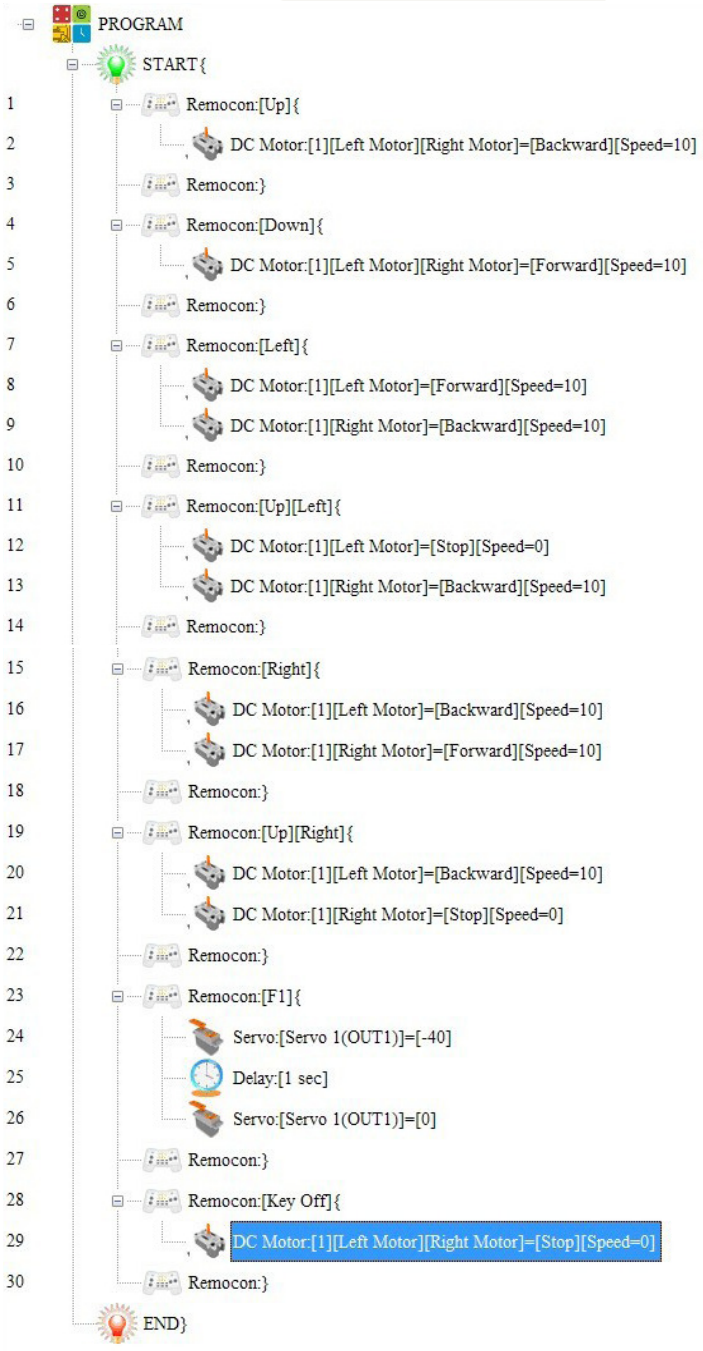
① Hang the catapult arm installation to the safety link that is connected to the servo motor.
② When the remote control's F1 Key is pressed, the catapult will launch itself .

※ - Using the motion patterns as reference, let's write the program.

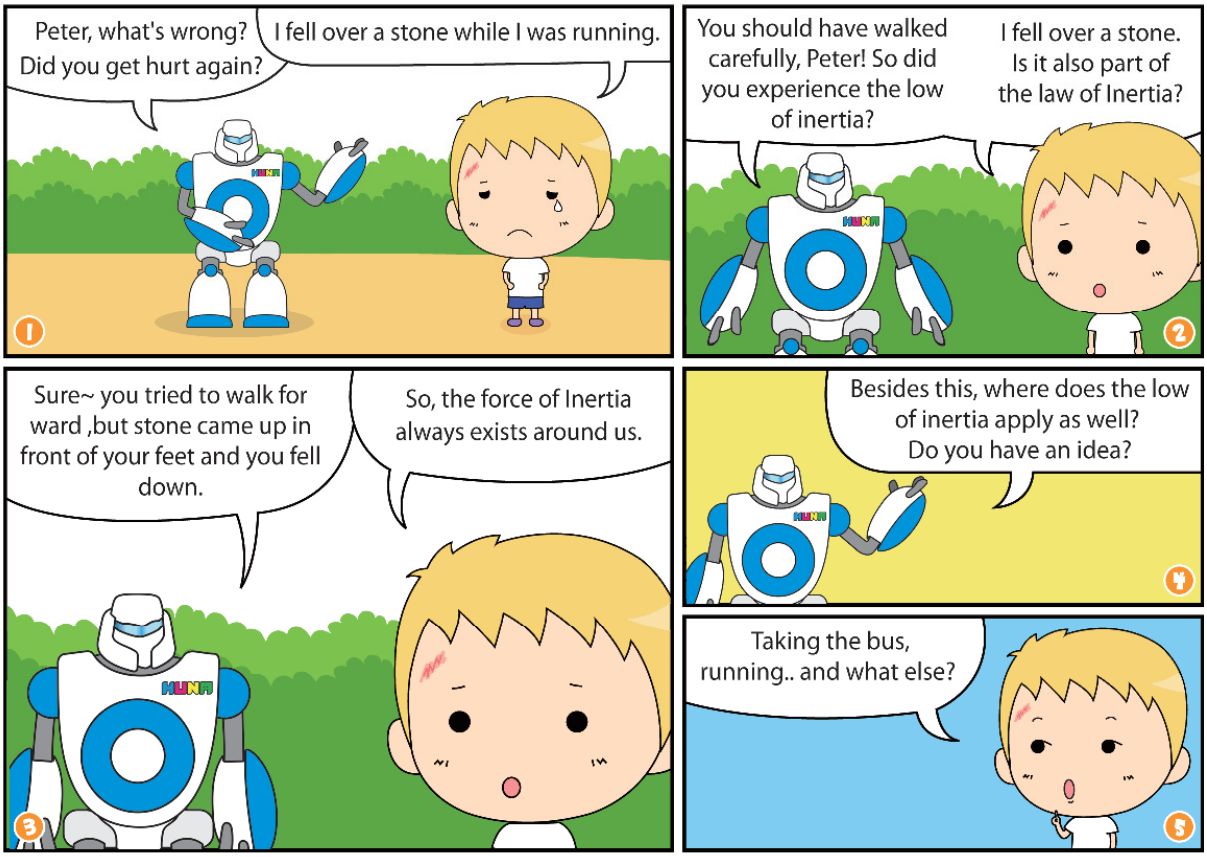
Program Download

1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

Program Example



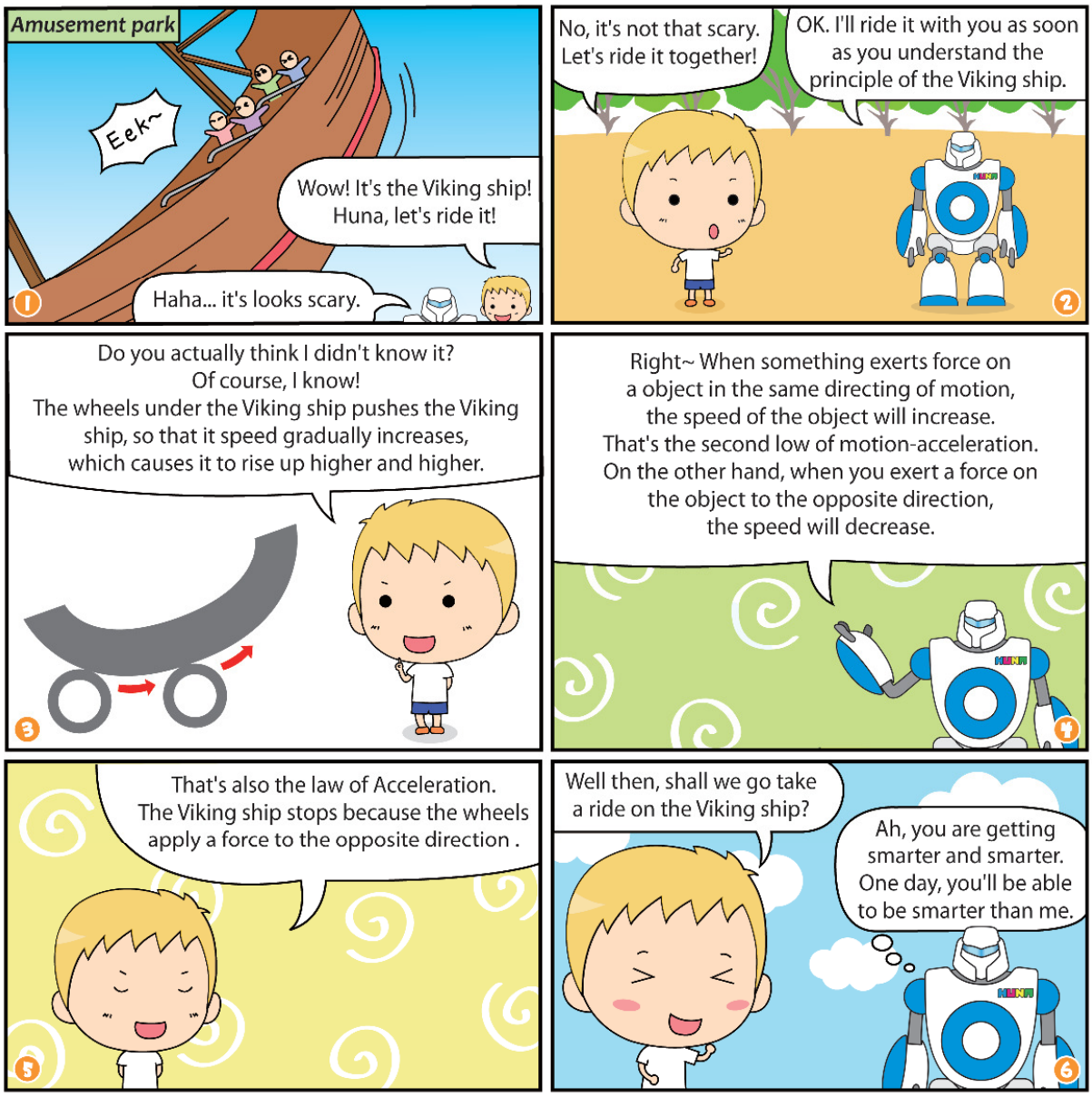
Science STEM 12. The law inertia can be seen all around us!



Think and write down all of things around you that is effected by the low of inertia!

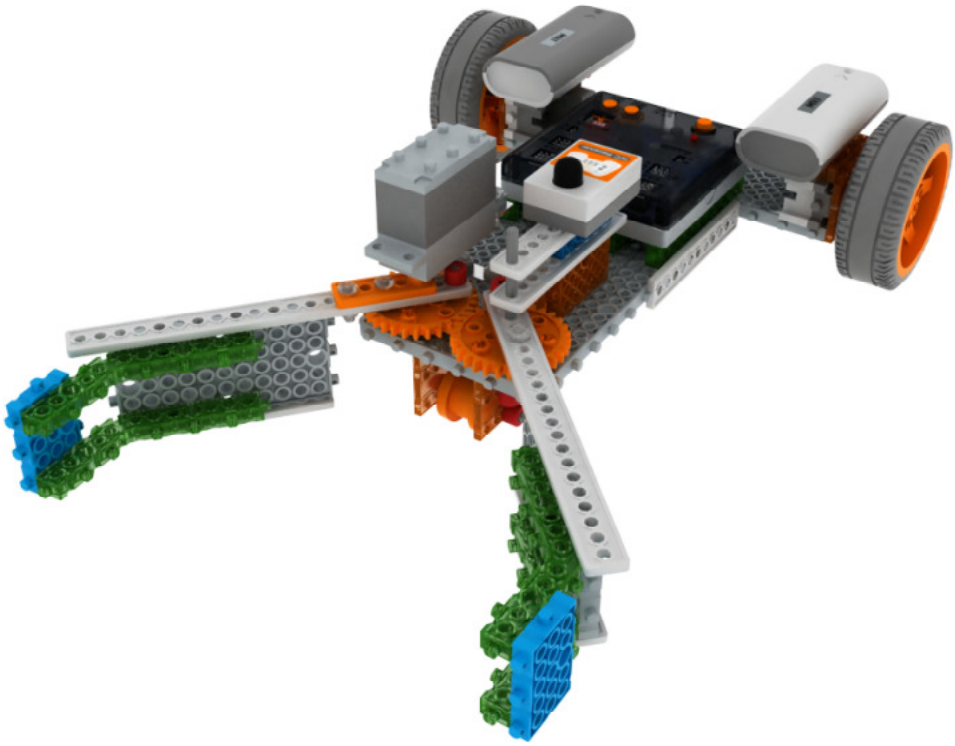
Science

STEM 13. The second law of motion-Acceleration



Technology Engineering

Robot Making7-Forceps Robot



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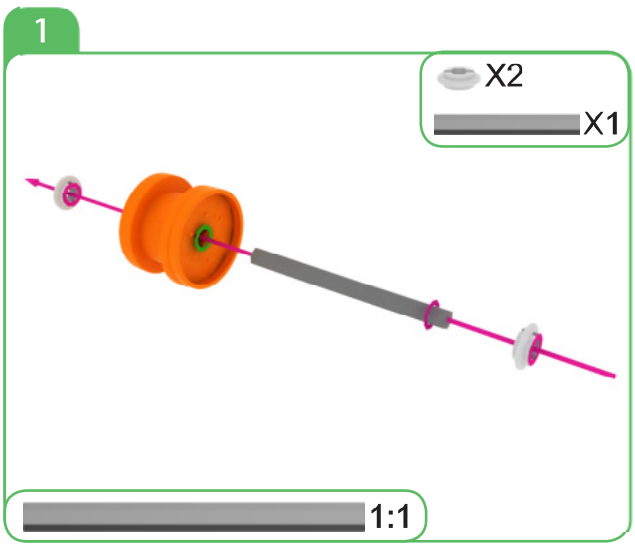

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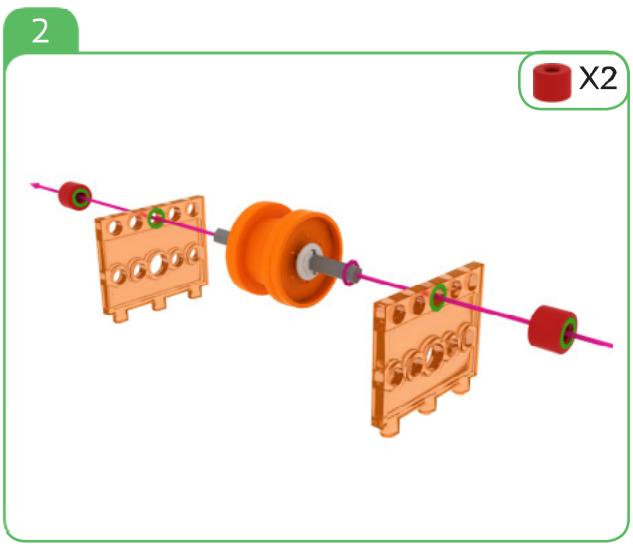

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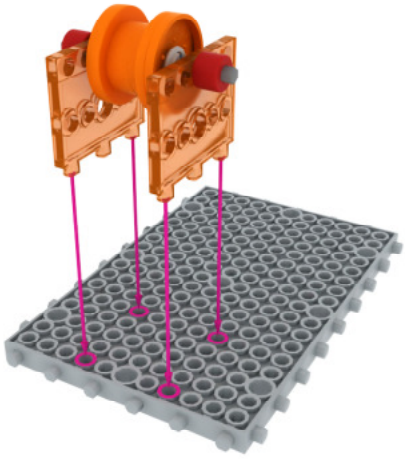

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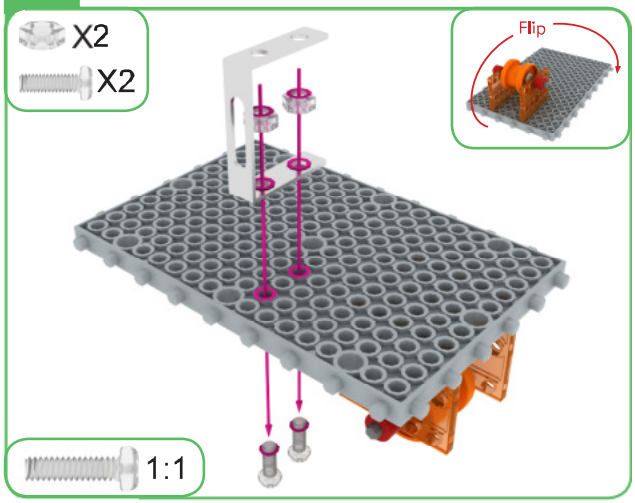

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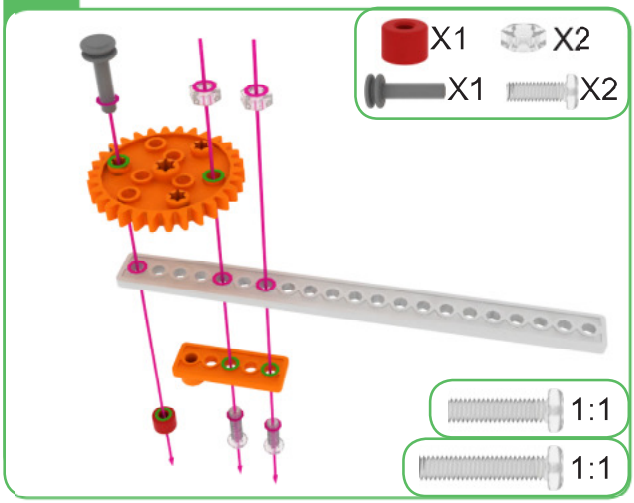

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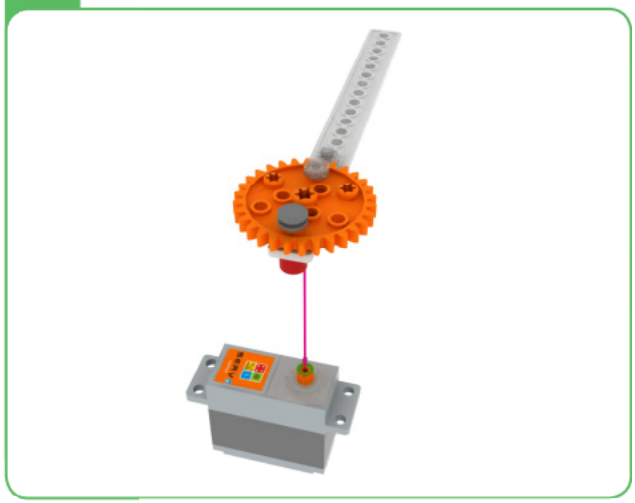
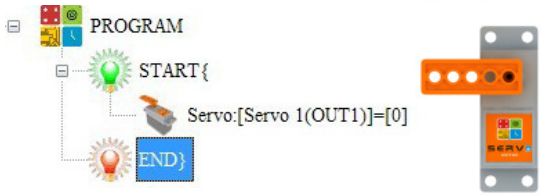


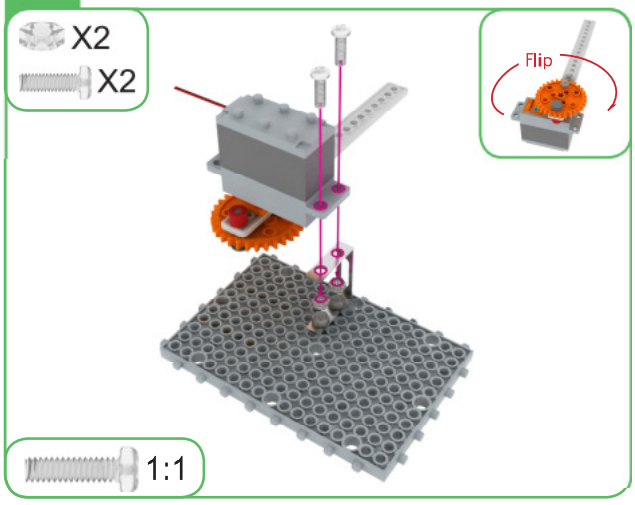
Servo Motor-Zero Point Adjustment

1. Connect the servo motor to the mainboard. You can write the program in the following way.



2. After downloading the program, power off and on again.
3. Fix servo motor horn to the servo motor with a small servo bolt as illustrated in the picture .

7



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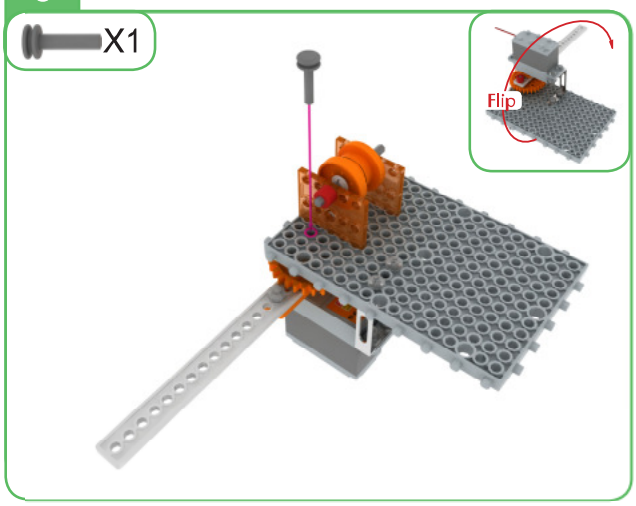

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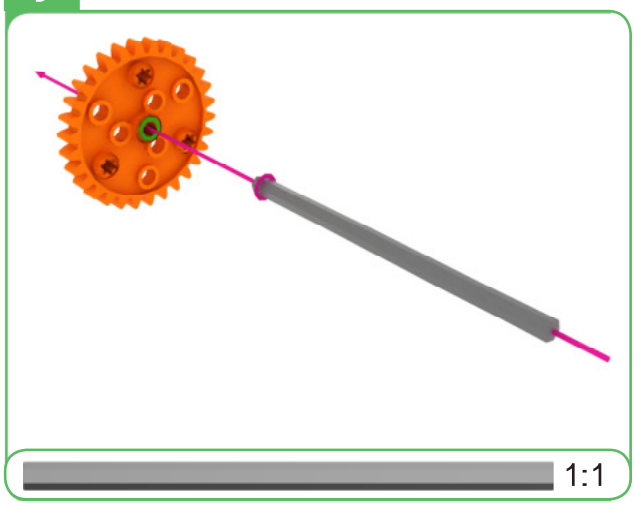

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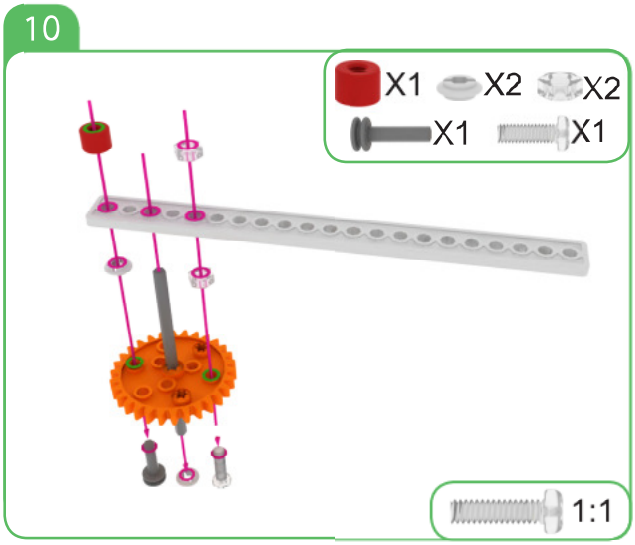

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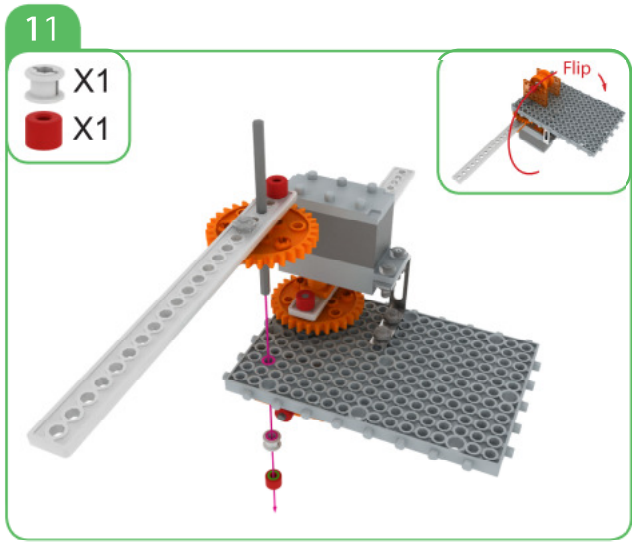

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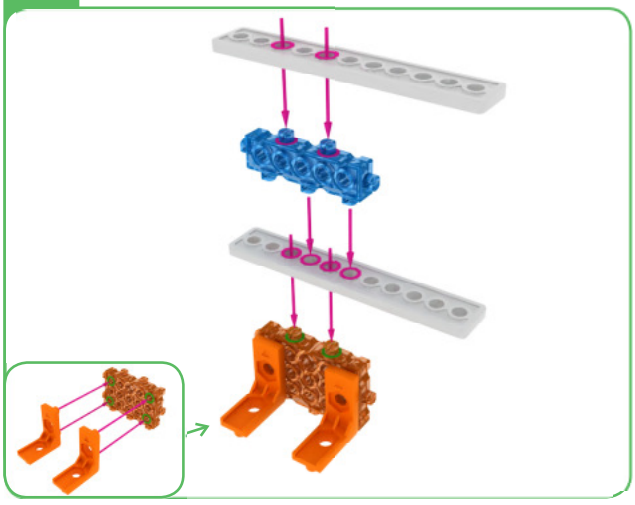

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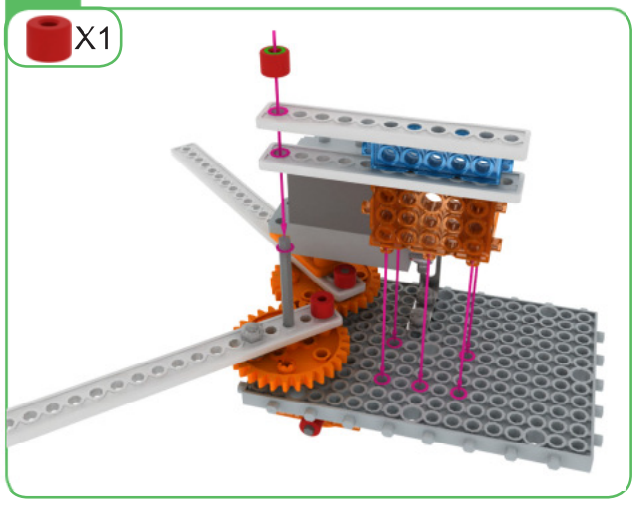

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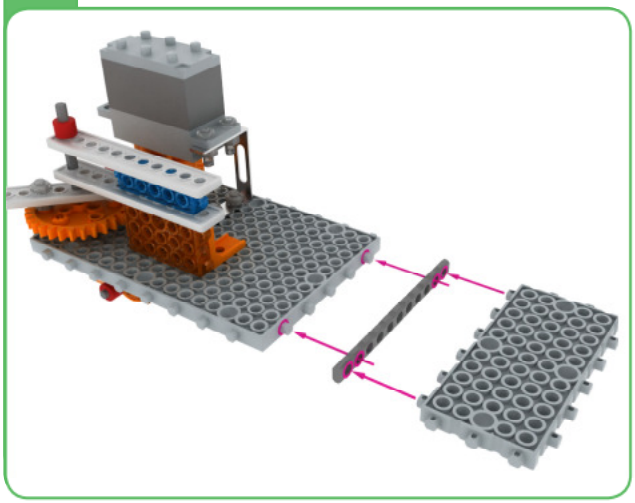

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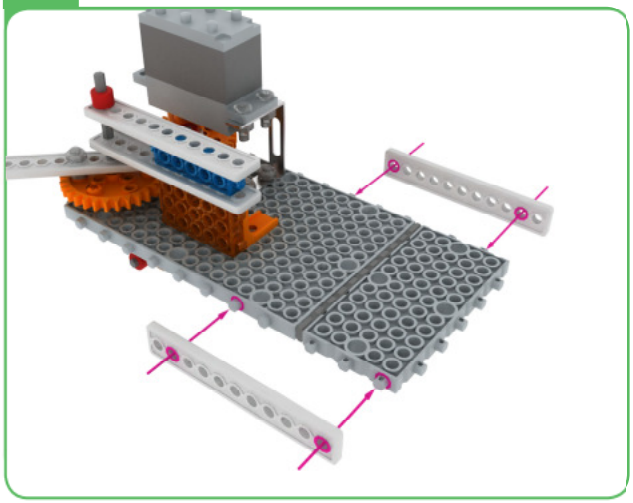

