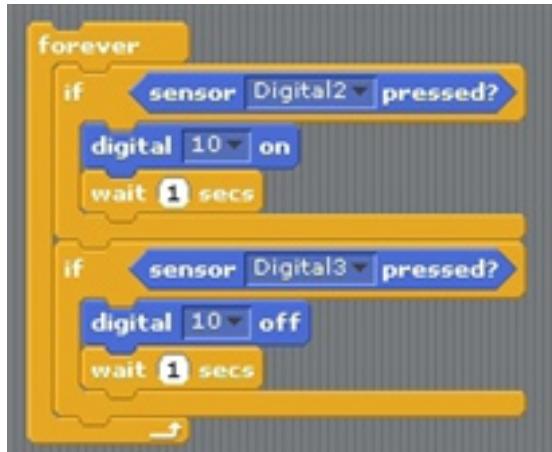


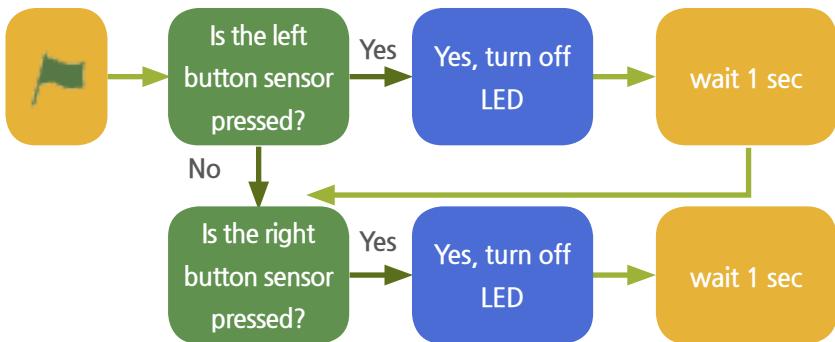
Experiencing the LED SENSOR

'If' phrase

Make the script below



With this code, the led sensor will turn on if you close the left button sensor. The led sensor will turn off if you close the right button sensor.



If you cover both of the sensors, the led sensor will start flashing.

Study the script and find out why!

S C R A T C H C O D I N G K I T

Logic boost

Sound sensor SONG GENERATOR

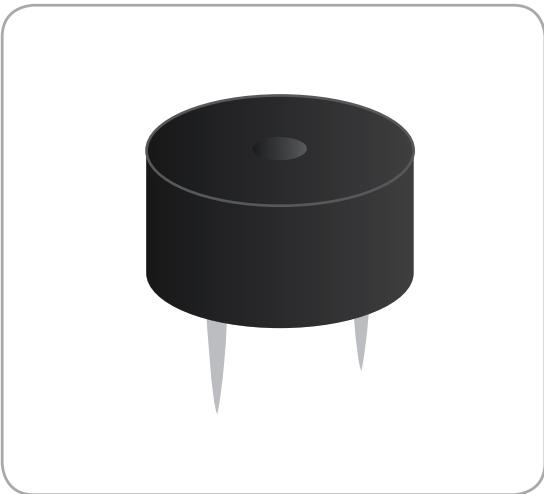
LESSON

5



Introduction

What is the sound sensor (song generator)?



The piezo buzzer is a small speaker that makes sound using a piezo effect. The piezo effect is also known as the piezoelectric effect and uses characteristics of crystal or ceramic. When pressure is applied, it causes changes and voltage occurs on the surface. And in opposition, it condenses or increases if voltage is given. And if a think board is placed on it, the vibration makes the sound we hear.



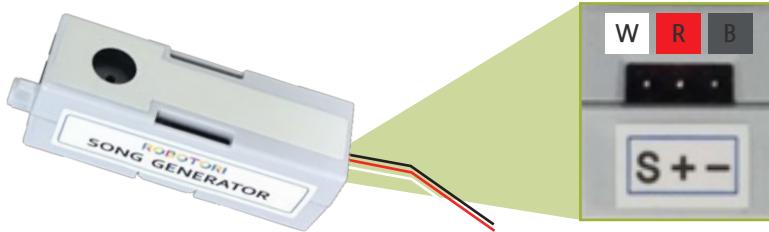
Let's learn about the sound sensor which is one of the roboTori sensors. The buzzer that is used by the sound sensor is the piezo buzzer. A buzzer is a simple output device that can make a simple sound. The buzzer used in this sensor can play only one sound. It's Beethoven's 'For Elise'. You will be able to hear a familiar melody from the sound sensor.



Connecting to the main cell

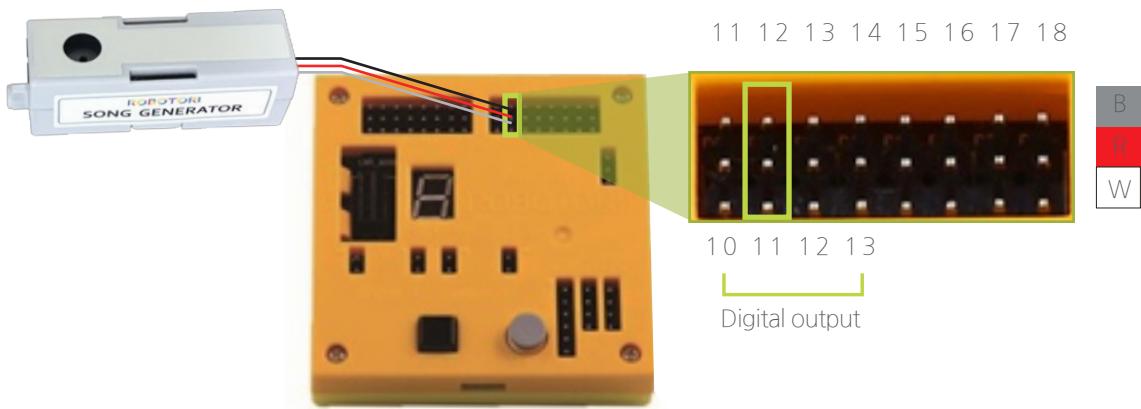
What is the sound sensor?

Using the sound sensor, we can produce a sound that robots make.



“S” = White
“+” = Red
“-” = black

Connect the sound sensor to port 12 (digital output port 11).

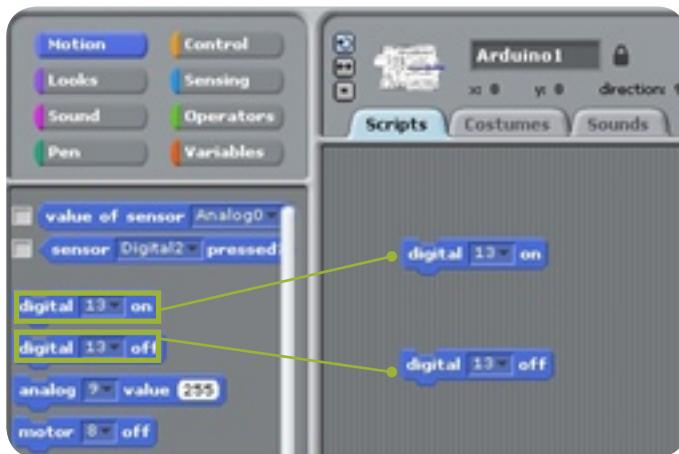


Experiencing the sound sensor coding

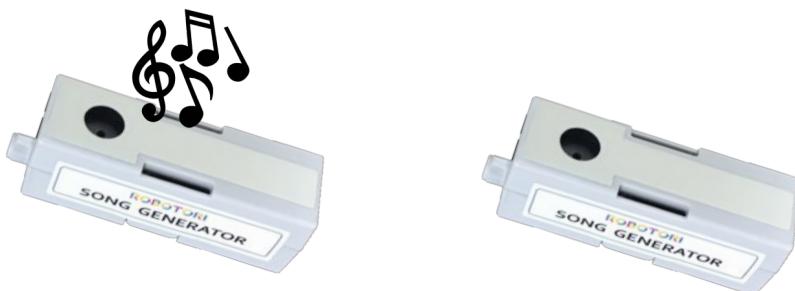
Turning the Sound Sensor On/Off

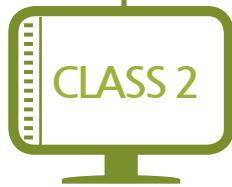
The sound sensor is controlled by the main cell that sends digital signals.

Drag the 'Digital output on' and 'Digital output off' blocks to the script and change Digital 13 to 11 (Digital output port 11 is used as the output port).



If you click each block...

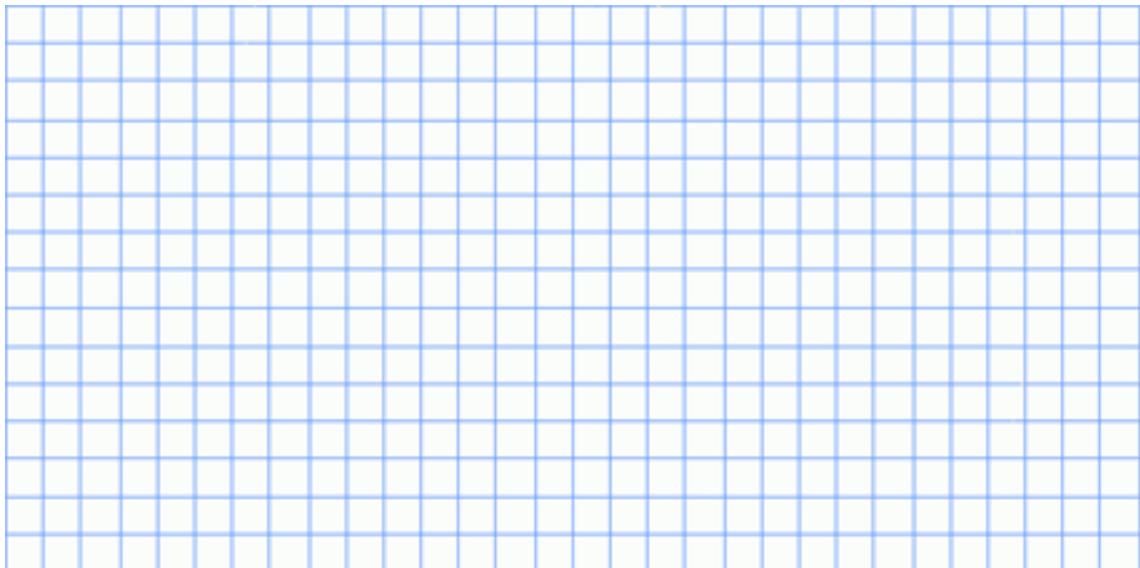




Experiencing the sound sensor coding

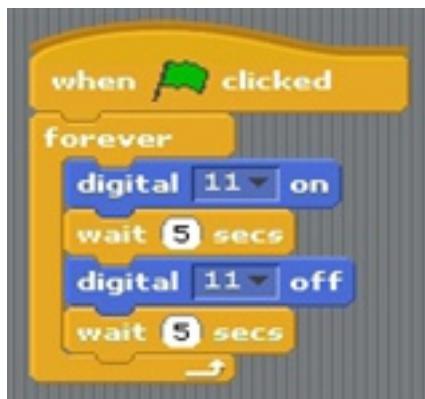
Making an alarm

You are going to use what you have learned to make the sound sensor turn on the saved music and turn off every 5 seconds. Draw an outline of how to make the Scratch code.



