

# LESSON 4 MOTOR PROJECT-RUN! WEEEBOT!

---

## Lesson Overview

Students will use their knowledge of repeat, motor, and logic to create a robot run in square route.

---

## Lesson Target

1. Learn the way to control motors, and coding blocks in WeeeCode; Students will have ability to skillfully control robot run in all direction.
2. Learn the way to control robot in offline mode.

---

## Lesson Tag

GRADE LEVEL	SUBJECTS	DIFFICULTY	DURATION	GROUP
Elementary, middle	STEAM, computer science physical, math	Beginner	2 x 50 mins	1-2 student

---

## Supplies

Robot	Accessories	Other Material	Tools Used
WeeeBot Kit	USB cable	PC with WeeeCode software; USB port required;	

---

## Lesson Outline

INTRO: Talk about cars and it's movement, observe wheel's rotation direction. Introduce WeeeCode blocks to control motor, introduce offline coding method. (20 mins)

CREATE: Students use the knowledge to control robot move, and create a robot run in preset route. (30 mins)

PLAY: Each group tests, then records learnings from their invention. Students explore how their invention works, plus the coding concepts behind it. (30 mins)

REMIX: Students will customize their robot's route, and work together to make a relay race. (20 mins)

Routine

1. INTRODUCE MOTOR.

Student discussion:

Q: Do you ever observe the wheels of cars? Describe the direction of wheel's rotation.

A:

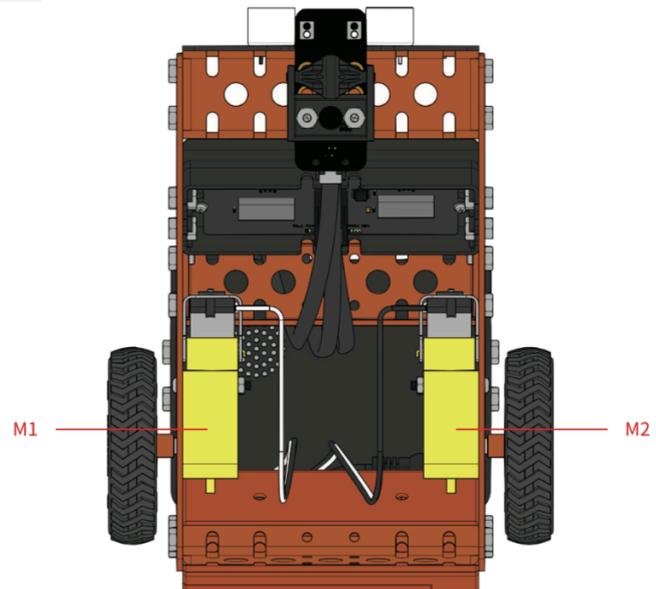
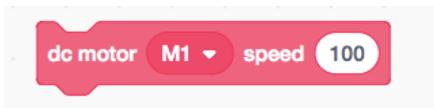
Moving Direction	Wheel's Rotation Direction
Forward	Two wheels spin forward
Backward	Two wheels spin backward
Turn Left	The left wheel run slowly, right wheel run quickly
Turn Right	The right wheel run slowly, left wheel run quickly

2. HARDWARE AND SOFTWARE INTRODUCTION

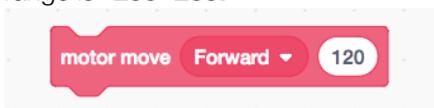
TT motor and its WeeCode code block

In WeeCode software, WeeCode category, we can find the following 3 code block.

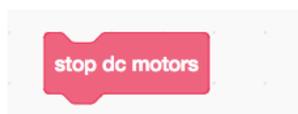
- Control single motor. Look WeeeBot from floor panel, the left motor is M1, the right motor is M2. **Positive number** value is running clockwise, **negative number** value is moving counterclockwise. The value range is **-255~255**.



- Control two motors moving at one code block. Four direction can be selected in dropdown, speed value range is **-255~255**.

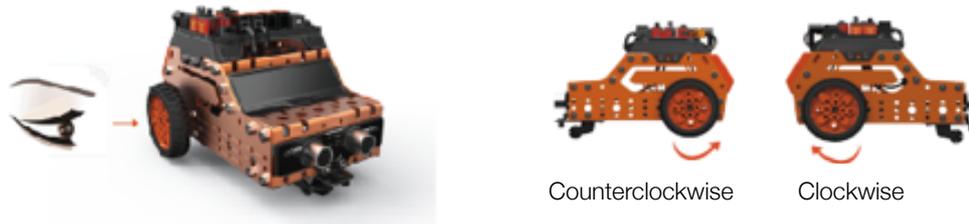


- Stop all motors.