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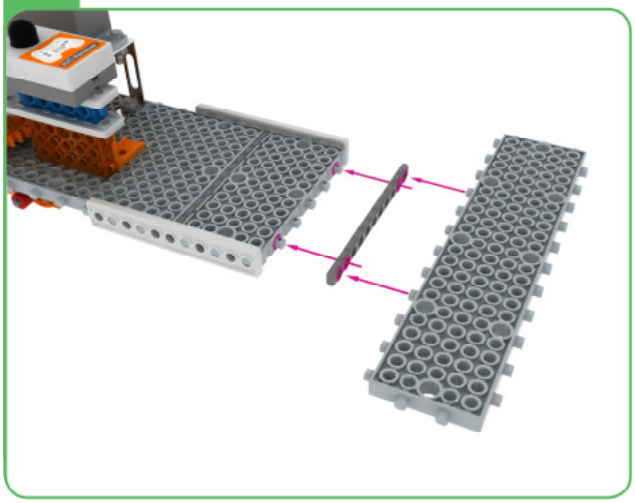

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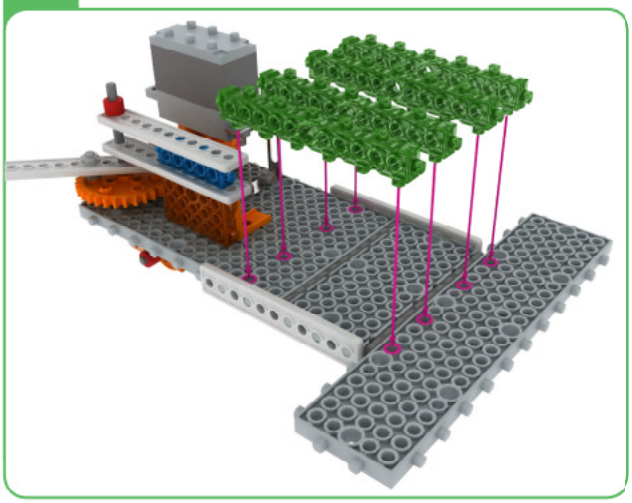

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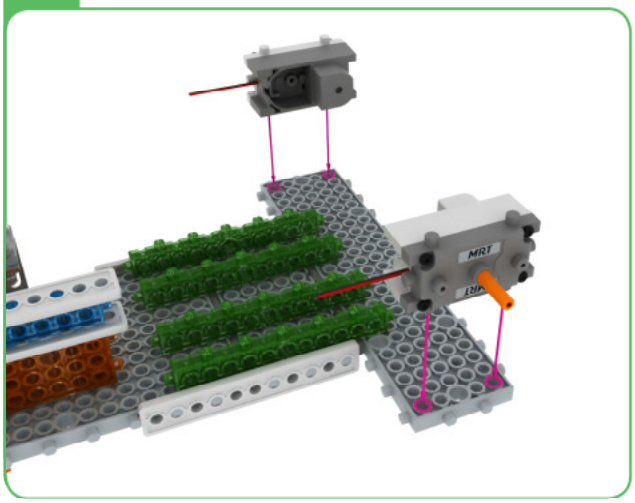

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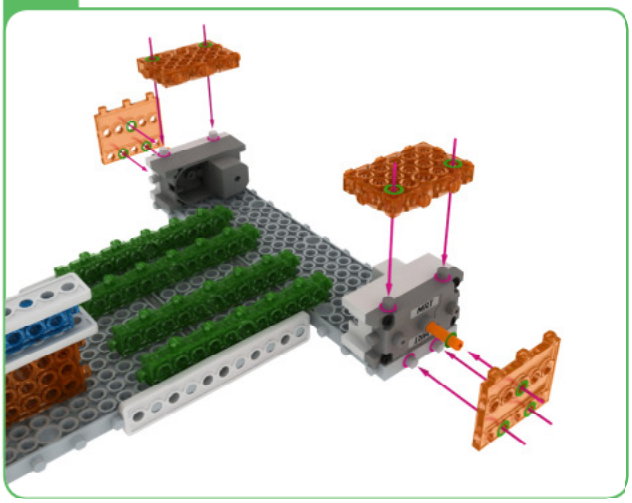

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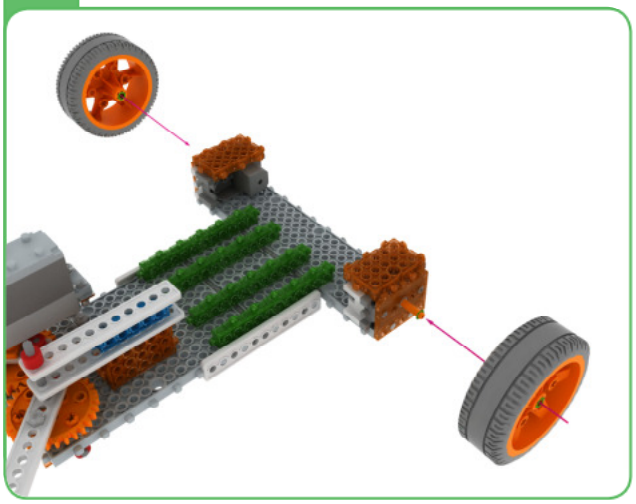

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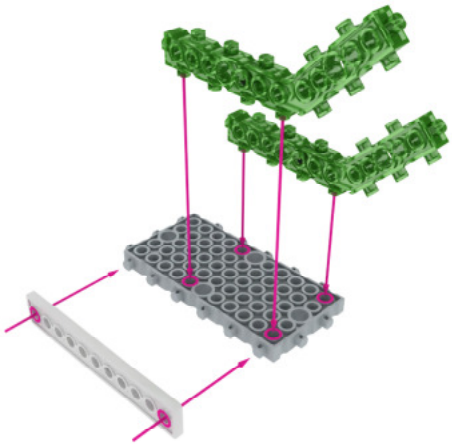

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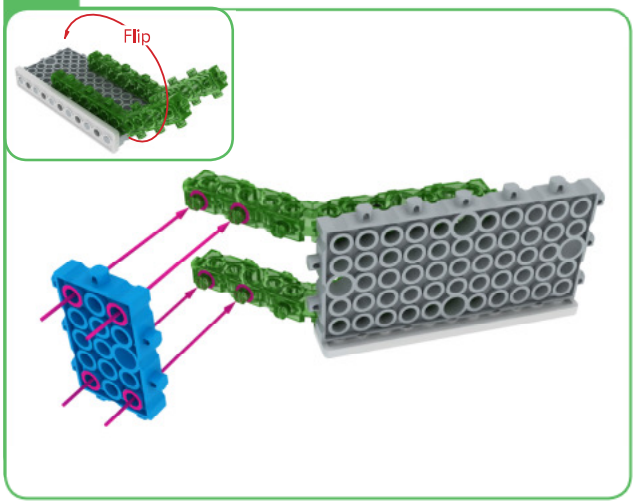

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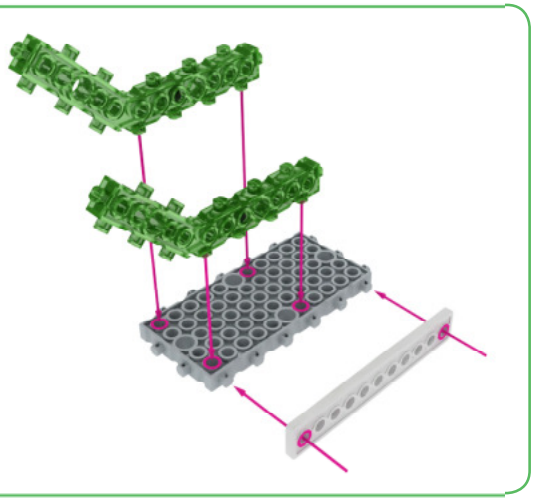

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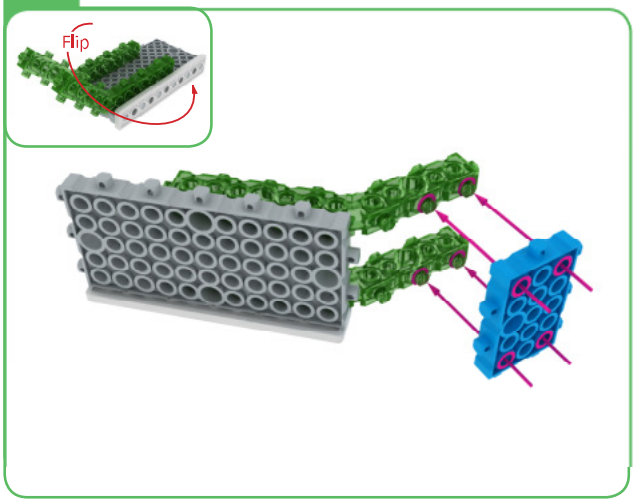

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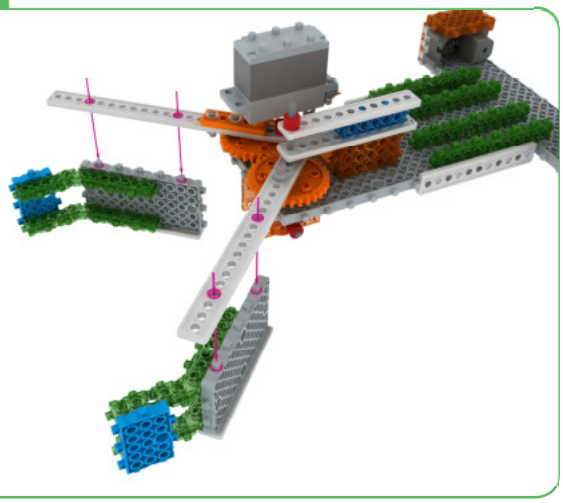

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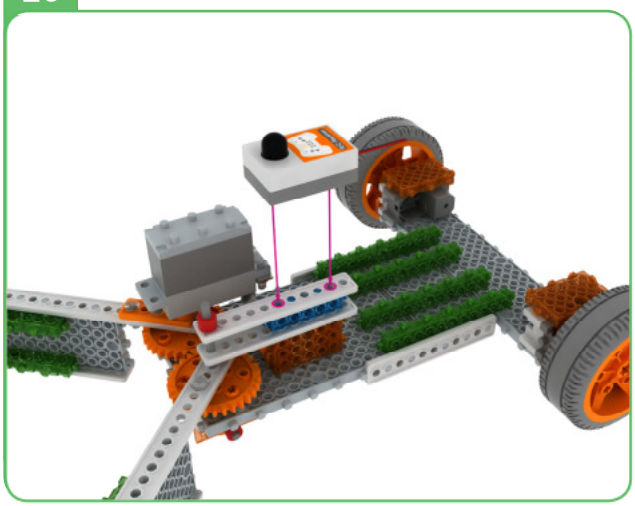

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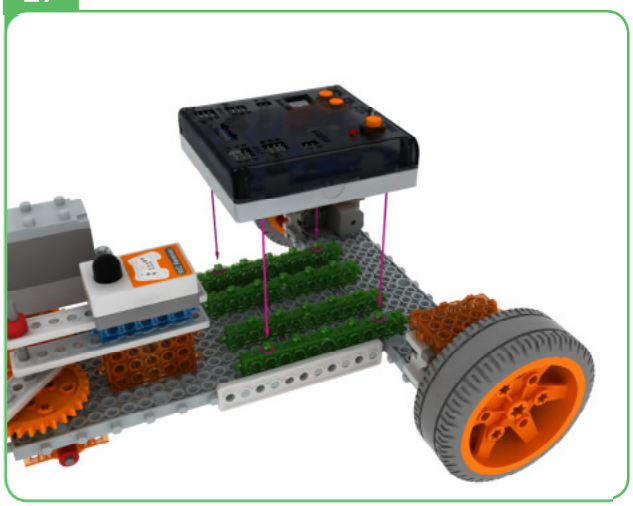

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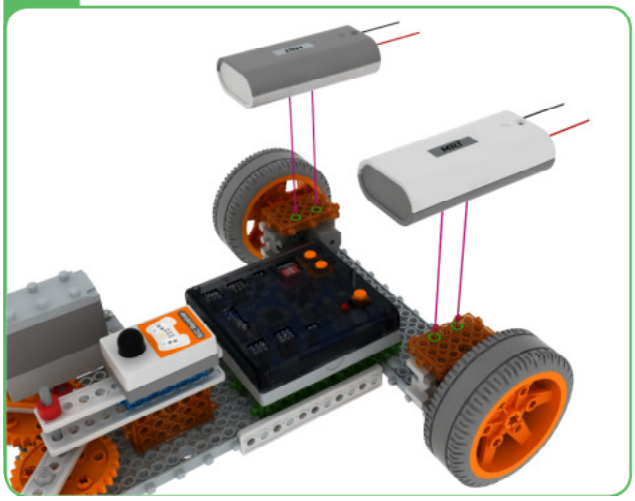

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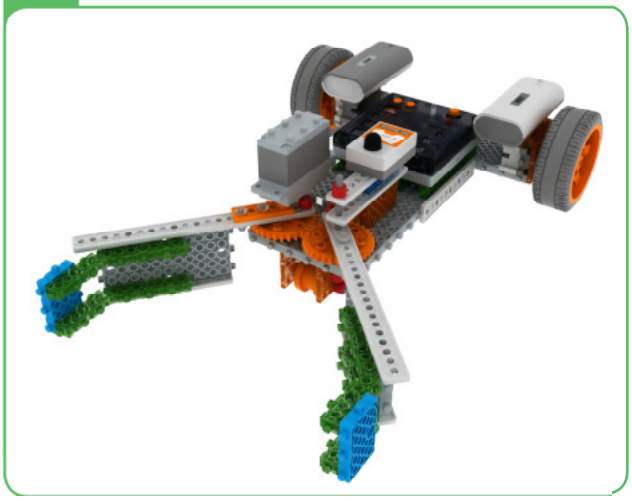
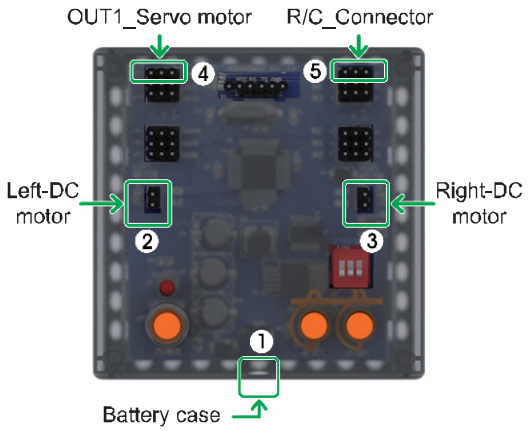


How to operate the Forceps Robot

Connecting the main board

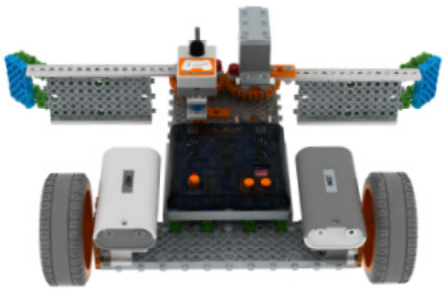


Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect Servo motor to OUT1 of OUTPUT connector.
5. Connect RC receiver board to R/C connector.

Motion Pattern/Program

1



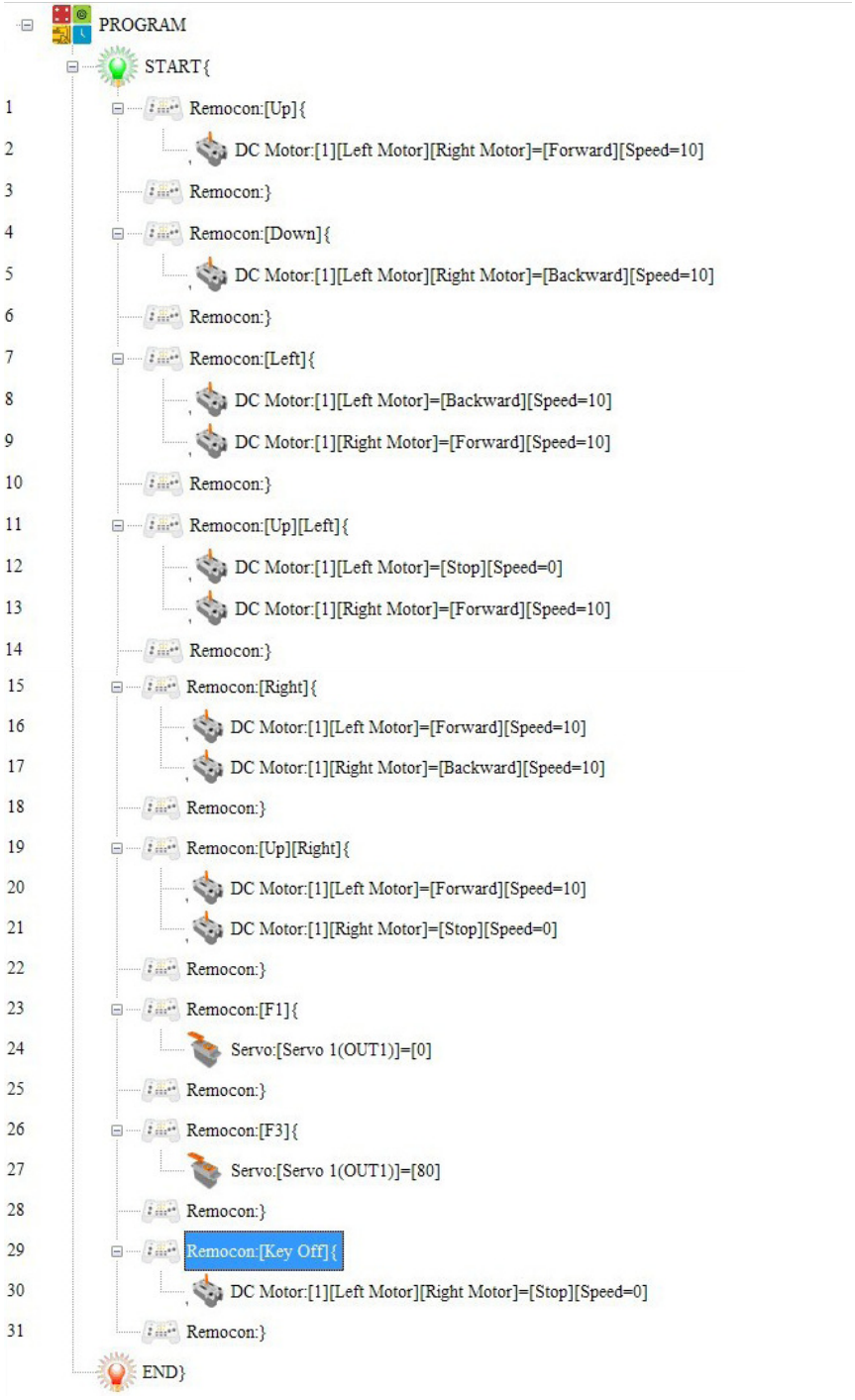
2

※ - Using the motion patterns as reference, let's write the program.

Program Download

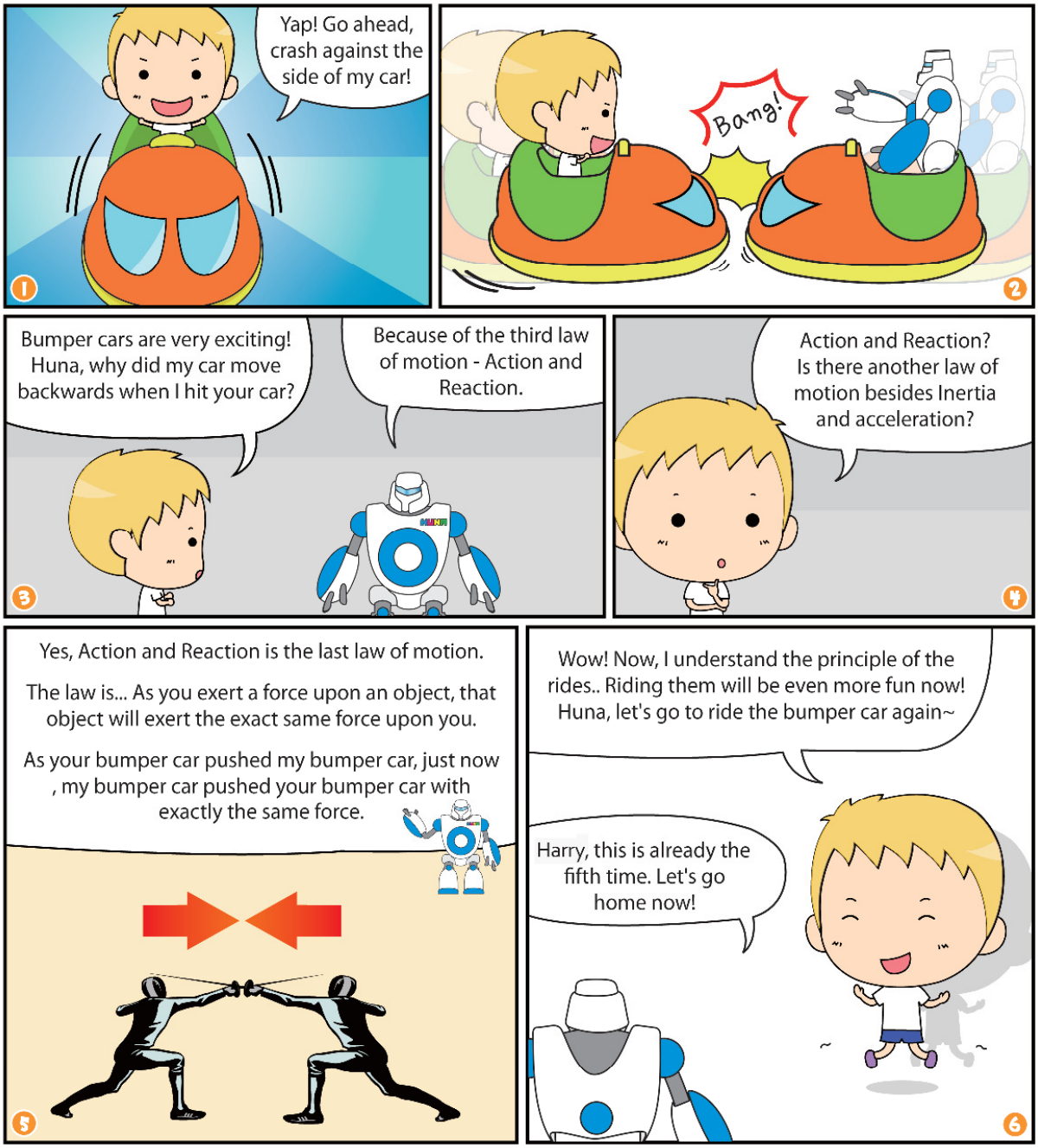
1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

Program Example



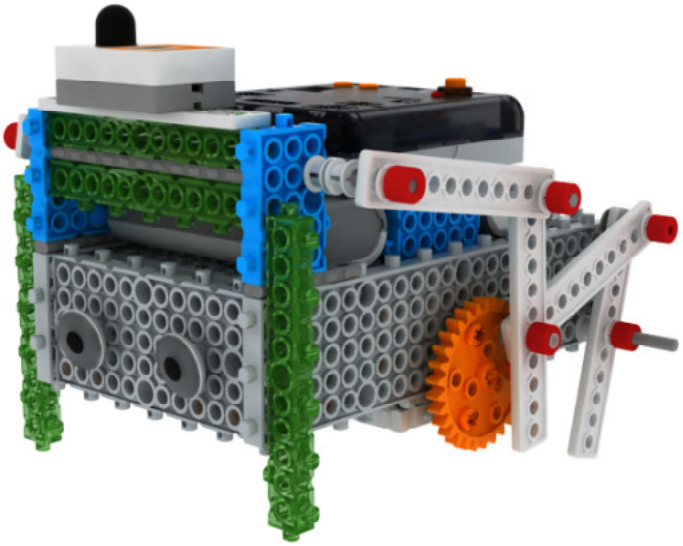
Science

STEM 14. The third law of motion -Action and Reaction



Technology Engineering

Robot Making8-Bug Battle Bot



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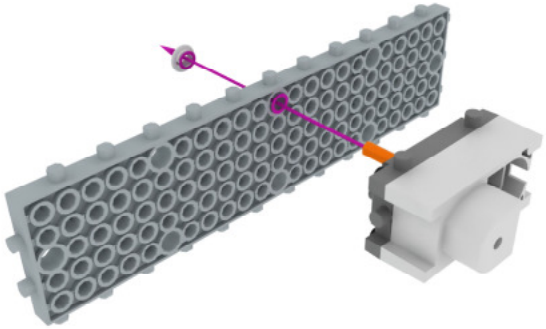

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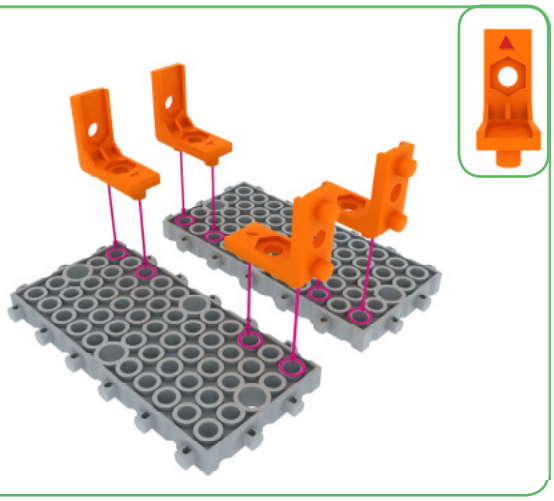

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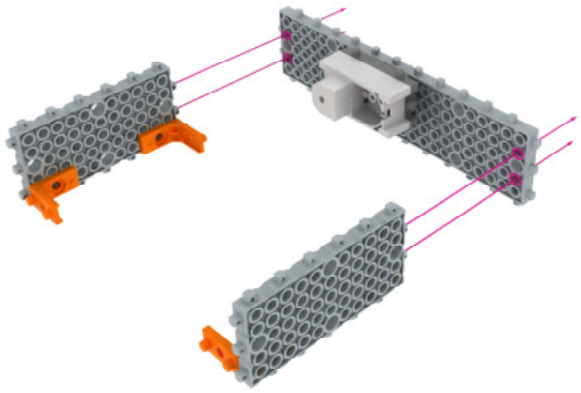

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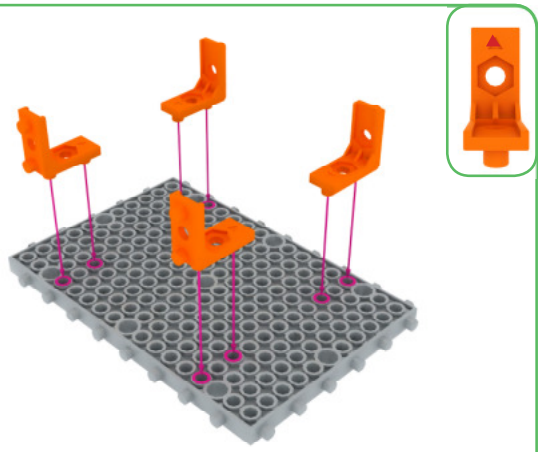

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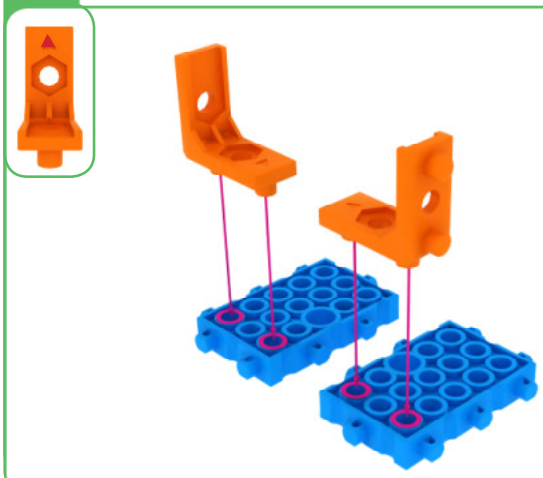