Start the code! Did the alarm work?

If it didn't, check the code below and find out what was wrong.



S C R A T C H C O D I N G K I T

Logic boost

Pelicana robot

LESSON

6





exercise

Pelicana robot

Make a model using the button and the sound sensor we learned about before.

The name of this model is Pelicana robot. It looks like a pelican, and it can move its wings up and down using a DC motor. Though, it can't really fly.



We are going to make it move by combining a input sensor-button sensor, a output sensor-sound sensor, and a DC motor. Let's make the wings flap and play music from the sound sensor whenever the button sensor is pressed.

exercise

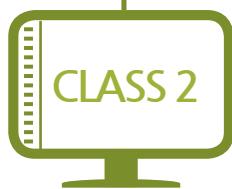
Pelicana robot

Make the pelicana robot.



Materials needed for Pelicana

Diamond H8 x 4	Diamond H6 x 6	Diamond V6 x 4	Rubi 8 x 6	Rubi 7 x 4	Rubi 4 x 14	Rubi 6 x 6	Rubi 2 x 8	Rubi 0 x 2	Mini 2 x 14	Mini 1 x 4	Curve x 9	Link x 7	SONG GENERATOR x 1



exercise

1

1-1



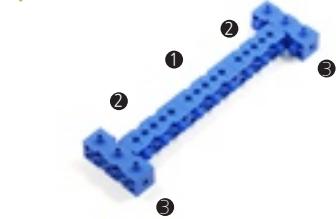
x 1



x 2



x 2



1-2



x 2



x 2

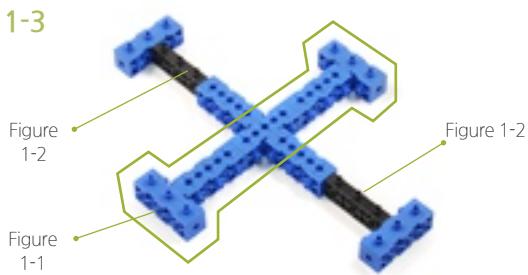


x 2

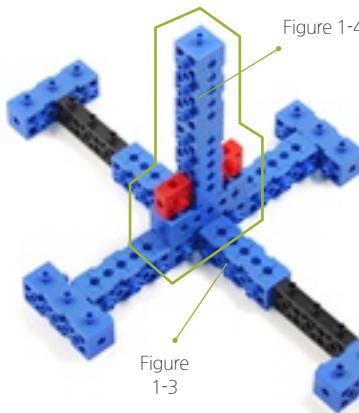


Make two of these.

1-3



1-5



1-4



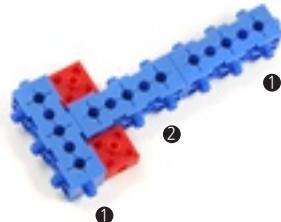
x 2



x 1



x 2



2

2-1



x 1

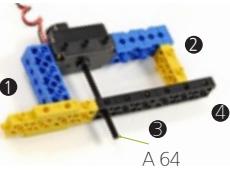


x 1



x 1

A 64

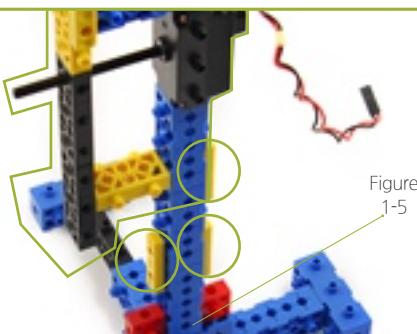


A 64

2-2

x 3

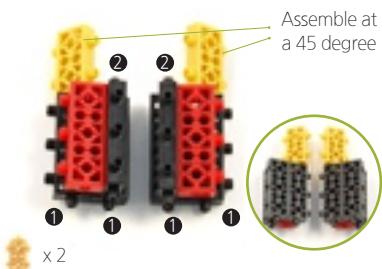
Figure 2-1



exercise

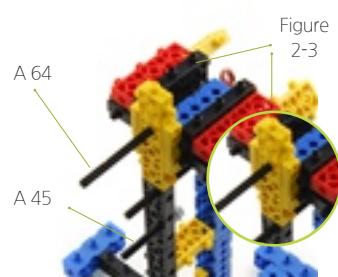
2 2-3

① x 4
② x 2
③ x 2



2-4

① x 2
② x 1
③ x 1
④ x 1



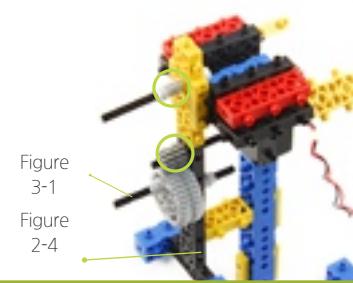
3 3-1

① x 2
② x 1
③ x 1



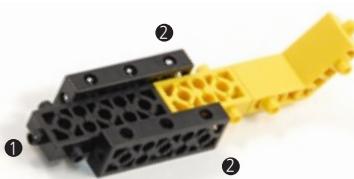
3-2

① x 2
② x 1



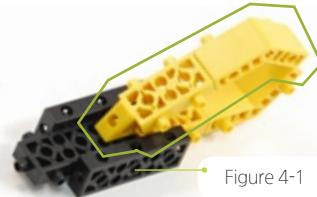
4 4-1

① x 1
② x 1
③ x 2
④ x 1



4-2

① x 1
② x 1
③ x 1

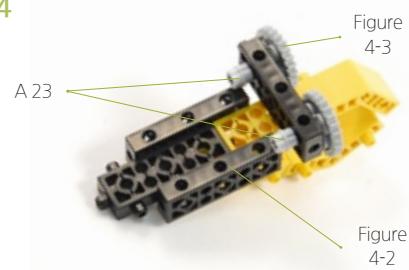


4-3

① x 1
② x 2
③ x 2
④ x 2



4-4



exercise

6 6-1

+

—

Y



6-2

D x 1

O x 1

Y x 1



6-3

D x 1

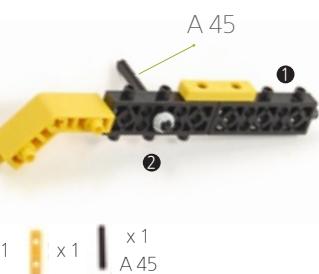
O x 4

Y x 1

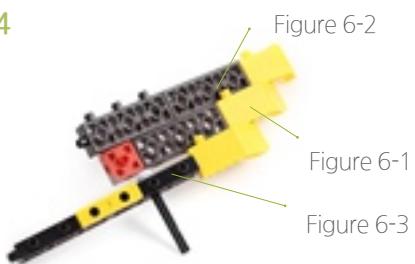
— x 1

Y x 1

A 45 x 1



6-4



7 7-1

D x 2

O x 1

Y x 1

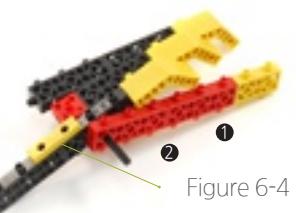


Figure 6-4

7-2



7-3

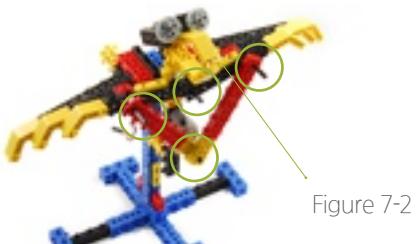


Figure 7-2

7-4

D x 4

Figure 5-5

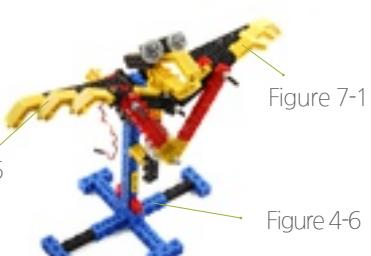
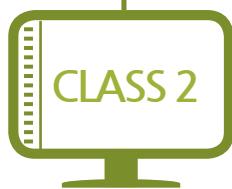


Figure 4-6



exercise

8

8-1

x 2
 x 1
 x 1 x 1



8-3

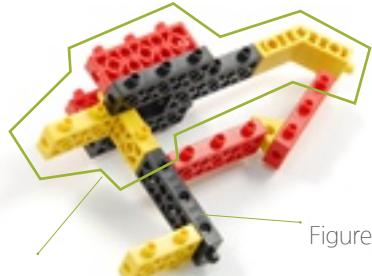
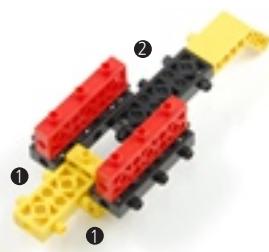