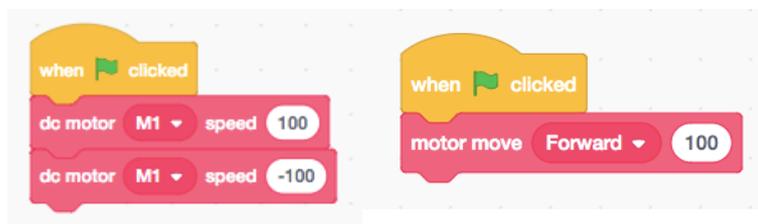
## WEEEMAKE

Tips: we need to face to motor and judge the motor's moving direction. For example, when robot moving forward, the right wheel need to run clockwise, the left wheel needs to run counterclockwise.



### Exercise:

Control robot move forward in two different way, program as follows.



Tips:

1. If speed value is positive number, but wheel moving backward, please check:
  - a. Motor wire: left motor wire to M1 port, right motor wire to M2 port.
  - b. Motor wire: each motor has one black wire and one white wire, make sure that black wire is in the left and white wire is in the right.
2. Please turn on robot power switch, or motors won't run.
3. When motor is controlled by code, if the code has not been changed, the motor will keep running in the same way.

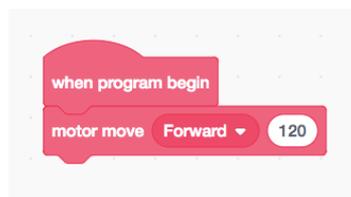
## Offline Mode Control

It's annoying to control robot with a USB cable connected, so let's try to control robot in offline mode.



### Exercise:

1. In Coding Block Zone, take block "when program begin", and then select the motor control block.



2. Click "Arduino", and then Arduino coding will be displayed.
3. Click "Upload". If you see "Upload successfully", means that the program is uploaded to mainboard ELF.
4. Unplug the USB cable, turn on the power switch, and then robot can run offline.

```

Mini - Not Connected - Arduino English -
Restore Firmware - Upload Open Arduino
1 #include <Arduino.h>
2 #include <WeELFMini.h>
3 WeDCMotor dc;
4 int speed;
5
6 void setup(){
7
8     speed = 120;
9     dc.reset(2);
10    dc.run(-speed);
11    dc.reset(1);
12    dc.run(speed);
13
14 }
15
16 void loop(){
17 }
18

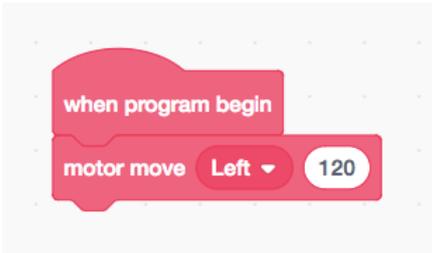
```

### 3. TOOLS (FOR WEEEBOT JEEP ONLY)

#### Reduce the force of friction during robot operation



**Discussion:** use below codes to control motor turn left, observe what will happen on smooth ground or on rough ground.



Under this code, robot's left wheel will run backward, right wheel will run forward to make robot turn left. If the ground surface is smooth, robot can turn left successfully; if the ground surface is rough, robot cannot turn left smoothly.

**Solution:**

1. Use the dc motor coding block to control the two wheels, one wheel run faster than the other one, just like vehicles.
2. Reduce the force of friction between robot and ground surface. At this case, we can remove the two front wheels of robot to reduce the friction.

#### Learn the tools

To remove the front wheels, we need to use tools. There are two necessary tools in WeeeBot robot tool pack:

