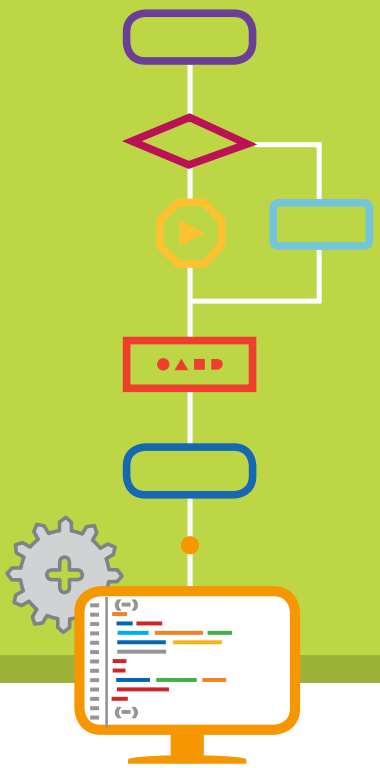
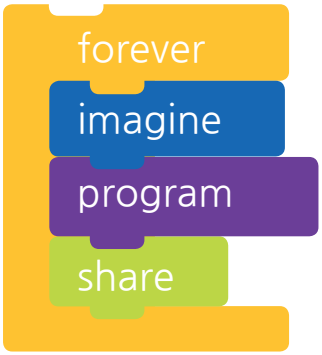
SCRATCH CODING KIT

Logic boost

CODING CLASS

CLASS 2





Educational Toy

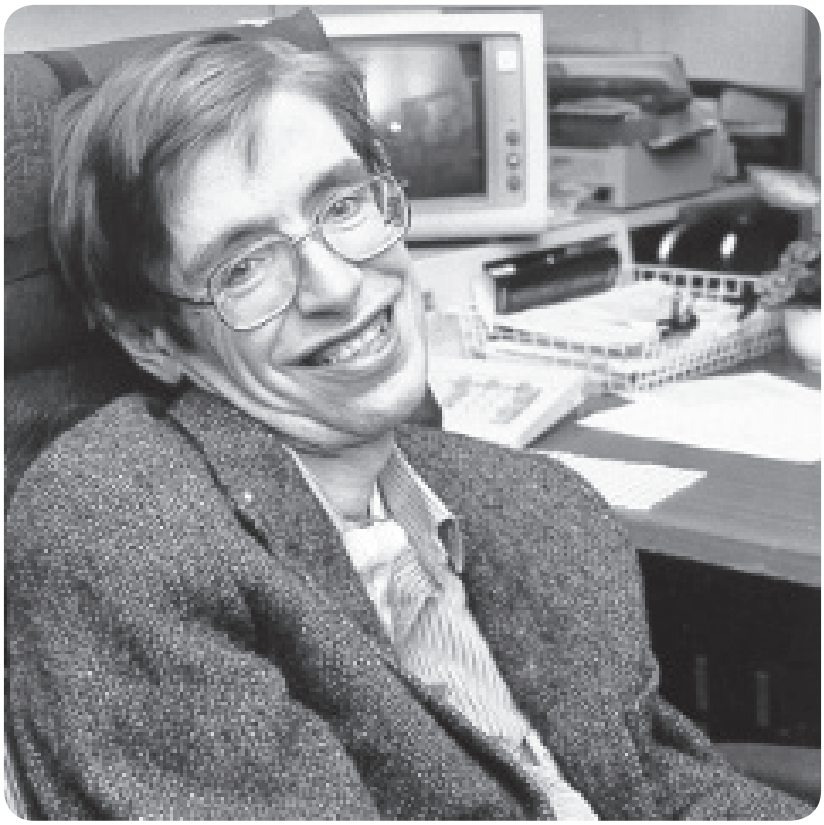
ROBOTORI

CLASS 2

Before we start

Whether you want to uncover the secrets of the universe, or you just want to pursue a career in the 21st century, basic computer programming is an essential skill to learn

Stephen Hawking, theoretical physist, cosmologist, author



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CLASS 2

Introduction

Welcome to CLASS 2!

How was Class1?

In this class, we will be testing different sensors and what we can do by adding sensors to a DC motor. You will be making more complex robots.

Should we start?

SCRATCH CODING KIT

Logic boost

conditional sentences

LESSON 1

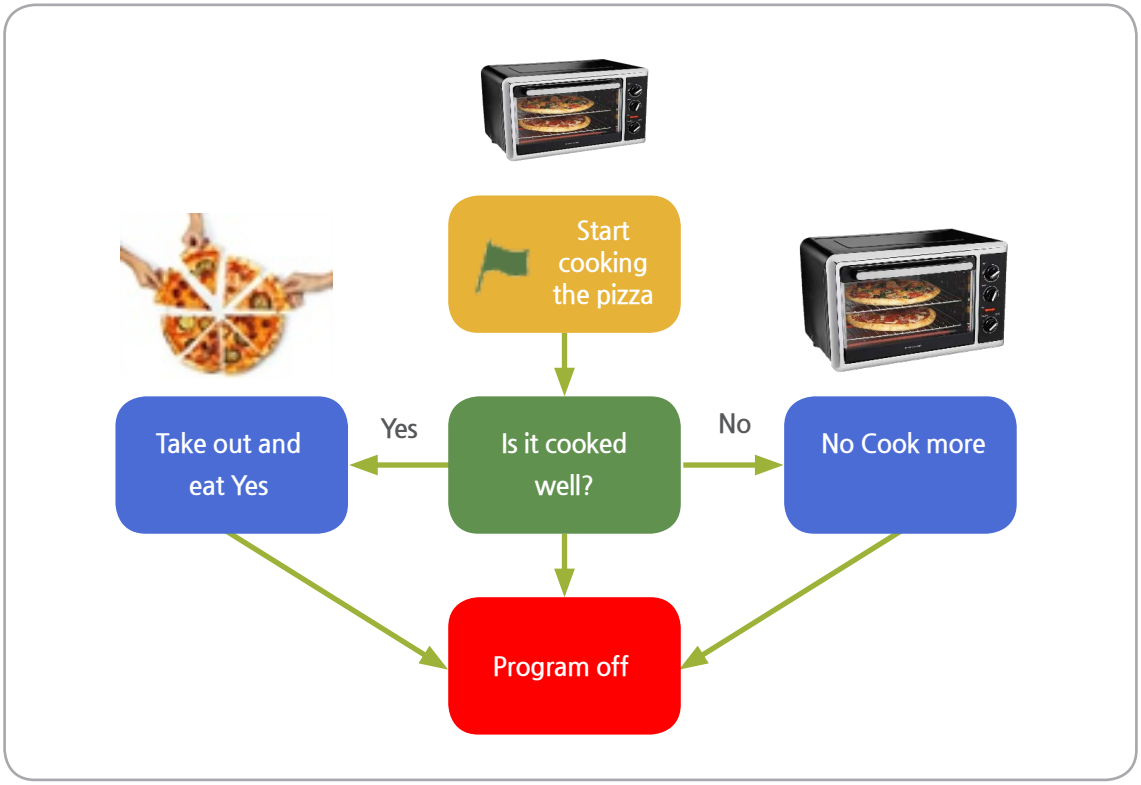
CLASS 2

Conditional sentences

Intro to conditional sentences

We are going to learn about conditional sentences.
We will be starting with 'If…' block and 'If…if not…' block. Let's find out what they do.

Imagine you are a computer that can cook a pizza in the oven. You will have to check if it's cooked completely or not. Look at the pictue below!

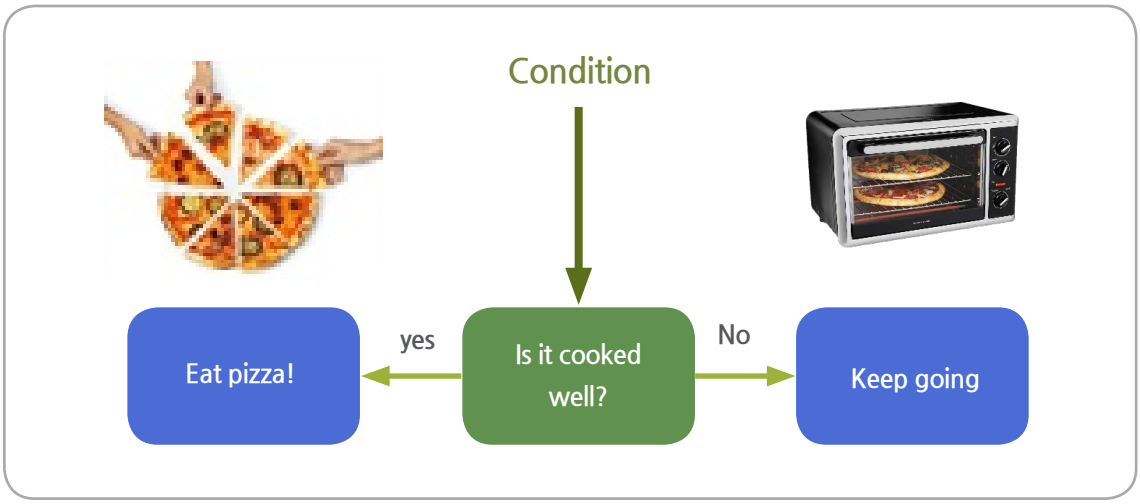


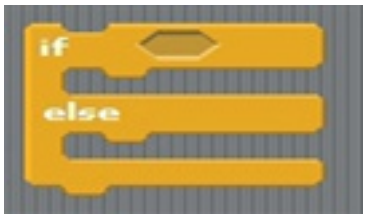
"If" the pizza is cooked well, you can eat it.
"If" it isn't, we have to cook it more.
This can explain how a program cooks the pizza!

Conditional Sentences

Conditional Sentences

Whether we can eat the pizza or not depends on the condition of the pizza. The conditions for the pizza are either cooked or uncooked.





Scratch 'If' and 'Else' block

Click the control tab and drag the 'If…Or else…' block to use it.