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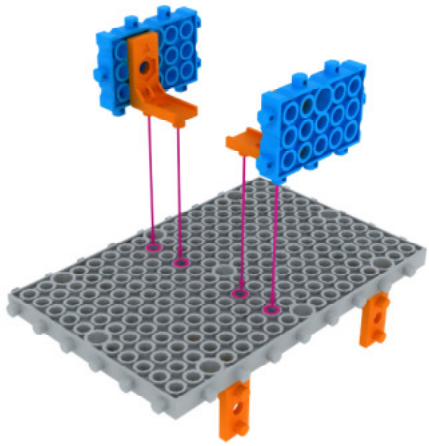

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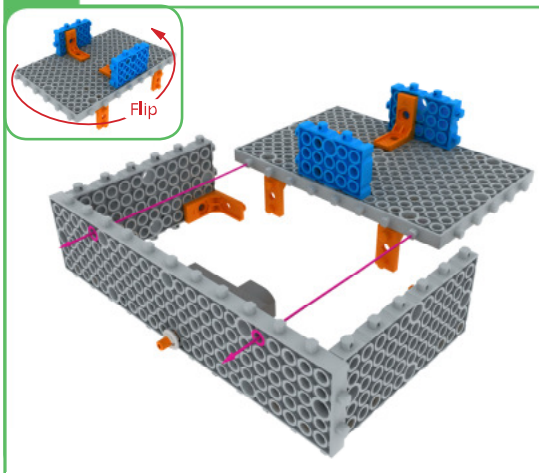

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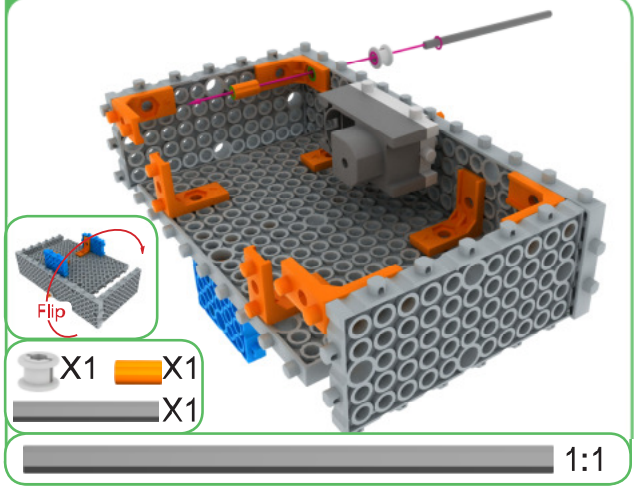

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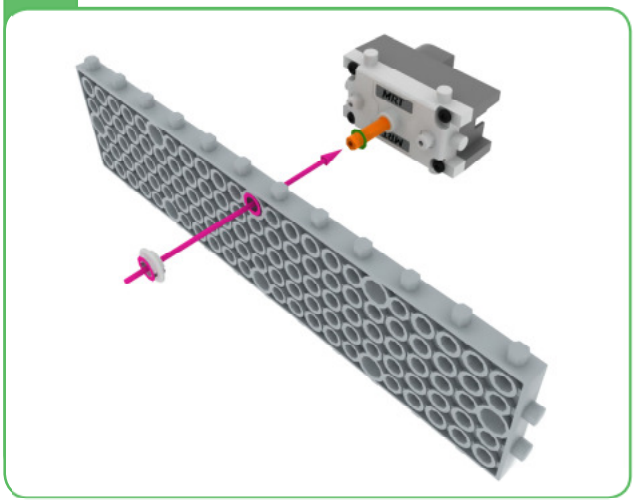

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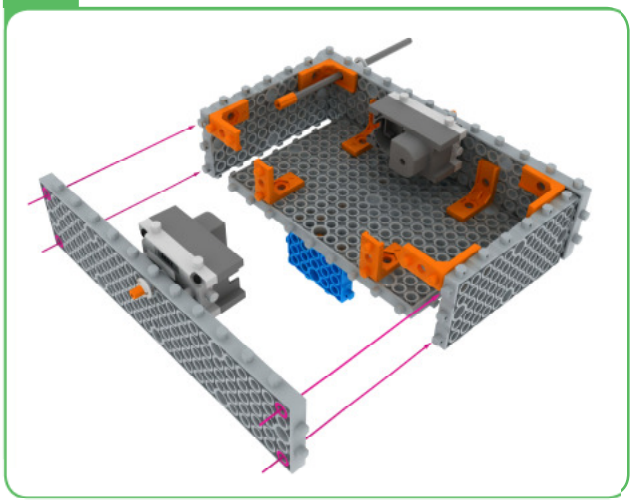

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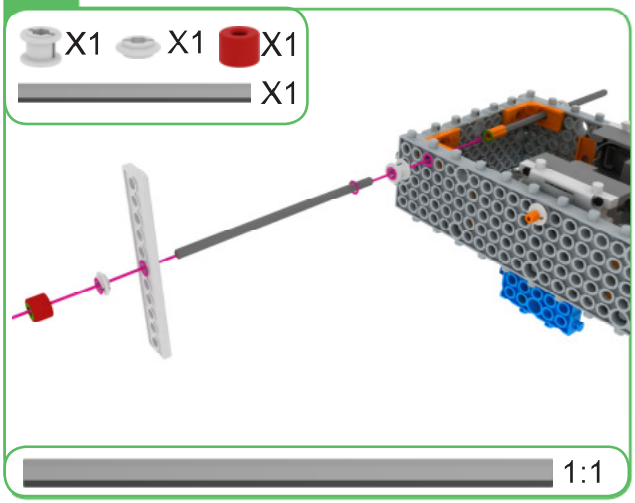

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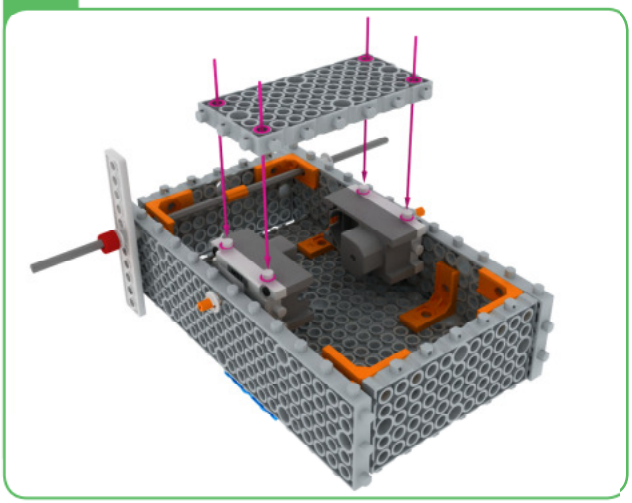

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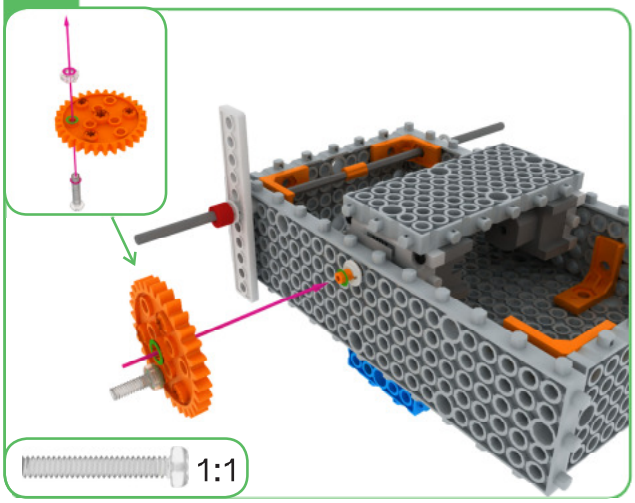

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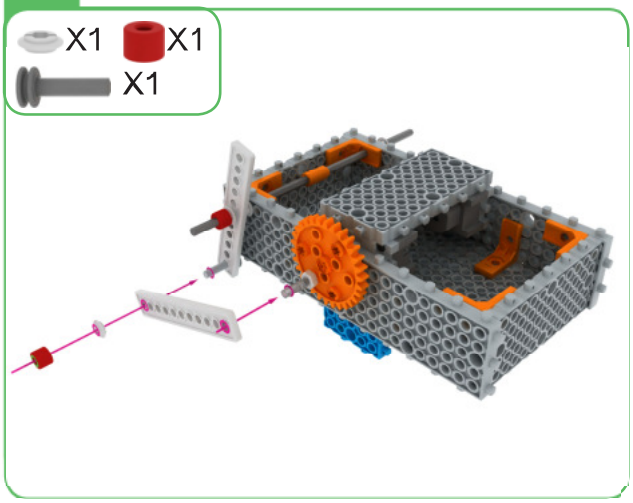

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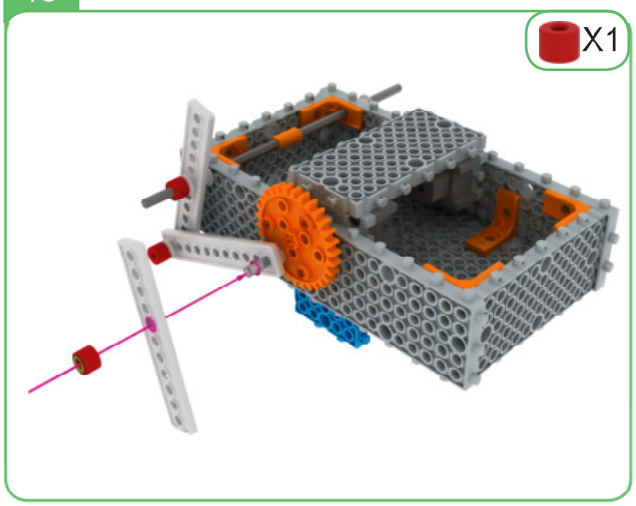

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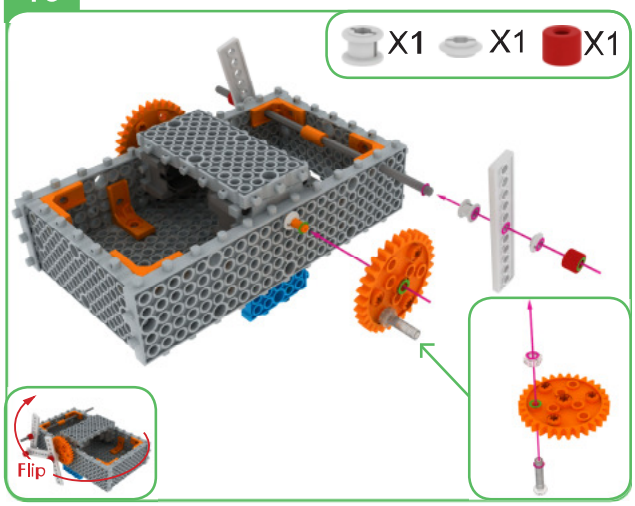

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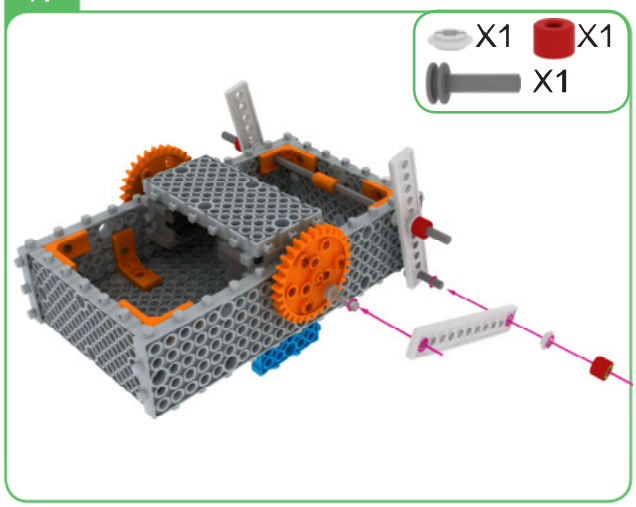

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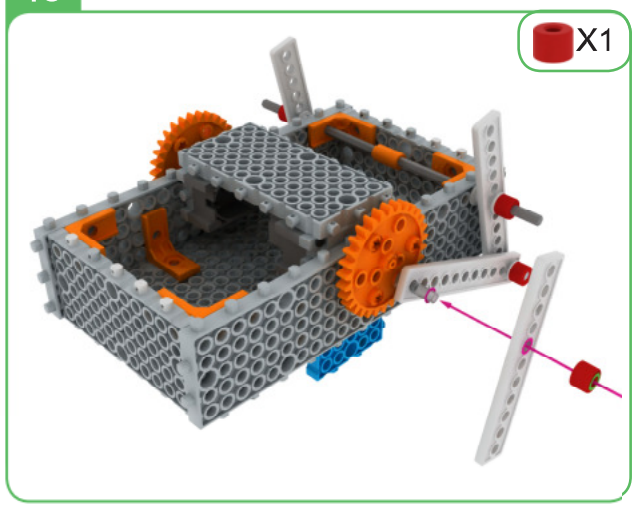

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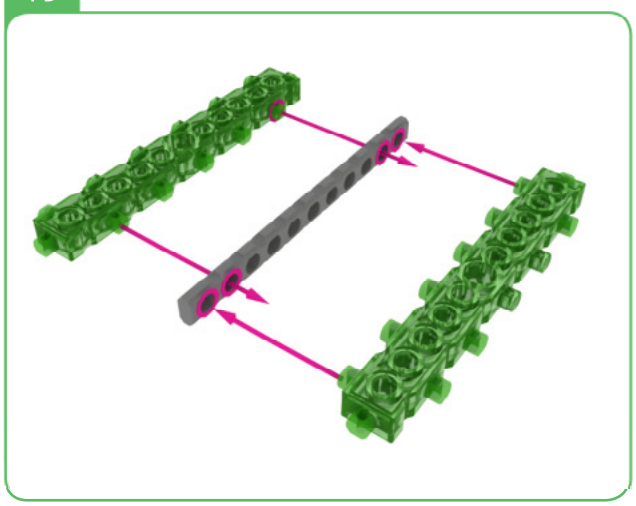

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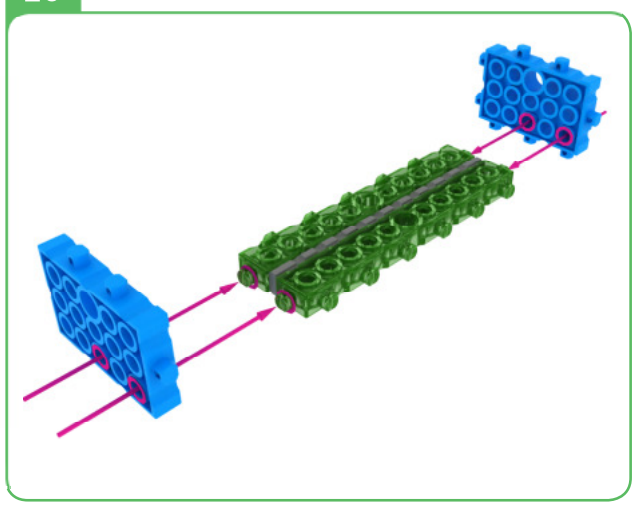

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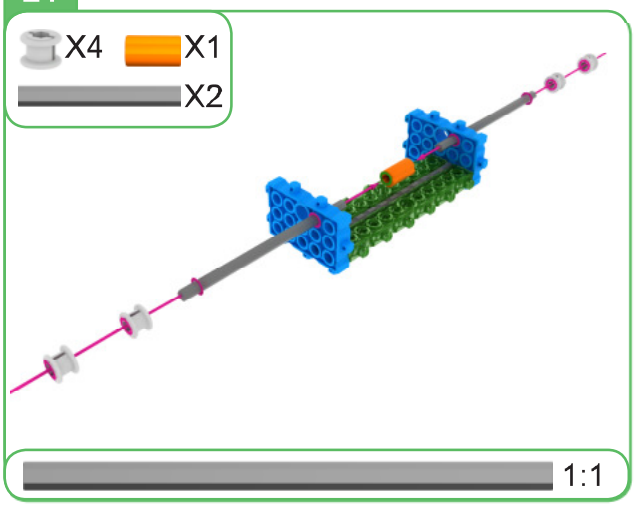

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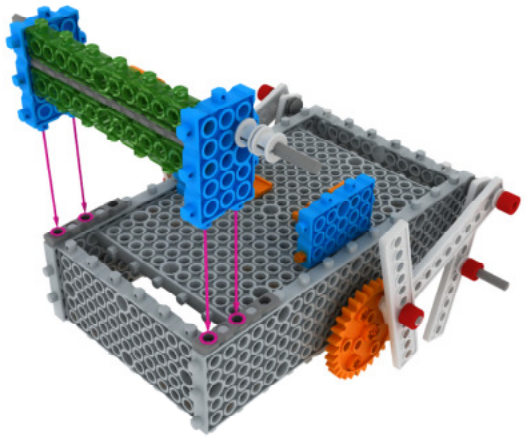

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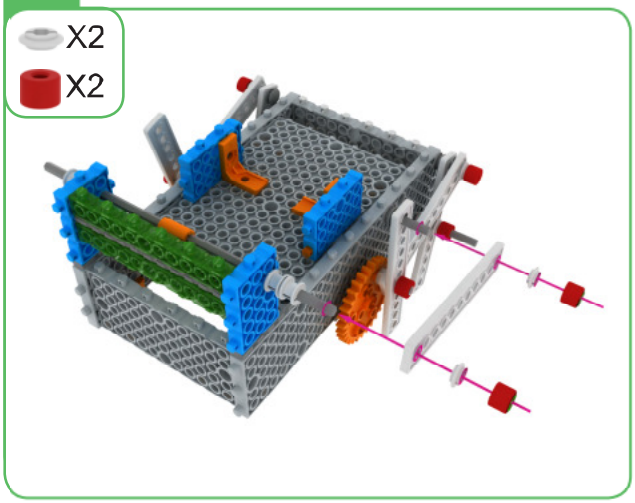

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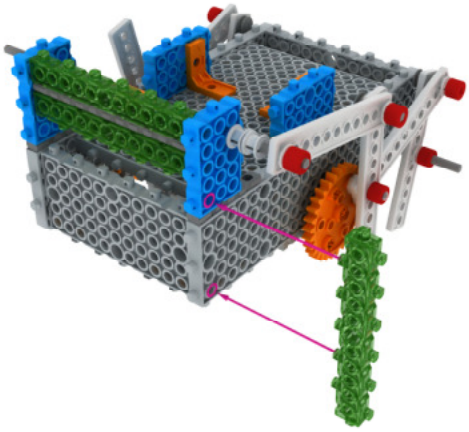

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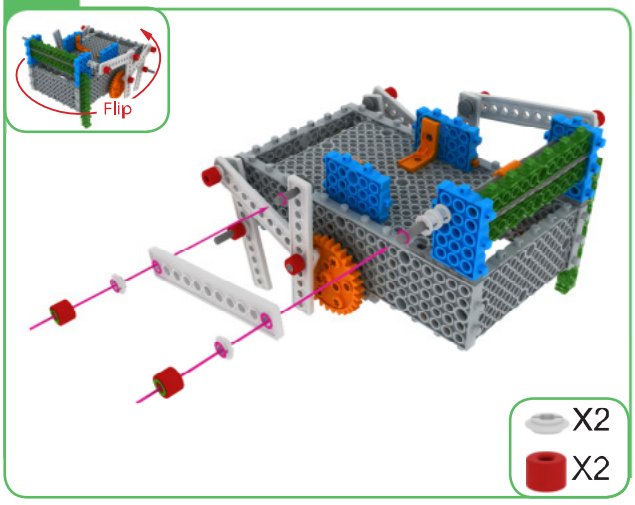

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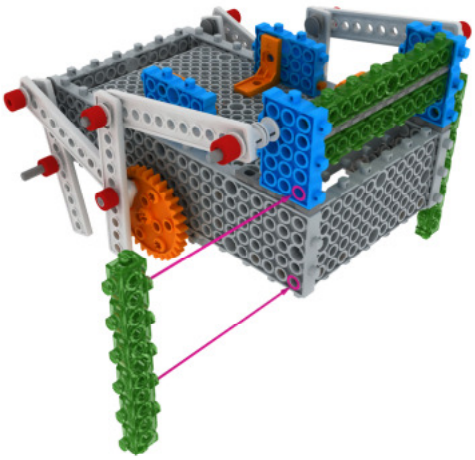

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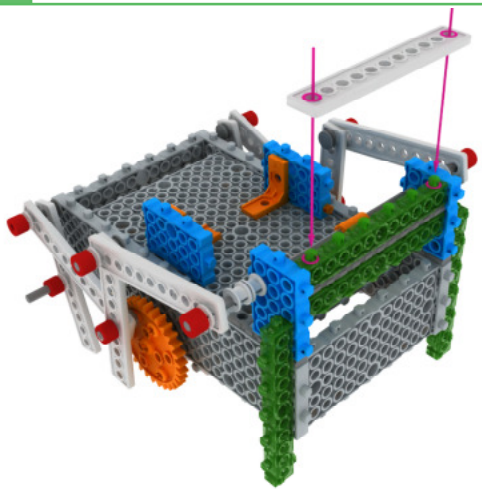

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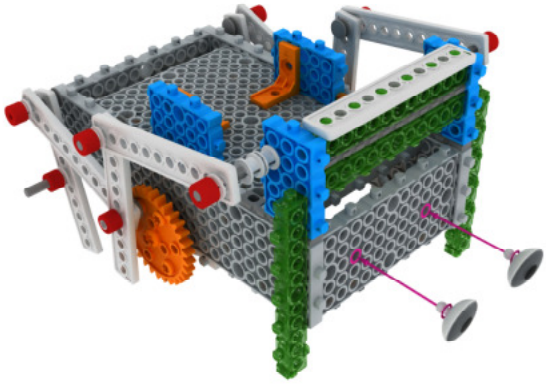

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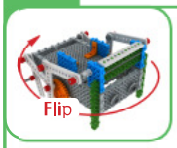

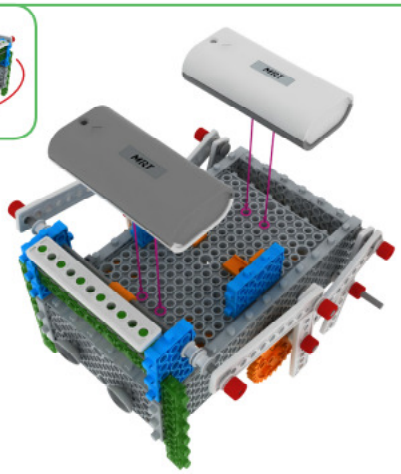

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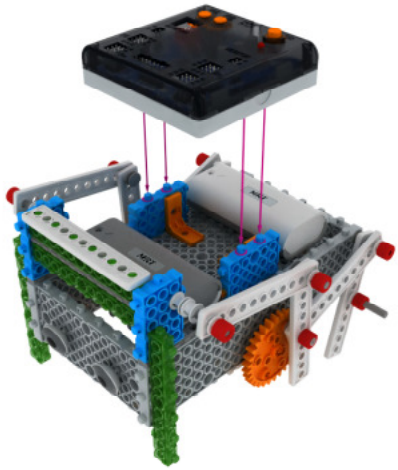

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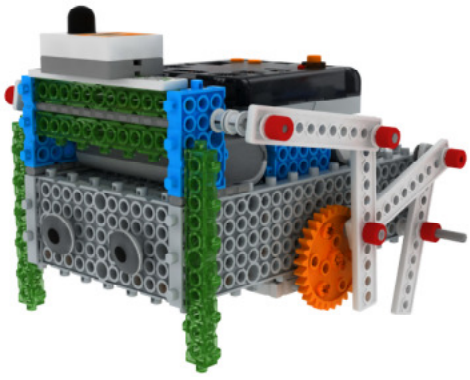
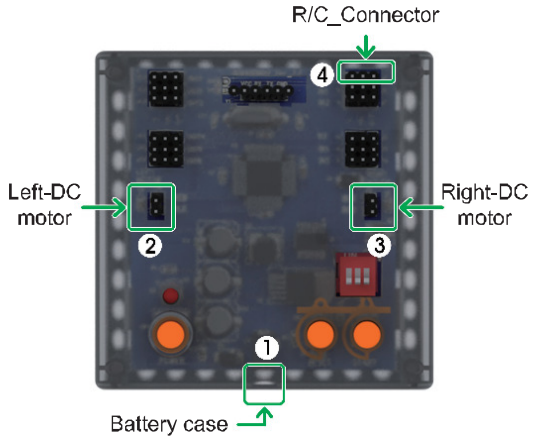


How to operate the Bug Battle Bot

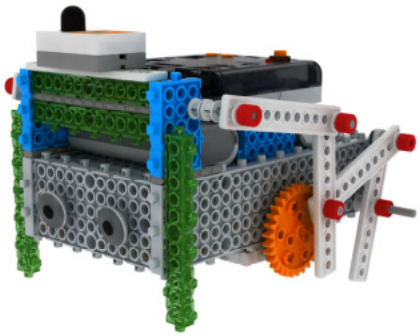
Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect RC receiver board to R/C connector.

Motion Pattern/Program



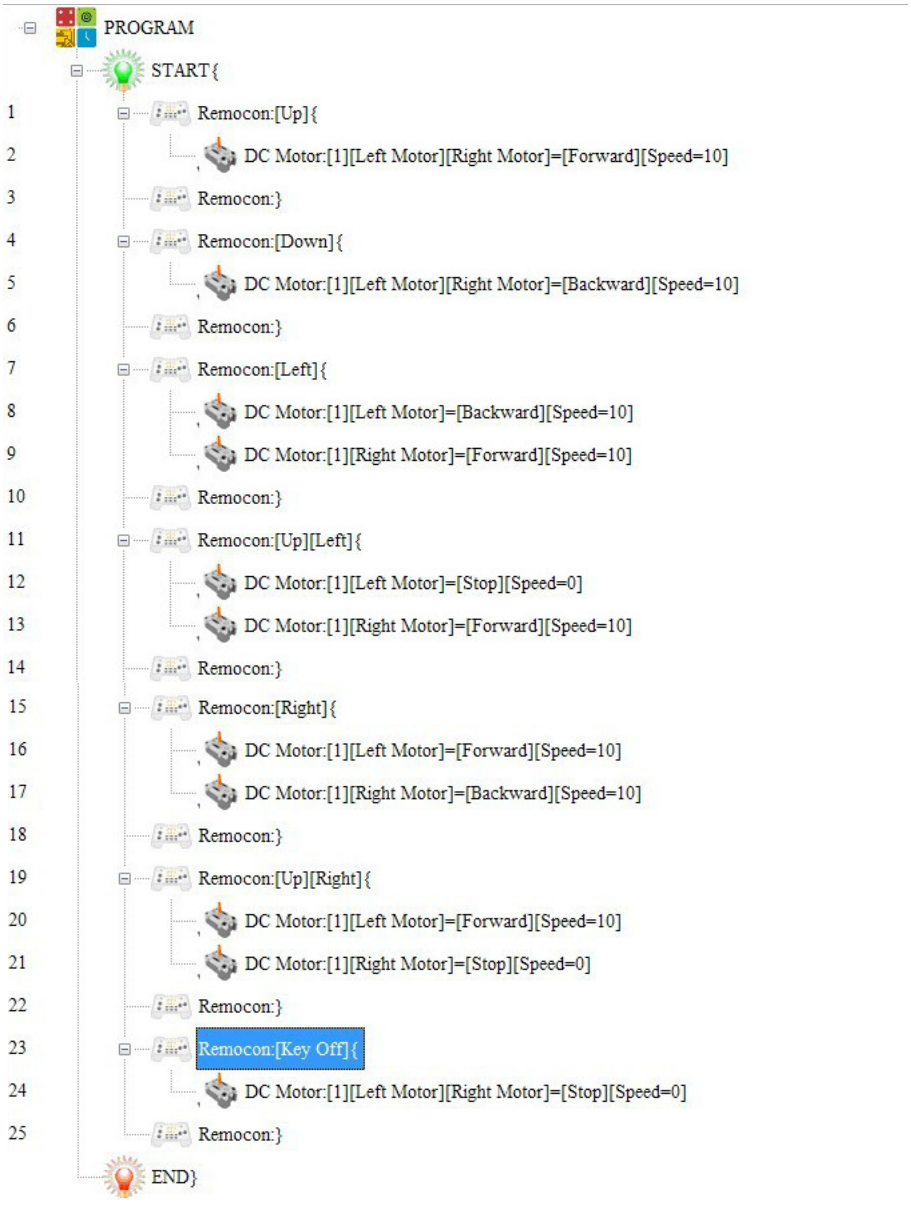
Bug leg is along with the wheel movement.

※ - Using the motion patterns as reference, let's write the program.