Figure 8-2

Figure 8-1

8-2

x 2 x 1
 x 2 x 1
 x 2



8-4

x 2
 x 2



Repeat the same step twice on the opposite side

8-5

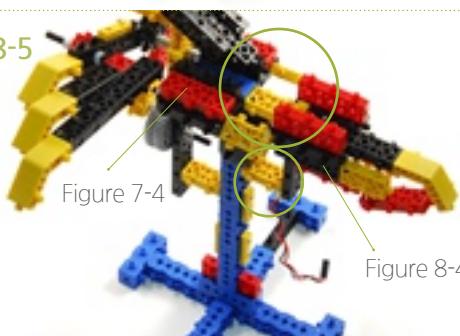


Figure 7-4

Figure 8-4

8-6



9

9-1

x 1 x 1
 x 1 x 3
 x 1

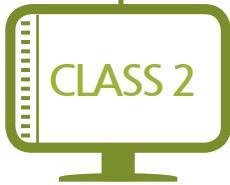


exercise

Complete 9-1



Think Box

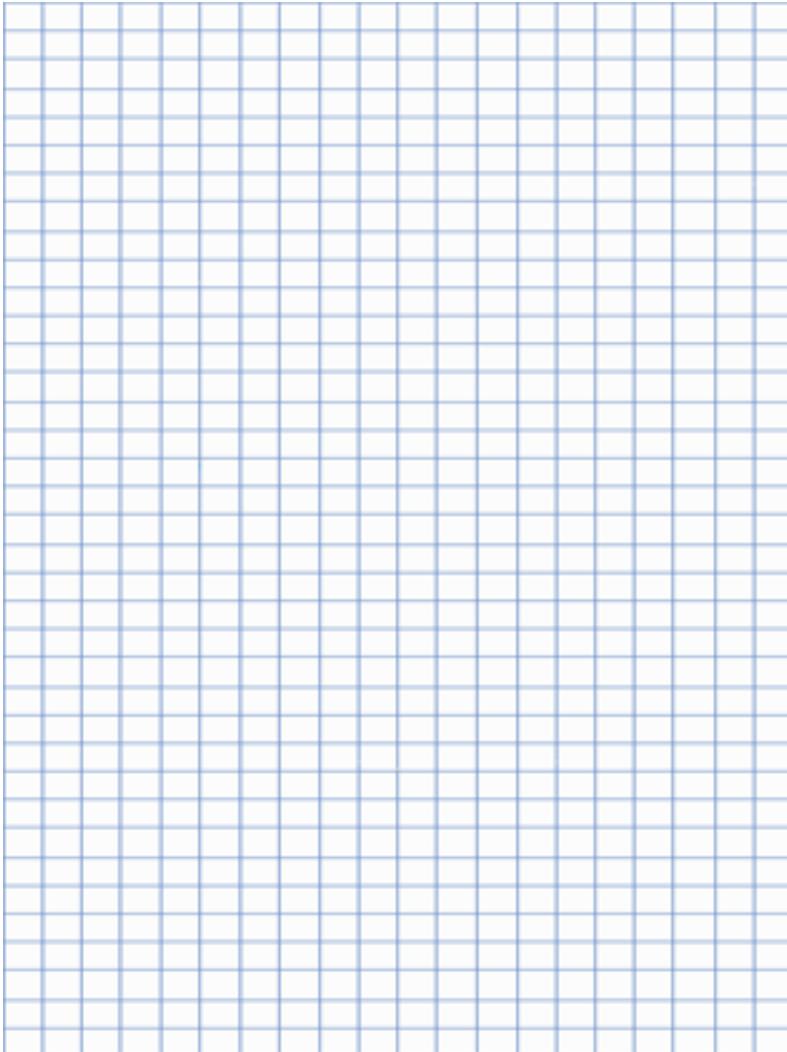


exercise

Coding Pelicana robot

Try coding the robot by yourself.

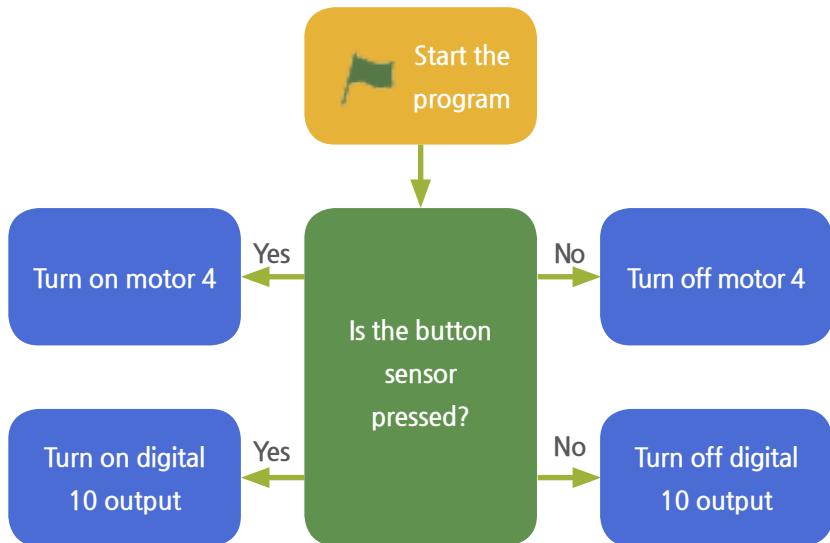
When you press the button sensor, DC motor and sound sensor have to operate. If you don't press the button sensor, it stops moving. Make a script using the 'If..or else..', sensor output, and DC motor activation blocks.



Explanations

Pelicana robot

Look at the flowchart. When the program starts, the DC motor has to operate and the digital output should be turned on when the button sensor is pressed. The program should keep checking if the switch was pressed or not.



Do you remember what we learned in using the button sensor?

First, 'if..or else' block would be used as the start of the program, and whether the button sensor is pressed or not will be the condition. If the condition is satisfied (if the button is pressed), dc motor will rotate clockwise, and the sound sensor will produce the sound by turning on the digital output.

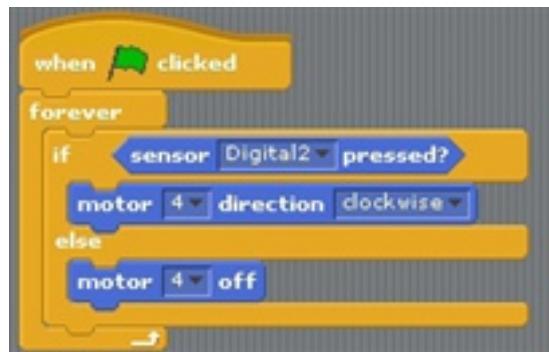
If the condition is not satisfied (if the button is not pressed), the DC motor stops, and digital output turns off, making no sound. You will be able to do it since it's a simple script!



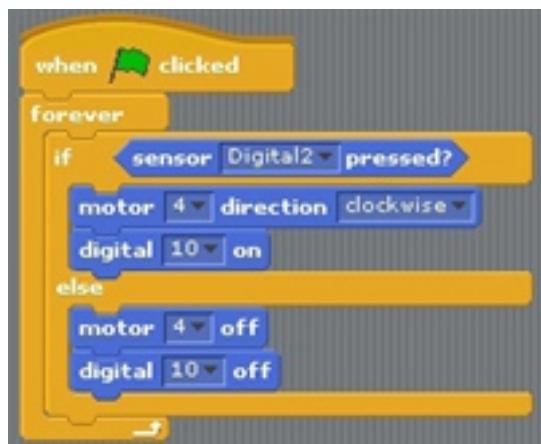
Explanations

Pelicana robot

Let's make a script that makes the DC motor turn on whenever the button sensor is pressed. Refer to the boxing robot script!



The script above will activate the DC motor when the button sensor is pressed. Now, should we add 'digital output on/off' here?

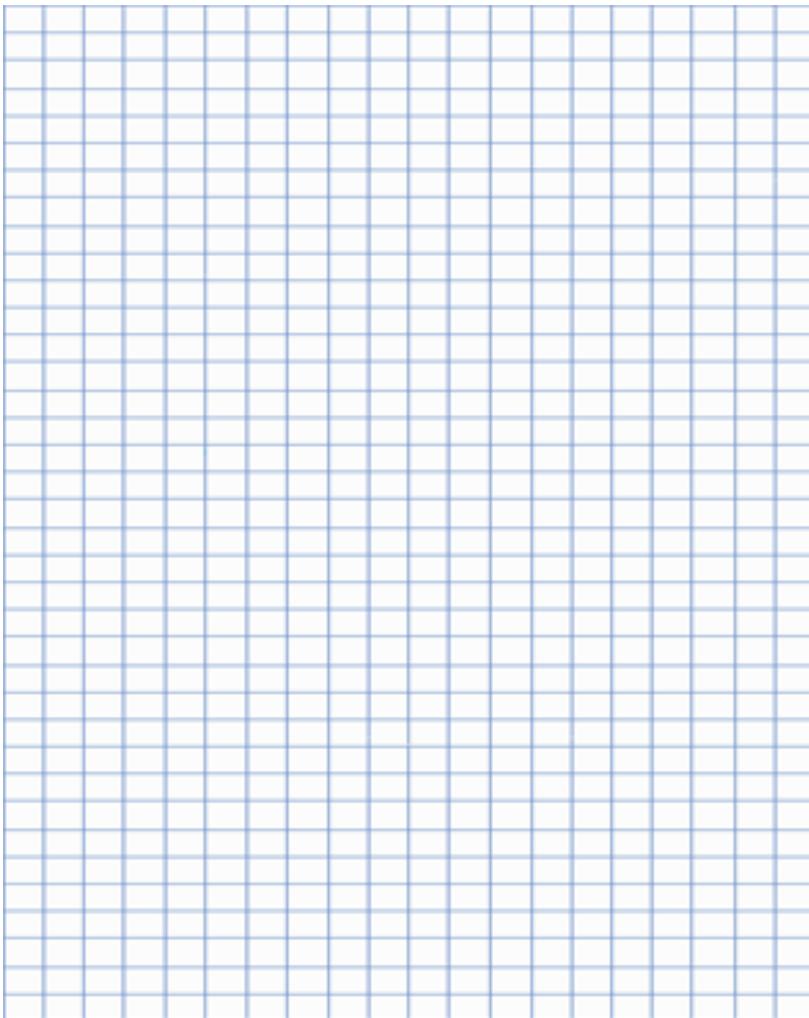


Pelicana will move its wings and make a noise when the button sensor is pressed. Furthermore, it can make various movements using the output sensor! Let's make some changes in its movement. Go to the next page.

Explanations

Coding the Pelicana robot

Let's change the robot's movement. Before, it started moving its wings when the button sensor was pressed. Now, we are going to make the DC motor rotate clockwise when the button is not pressed and counter-clockwise when the button sensor is pressed. It's very easy!





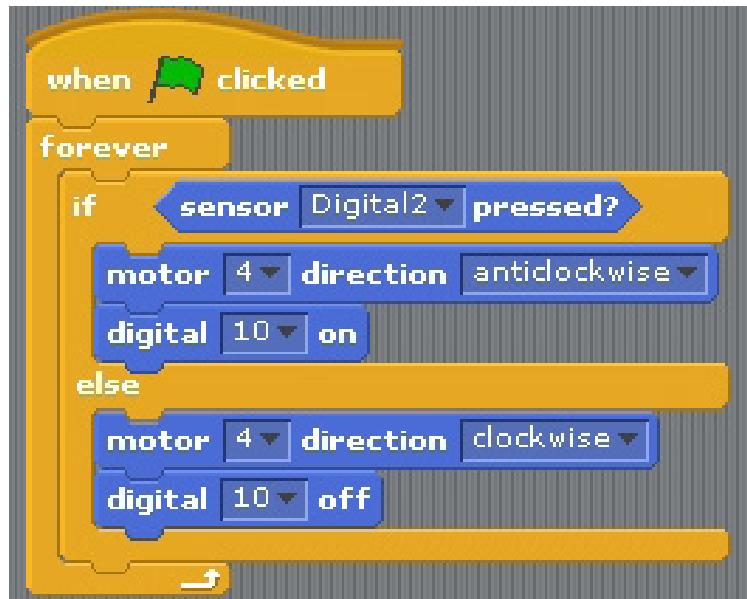
Explanations

Pelicana robot

Were you able to make the script? If it didn't work very well, check out the script below.