CLASS 2

Conditional sentences

Conditional sentences

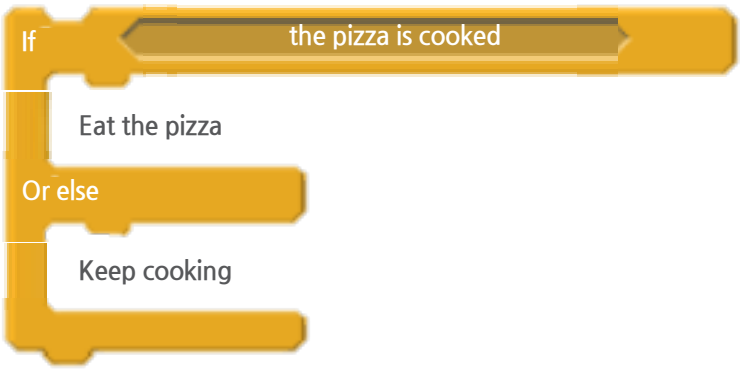
Let's apply what we learned.

If pizza is cooked well…

Eat pizza!

Or else…

Keep it in the oven!

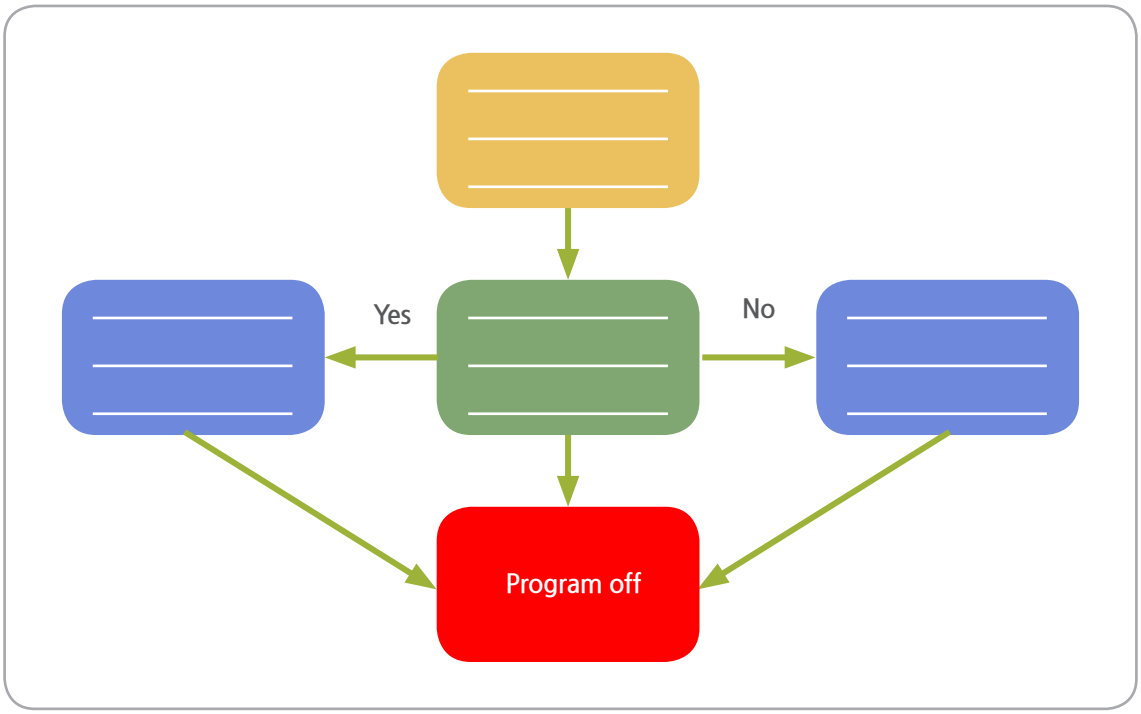


To start from the top, it says eat the pizza "If" it's cooked.
But, it says "or else," keep cooking if it's not cooked well.

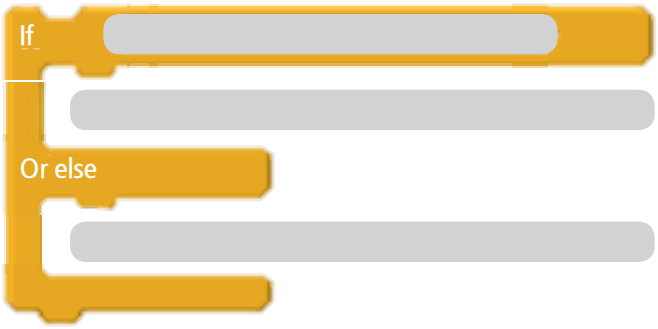
Conditional sentences

Make your own "If…Or else…" example

Make your own 'if or else' example below.



Apply your example above to this 'If..or else..' Scratch block.



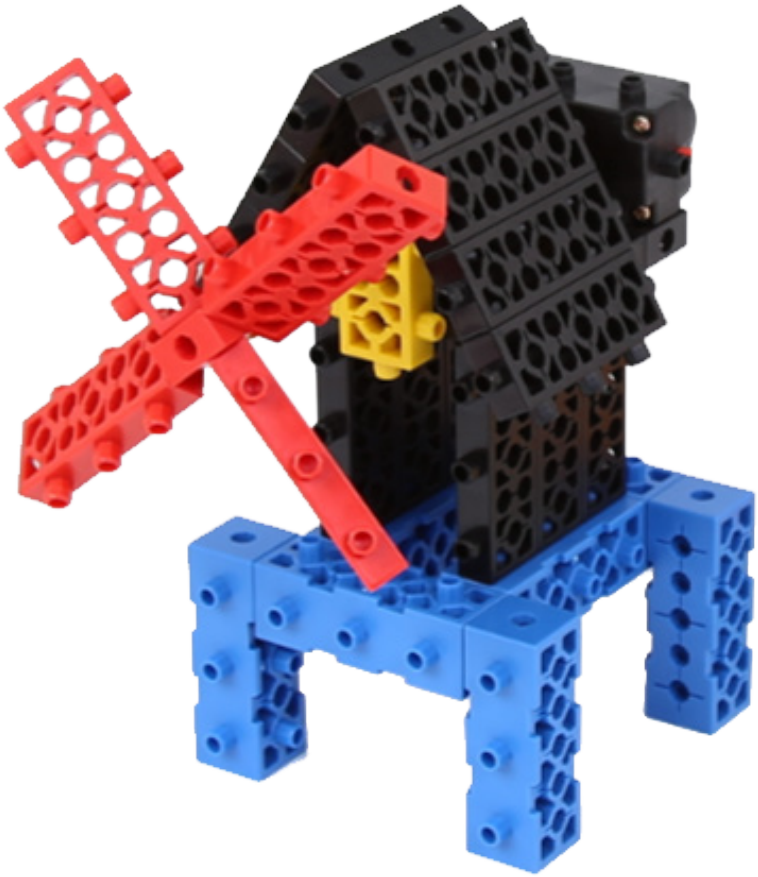
CLASS 2

Intro to conditional sentences

Windmill using conditional sentences

Let's make the familiar windmill model from class1!

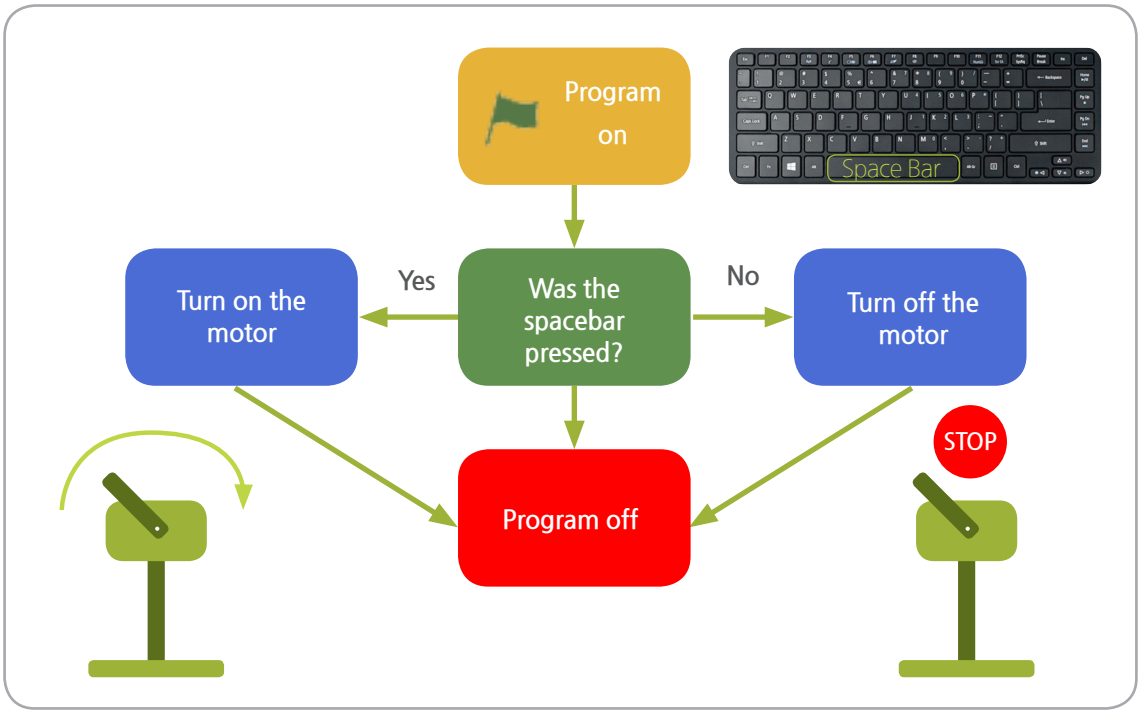
It will be easy since you've already made one. Using this, we will be experiencing how to use 'If..or else..' phrase.



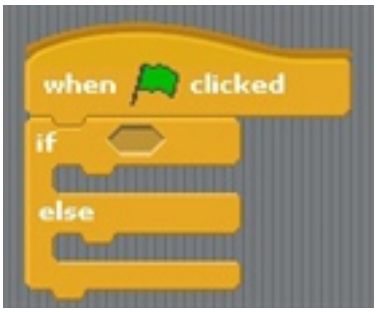
Intro to conditional sentences

Windmill using conditional sentences

Our goal is to activate the motor with the spacebar.
Let's look at the picture!



To start the program, bring the 'if or else' block under the green flag block.