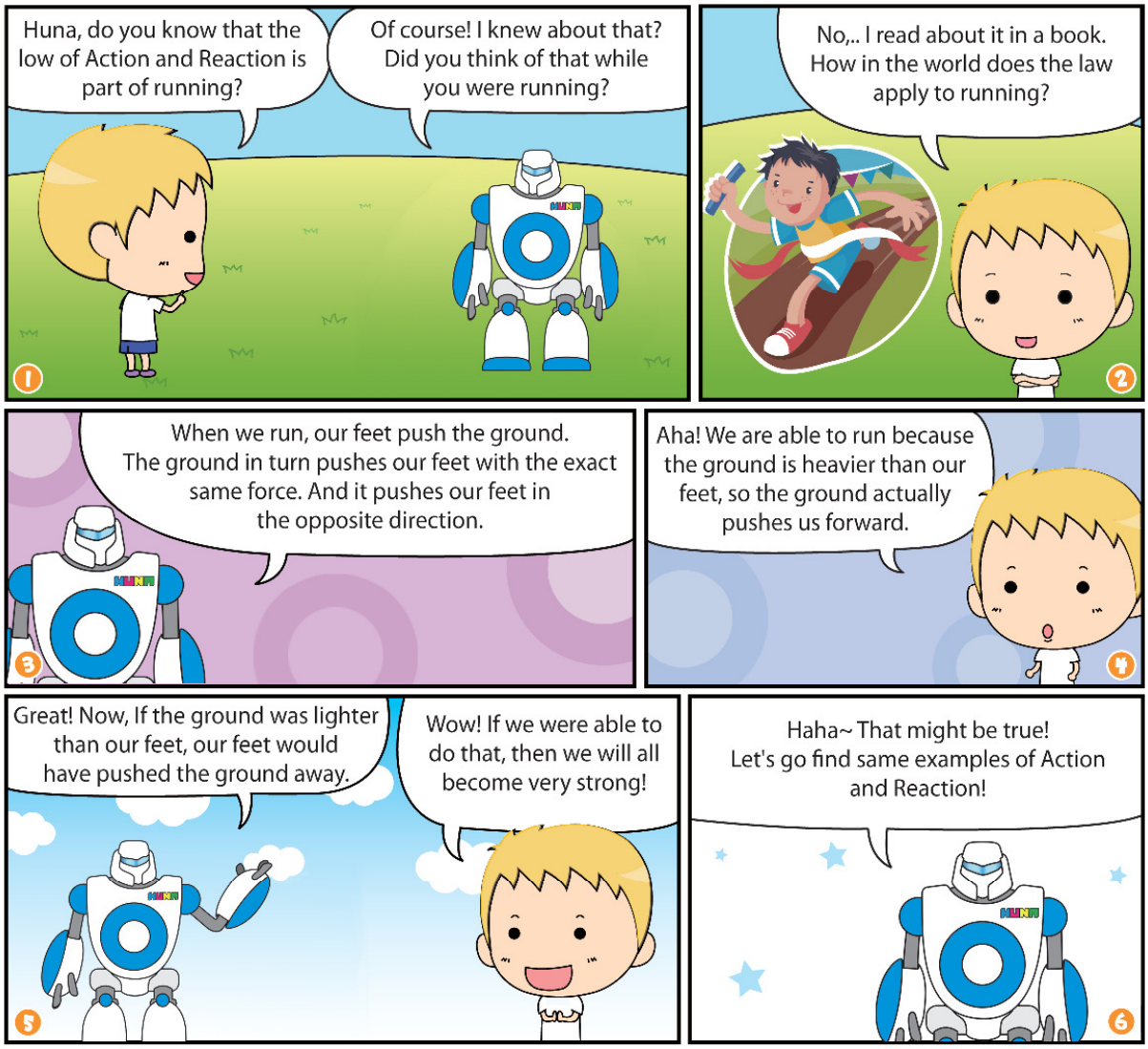
Program Download

1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

Program Example

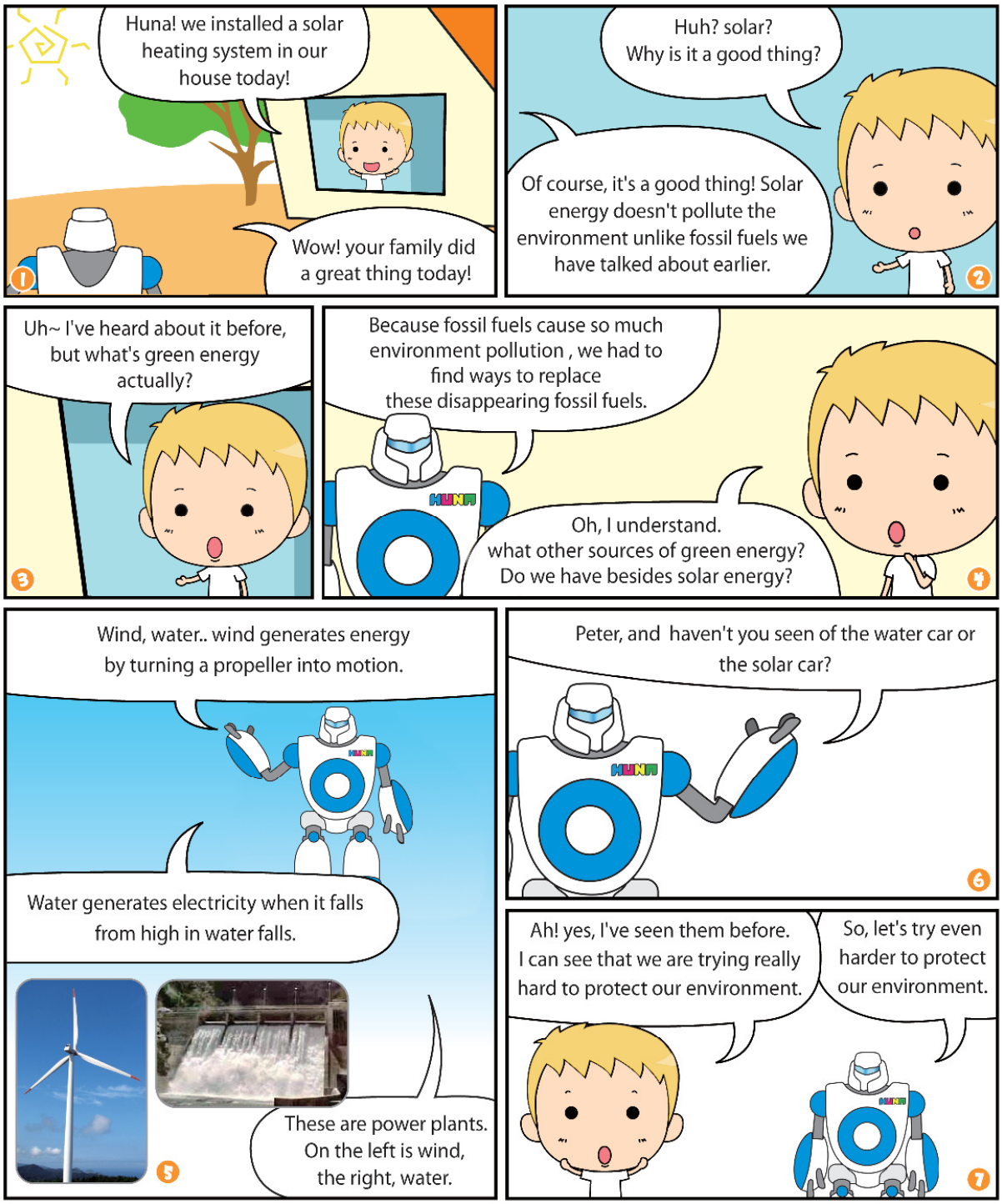


Science STEM 15. Running, action and reaction too!



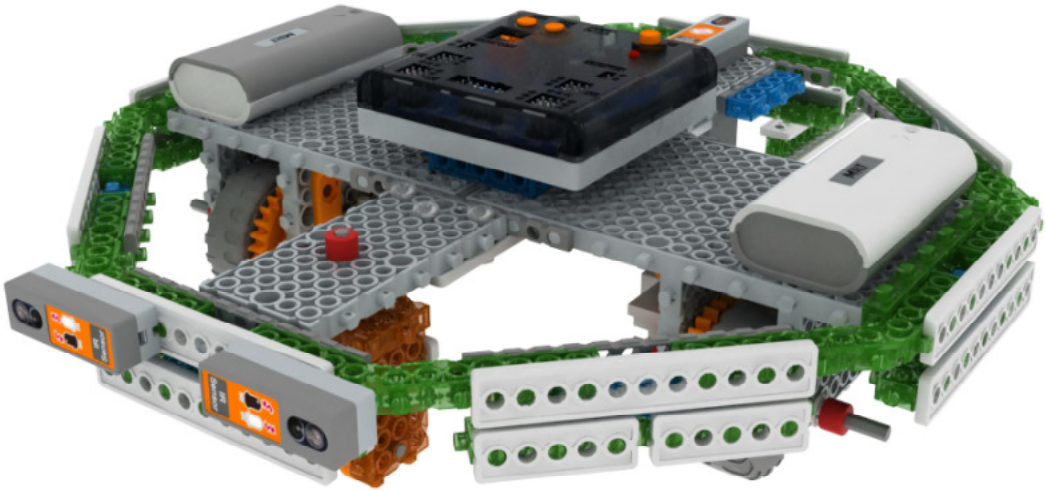
Let's find what's the example of Action and Reaction law applying around us!

Science STEM 16. Protecting the environment and creating sustainable energy sources -Green energy



Technology Engineering

Robot Making9-Cleaner Robot



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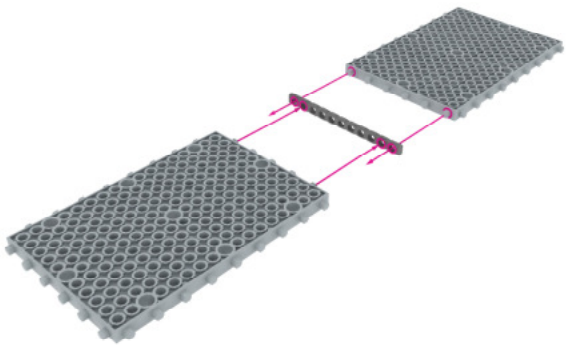

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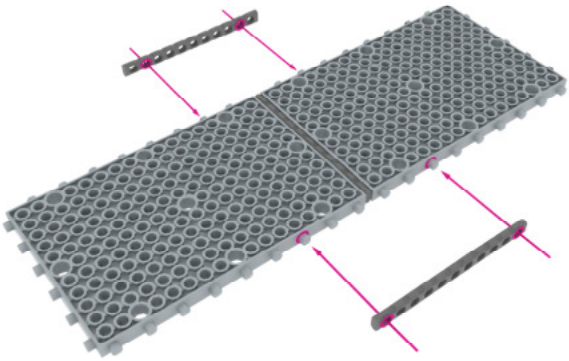

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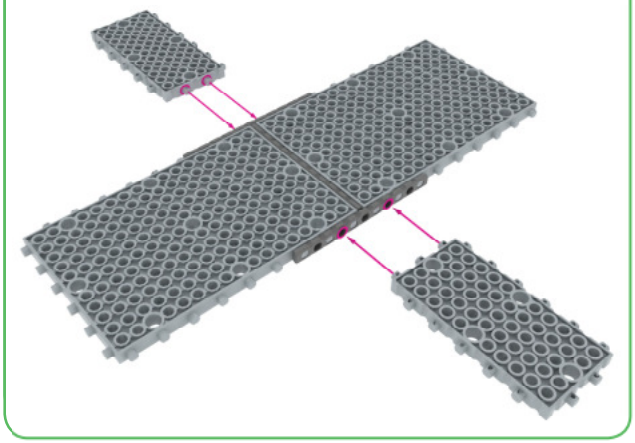

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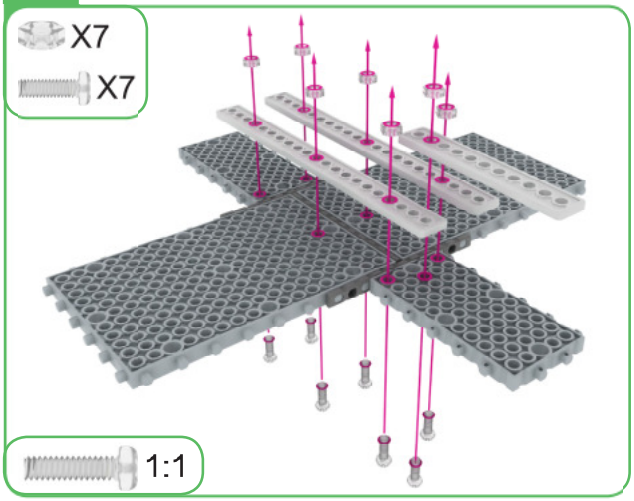

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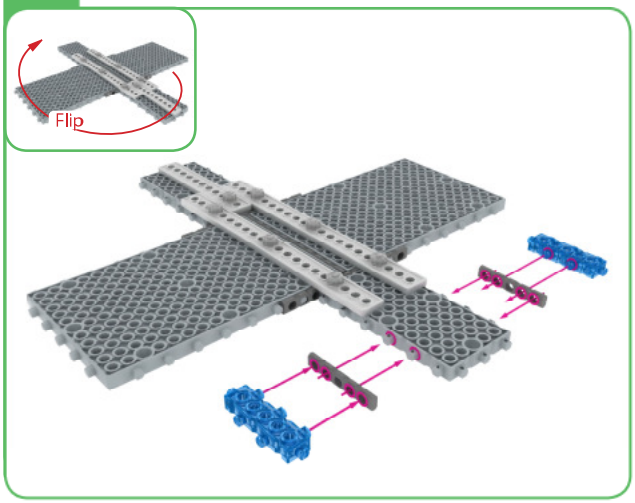

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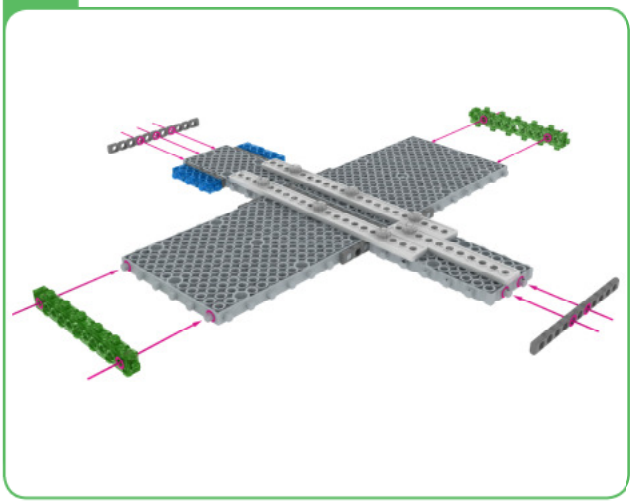

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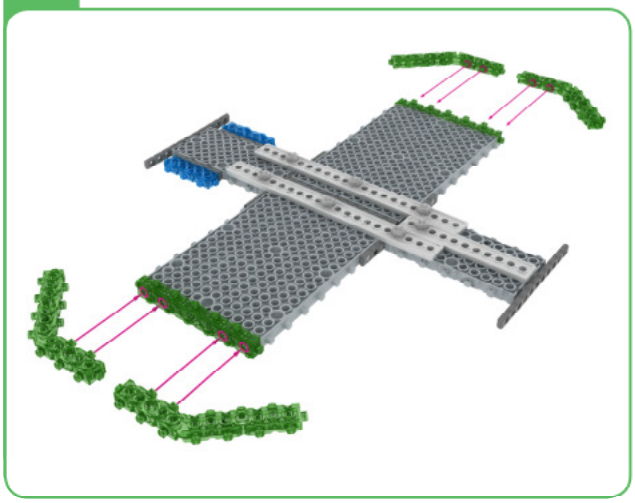

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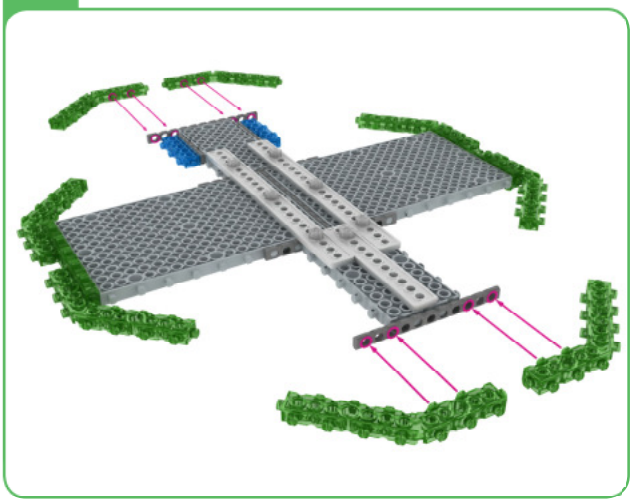

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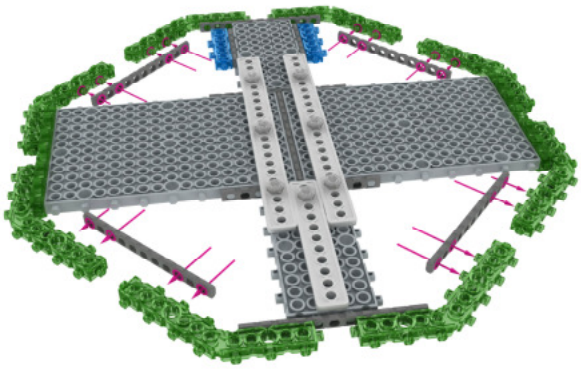

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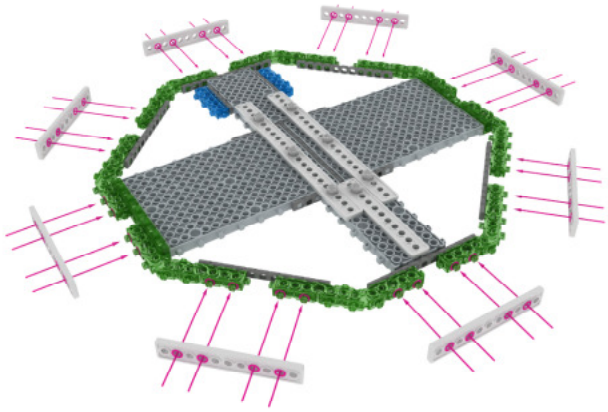

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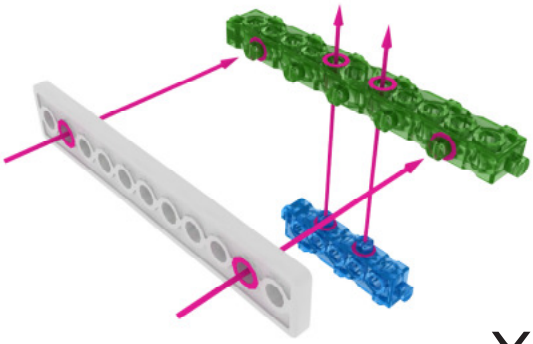

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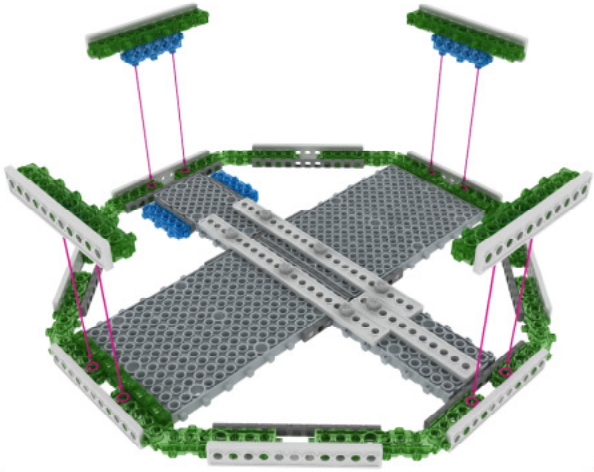

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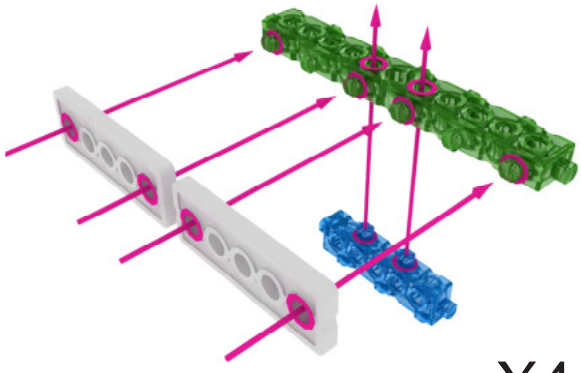

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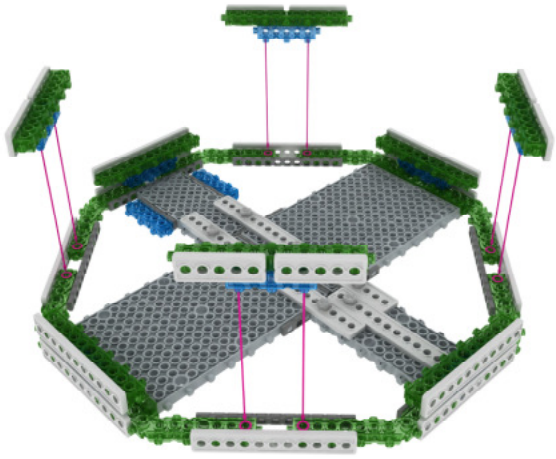

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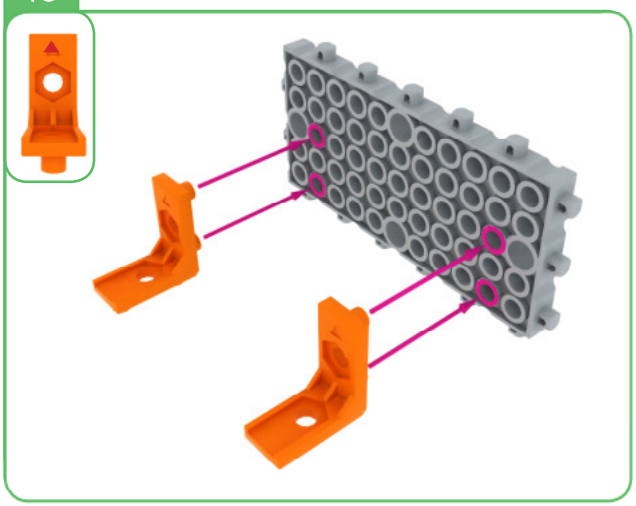

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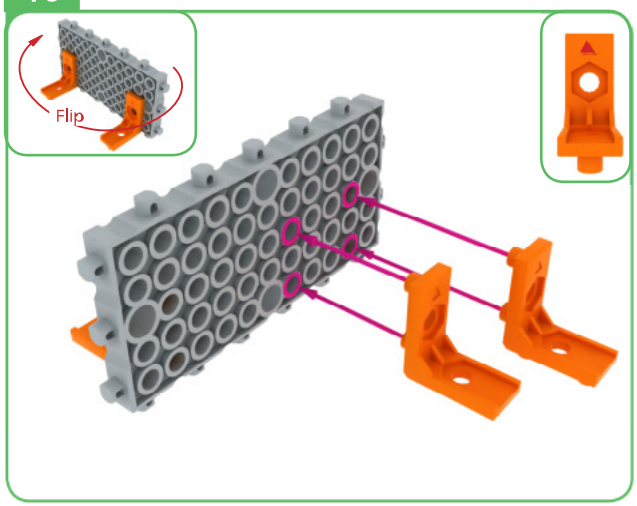

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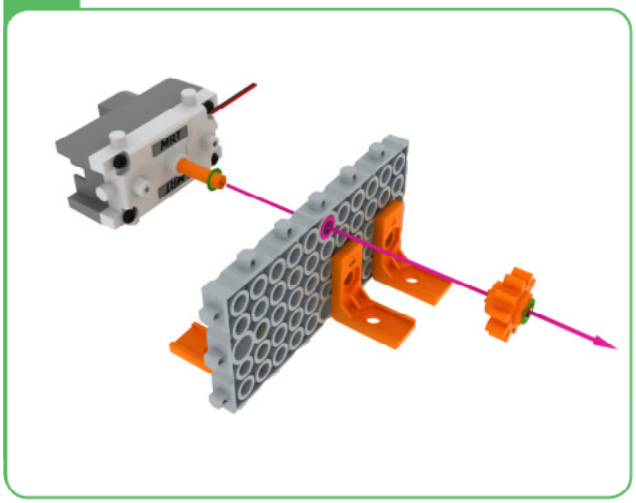

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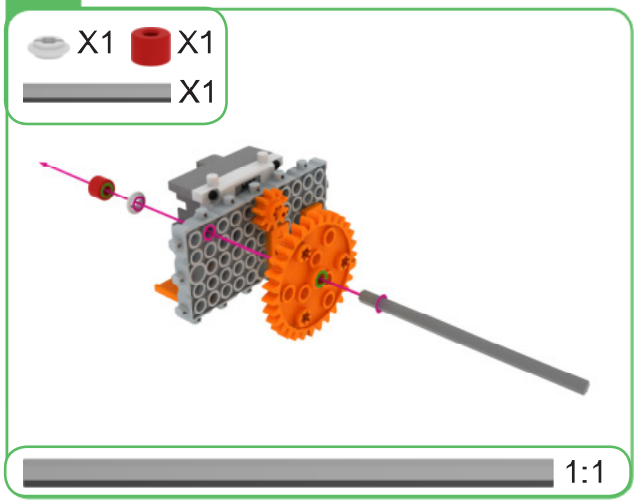

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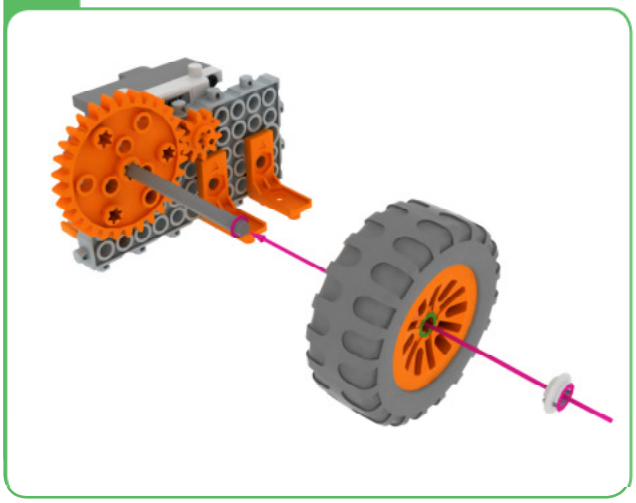

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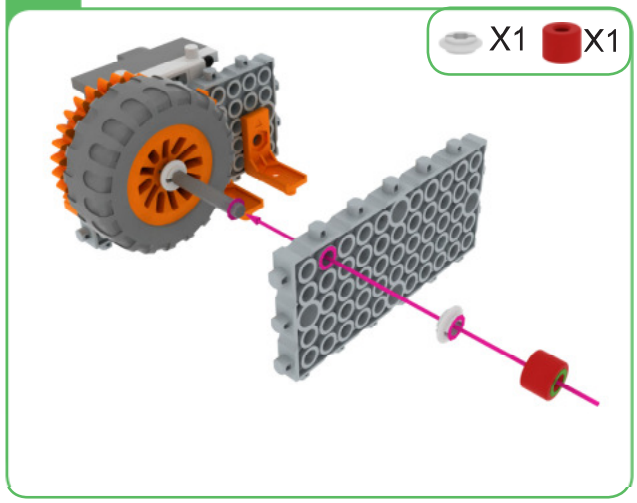

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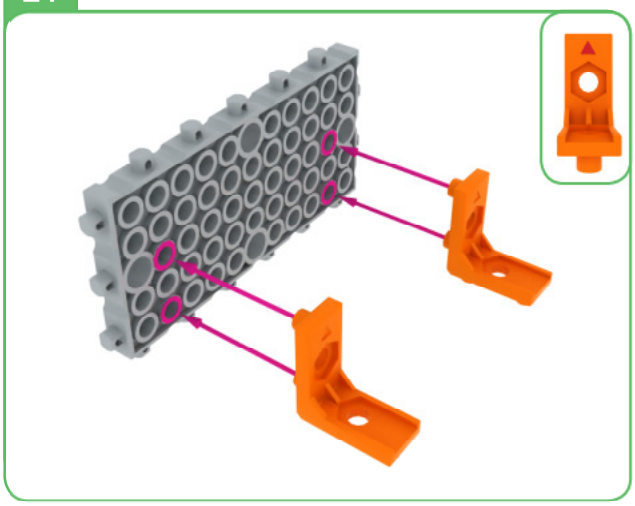