When the button sensor is not pressed, the DC motor rotates clockwise and the digital 10 output should be off.

When the button sensor is pressed, the DC motor rotates counter-clockwise and digital 10 output should turn on.



Now, code the robot so that it moves in any way that you want! Try using different blocks to produce different movements.

S C R A T C H C O D I N G K I T

Logic boost

Servo Motor

LESSON

7





Motor intro

Introduction to a servomotor

In this lesson, we will learn how to use a servomotor

Compared to the DC motor we have been using, a servomotor moves at an exact angle. Let's see how they are more different.

As you know, the DC motor is an electric motor that provides energy by rotating.

On the other hand, a servomotor acts like a human hand, making small movements. It is used to carry out detailed tasks.



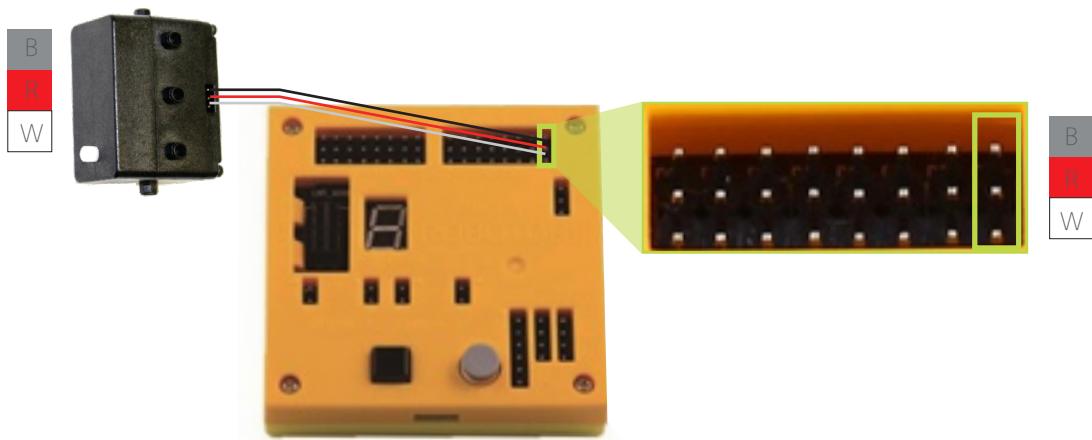
This robot arm uses a servomotor to carefully move around objects.

Robot arms might be more useful than human hands! Doctors sometimes let robots to save a person's life. These robots contain many servomotors inside.

Connecting the Servomotor

Connecting the Servomotor

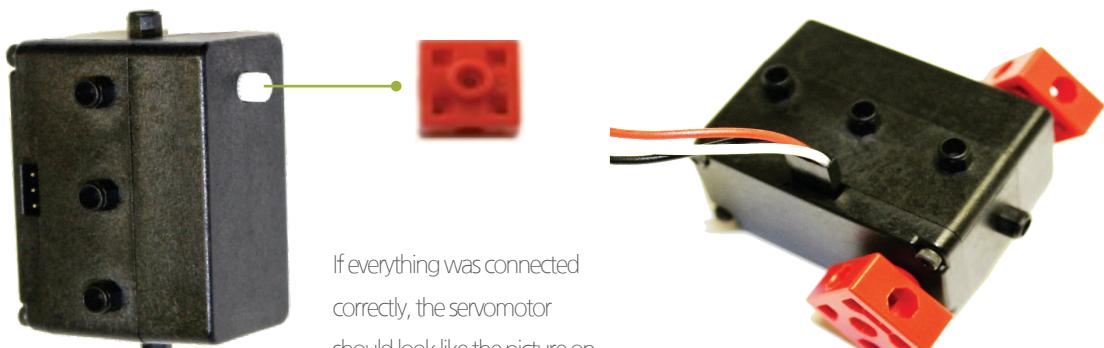
Before using the servomotor, connect it to the main cell using a 3-pin connector.



Connect the servomotor with the cable like above. Connect it so that the white cable is the closest to the servomotor's white bump.

For the servomotor to work correctly, a special cell called servo cell has to be connected to the motor.

Look for the servo cell (shown in the picture below) and connect it to the white bump of the servomotor.



If everything was connected correctly, the servomotor should look like the picture on your right!



Exercise servomotor coding

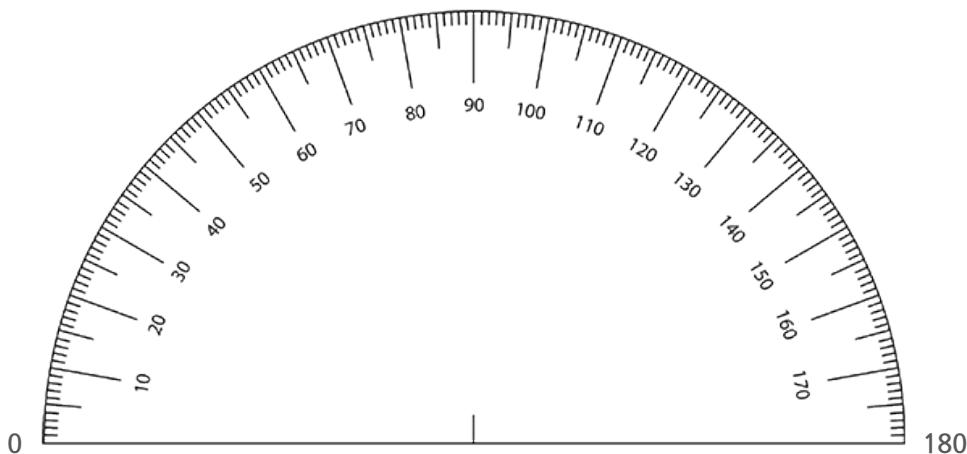
Activating the servomotor

Let's go to Scratch and activate the servomotor. Click the 'movement' tab and drag the block (shown below) to the script.



This block is to control the servomotor.

As mentioned before, servomotor moves in a certain angle. The servomotor will move at a 180 degree angle when the block is clicked.



You will see the red servo cell rotate when the block is clicked. The servo motor moves at a 180 degree angle. Change the number inside the block and it will move at different angle.

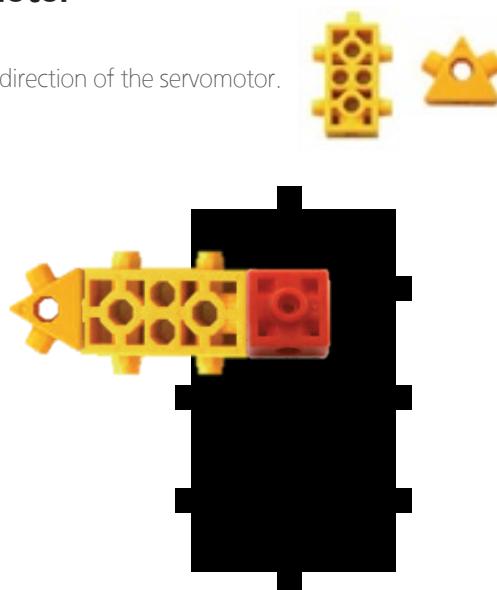
Like the picture below, if 180 is changed to 0, you will be able to hear the servomotor moving.



Exercise servomotor coding

Activating the servomotor

Using these blocks, we can see the direction of the servomotor.



Like you see above, let the pointer of the servomotor point at a 0 degree angle.

If you can't do it, take off the red cell and put it back so that it can point at a 0 degree angle.

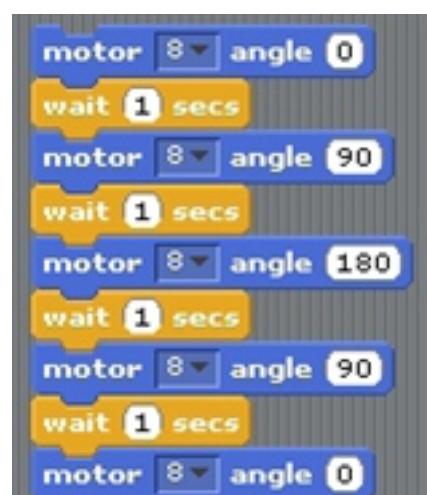
Let's make a simple program using the servomotor.

This program lets the servomotor start at a 0 degree angle and go back to 0 after moving at certain different angles. Make the script like you see on the right .

Remember!

Servomotor only moves between 0 and 180 degrees.

Even if you put in a number larger than 180, it won't go to that number.