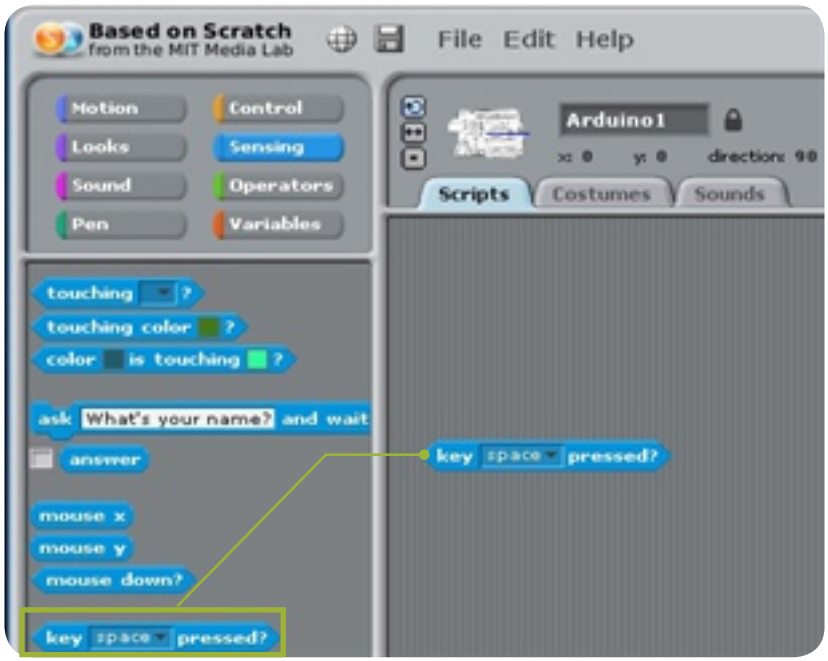


CLASS 2

Intro to conditional sentences

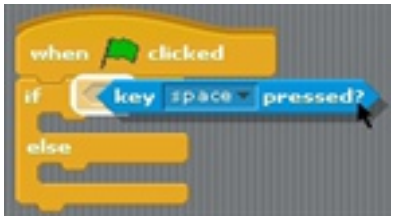
Windmill using conditional sentences

Click the 'Observation' tab and drag the 'Click ___key' block to the script.

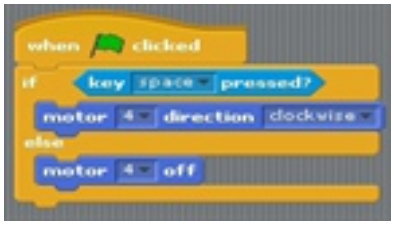


Now, drag the 'Click___key' block into the 'if or else' block.

The conditions would be whether the spacebar is pressed or not



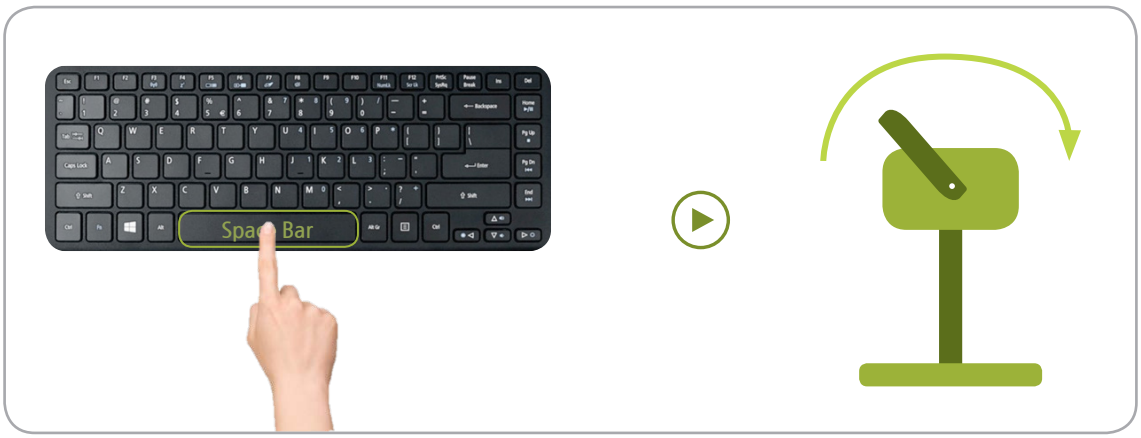
Now, this code tells us that when the spacebar is pressed, it starts motor4 or else it gets turned off.
But, it does not start when the spacebar is pressed. Let's find out why.



Intro to conditional sentences

Windmill using conditional sentences

Press the spacebar and see if the motor starts working!



Now, don't press the spacebar and click the flag icon. You will see the motor is not starting!
This is because the program checks if the spacebar was pressed or not pressed before it turned the motor on or off.

You might be wondering why we didn't use the block below when we made the script.

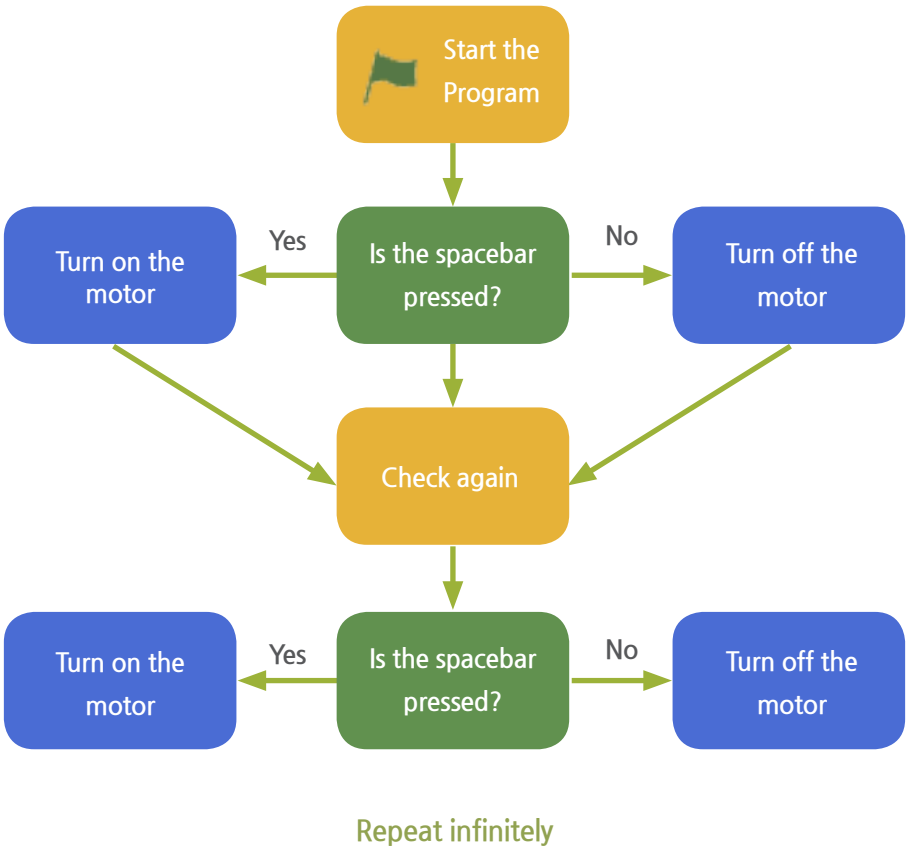
The block above is in charge of activation, so it's hard to use when we want the spacebar to start the motor and turn off the motor (two tasks). Think about the difference between the 'Condition' block and the 'Start' block.

CLASS 2

Practice Using Conditional Sentences and Loop

'If or else' and infinite repetition

Now, your program does not check if the spacebar is pressed or if it was pressed again. What we are trying to do now is make the program continueously check if the space bar is pressed.



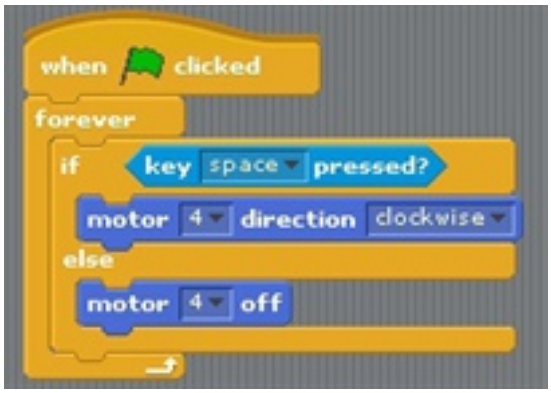
Practice Using Conditional Sentences and Loop

'If or else' and infinite repetition

If we want the program to keep checking, it would look like this.

We will make the program wait 1 second and check again. Then, we have to use an infinite number of blocks!

This is the perfect time to use 'infinite repetition'.



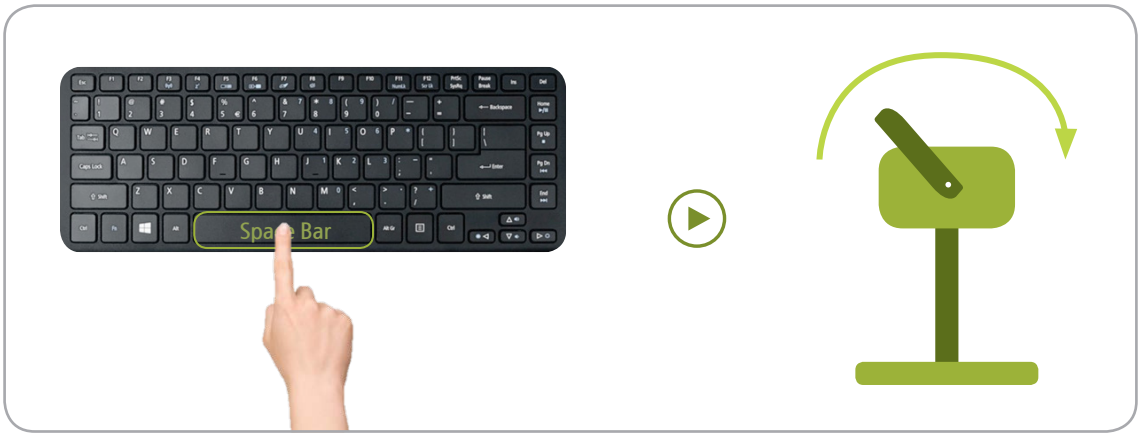
Now, the program will automatically keep checking if the spacebar is being pressed or not. Let's see what change this brought to the motor's movement.