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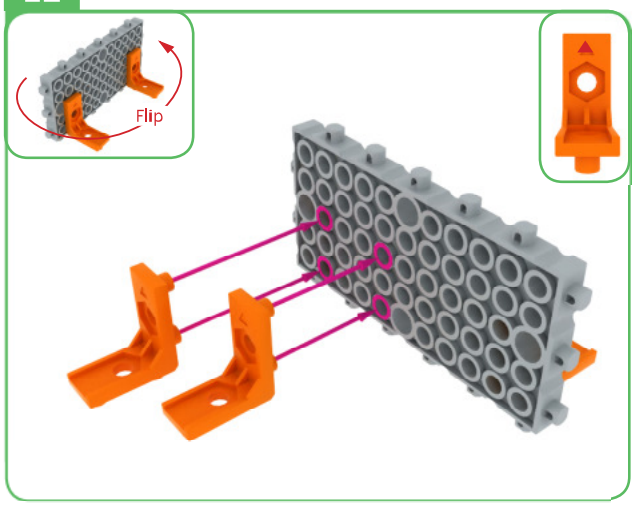

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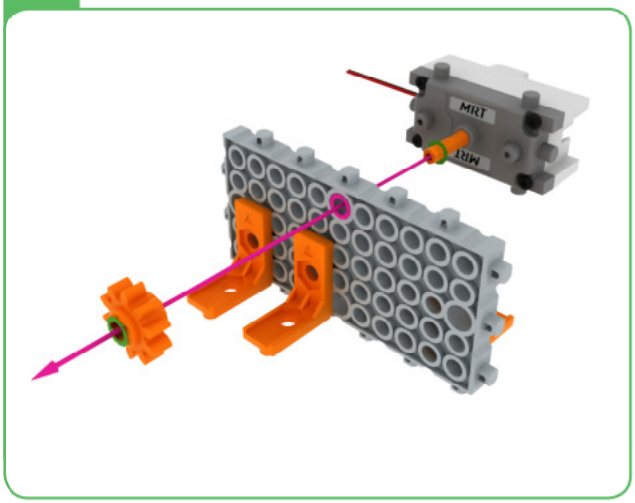

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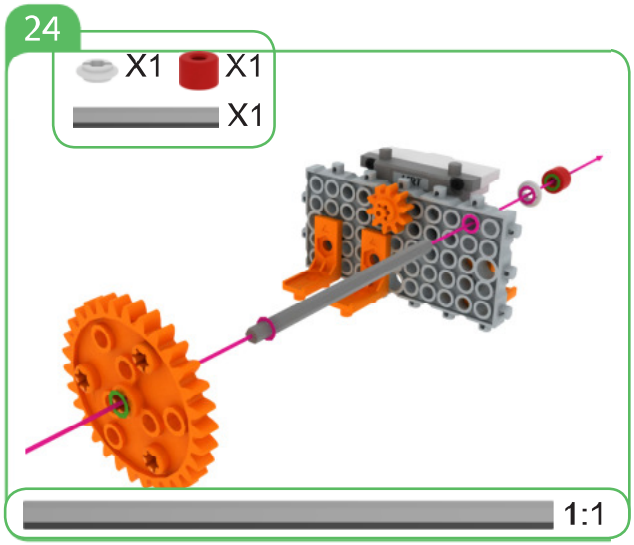

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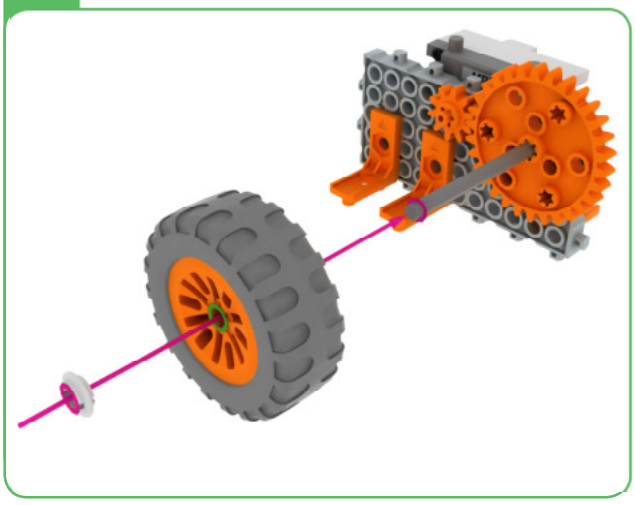

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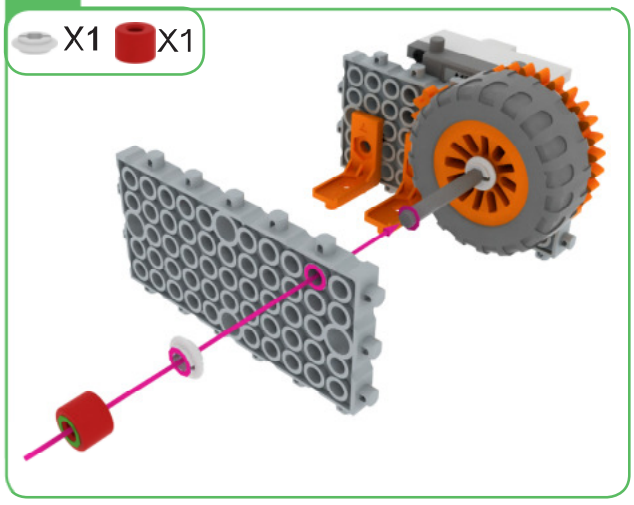

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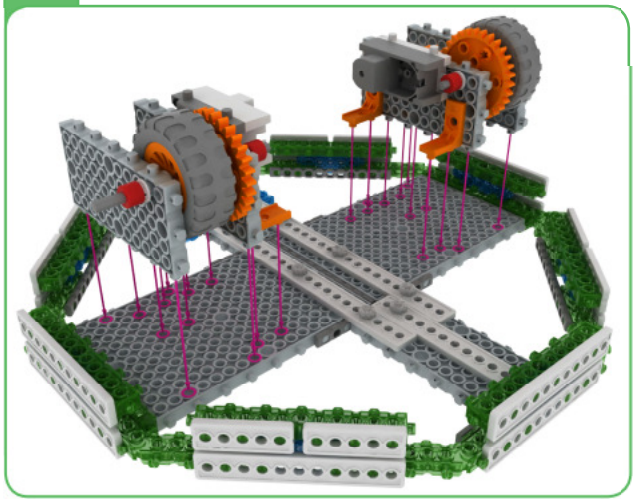

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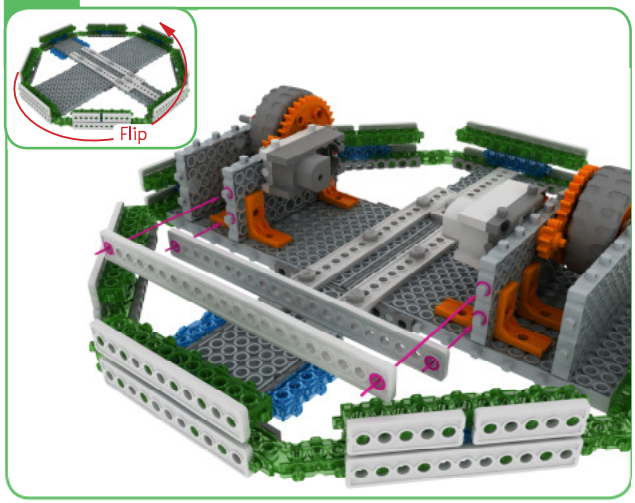

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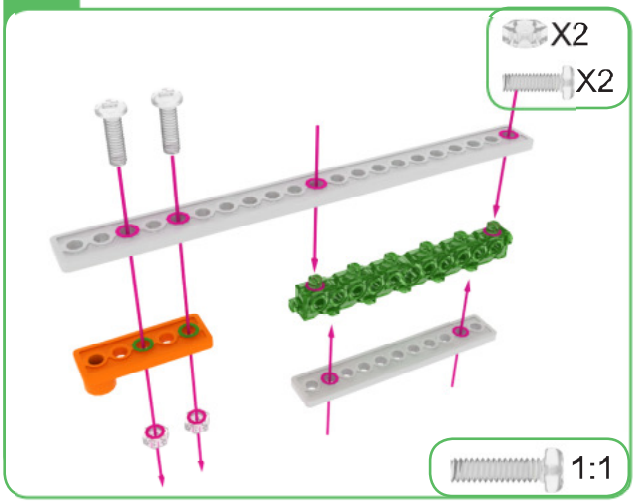

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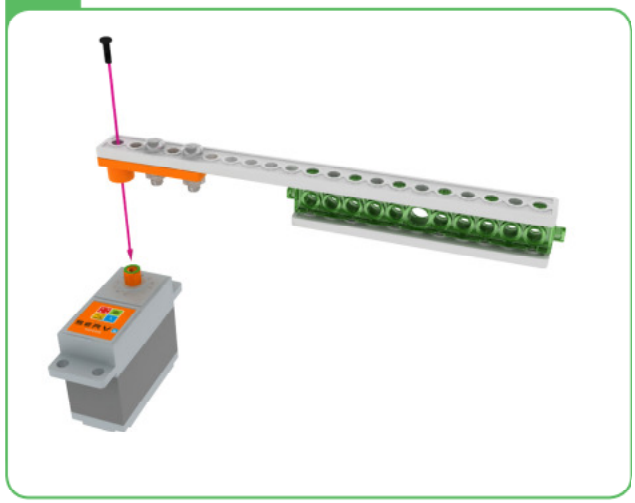
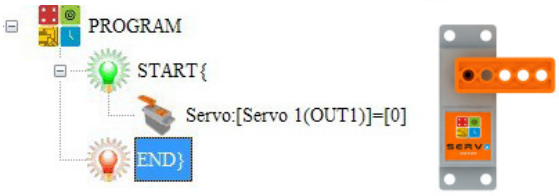


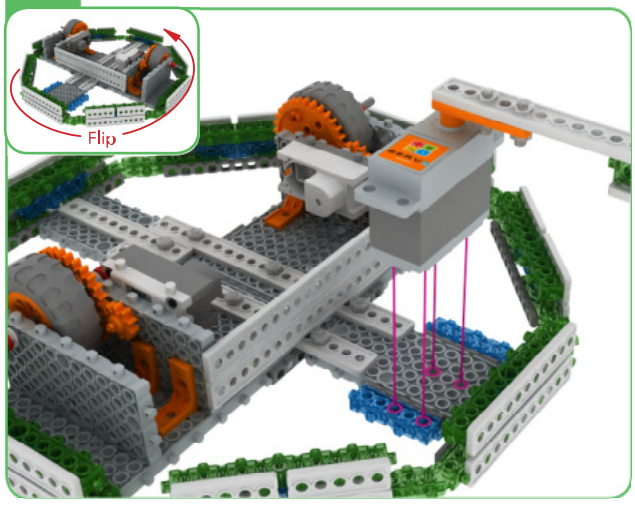
Servo Motor-Zero Point Adjustment

1. Connect the servo motor to the mainboard. You can write the program in the following way.



2. After downloading the program, power off and on again.
3. Fix servo motor horn to the servo motor with a small servo bolt as illustrated in the picture .

31



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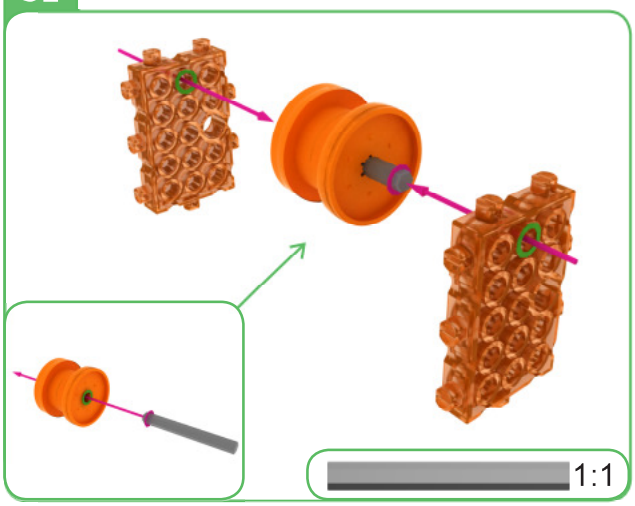

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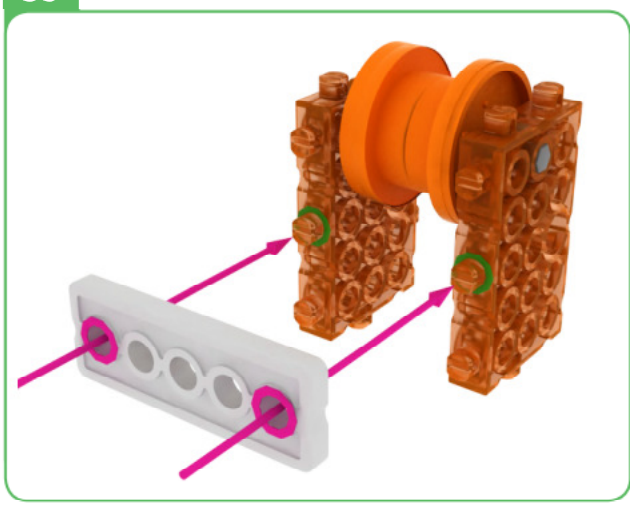

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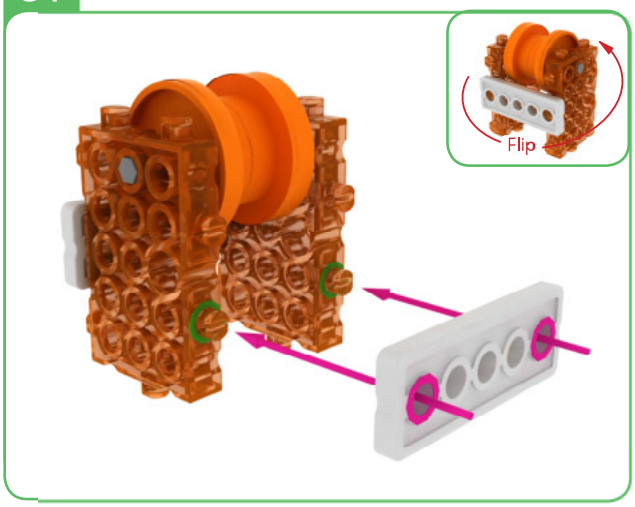

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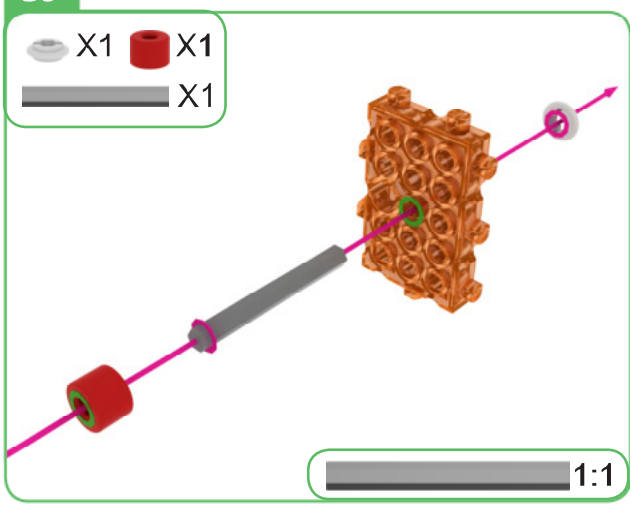

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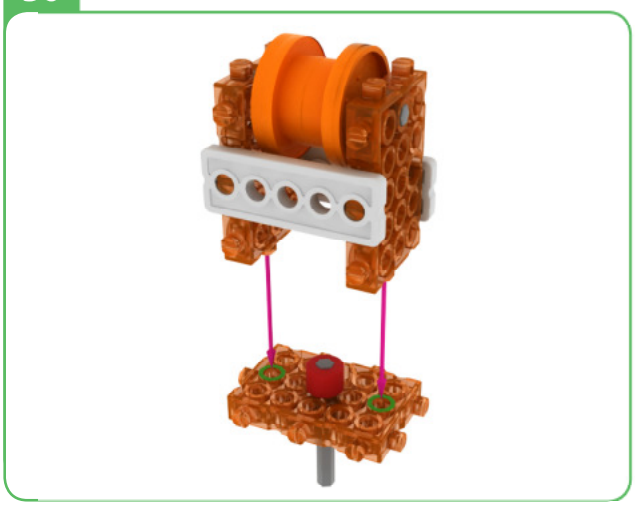

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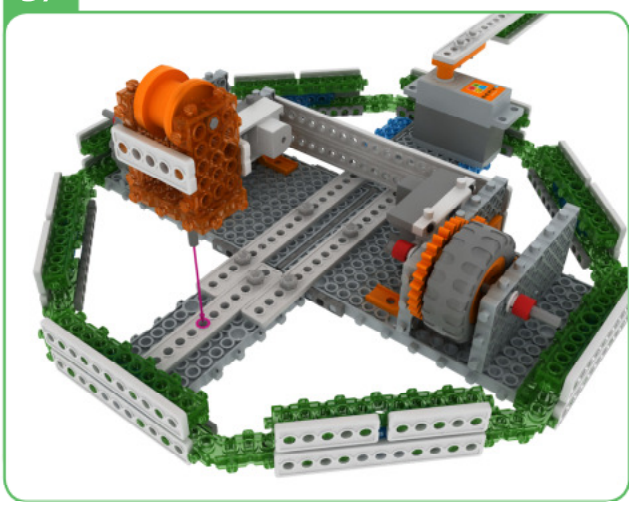

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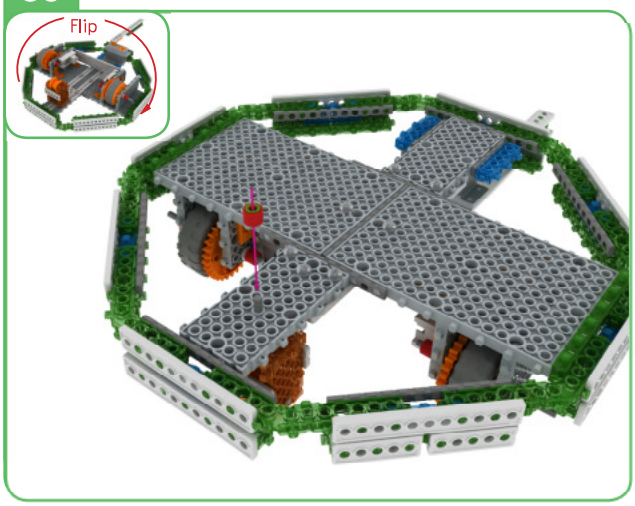

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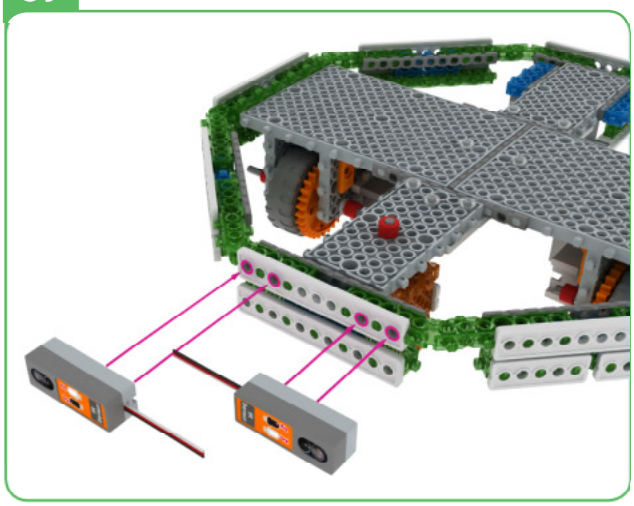

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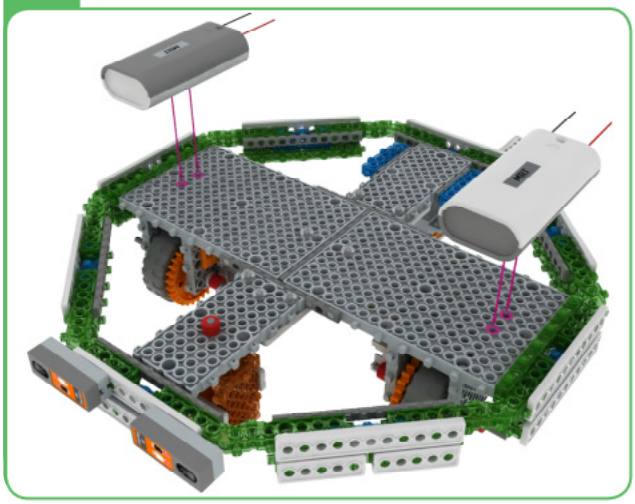

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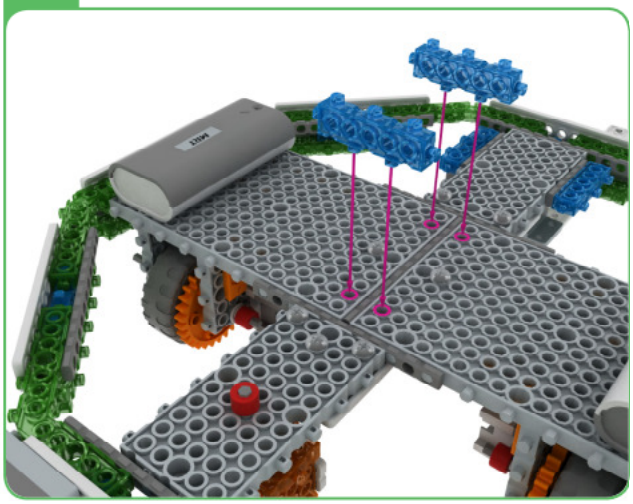

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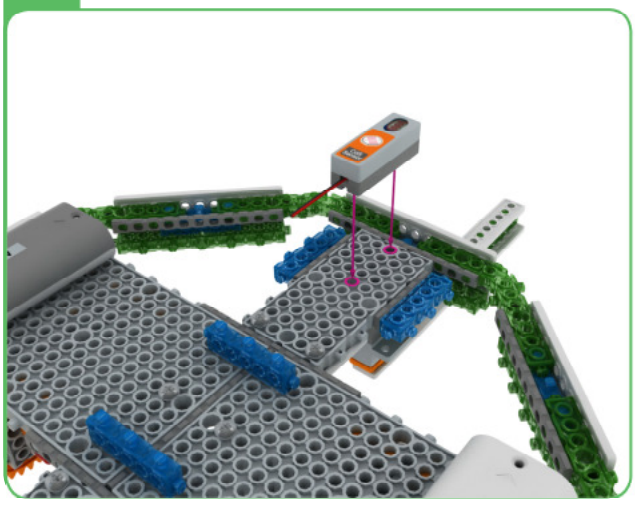
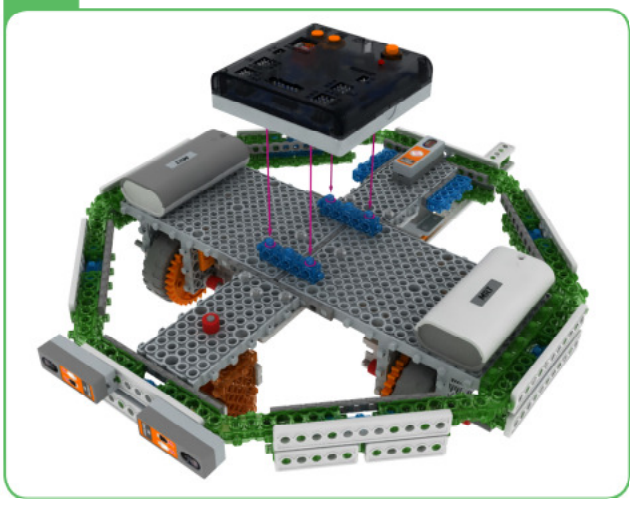
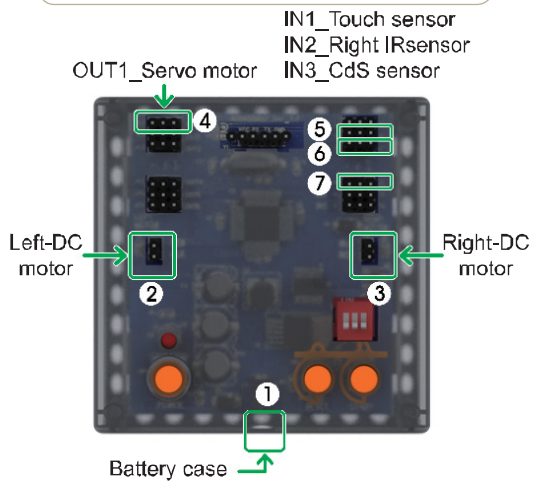


End



How to operate the Cleaner Bot

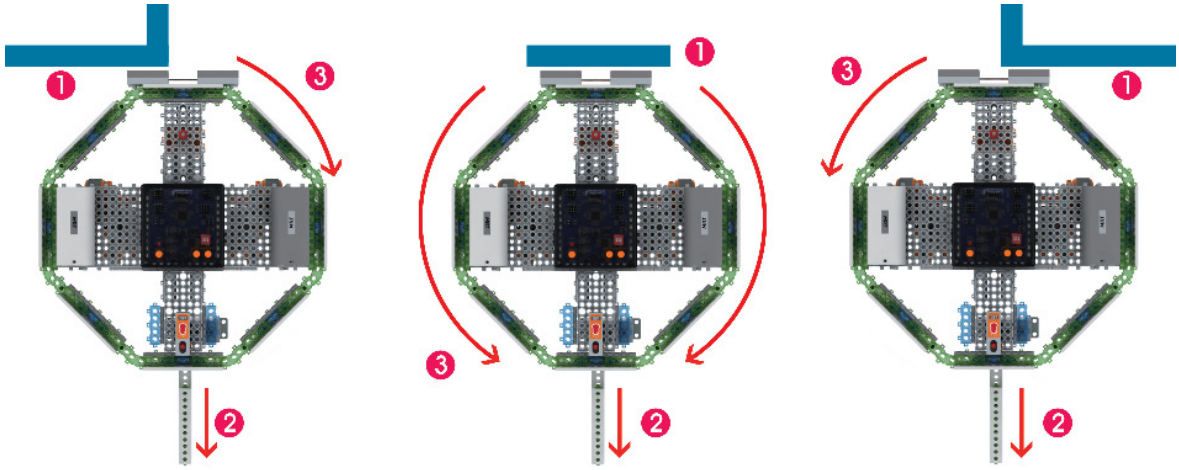
Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect Servo motor to OUT1 of OUTPUT connector.
5. Connect Left IR sensor to IN1 of INPUT connector.
6. Connect Right IR sensor to IN2 of INPUT connector.
7. Connect CdS sensor to IN3 of INPUT connector.

Motion Pattern/Program

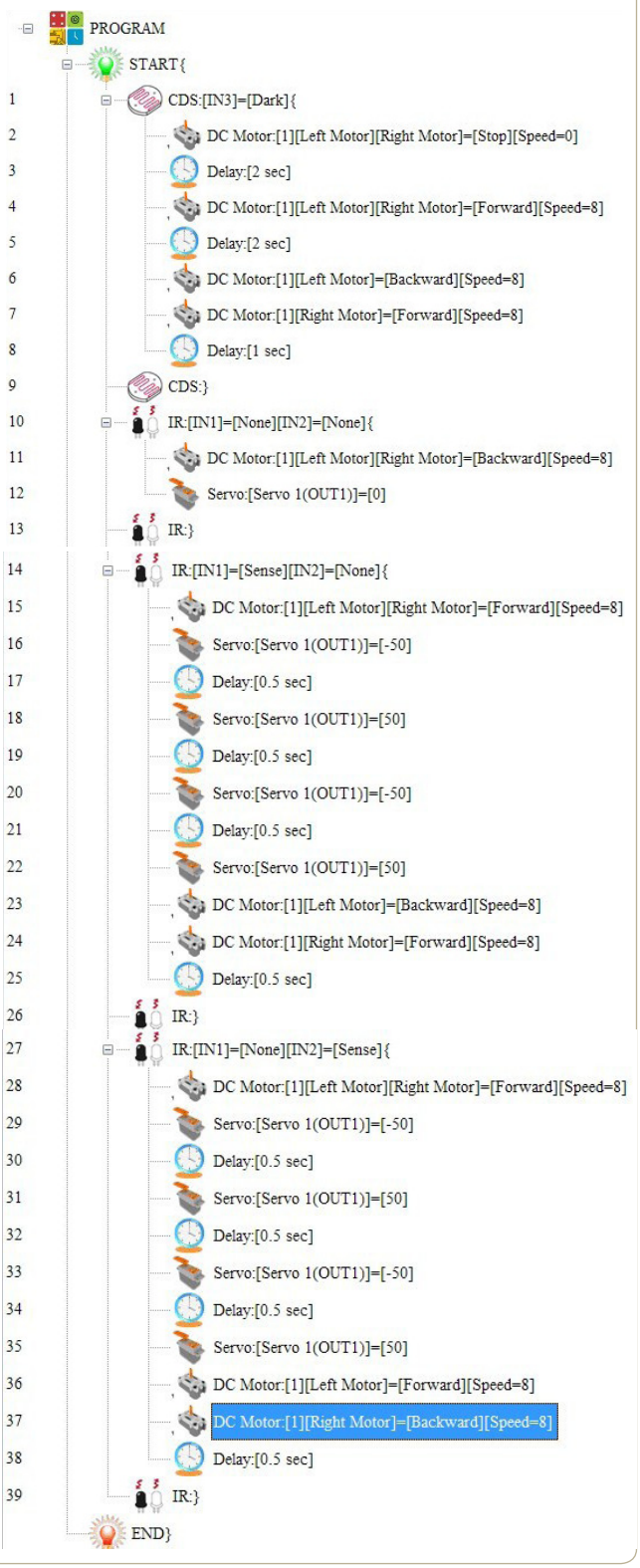


※ - Using the motion patterns as reference, let's write the program.