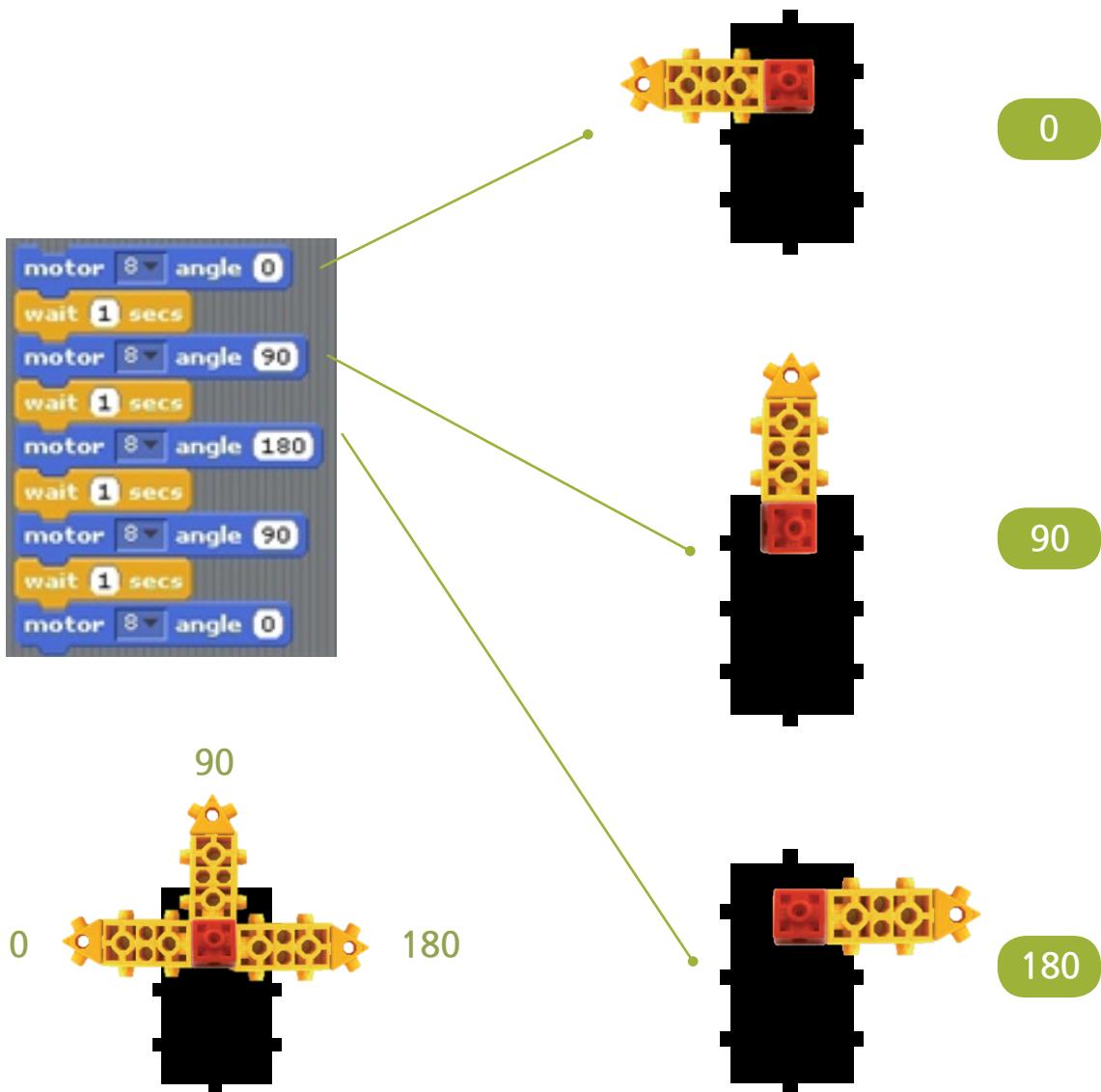




Exercise servomotor coding

Activating the servomotor

You can see the servomotor move like the picture

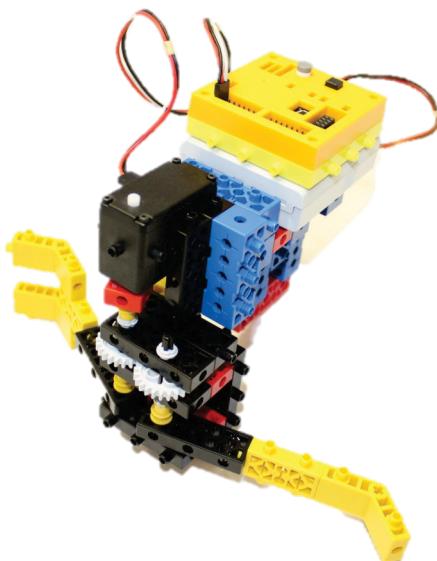
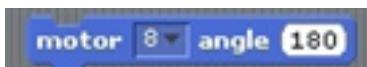


How to Make a Robot

Making catchbot

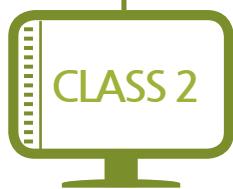
We will learn about the servomotor by making a catchbot that uses it.

Tip: Set the servomotor angle to 180 degrees. It would be easier to make the robot since the tongs will be opened.



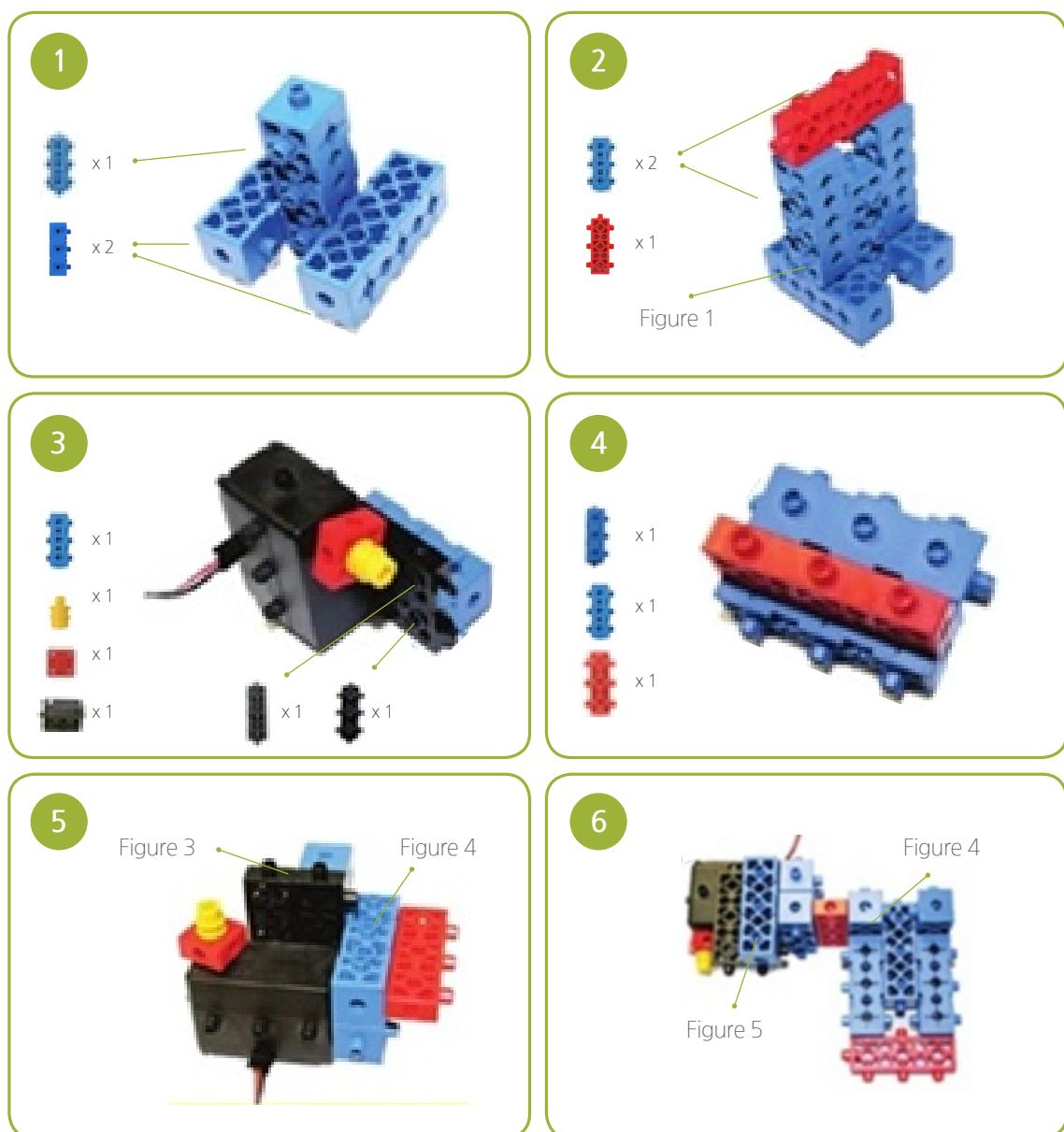
Materials needed for Catchbot

Diamond H8 x 1	Diamond H6 x 4	Diamond V8 x 1	Diamond V6 x 2	Rubi 8 x 3	Rubi 7 x 1	Rubi 6 x 3	Rubi 4 x 2	Rubi 2 x 1	Rubi 0 x 4	Mini 2 x 4