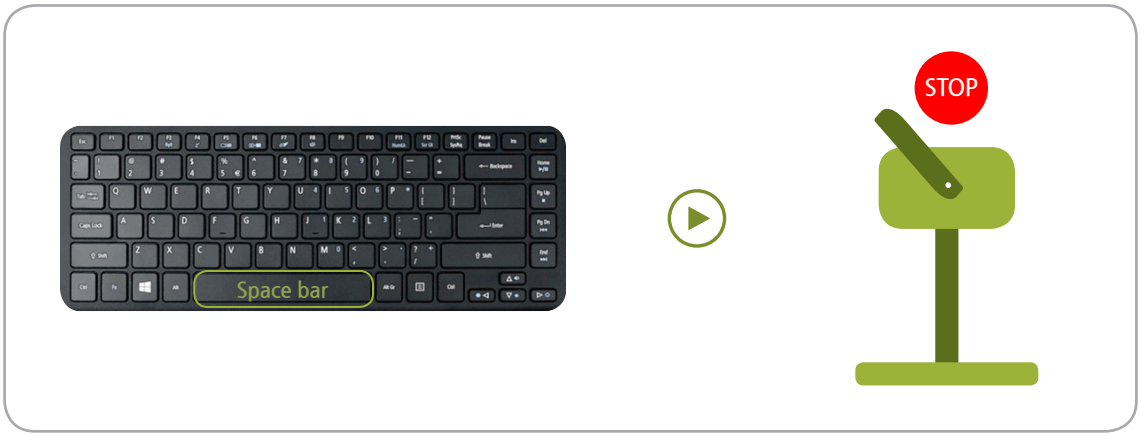
CLASS 2

Practice Using Conditional Sentences and Loop

'If or else' and infinite repetition

Now, the motor will turn on when you press the spacebar.
On the other hand, if you don't, the motor will turn off.





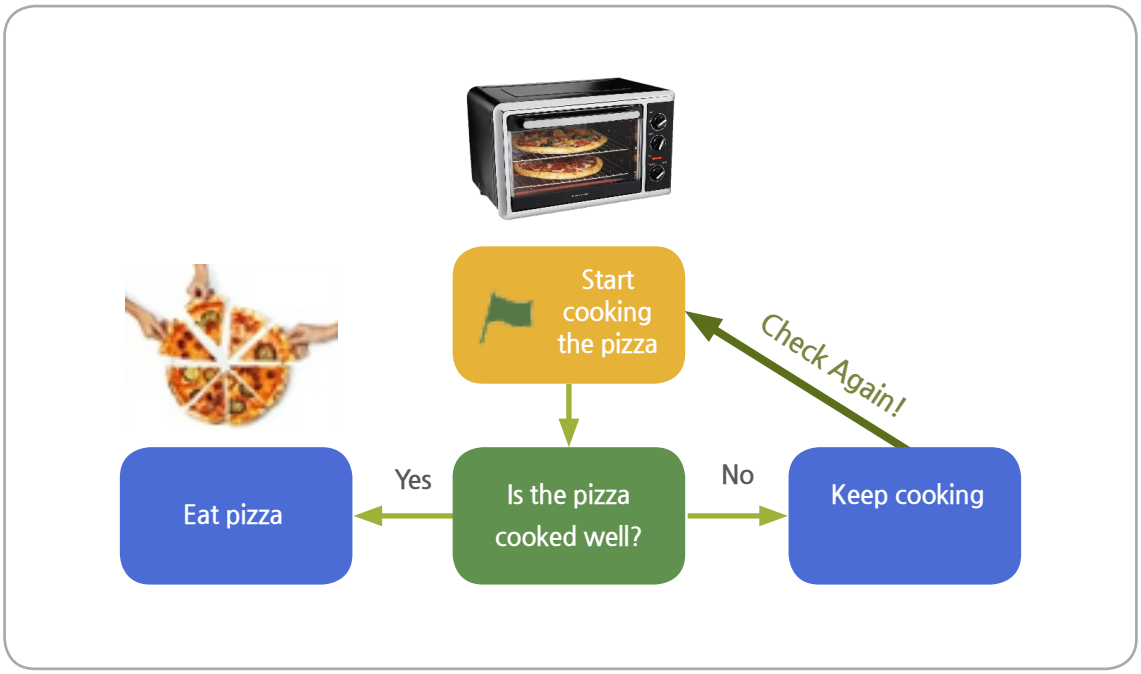
This is because the computer constantly checks if the spacebar is being pressed or not.

For one more example, let's see the next page where it explains the pizza program.

Practice Using Conditional Sentences and Loop

'If or else' and infinite repetition

The pizza program below checks the pizza only once!
This means that we could've burn the pizza and have to throw it away!
To avoid this, we need to keep checking the pizza.



SCRATCH CODING KIT

Logic boost

BUTTON SENSOR

LESSON 2

Sensor Introduction

What is BUTTON SENSOR ?

The button sensor is used for the circuit's connection/disconnection.
It becomes 'active' when the button is pressed down at the part where it opens/closes in a circuit. It goes back automatically when the button is not pressed down.

It clicks when the button is pressed, and LED will light up and connect the circuit.

Side

Front

Above is how the button sensor looks like. Look for one!

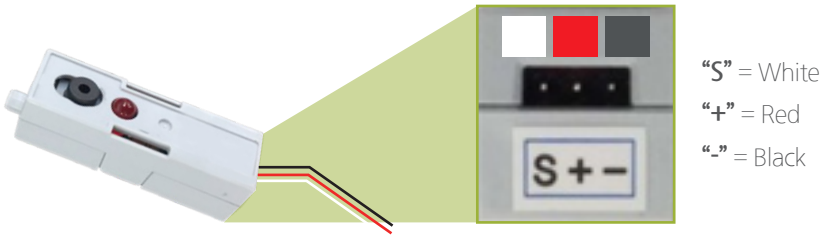
Now we are going to check if a value gets entered when the button is pressed.
Let's check what kind of values there are.

CLASS 2

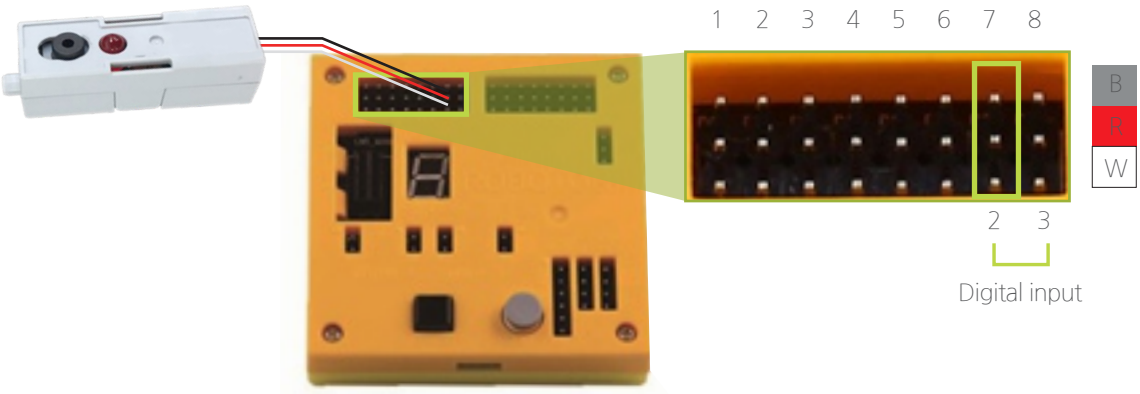
Connecting to the main cell

Connecting the button sensor

Let's learn how to connect the button sensor with the main cell.
Plug in the 3-pin connection jack to the button sensor.
Refer to the picture below



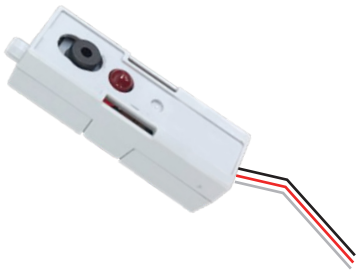
※ If it's not plugged in to the right place, the sensor won't work. Check before you plug it into slot 7.



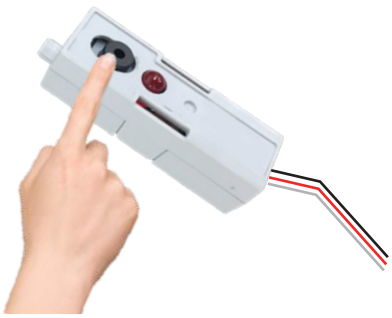
Experiencing the button sensor

Using the button sensor

Let's turn on the main cell and go to Scratch. See what kind of information the sensor is giving us. If everything is connected well, try pressing the button.



If the button is not pressed, "digital2" will show "false".



When the button is pressed, "digital2" will show "true".

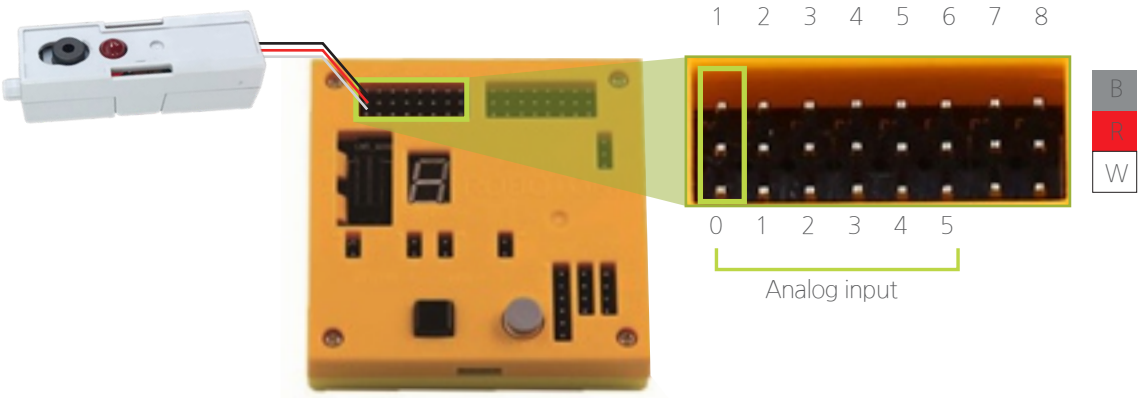
It basically means the button is pressed when 'digital2' shows 'true' and vise versa.

CLASS 2

Experiencing the button sensor

Connecting the button sensor to the analog port.

Connect the main cell's analog port and the button sensor.



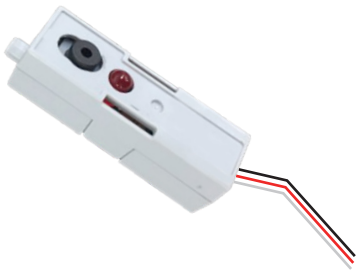
Check the values shown after connecting the button sensor.