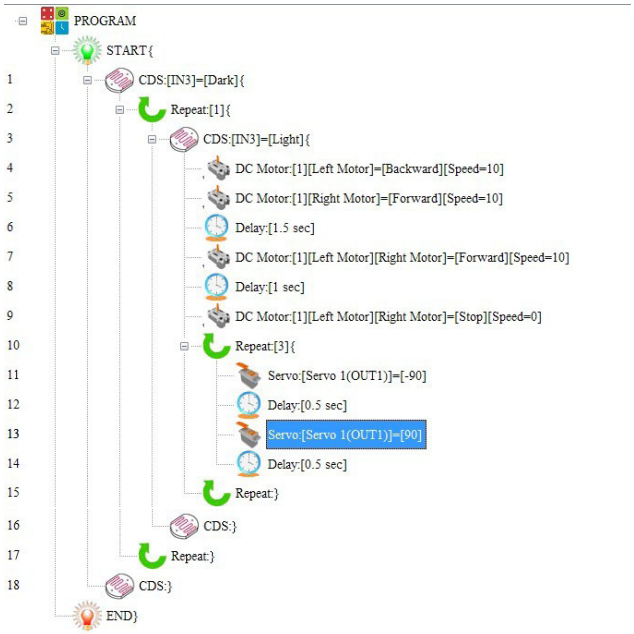
Program Download

1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

Program Example



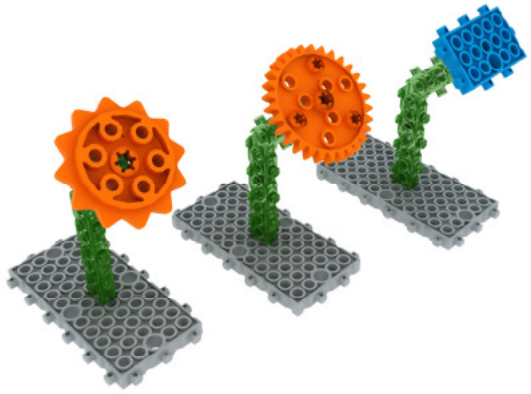
Program Example



Art Let's play games to use cleaner robot!

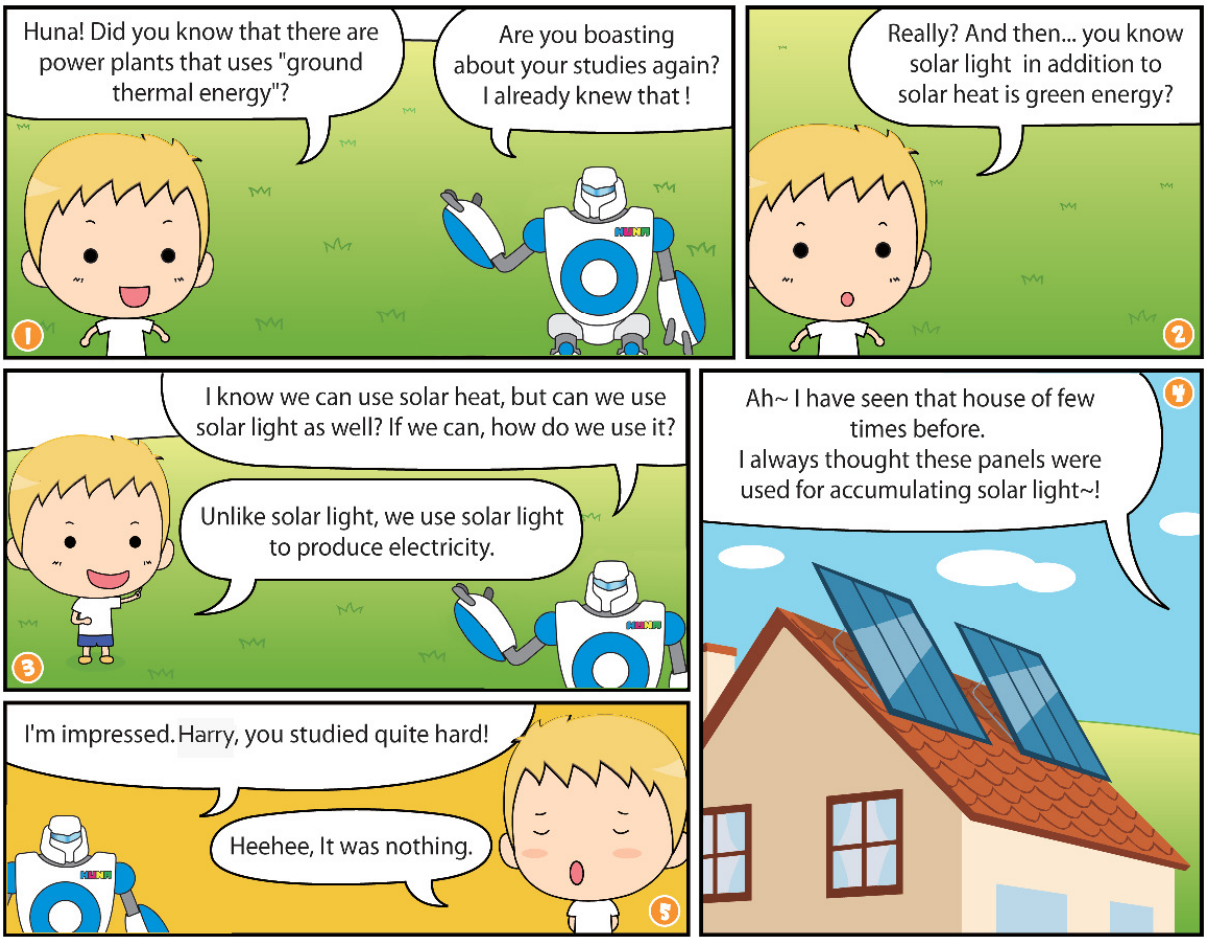
1. Make some small models with the blocks.
2. Put the small mode into different place ,and put the cleaner robot in the center.
3. Use your hand to touch the CDS sensor,the robot will follow your hand.
4. when cleaning robot encounters to the models,this model is eli minated.
5. Let's check who are the winner.

model



Science

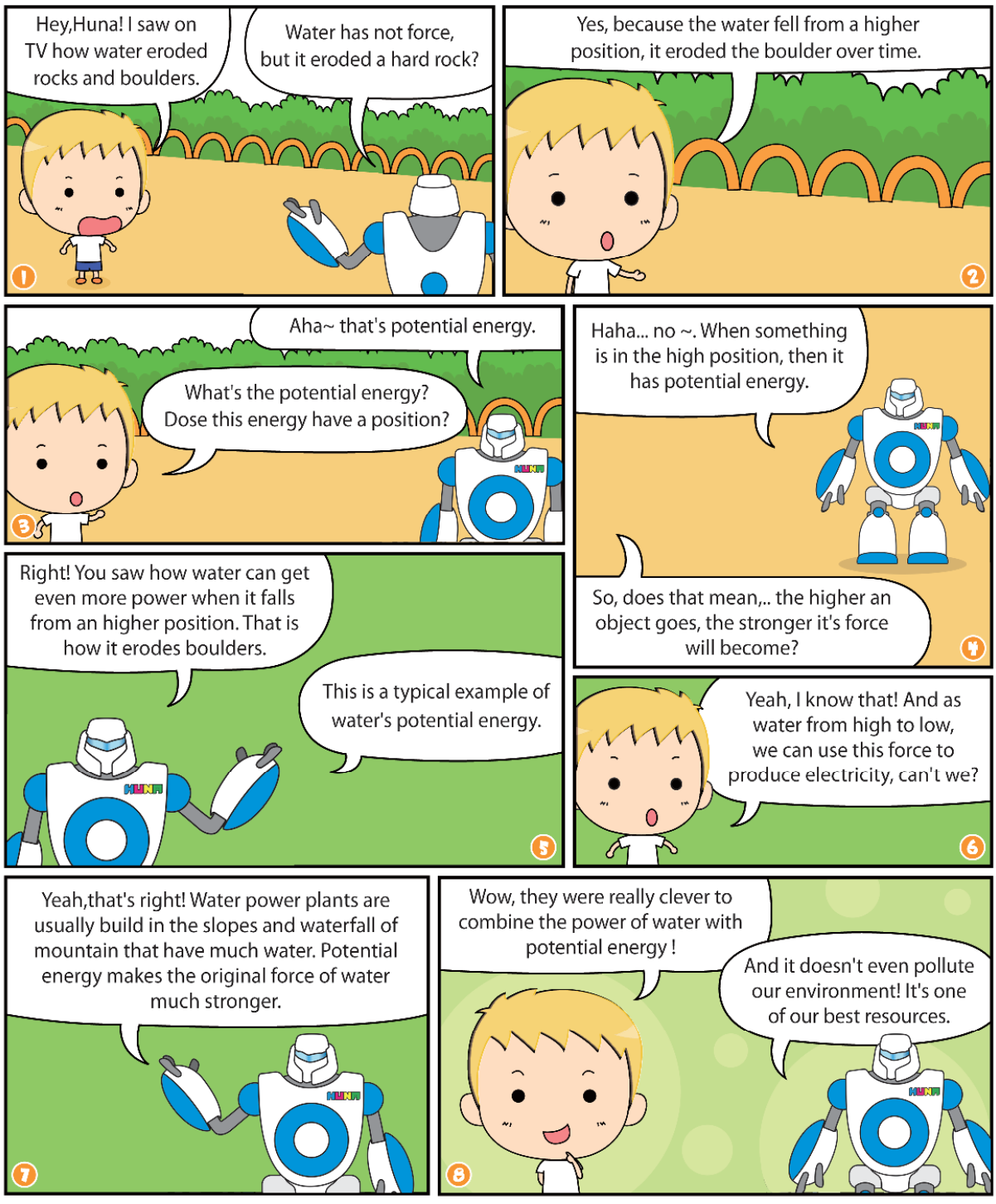
STEM 17. There is green energy everywhere around us!



Let's see what other things we can find that uses green energy as a energy sources.

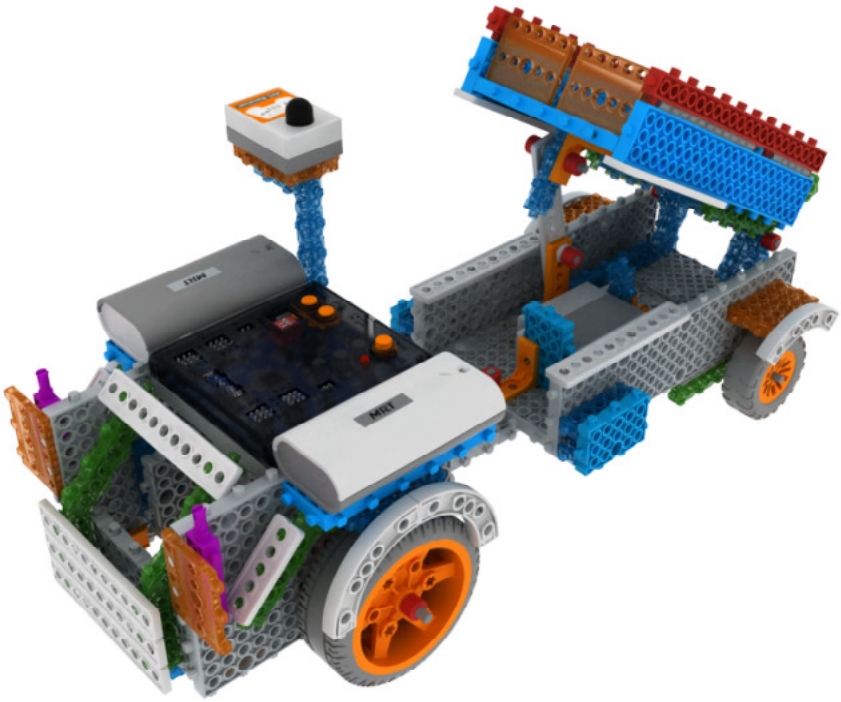
Science

STEM 18. The incredible power of thing in higher positions -Potential energy



Technology Engineering

Robot Making10-Dump Truck



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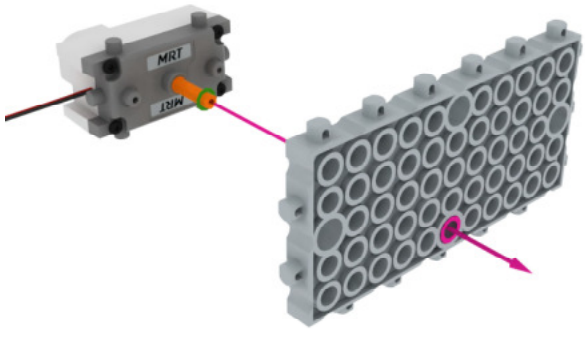

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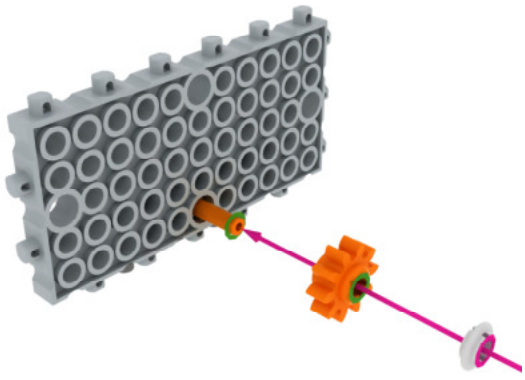

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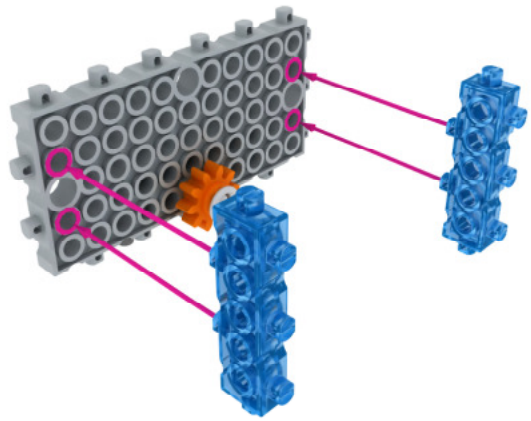

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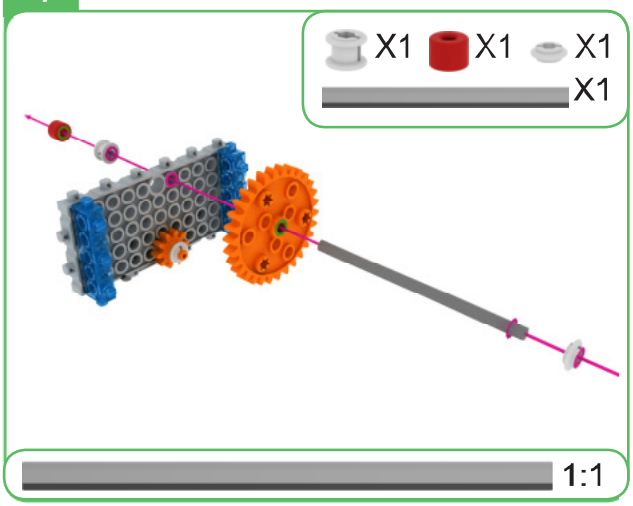

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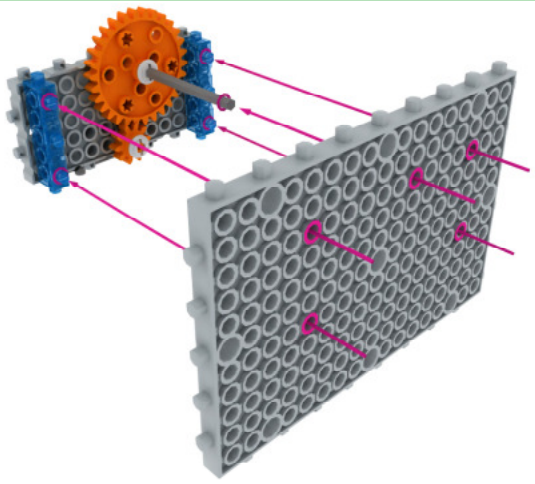

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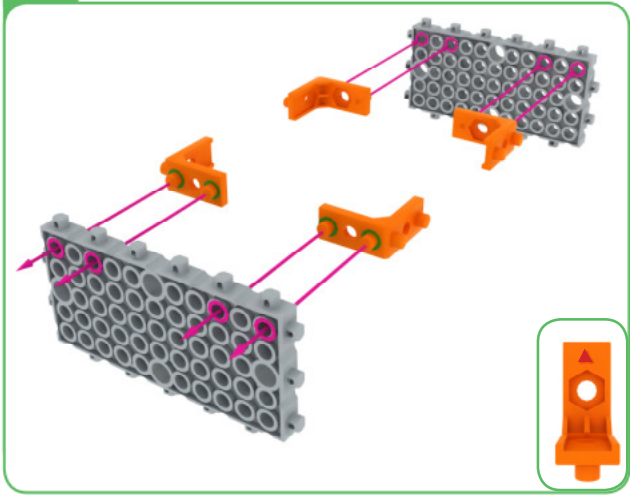

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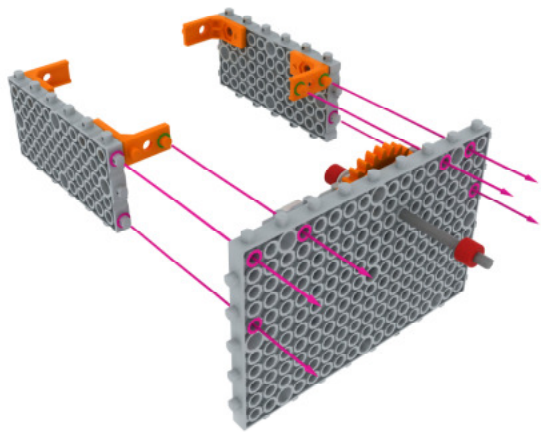

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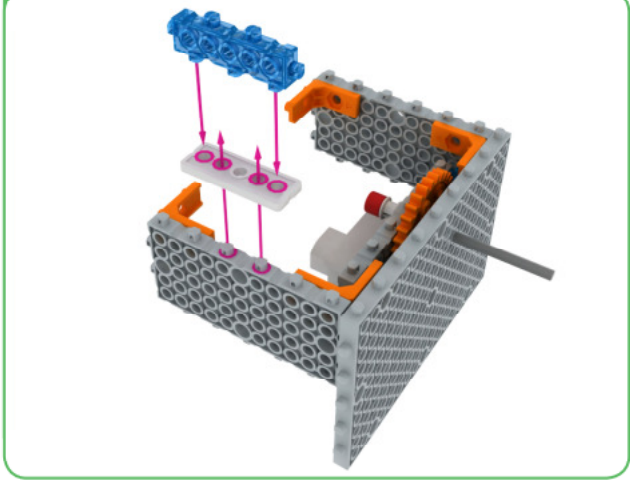

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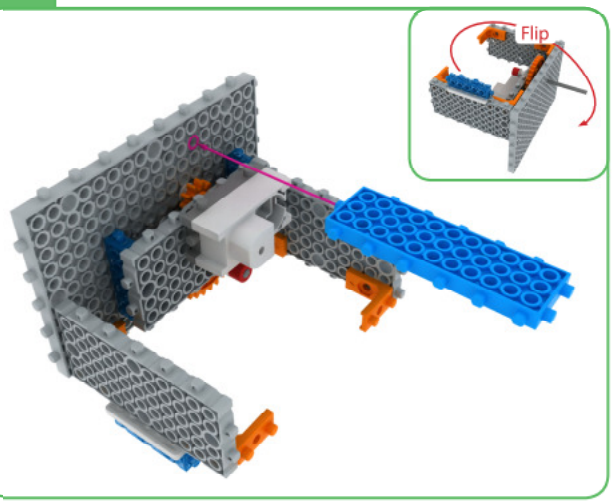

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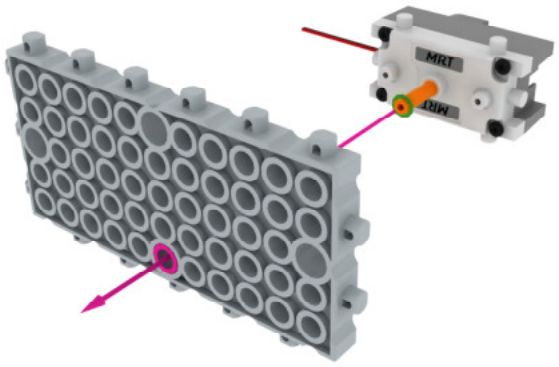

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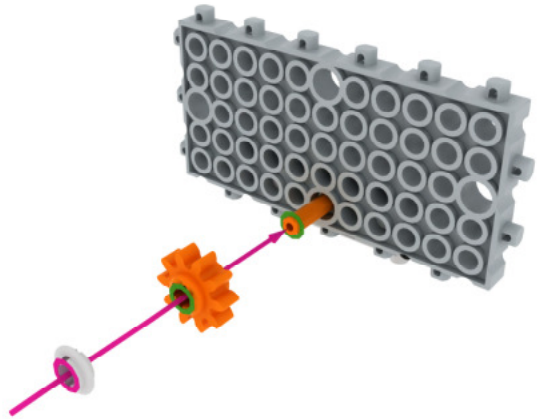

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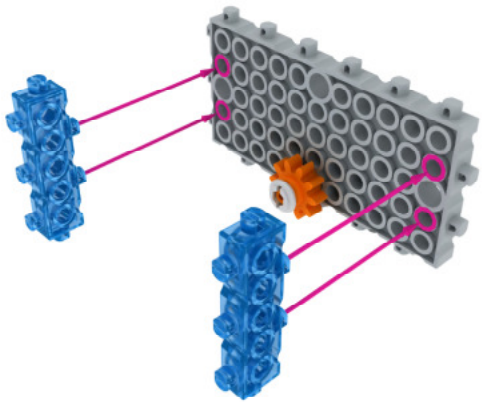

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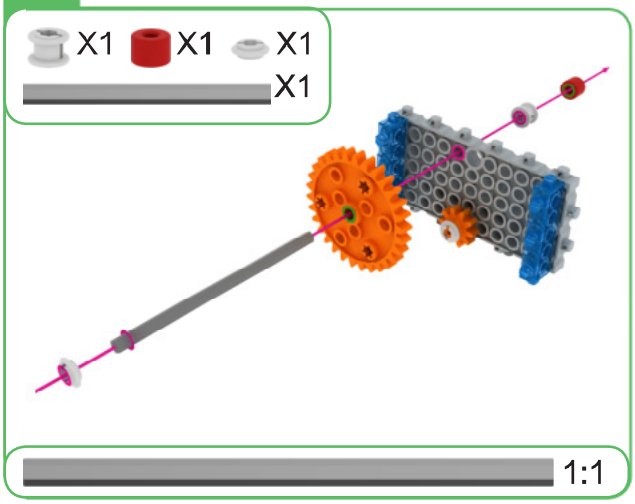

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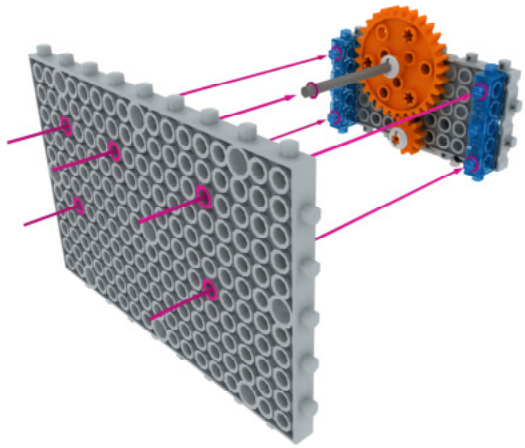

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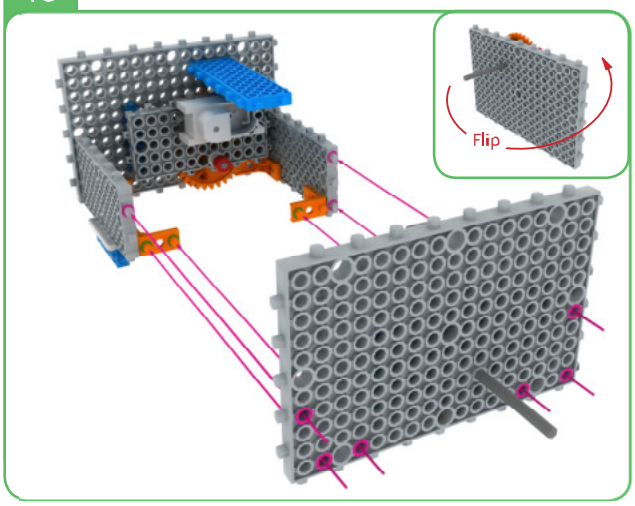

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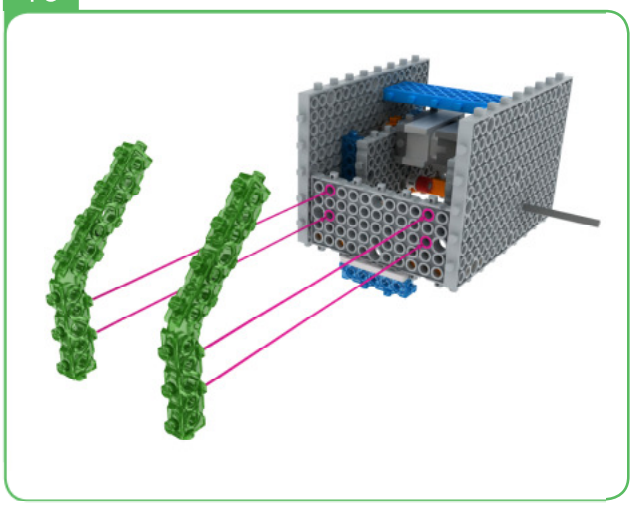

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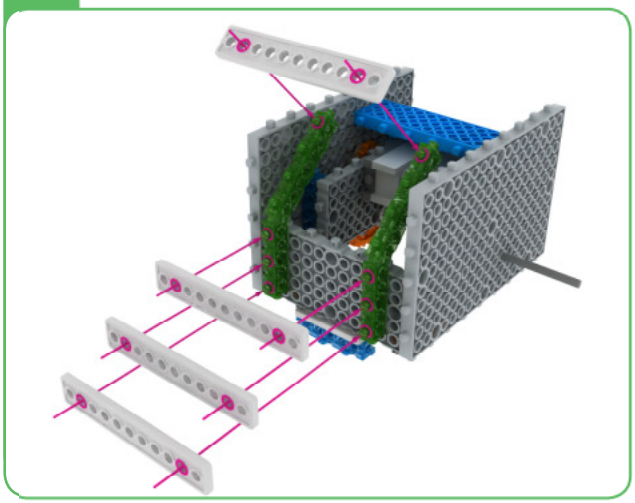