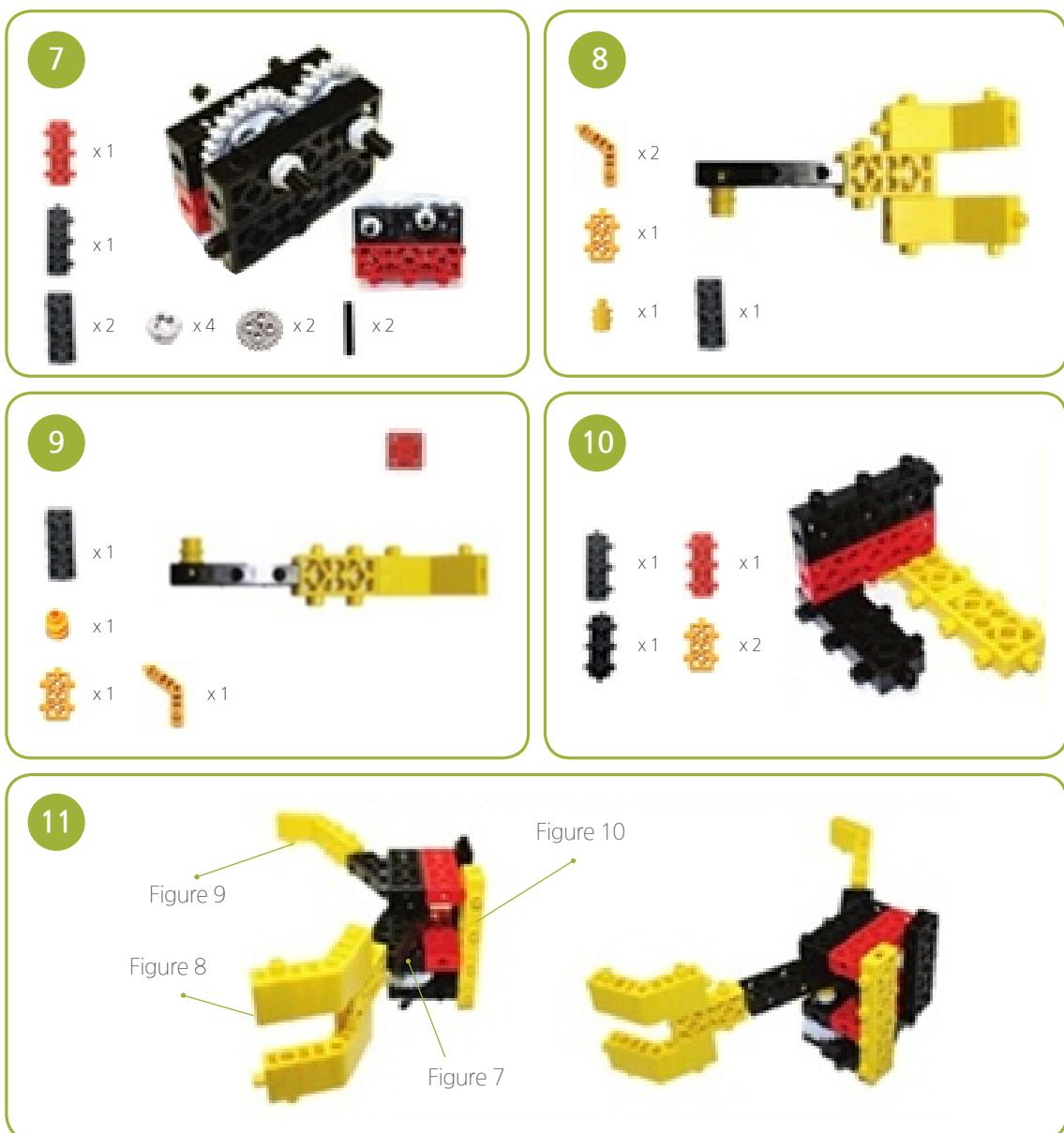
How to Make a Robot

Making catchbot



How to Make a Robot

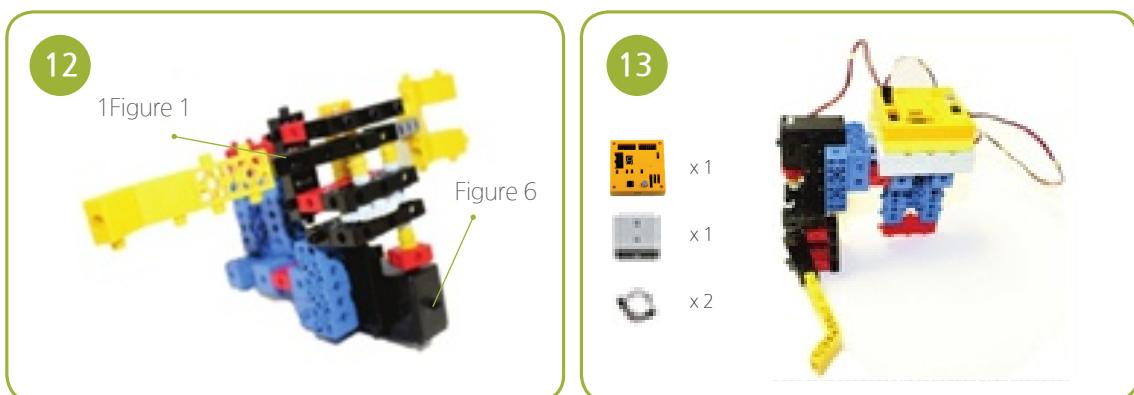
Making catchbot





How to Make a Robot

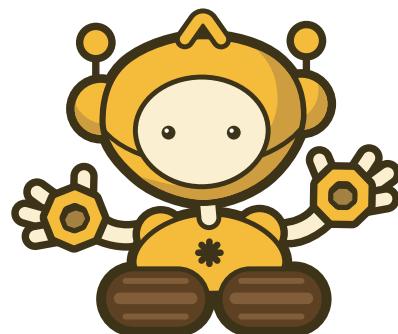
Making catchbot



Complete



I have tongs too!

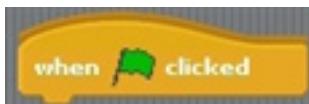
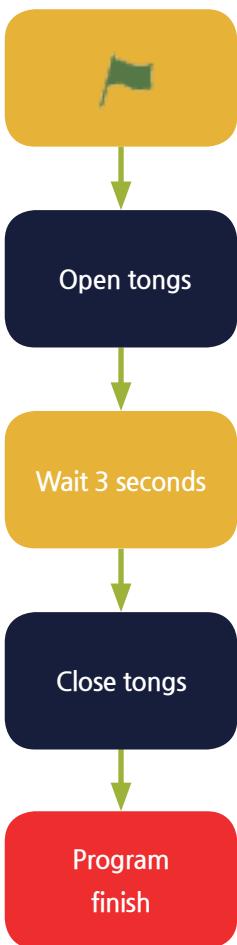


Experiencing catchbot coding

Coding Catchbot

Code so that the catchbot can hold an object.

The catchbot you just made can open and close its tongs. Let's see how the catchbot program will work by looking at the flowchart below.



The block above starts the catchbot program



Find out the angle at which the tongs open, and type it in the block



Find out the angle at which the tongs close, and type it in the block



Experiencing catchbot coding

Coding Catchbot

When the blocks are connected, it will look like the ones shown below.



Check out how the angles change. Depending on the user, the angles can be different.

Keep activating the program. You will see the tongs you made open and close!

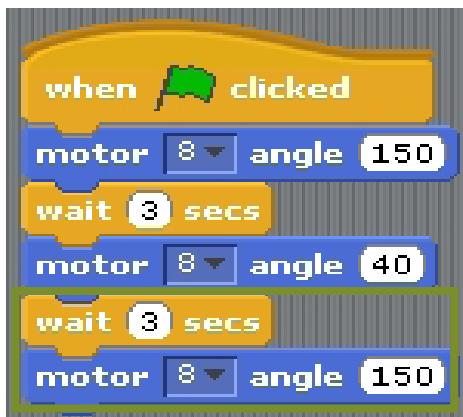
Using the catchbot, try holding an object like a tire from the robotory coding class kit.



Experiencing catchbot coding

Application of catchbot

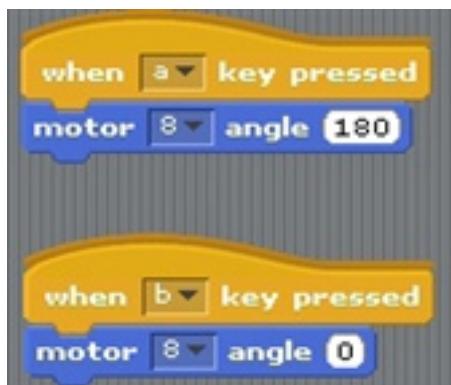
Add blocks to slightly change the program.



Remember the angles are different for different users.

Play a game with your friends. Draw a circle and try to move some objects into the circle. The winner is the one who does this the fastest without dropping any.

After the game, change the start block so that you can control the catchbot using the keyboard. Refer to the example below.



S C R A T C H C O D I N G K I T

Logic boost

DEBUGGING

LESSON 8



Intro to debugging

What is debugging?

Debugging is important in learning a program.

Debugging fixes program errors like fixing mistakes in a class project. Sometimes, a computer might not recognize the code you made and the program won't start at all.

Debugging finds the errors of a program and fixes them so the program will start correctly.



50 years ago, a computer was big enough to fill up a whole room!

The word 'debugging' was made by Grace Hopper in US navy.

When she was working in summer of 1945, computer kept showing errors, so she checked the computer and found a dead moth. She called it 'debugging' when removing the bug, making an important achievement.

Hopper taped the moth on the computer journal and wrote 'first bug founded'.



How to Make a Robot

Tongs robot

Now you will learn how to debug using the tongs robot.

First, let's make the robot.

Before starting, set the servomotor angle to 180 degrees. It's due to the same reason with the catchbot before.



Materials needed for tongs robot.

Diamond H8 x1	Diamond V8 x1	Rubi 8 x1	Rubi 4 x5	Rubi 7 x2	Rubi 6 x2	Rubi 2 x2	Rubi 0 x2	Mini 2 x2	Curve x1	Triangle x7	Servo x1
Short connector x2	Sawtooth 36 x2	A45 x2	Servo motor x1	DC motor x2	3pin connector x2	Main board 128x1	Battery case x1	Off-road wheel x2			

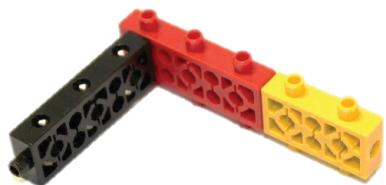
How to Make a Robot

Making the tongs robot

1

Make two of these.

— x 2
— x 2
— x 2



2

Figure 1

— x 2

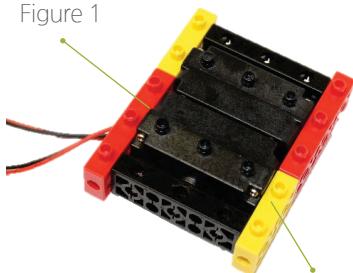


Figure 1

3

Make two of these.