You can see that 'Analog0' stays at 255! When there is no input or nothing entered, the analog value of the button sensor will stay at 255.

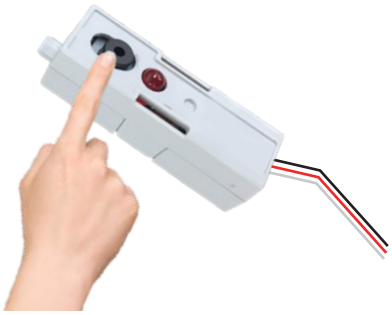
If you press the button, the value will decrease. If It isn't, the value will increase.

Experiencing the button sensor

Using the button sensor



Leave the button sensor and 'analog0' will be 255



When the button sensor is pressed, 'analog0' will decrease.

The button sensor's analog value is 255 before pressing, and it decreases when it's pressed. Keep this in mind so that we can set the basic value while coding. Just remember the analog value of the button sensor decreases when we press the button.

More details of analog will be covered in the next level. Button sensor can also be connected to the analog port.

CLASS 2

How to Make a Robot

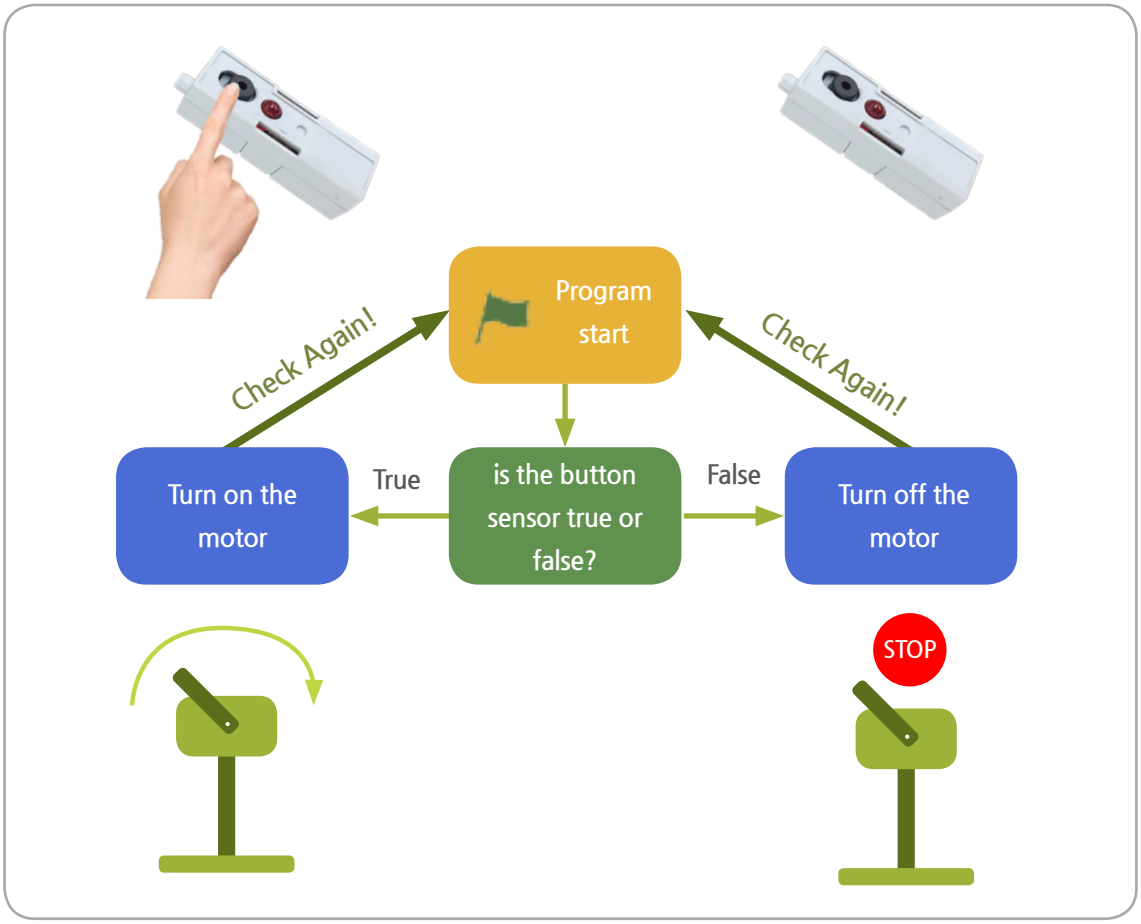
Using the button seonsor

Now we are going to find out how we can use the button sensor.
You will first have to make our old friend, the windmill. You will be able to make the model easily!

Experiencing the button sensor

Coding the windmill using the button sensor

The flowchart will be the same with only some little differences



If you press the button, the motor will turn on. If you don't, the motor will turn off!

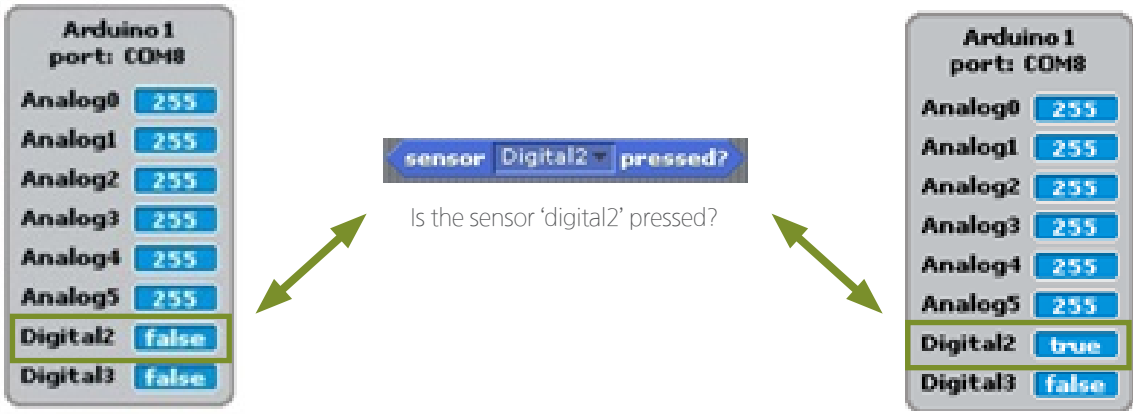
CLASS 2

Experiencing the button sensor

Using the windmill and the button sensor

Now, we are going to activate the windmill with the button sensor.
First, we need a way to bring "True" and "False" from the button sensor to Scratch. To do this, go to the 'movement' tab and drag in the 'is sensor digital 2 pressed?' block to the script.

This 'is sensor digital 2 pressed?' block shows if the value is 'true' or 'false'.

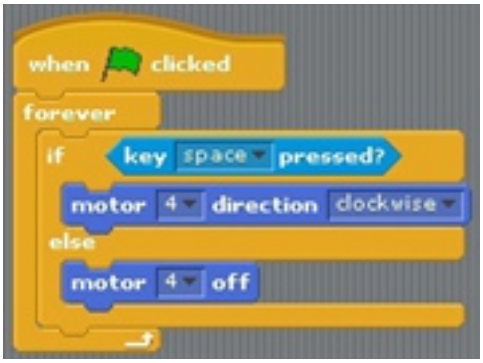


Experiencing the button sensor

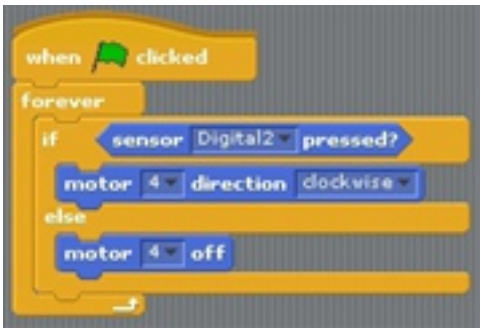
Coding the windmill using the button sensor

We just finished coding the windmill to operate when the spacebar is pressed. Now, we are going to code the windmill to operate when you press the button sensor. You might have realized already, but the 'is the sensor 'digital 2' pressed?' block and the 'click the spacebar?' block are the same shape.

This is because these blocks are conditional. The program we made before is the same as this.



If we change the 'click spacebar?' block to the 'is the sensor 'digital2' pressed?' block…



Now, start the program to see if the windmill operates well.

SCRATCH CODING KIT

Logic boost

Boxing robot

LESSON 3

How to Make a Robot

Boxing robot

We are going to make a robot that can throw some punches using two button sensors. It's a boxing robot!

Do you remember activating a motor using just one button sensor?

This time, we will be using two button sensors to control two motors separately.

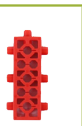
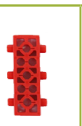
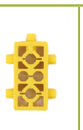
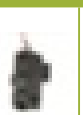
CLASS 2

How to Make a Robot

Boxing robot

Make a boxing robot

Materials needed for the boxing robot

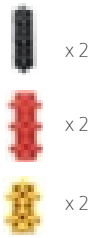
										
Diamond H8 x 3	Diamond V8 x 2	Rubi 7 x 4	Rubi 6 x 4	Rubi 4 x 5	Rubi 2 x 4	Rubi 0 x 2	Mini 2 x 4	Mini 1 x 2	Curve x 4	Triangle x 3
										
Sawtooth 36 x 5	Short connector x 7	Middle connector x 6	hexagon x 1	A 14 x 2	A 23 x 6	A 45 x 2	A 64 x1	BUTTON SENSOR x 2	DC motor x 2	connector x 3	Battery case x 1	Mainboard x 1

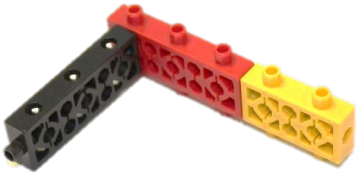
How to Make a Robot

How to Make a Boxing robot

1

Make two of these.