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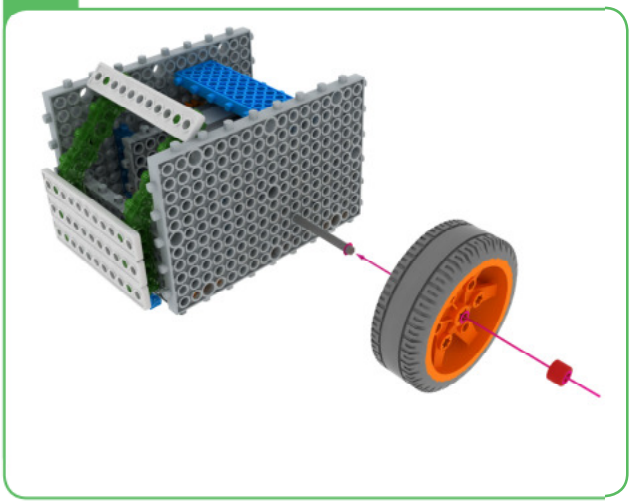

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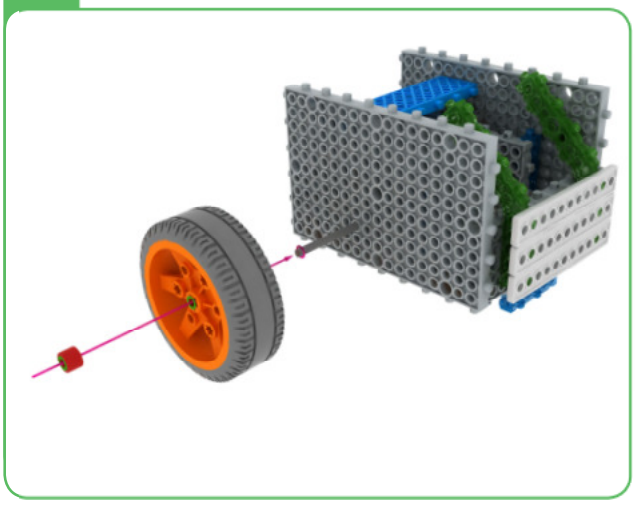

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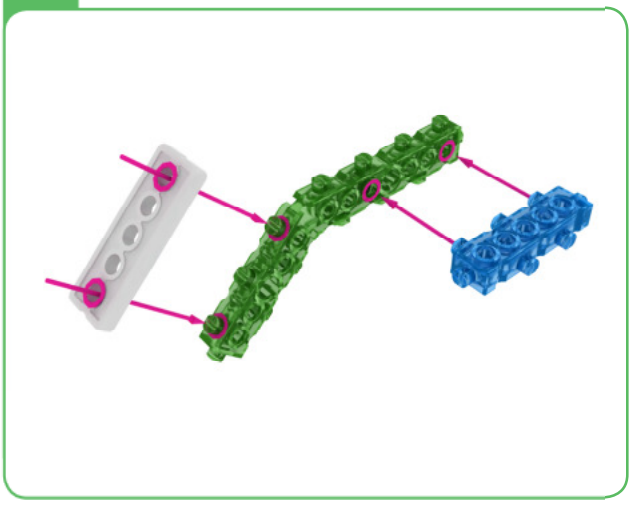

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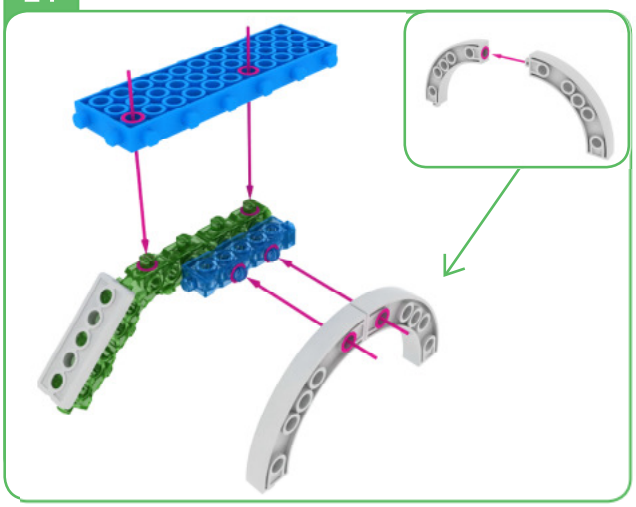

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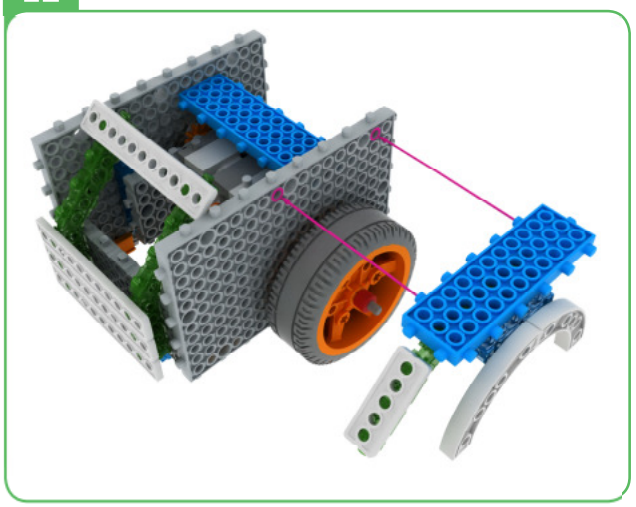

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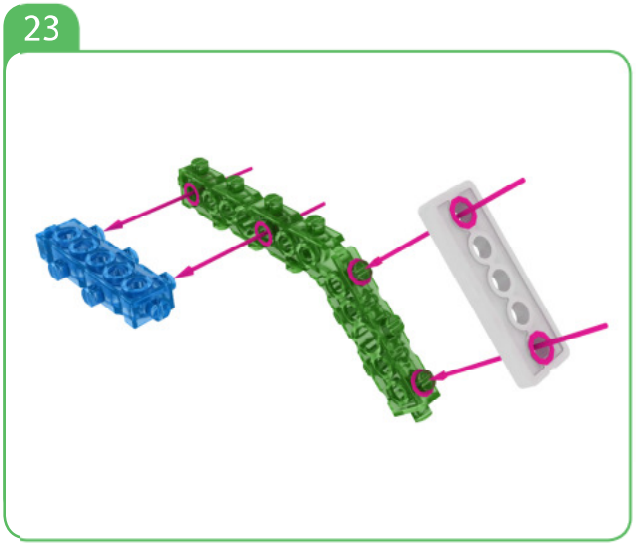

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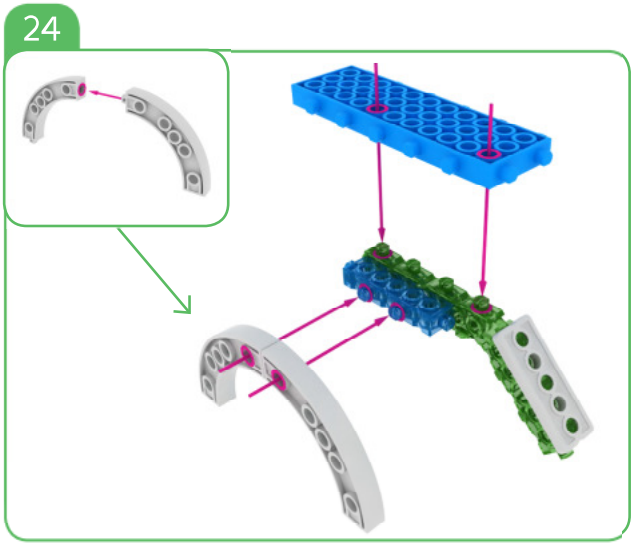

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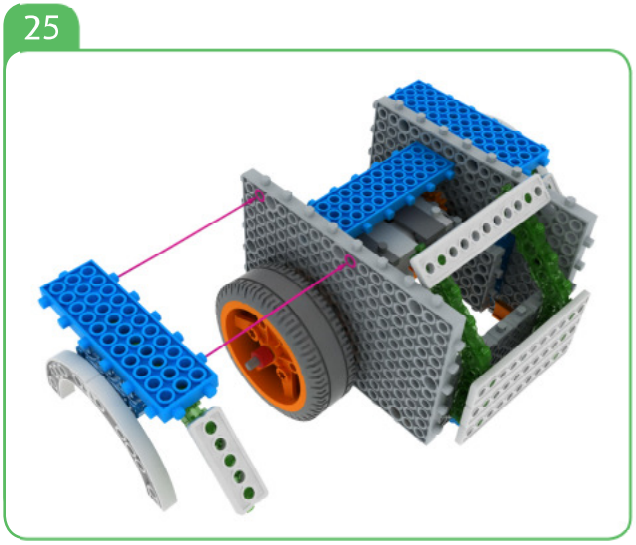

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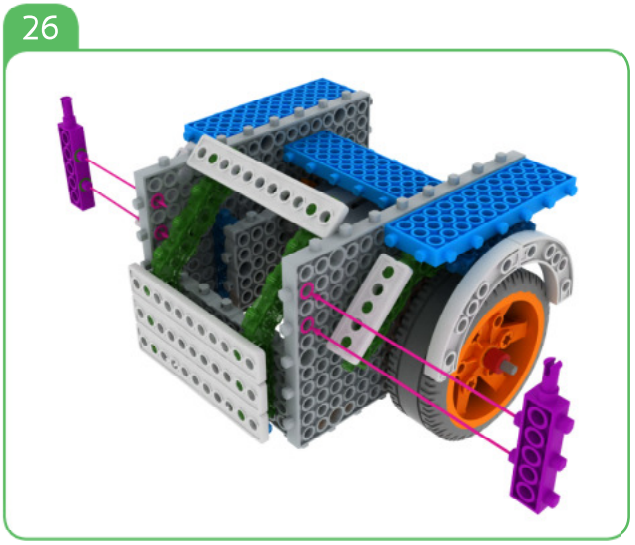

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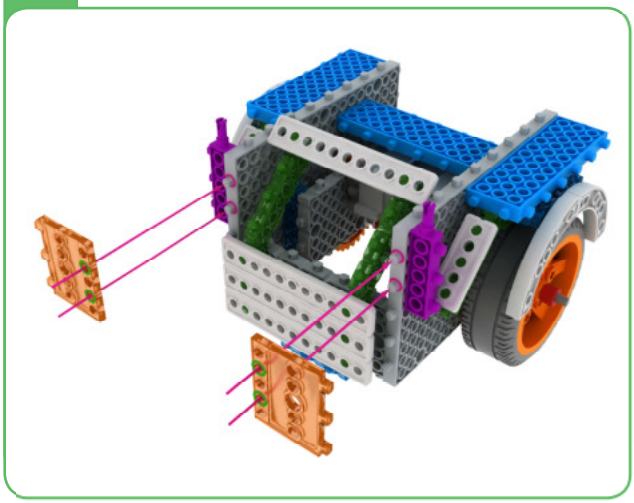

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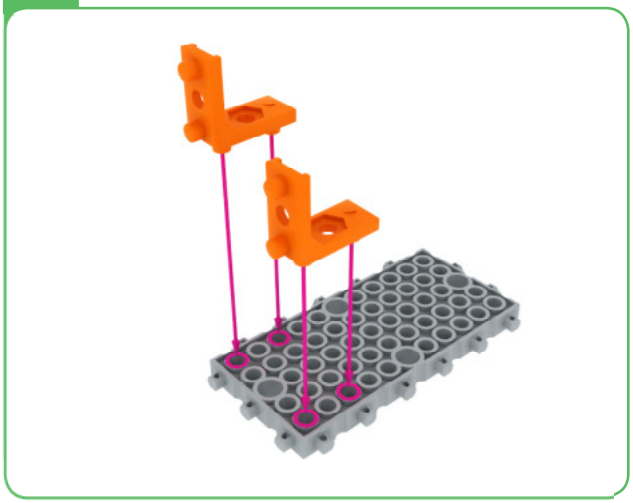

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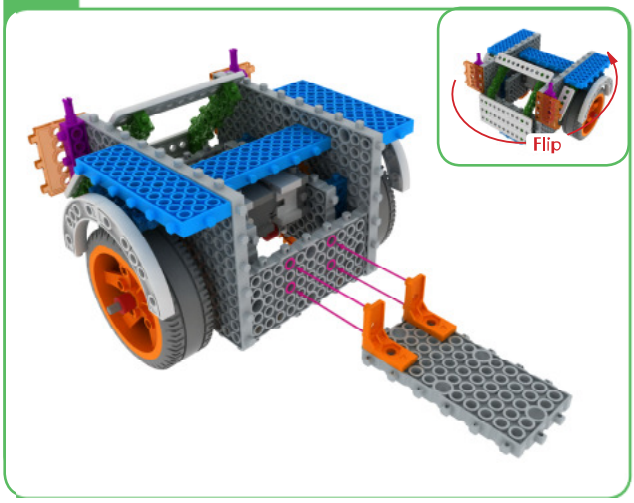

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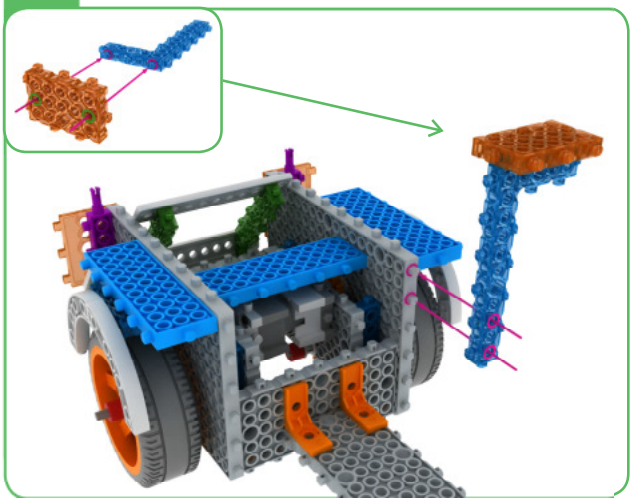

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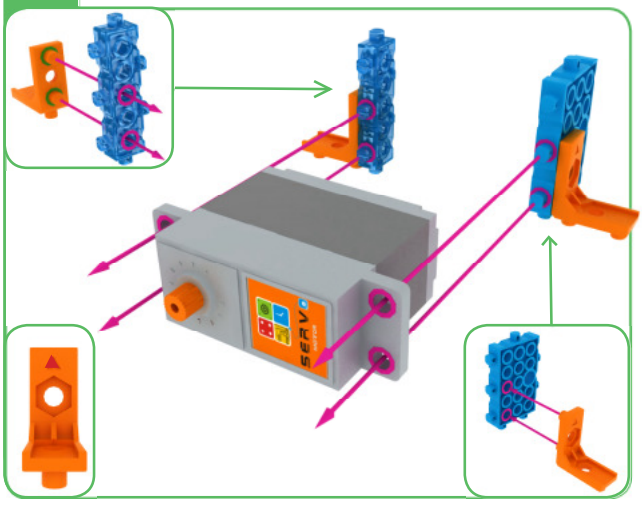

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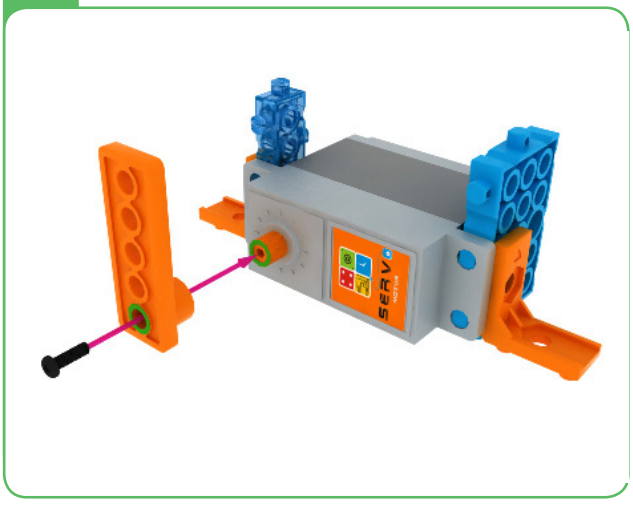
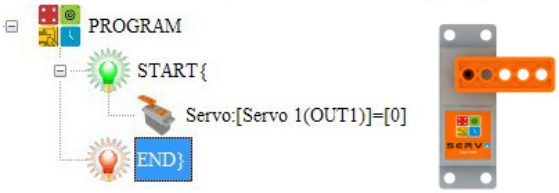


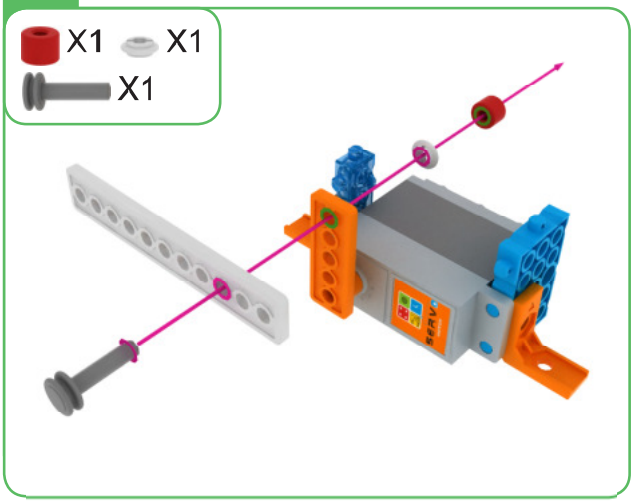
Servo Motor-Zero Point Adjustment

1. Connect the servo motor to the mainboard. You can write the program in the following way.



2. After downloading the program, power off and on again.
3. Fix servo motor horn to the servo motor with a small servo bolt as illustrated in the picture .

33



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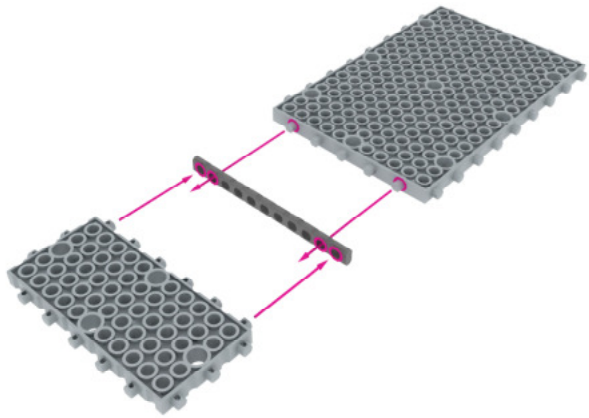

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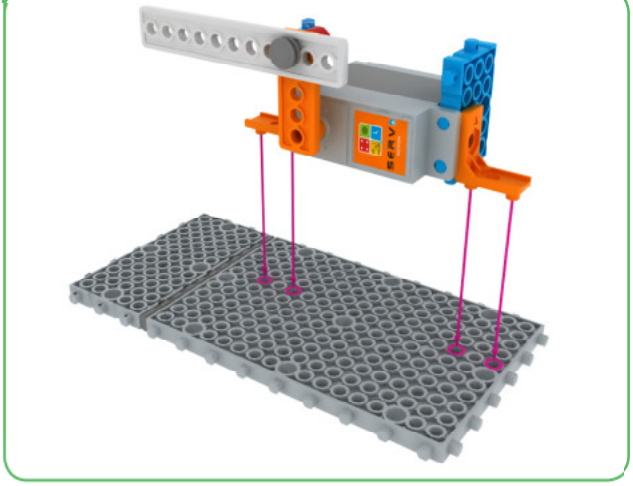

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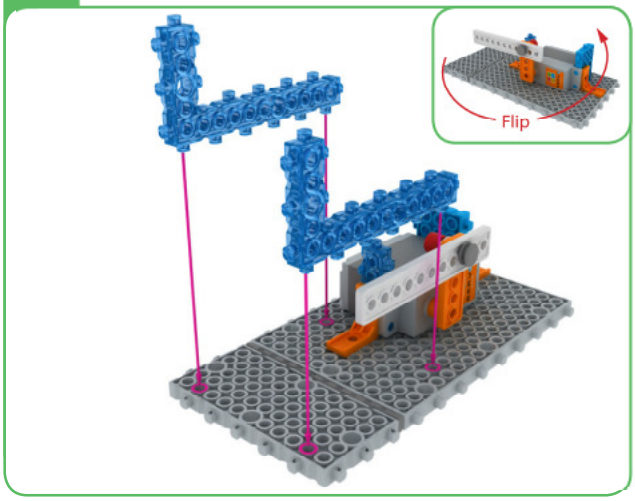

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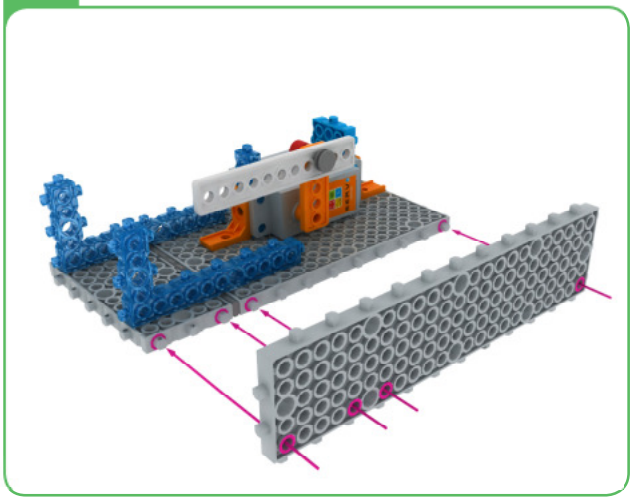

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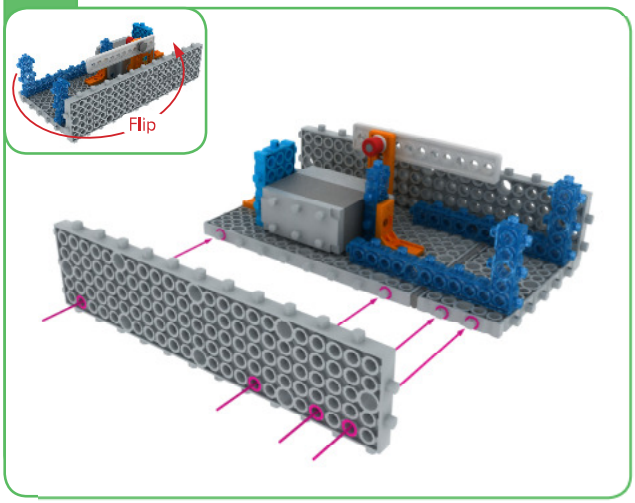

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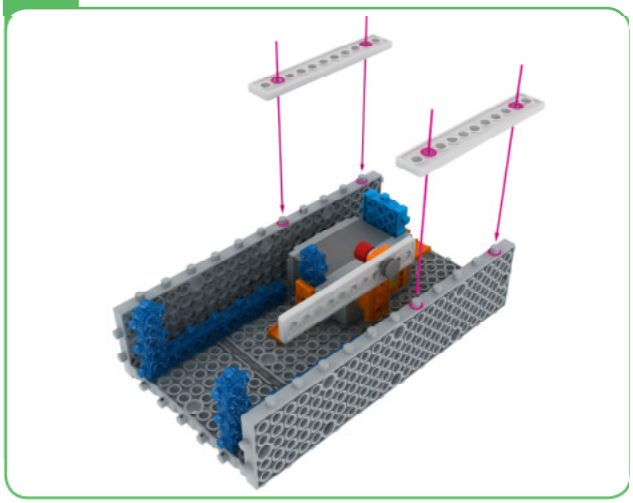

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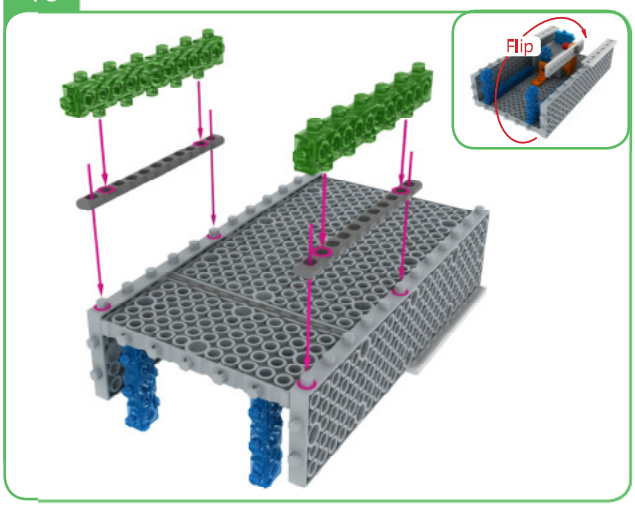

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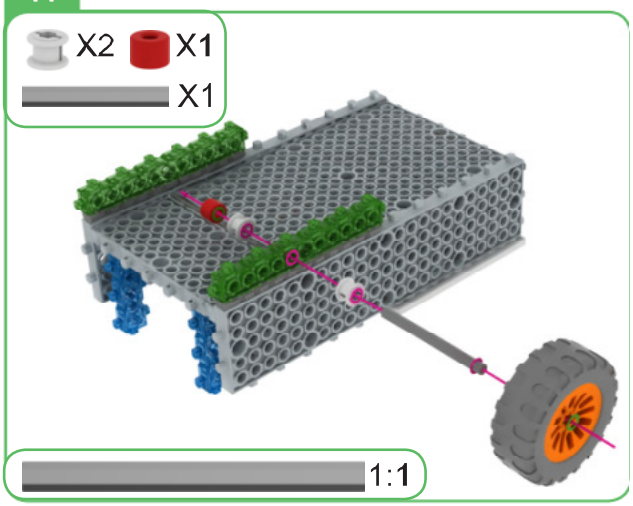

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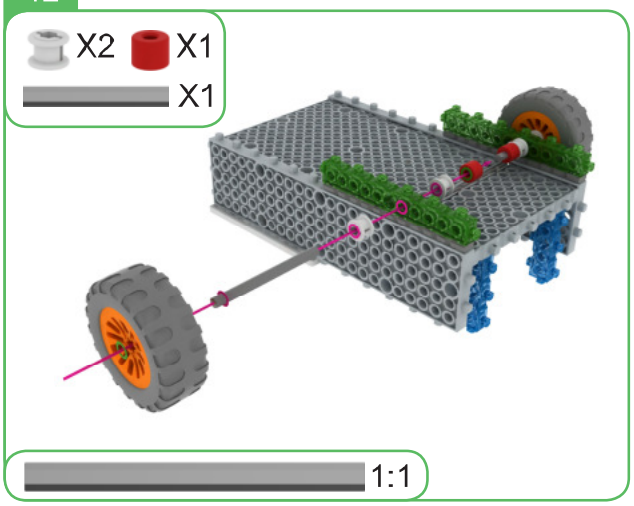

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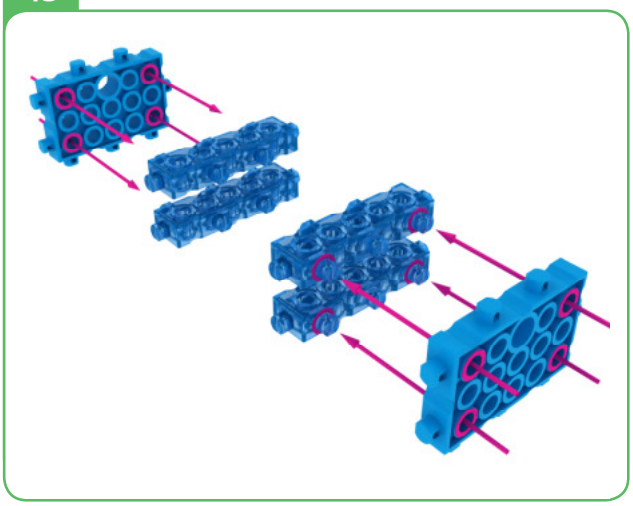

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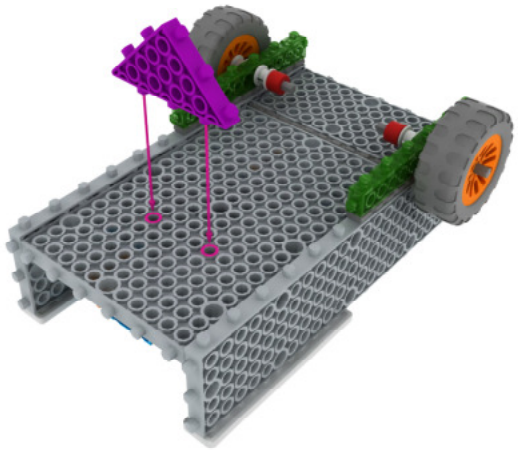