— x 2
A 45
— x 2
— x 2



4

Figure 3

— x 2



front

5

Figure 4



Figure 2

6

— x 3

— x 1

— x 1

— x 1





How to Make a Robot

Making the tongs robot

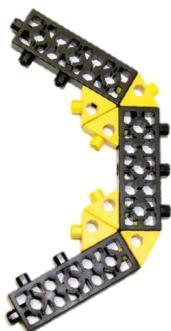
7



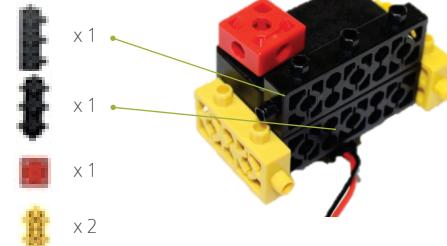
8



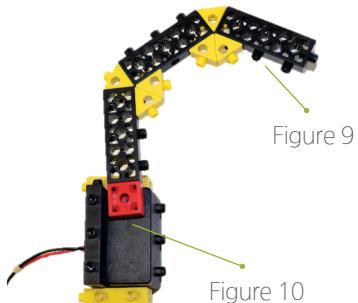
9

 x6
 x3

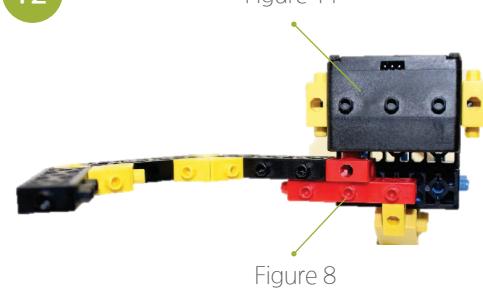
10



11



12



How to Make a Robot

Making the tongs robot

13

Figure 6

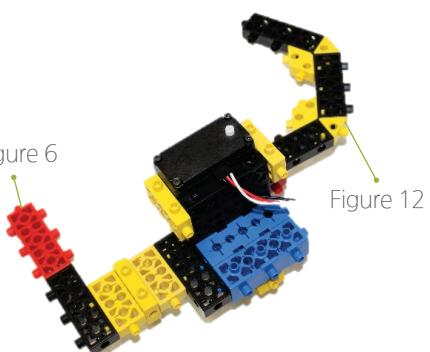


Figure 12

14

Figure 5

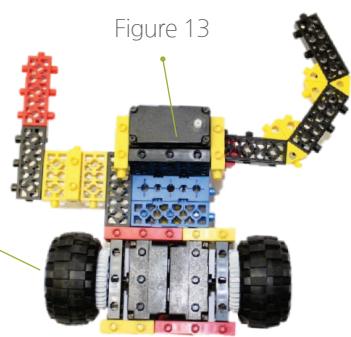


Figure 13

Complete



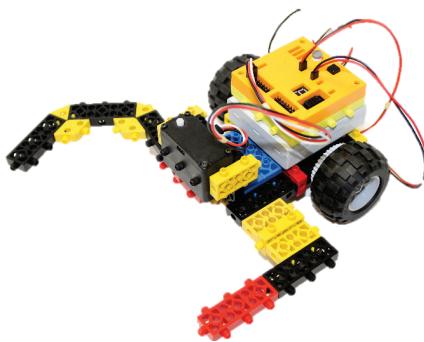
x 1



x 1



x 2

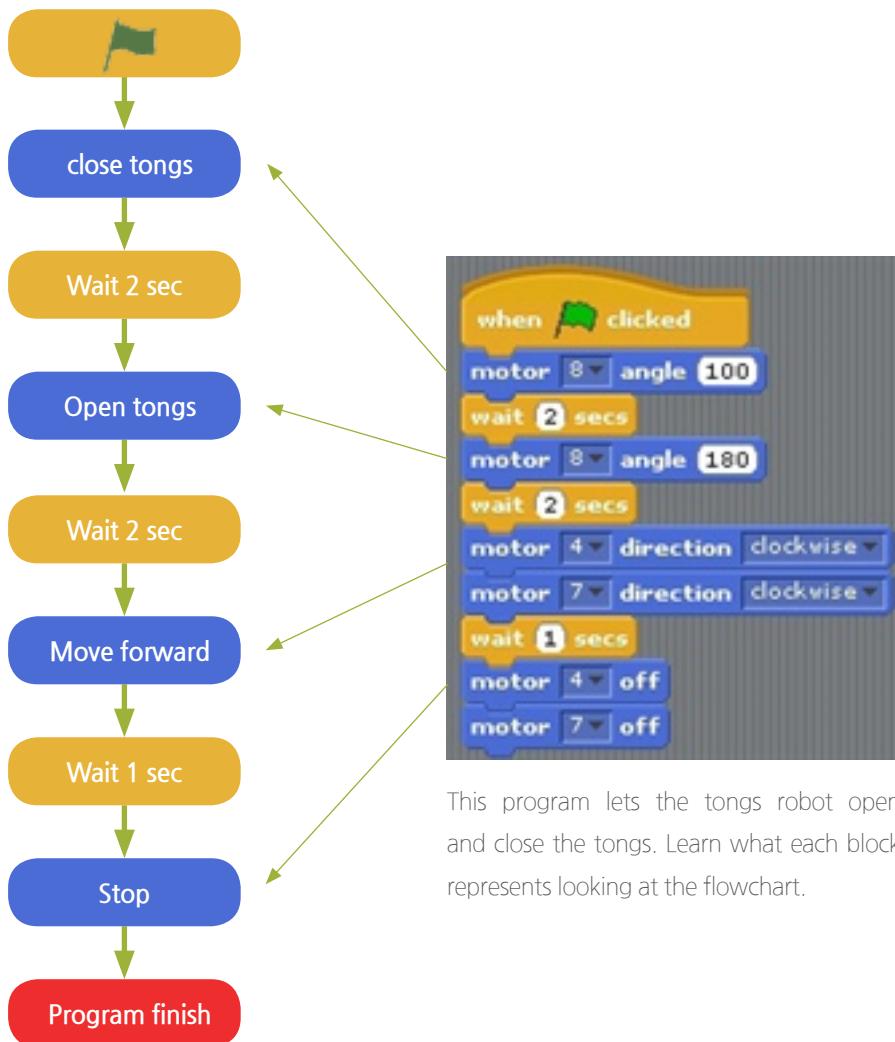




Coding the tongs robot

Understanding the tongs robot code

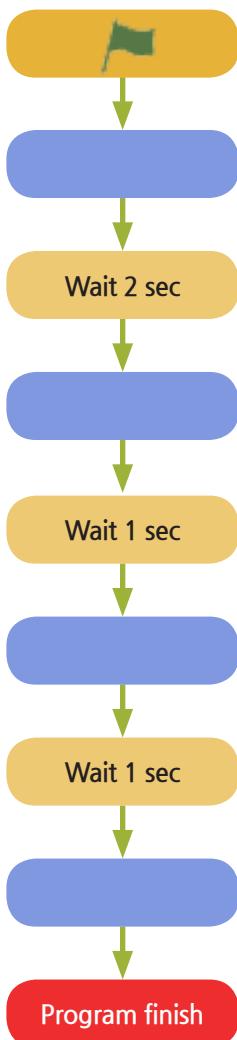
It's important to imagine how you will operate the program after looking at this code. Check out the code below.



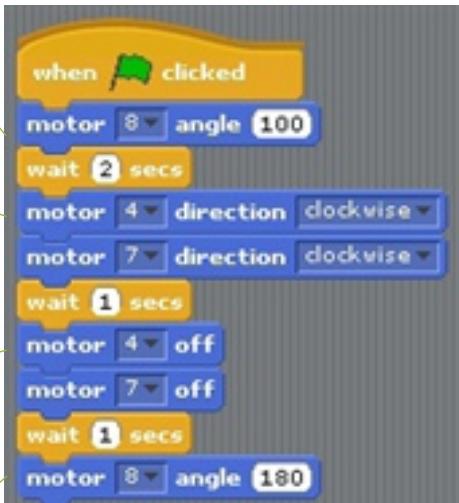
Coding the tongs robot

Understanding the tongs robot code

Make the program below. This time you can fill out what each block does in the flowchart.



Before starting the program, fill out the blanks to the left. What does each block do?



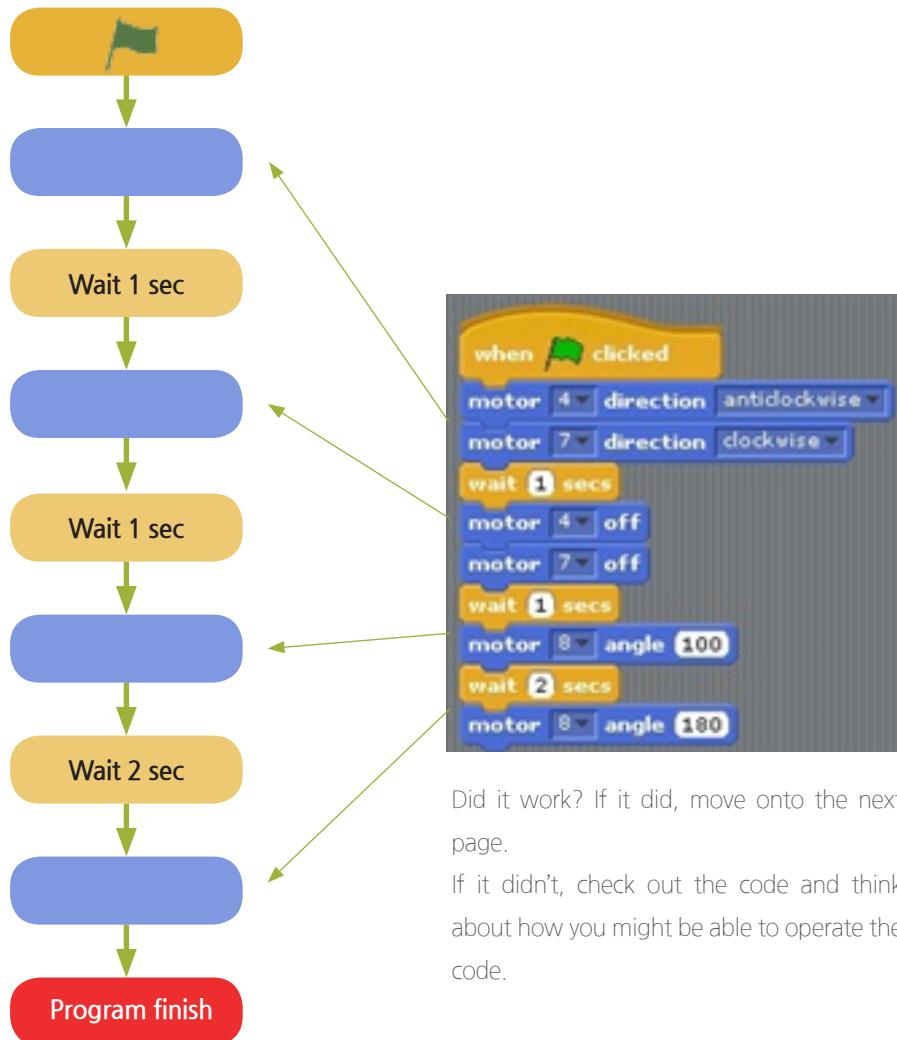
Did it work? If it did, move onto the next page. If it didn't, check the code again and think about how you can operate the code differently.



Coding the tongs robot

Understanding the tongs robot code

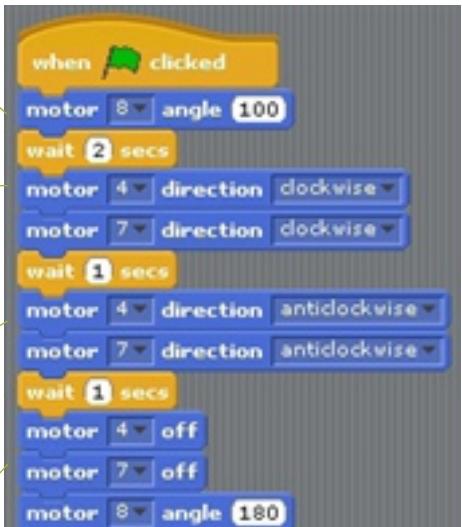
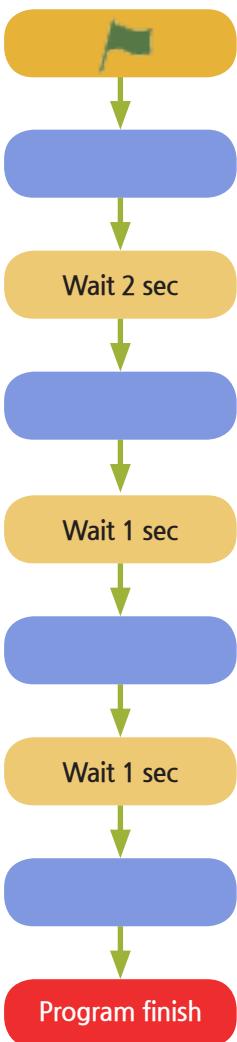
Make the program below. Fill in the blanks of the flowchart, too.