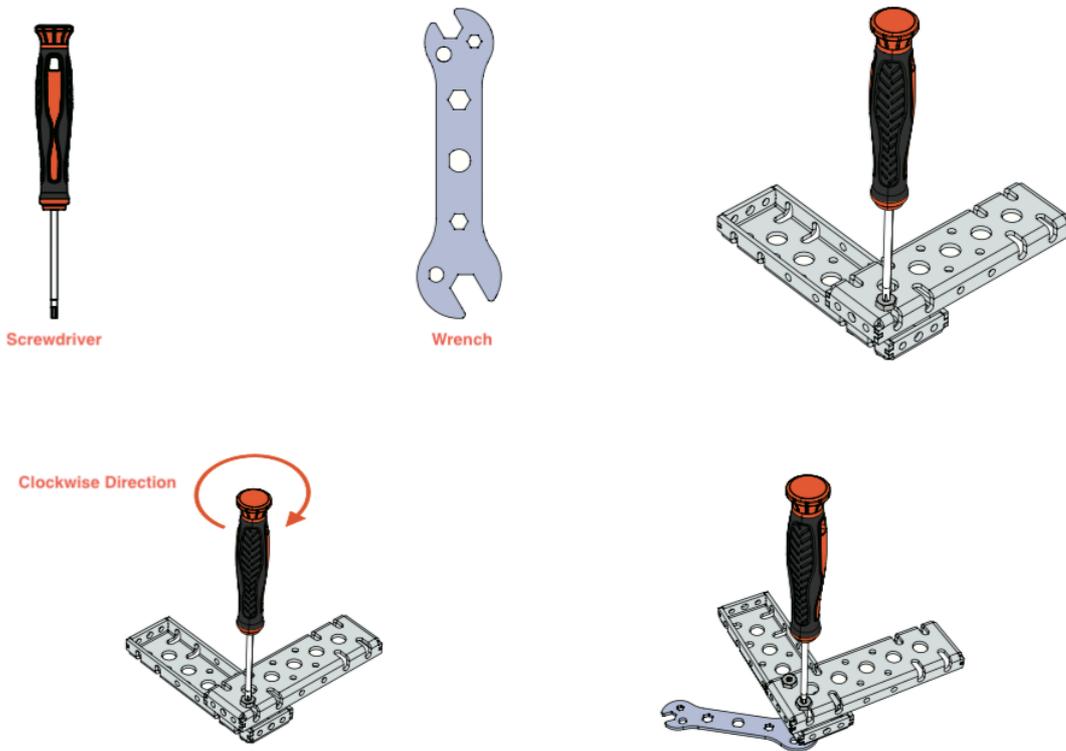
1. H2.5 Hex Screwdriver. It is used to turning hexagon head screws.

## WEEEMAKE

2. M1.6-M4 Multifunctional Wrench. It is used to turning screws, screw nuts.

Two method to use above tools:

1. Without screw nut: fit the screwdriver tip into the head of screw and turn it.
2. With screw nut: use the wrench to grip the screw nut, and then use screwdriver to turn screws. Turn clockwise direction to tighten the screw, turn counterclockwise direction to unscrew.



### Exercise:

1. Remove the two front wheels of WeeeBot Jeep.
2. Use “motor move” coding block to control robot turn left, observe the result.

Tips: please ask students collect the disassembled part in box, and resume the robot after class.

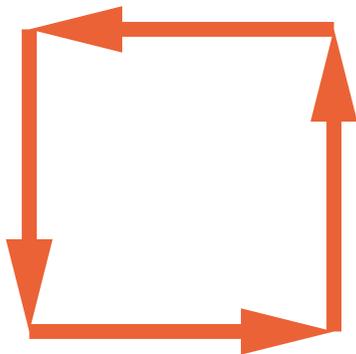
## 3. WRITE CODES AND OPTIMIZE CODES

**Make a program, control the robot run square route**



**Exercise:** how to make robot run square route?

[Sample Program](#) (Only for reference, motor speed can be revised if necessary.)



```

when program begin
  motor move Forward 120
  wait 1 secs
  motor move Left 120
  wait 0.5 secs
  motor move Forward 120
  wait 1 secs
  motor move Left 120
  wait 0.5 secs
  motor move Forward 120
  wait 1 secs
  motor move Left 120
  wait 0.5 secs
  motor move Forward 120
  wait 1 secs
  motor move Left 120
  wait 0.5 secs
  motor move Forward 120
  wait 1 secs
  motor move Left 120
  wait 0.5 secs
  stop dc motors
  
```

1. The moving direction should be forward →left →forward →left →forward →left →forward →left (or in reverse direction)

**Observe and Discovery: find the regularity, optimize program.**

To make robot move in square route, we are controlling wheels move four times of “move forward, turn left”. Usually, programs will use “repeat” block to replace some repeating code, in order to reduce the amount of code blocks.

```

when program begin
  repeat 4
    motor move Forward 120
    wait 1 secs
    motor move Right 120
    wait 0.5 secs
  stop dc motors
  
```

**4. REMIX**

- A. Teacher can set a route as exercise, students should control robot to move follow the route.
- B. Students can design their own routes, and make a story.