2

Figure 1

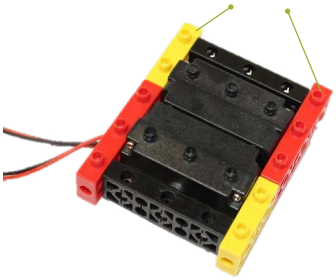


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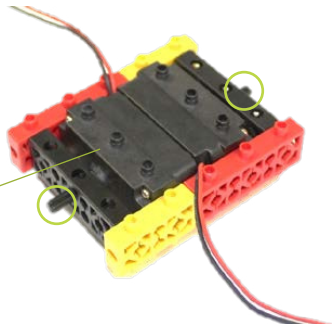
Figure 2



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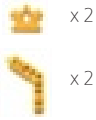

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Figure 4

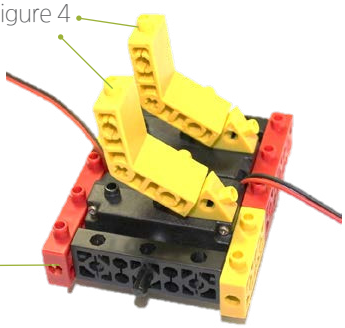


Figure 3

6

Make two of these.

CLASS 2

How to Make a Robot

How to Make a Boxing robot

7

Make two of these.

x 2

x 2

A23

8

Figure 7

Figure 6

9

Make two of these.

x 2

x 2

10

Make two of these.

x 2

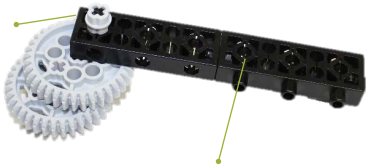


Figure 9

11

Figure 10

Figure 5

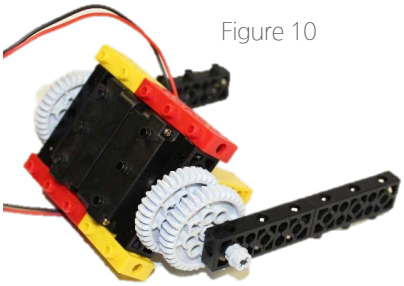
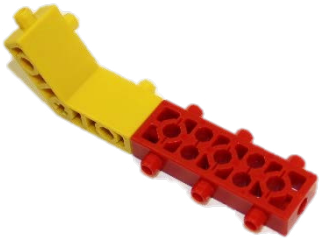


Figure 10

12

x 1

x 1



How to Make a Robot

How to Make a Boxing robot

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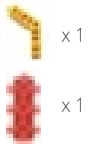

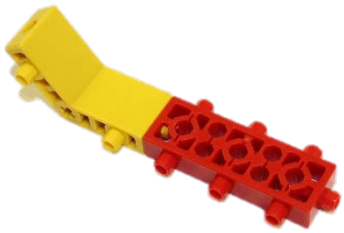

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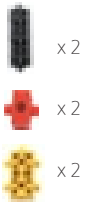

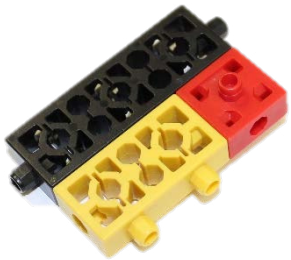

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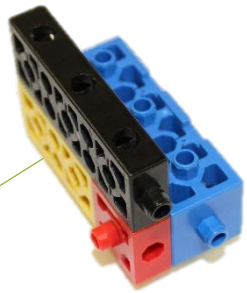

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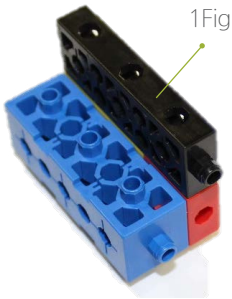

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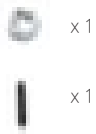

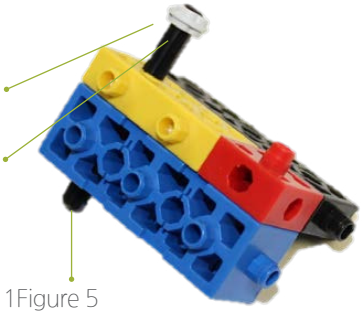

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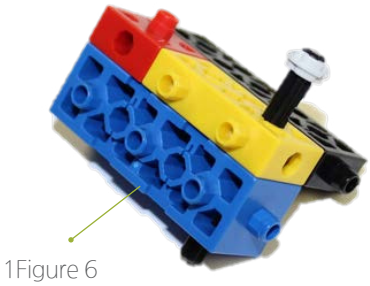

CLASS 2

How to Make a Robot

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Figure 17

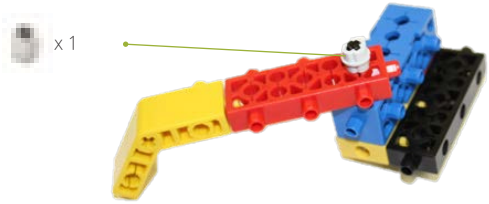


Figure 13

20

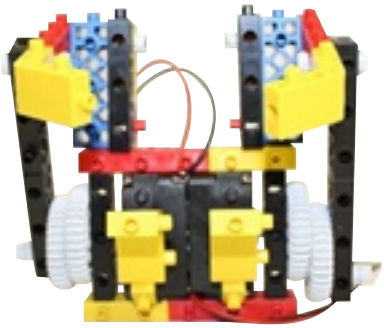
Figure 18

Figure 12

21

Figure 20

Figure 19

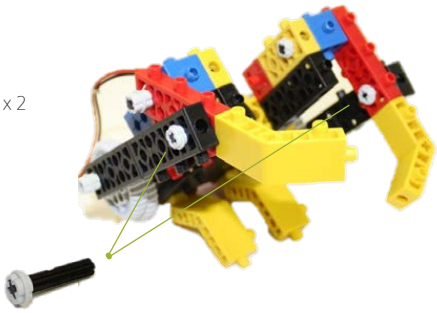


22

Make two of these.

A23

23



How to Make a Robot

How to Make a Boxing robot

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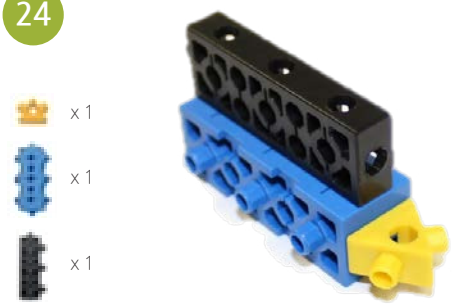

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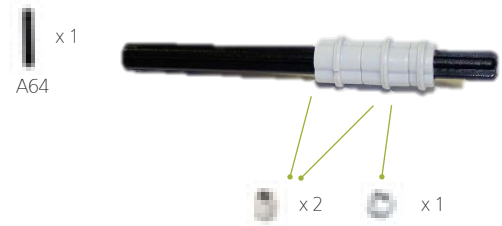

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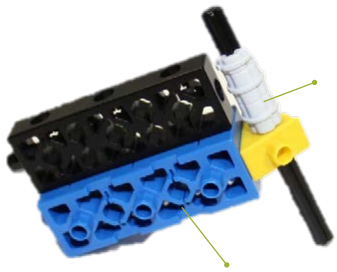

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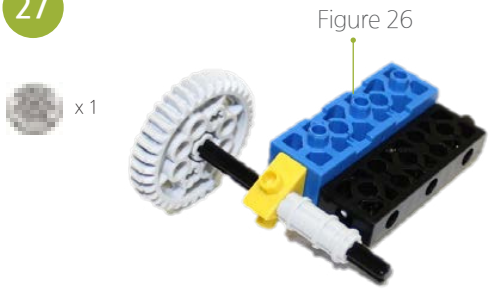

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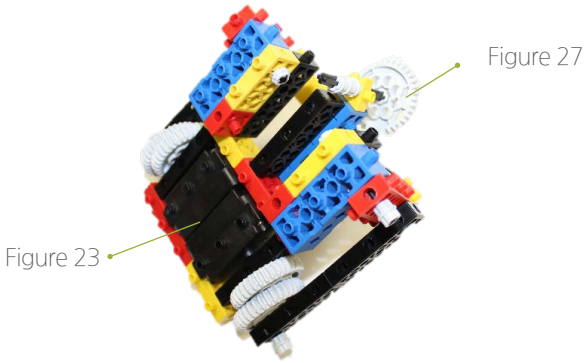

CLASS 2

How to Make a Robot

How to Make a Boxing robot

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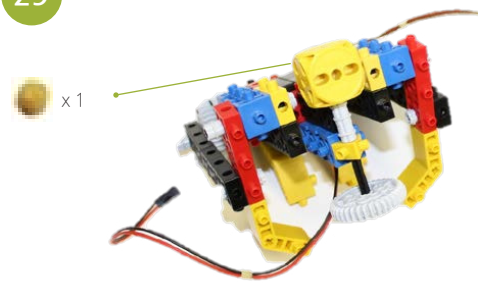
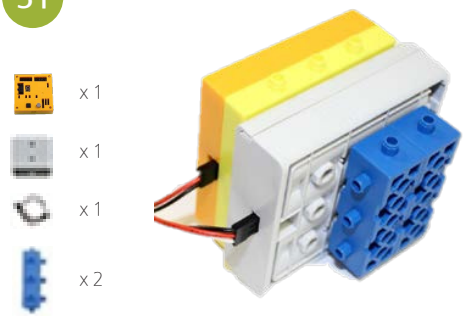


30

Make two of these.