Coding the tongs robot

Understanding the tongs robot code

Make the program below. Fill in the blanks of the flowchart too. The last block might be a bit hard.

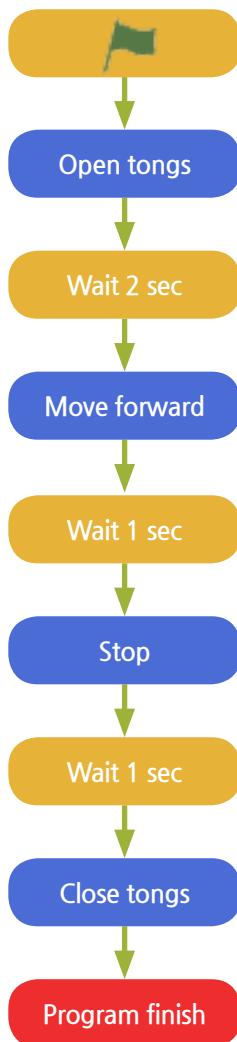


Did it work? If it did, move onto the next page. If it didn't, check out the code again and think about how you might be able to operate this code.



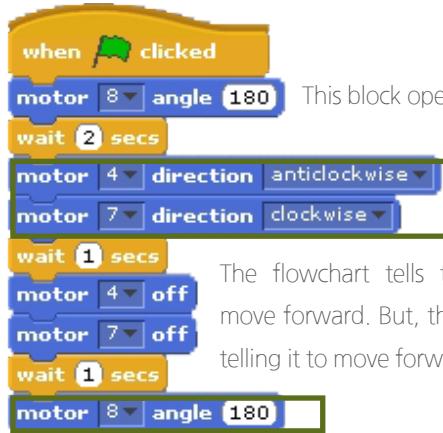
Tongs robot and Debugging

Debugging the tongs robot



If you understood how the code works before, let's see a code with some errors. The flowchart is made with correct orders in sequence.

But, the code below has some errors. Read it through and let's find out what they are.



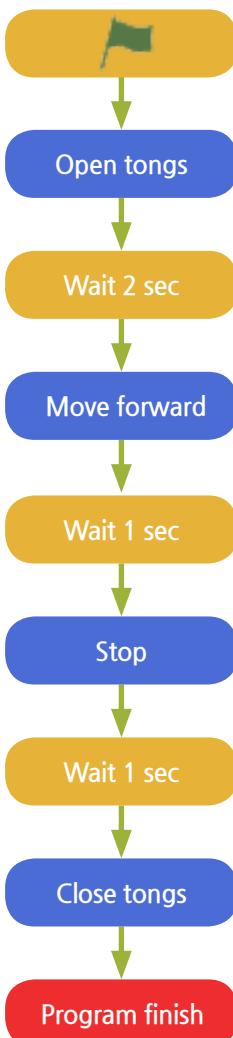
The flowchart tells the robot to move forward. But, the code is not telling it to move forward.

Is this block opening or closing the tongs? Do you see the problem?

The code above has two problems. Compare it with the flowchart and fix the errors of the program.

Tongs robot and Debugging

Debugging the tongs robot



If you understood how the code worked before, let's see a code with some errors. The flowchart is made with correct orders in sequence.

But, the code below has some errors. Read it through and let's find out what they are.

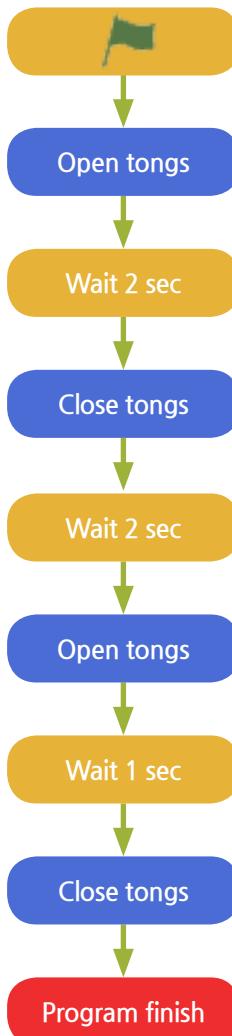


Type in an angle at which the tongs are closed.



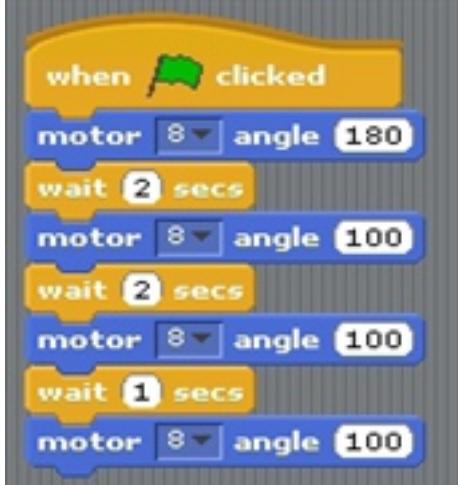
Tongs robot and Debugging

Debugging the tongs robot



Now, try debugging the code by yourself. Make the program you see below and fix the problems by referring to the flowchart on your left.

Did you find the errors?
If you don't, start the program and see where you find the problems.



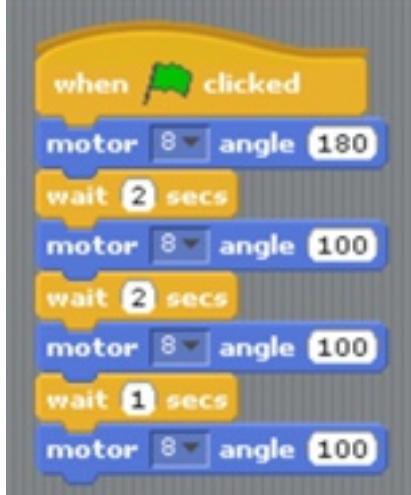
Write down what the errors are and how they should be fixed on the next page.

*The whole script can be found at http://www.robotori.com/web_eng → Moretips → Manual → EDU → Logic boost CODING CLASS 2 → download whole script

Tongs robot and Debugging

Debugging the tongs robot

Program debugging journal





Tongs robot and Debugging

Debugging the tongs robot

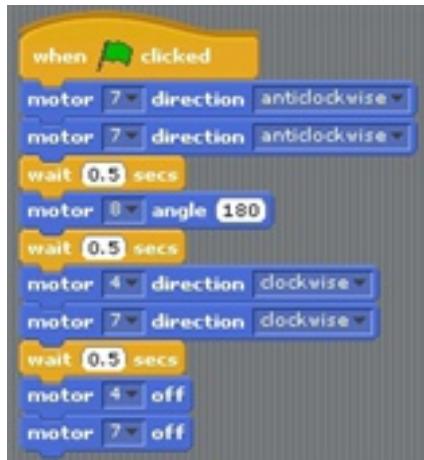


Check out the second example.

Make the program you see below and fix the errors by referring to the flowchart on your left.

Did you find the errors?

If you didn't, start the program and see where you find the problems.



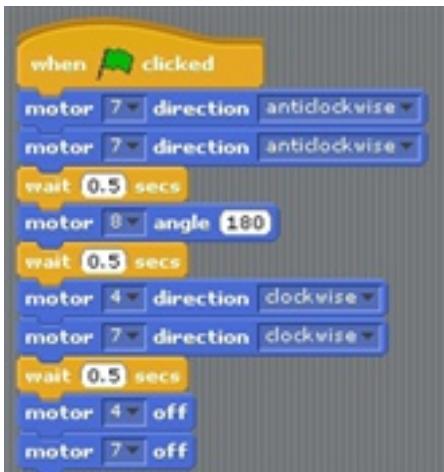
Write down what are the errors and how they should be fixed on the next page.

The whole script can be found at http://www.robotori.com/web_eng → Moretips → Manual → EDU → Logic boost CODING CLASS 2 → download whole script

Tongs robot and Debugging

Debugging the tongs robot

Fix the program errors in the space to the right. Pay attention to the DC motor's port numbers. Find the problems in the script below!

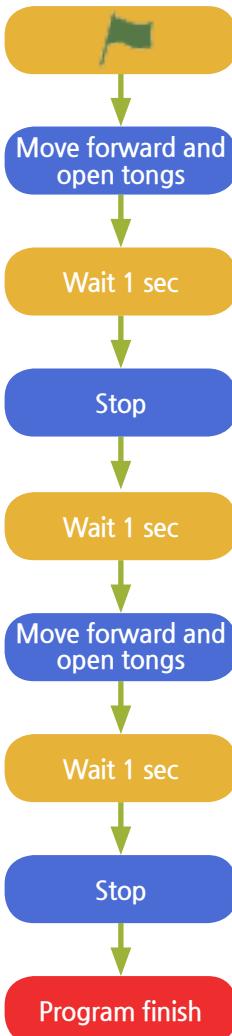


Program debugging journal



Tongs robot and Debugging

Debugging the tongs robot

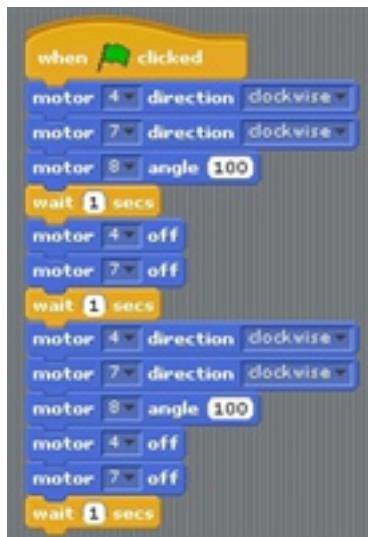


Check out the third example.

Make the program below and fix the errors referring to the flowchart on the left. This one can be a bit tricky.

Did you find the errors?

If you couldn't, start the program and see where the problems are.



Write down what the errors are and how they should be fixed on the next page.

※ The whole script can be found at
[www.robotori.com-Moretips-Code-robotory coding
 class-download whole script.](http://www.robotori.com-Moretips-Code-robotory coding-class-download whole script)