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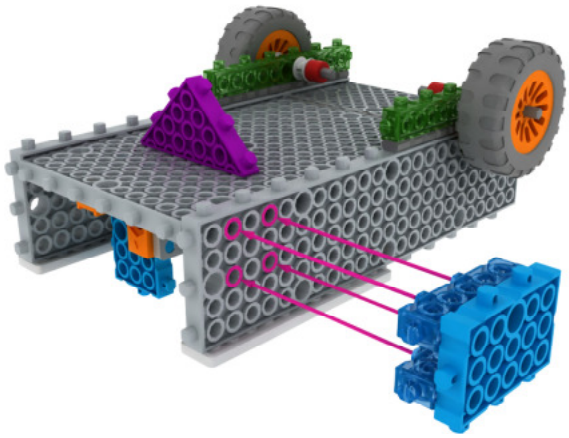

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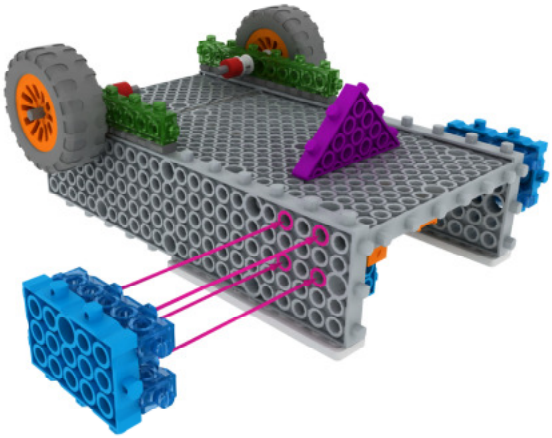

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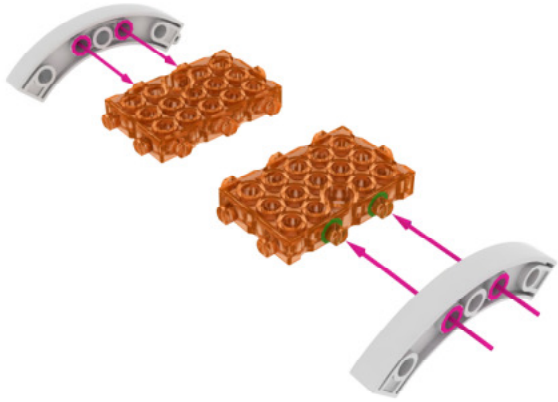

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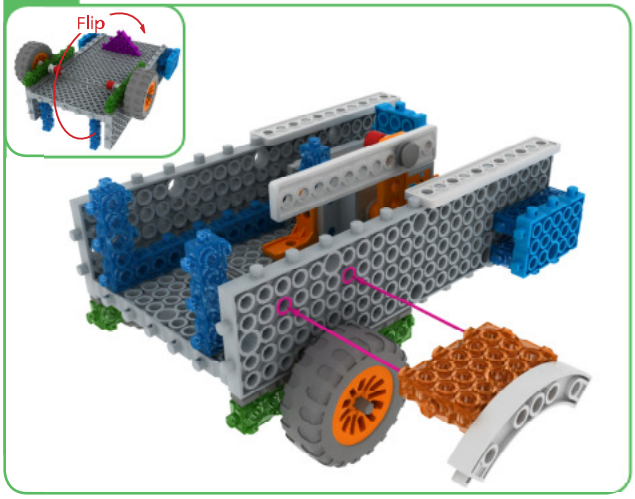

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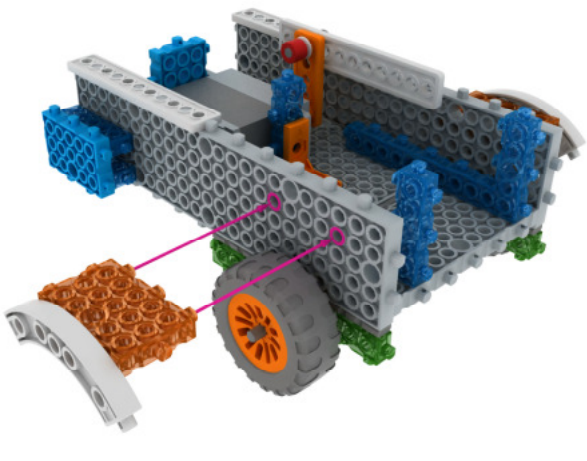

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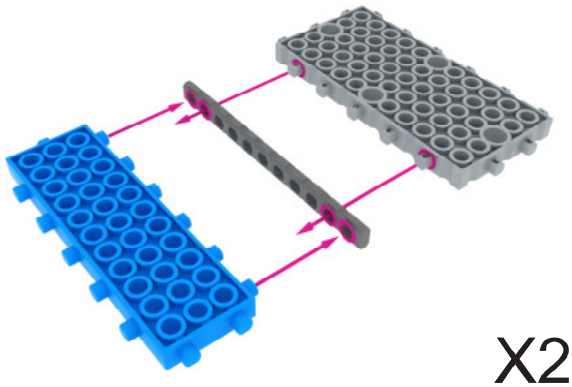

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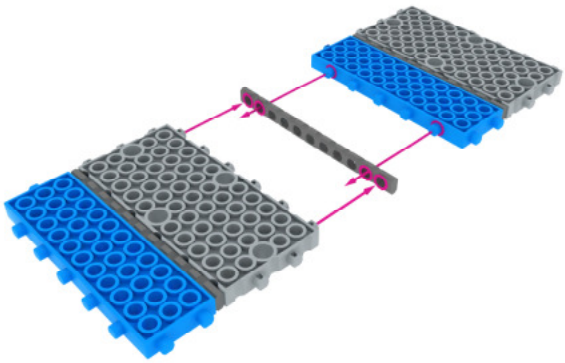

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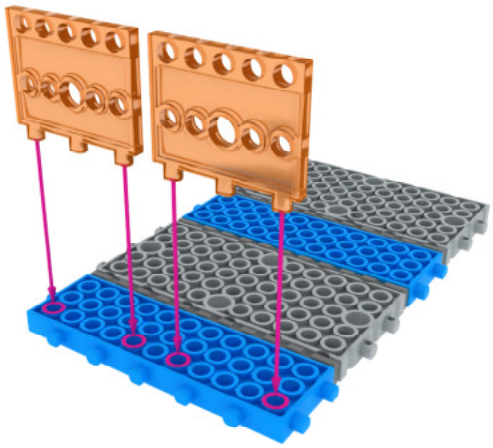

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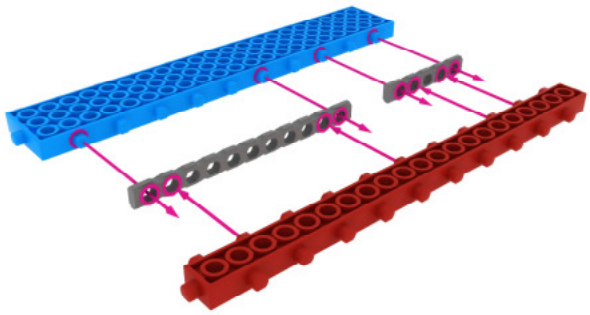

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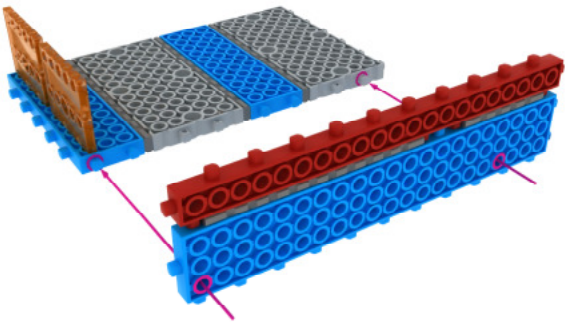

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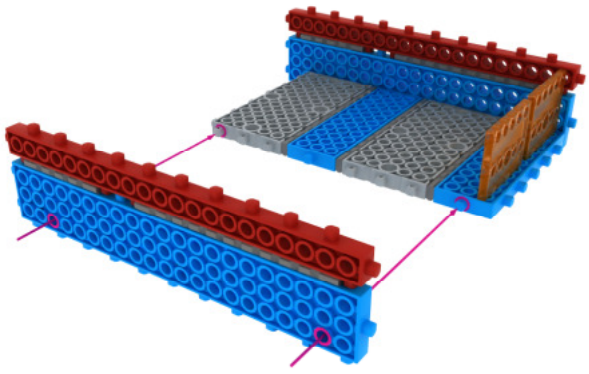

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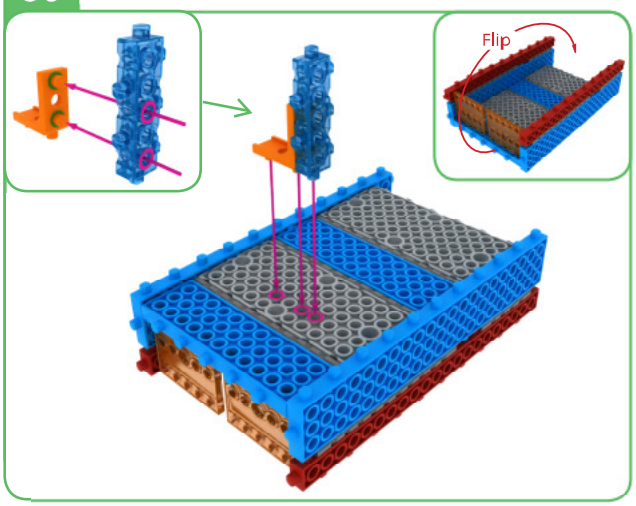

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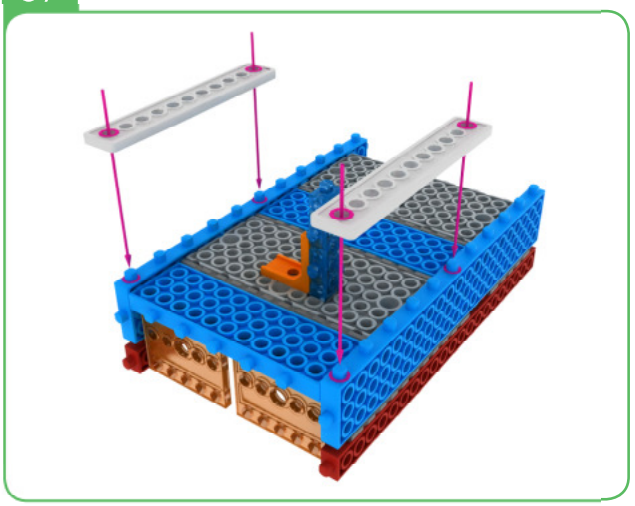

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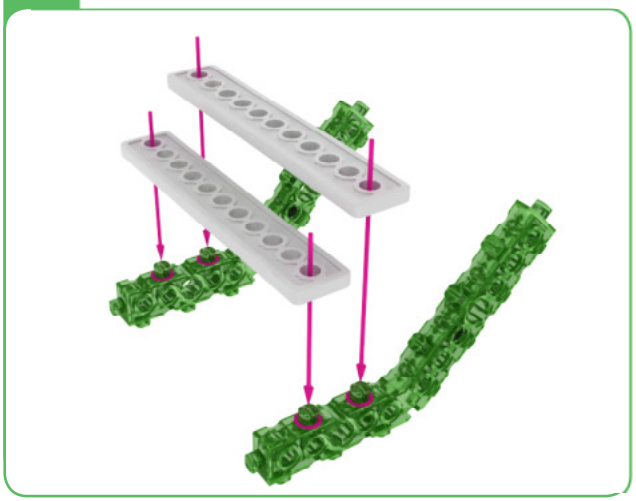

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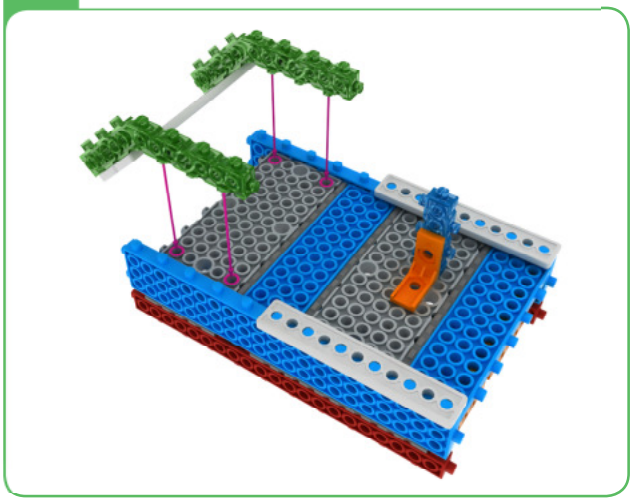

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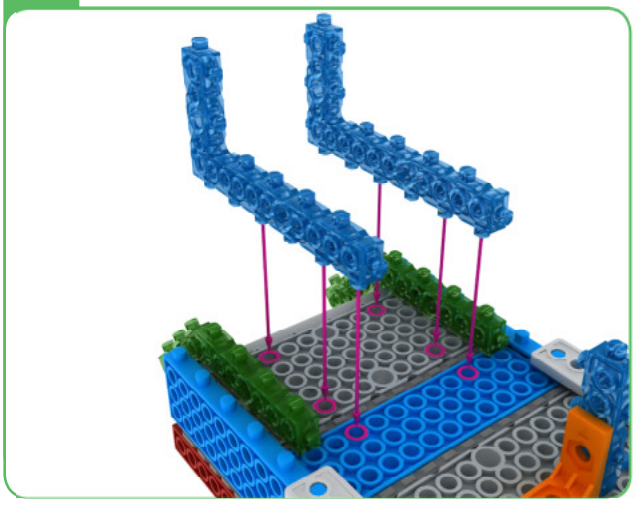

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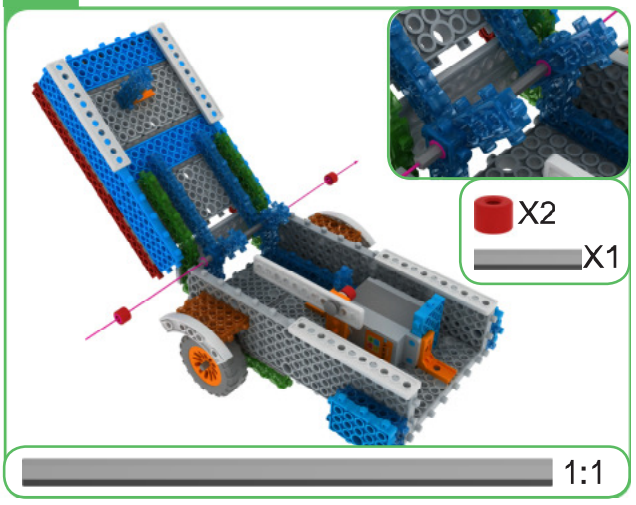

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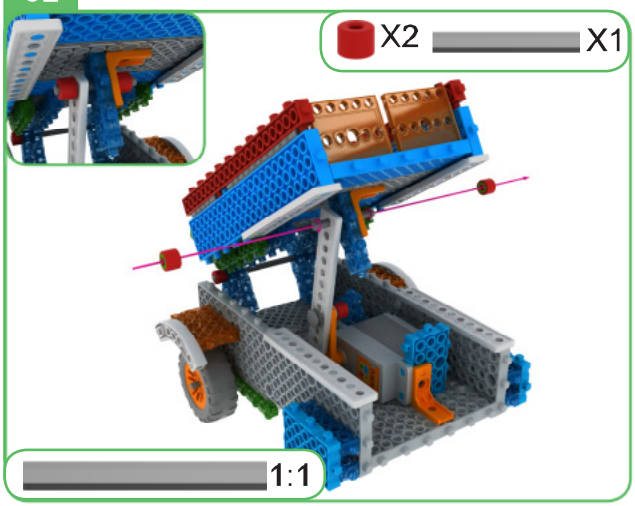

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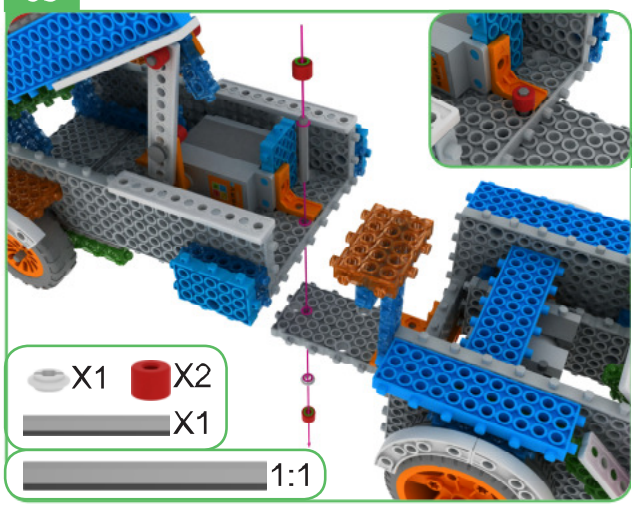
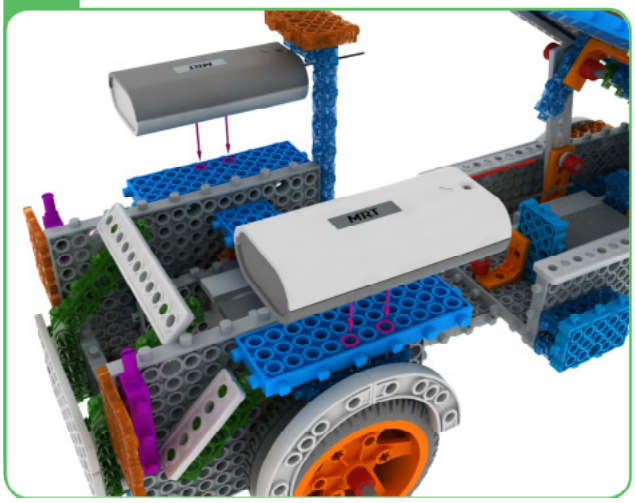


64



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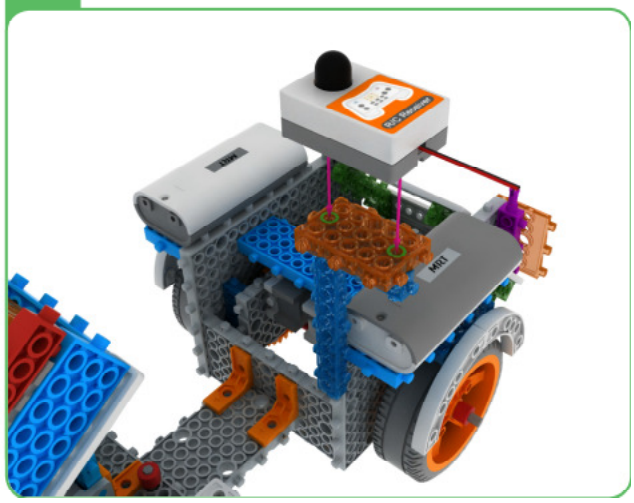
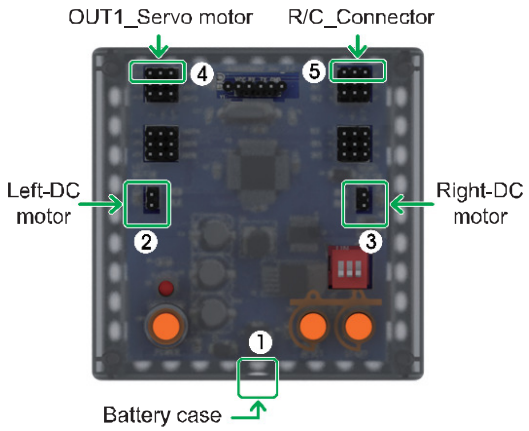


66

End

How to operate the Dump Truck

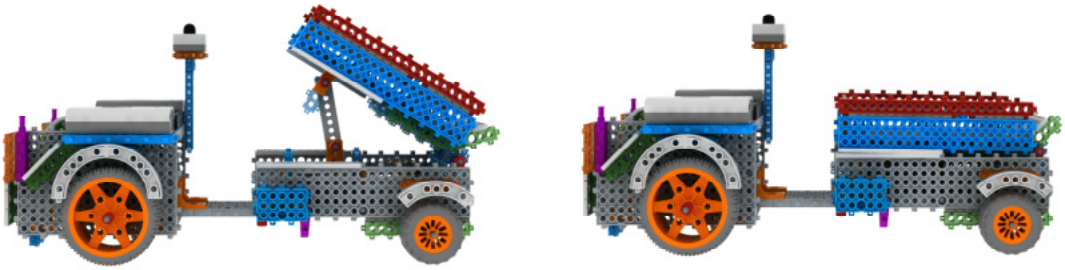
Connecting the main board



Connect in this order.

1. Connect Battery Cases to Power connector.
2. Connect Left-DC motor to Left-motor connector.
3. Connect Right-DC motor to Right-motor connector.
4. Connect Servo motor to OUT1 of OUTPUT connector.
5. Connect RC receiver board to R/C connector.

Motion Pattern/Program

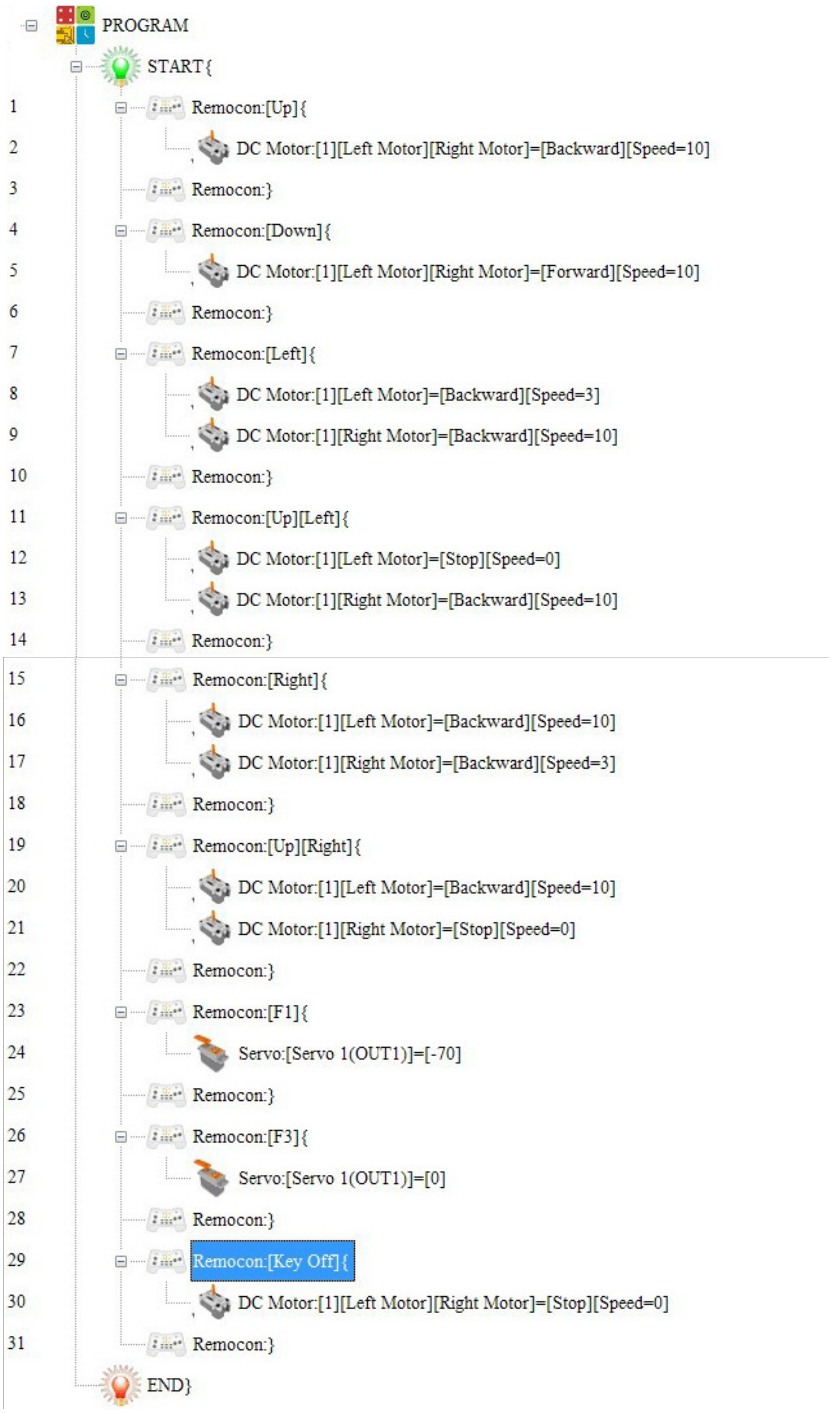


※ - Using the motion patterns as reference, let's write the program.

Program Download

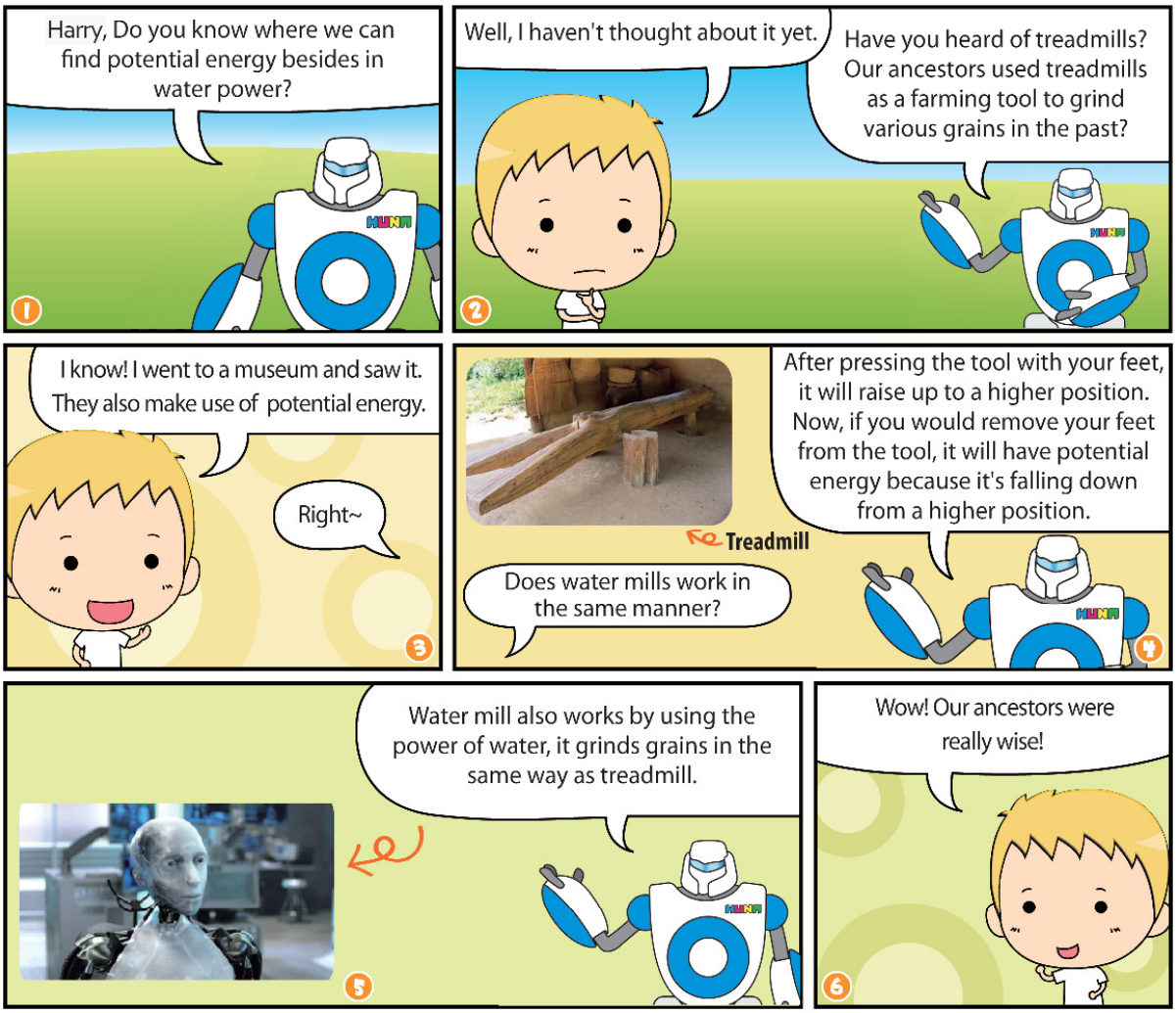
1. Write the program.
2. Make sure Power / DC Motor connector and sensor's connector are well connected.
3. Check the power OFF state, then insert the download cable.
4. 'SAVE' and click the 'DOWNLOAD' button on the program window.
5. Turn on the power when 'DOWNLOAD' window opens. (Power ON)
6. Once the download is completed, remove the download cable and then turn the power off and on.
   (Power OFF → Power ON)

Program Example



Science

STEM 19. Where can we see potential energy?



Let's have a look and see what things we can find that uses potential energy?

MRT3-3

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