31



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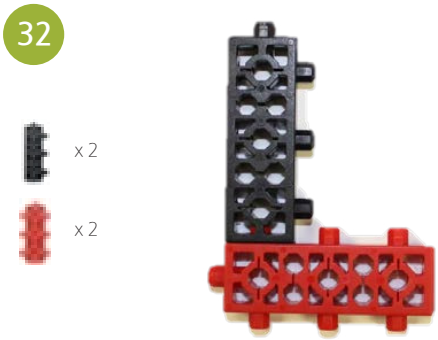

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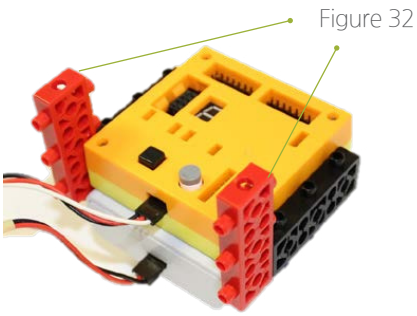

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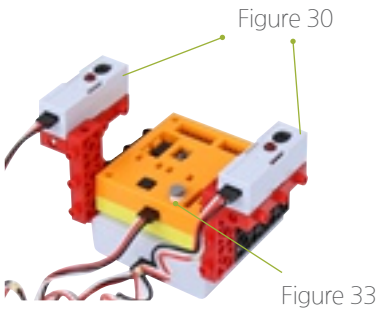
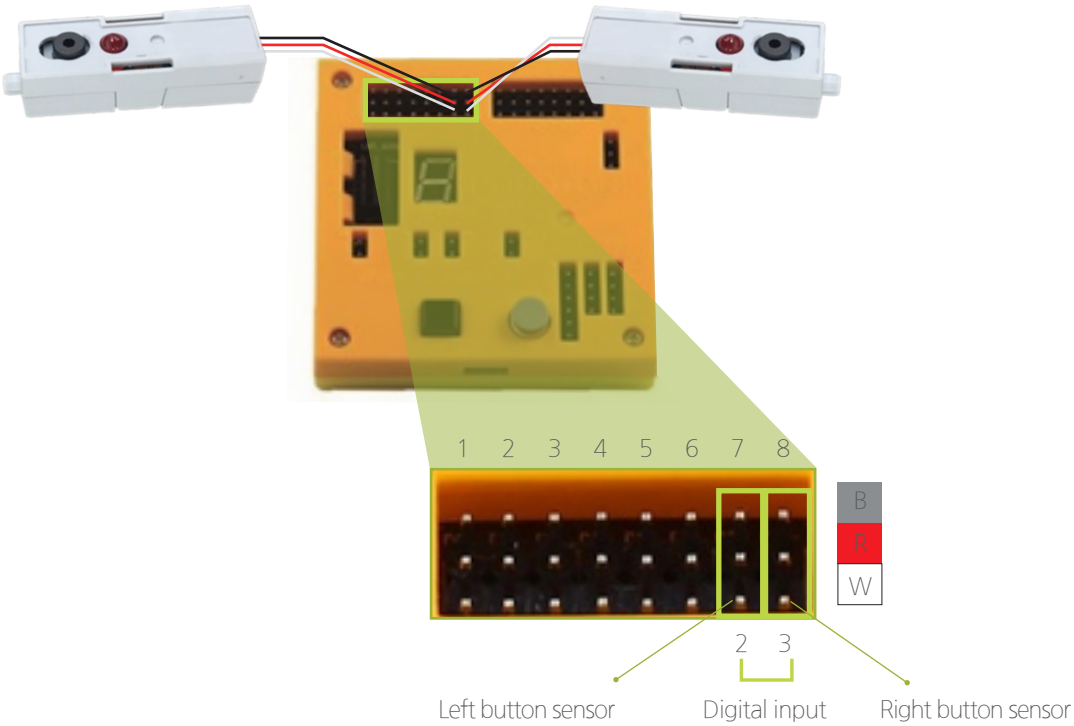


Connecting to the main cell

How to Make a Boxing robot

Complete



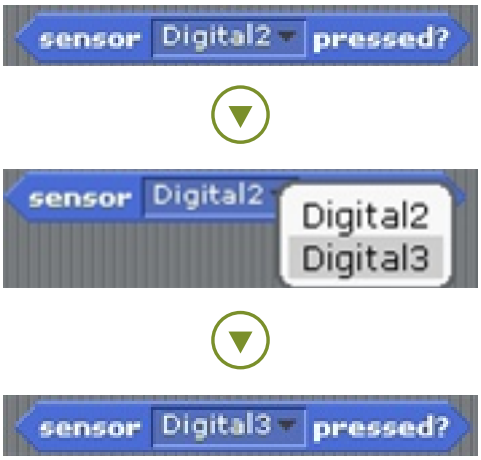
CLASS 2

Expansion of the Button Sensor

Using two button sensors

Now, we are going to learn how to use two button sensors with the boxing robot.
Connect the boxing robot tot Scratch and press the left and the right sensror. You will see the left sensor at Digital2 and the right sensor at Digital3.

You can choose Digital2 or Digital3 by clicking the small black arrow on the block.



Expansion of the Button Sensor

Boxing Robot

Connect the left motor and the right motor to the main board's motor slot4 and motor slot7.
We will now make a code that will control the boxing robot. When the left sensor is pressed, the robot's left arm should throw a punch. If the right sensor is pressed, the right arm should throw a punch.

Draw a flowchart of how you would make this possible.
If it's difficult, refer to the windmill script we made before!

Program Start

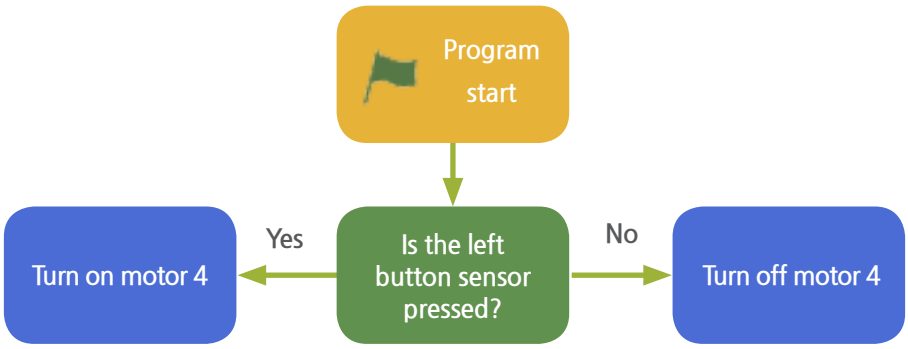
CLASS 2

Expansion of the Button Sensor

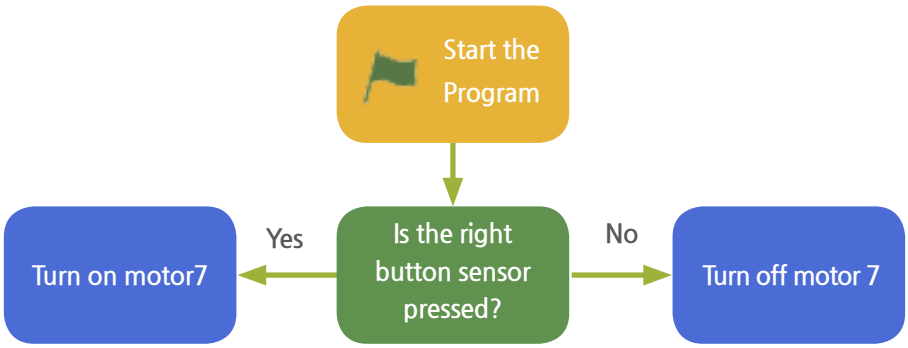
Boxing robot

You must've drawn a similar picture with the one below!

The code below shows how the left motor operates when the left sensor is pressed



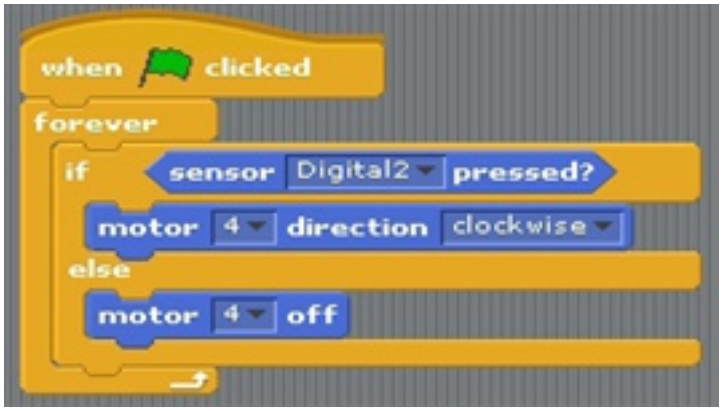
The code below shows the right motor operating when the right button sensor is pressed



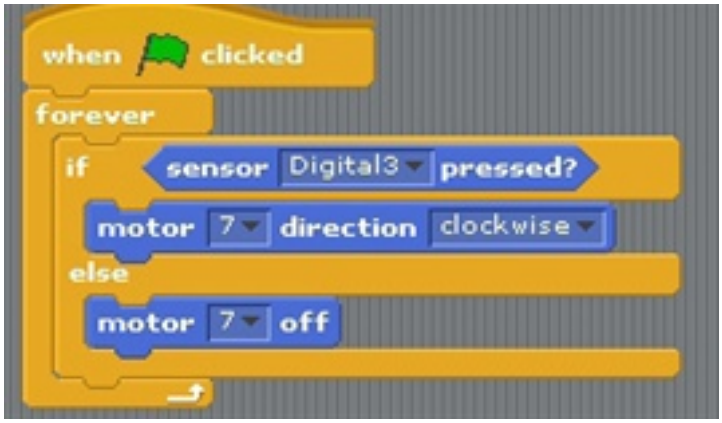
Expansion of the Button Sensor

Boxing robot

The code from the first program is almost the same as the windmill script!



The second program's script looks similar, but we are going to change from motor 4 to motor 7 and from digital 2 to digital 3.



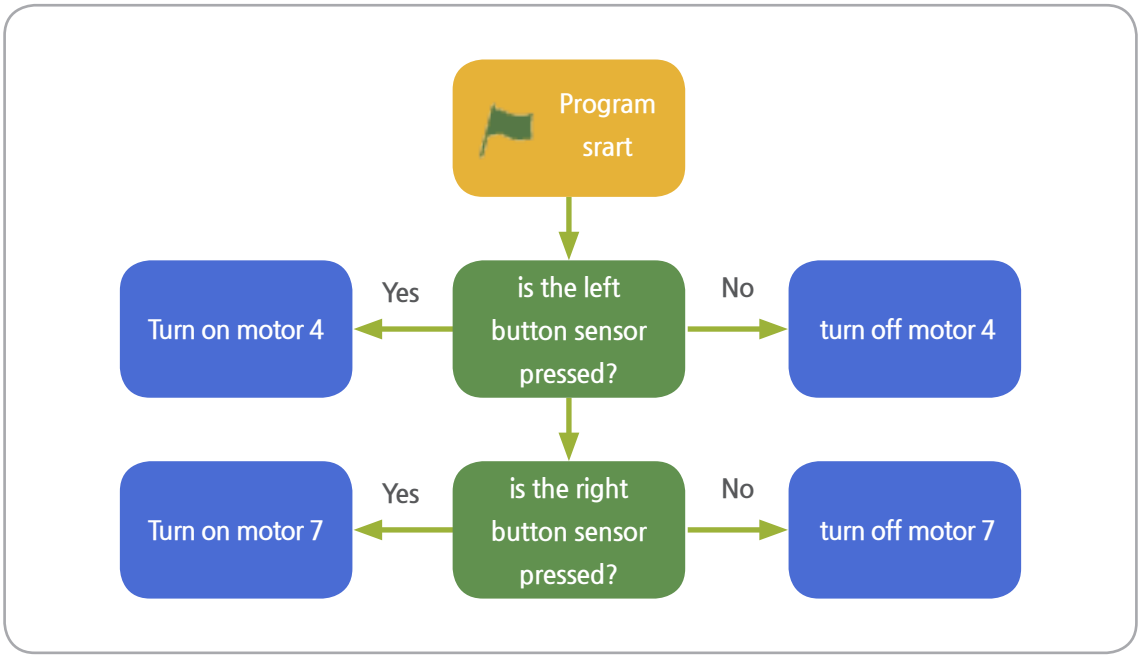
Start the program!
The boxing robot will throw punches when you press the left or right button sensor.

CLASS 2

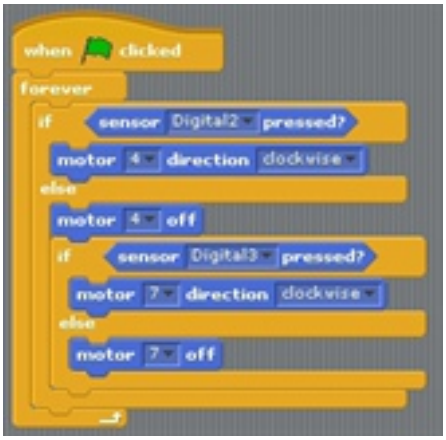
Expansion of the Button Sensor

Combining the program

We can combine two programs into one.
The flowchart looks like below! Let's say the program will repeat infinitely.



We can combine the programs like the picture on the right. Should we start the program now and control the boxing robot?



exercise

Boxing robot

Start the program! The combined programs will work as they used to before.
Now, choose a partner and play this game.

Rules for the boxing robot game

1. The player holds the main cell trying to make robots slip
2. The players cannot pick up the robots
3. Let the robot throw punches at the front gear.
4. If the cube falls, the round is finished!

Record your scores below!

	ROUND 1	ROUND 2	ROUND 3	ROUND 4	ROUND 5	FINISH
PLAYER 1						
PLAYER 2						

SCRATCH CODING KIT

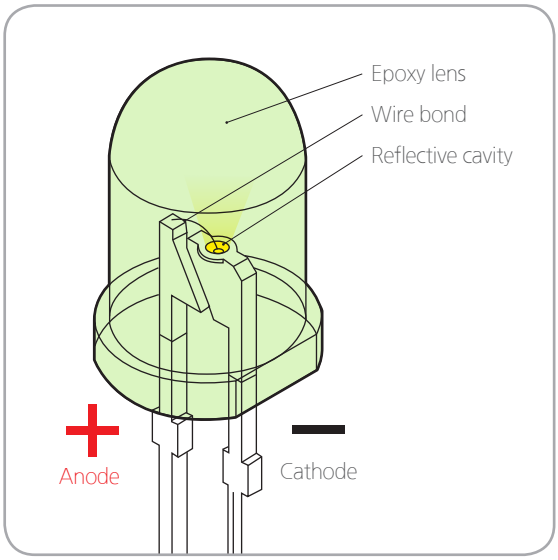
Logic boost

LED SENSOR

LESSON 4

Introduction

What is a LED SENSOR?



There is an electric current that flows in a lightbulb called a semiconductor. It lights up if there is an electric current flowing through it.

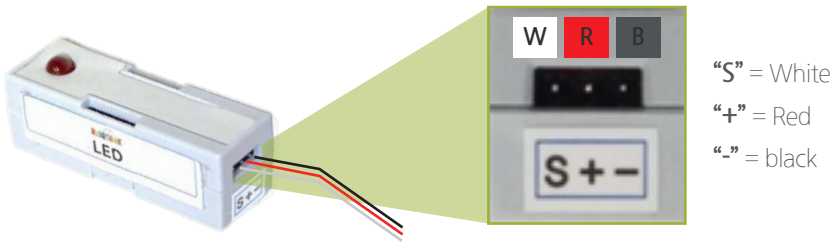
LEDs can shine different colors of light depending on which semiconductor was used.

LEDs can shine for thousands of hours more than filament lightbulbs. Also, LEDs uses less electricity, so a lot of houses and offices started using LED lightbulbs instead of pilament.
Now we are going to learn how to use an LED as a sensor in controlling robots. The LED sensor looks similar to the button sensor. There is a red light at the end just like the picture.

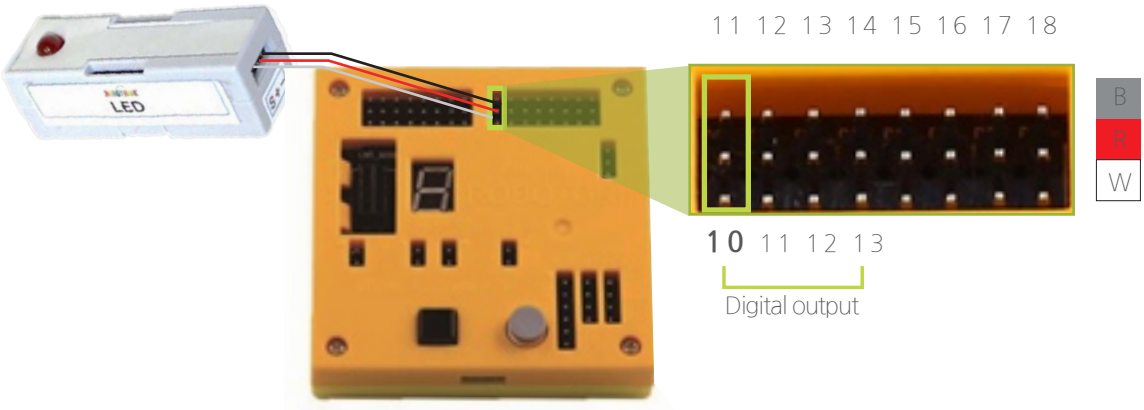
CLASS 2

Connecting to the main cell

LED SENSOR?



Connect the LED sensor to port 11 (Digital output port 10).

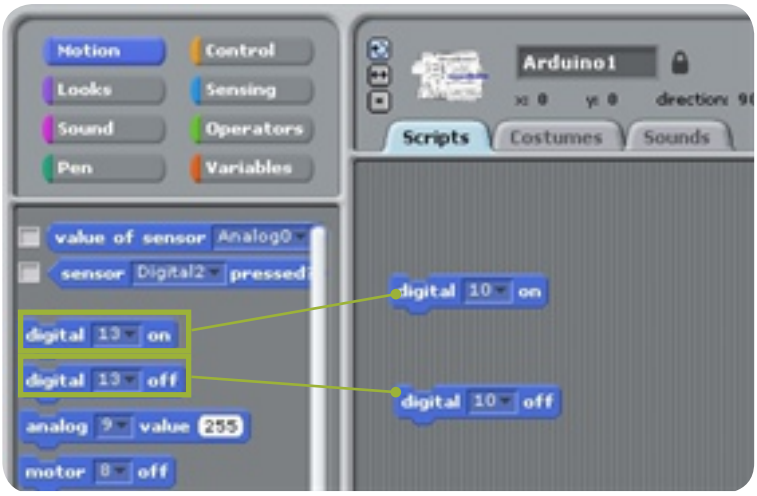


Experiencing the LED SENSOR

Turning the LED sensor on and off

The main cell controls whether the LED sensor turns on or off.

Drag in the 'Digital 13 output on' block and the 'Digital 13 output off' block to the script and change 13 to 10 (digital output port 10 will be used as the output port).



If you double click each block…

CLASS 2

Experiencing the LED SENSOR

Flashing led sensor

Now, you are going to use what you know about sequence and make the LED repeat a flashing light. Make an outline about how you will make the script.

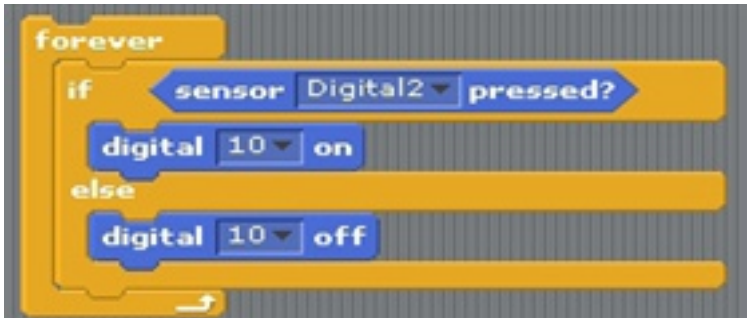
Try it! Does it flash and go off?
If not, look at the code below and find out what the problem was.

Experiencing the LED SENSOR

Using the button sensor to activate the led sensor

Now, connect the button sensor and the main cell, and make a script that the led sensor will turn on when the button sensor is pressed. Make an outline of your script below.

Try it! Does it work?
If not, check the picture below and find out what the problem was.

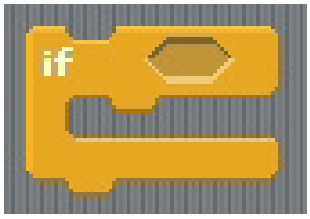


CLASS 2

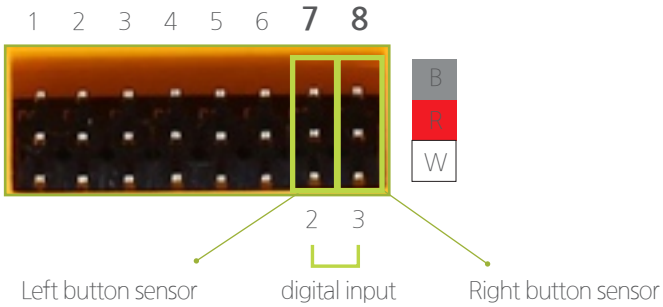
Experiencing the LED SENSOR

'if' phrase

We have learned what the 'if..or else..' phrase is. There is a simpler phrase than this, too. It's the 'If' phrase.



The block you see above is the 'If' block. It activates blocks inside if 'if…' is satisfied. If it is not satisfied, it skips without doing anything. Now, let's put in the condition we need.

If we operate the led sensor using the 'if' phrase, the led sensor will never turn off since there is no 'or else' part.

Let's use the 'If' phrase to turn the led sensor on and off.
Connect the second button sensor with the main cell.