

## LESSON 5 IR PROJECT-CONTROL YOUR ROBOT

### Lesson Overview

Students will learn the theory of infrared remote control, the method to use infrared receiver module, and be able to make program of IR remote control robot.

### Lesson Target

1. Learn learn the theory of infrared remote control, the method to use infrared receiver module.
2. Learn program flow chart, and use it to prepare coding.
3. Learn the case structure of coding.

### Lesson Tag

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

### Supplies

Robot	Accessories	Other Material	Tools Used
WeeeBot Kit	USB cable IR Remote control	PC with WeeeCode software and drawing software. USB port required;	

### Lesson Outline

INTRO: Talk about remote control in daily life, and the application of infrared. (20 mins)

CREATE: Students will learn the IR transmitter and receiver module, and create IR remote robot. (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 and enhance their inventions to control other module via IR remote control through opportunities to change the circuit, code, and the game play. (20 mins)

## Routine

### 1. INTRODUCE IR REMOTE CONTROL AND INFRARED.

#### Student discussion:

Q: Where did you see a remote control?

A: We see remote control in our daily life everyday: for television, air conditioner, remote control toy, etc. Generally, remote control is using infrared to transfer signal. And through the remote control in our life, we know infrared's two features:

1. Invisible
2. Steady, it is not susceptible to interference.

Q: Do you know any other application of infrared?

A: There is one very important feature of infrared: transfer heat. Because of this feature, IR (infrared) is widely used in lift.

1. Thermograph: an instrument that produces a trace or image representing a record of the varying temperature or infrared radiation over an area or during a period of time.
2. Bathroom heater: use IR bulb's thermal radiation to improve the temperature of lighting area.
3. IR guided missile: use the target's IR to lead missile flying to the target automatically.

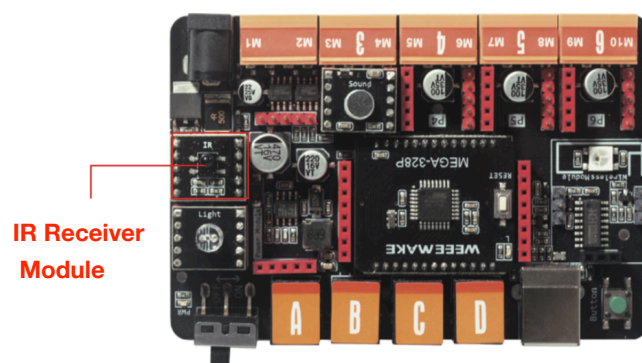
### 2. HARDWARE AND SOFTWARE INTRODUCTION

#### Hardware - IR Modules

IR Module is consist of IR transmitter and IR receiver.

IR Transmitter: to generate and transmit infrared signal. Remote control is a IR transmitter, different button will send different signal.

IR Receiver: to receive IR signal.

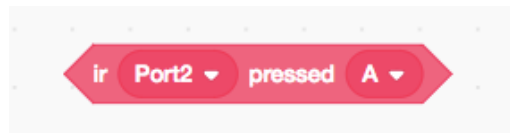


#### Software - WeeeCode module

Open WeeeCode software, find "WeeeCode" category in coding block zone, and check below IR coding block. This block has two drop down box.

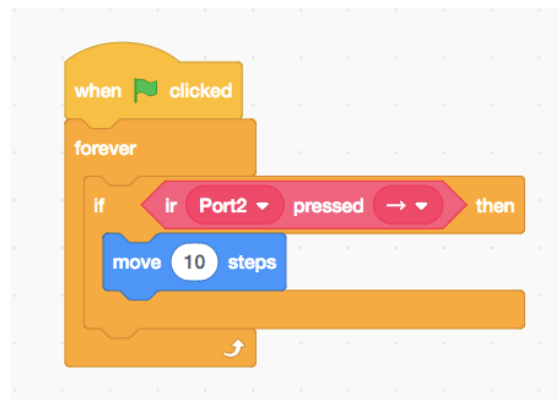
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1. The first one is the port of IR receiver module connected.
2. The second one is the button of IR transmitter (remote control). If we use button "A" to control robot, you should select "A" in this drop box.



### Exercise:

1. Connected robot with USB cable, restore online firmware to bring robot into online mode.
2. Make a program to use IR remote control, so the cartoon elephant will move right when press IR remote control.



## 3. WRITE CODES AND OPTIMIZE CODES

### Write code, make a remote control robot

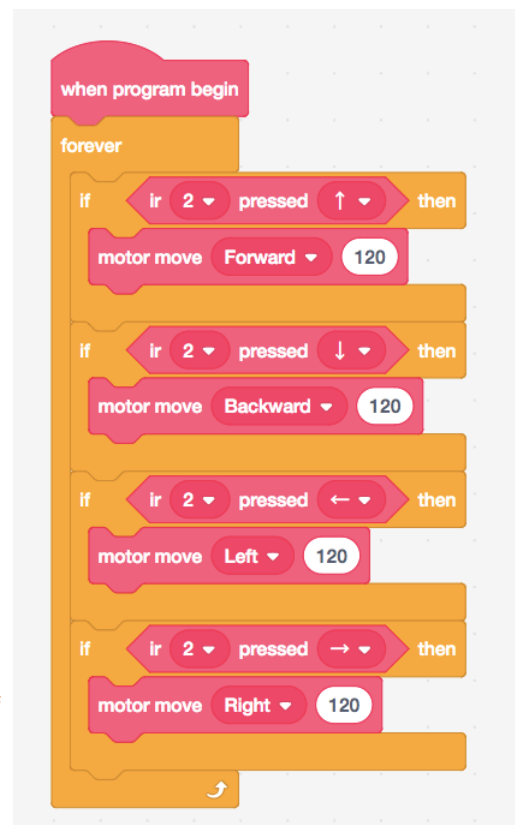
Q: how do we make a program of remote control robot?

The program should achieve: press direction button of remote control to make robot move in accordingly direction.

A: First, recognize the button that be pressed; second, select direction by the pressing button.

Tips:

1. If students realized problem of this program before coding, you can enter the next level directly.
2. If robot doesn't move after pressing button, examine:
  - A. Whether IR receiver module connected to port 2 or not;
  - B. Whether IR transmitter (remote control) is functional or not;
 Open the camera of your phone, press any button and watch the transmitter bulb through camera, you should see purple flashing if functional.
3. IR travels in straight lines, please point remote control to



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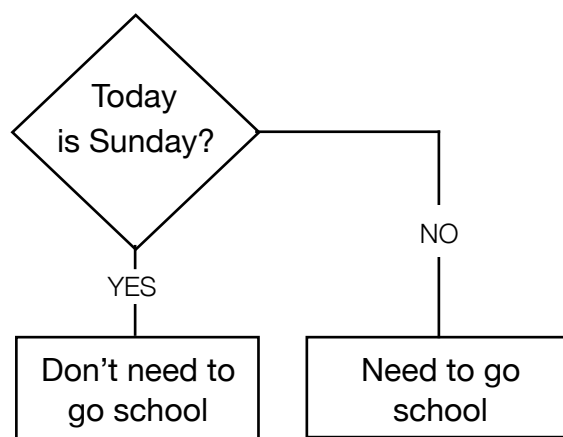
robot.

4. Remote control's transmit range is around 10 meters. Do not use remote control under hot sun, because strong sunlight will interfere with IR signal.
5. Remote control and robot do not have pairing ID, one remote control can transmit signal to multiple robots. Please separate students and robots while using remote control.

Result: after upload the program, we will see that this program has issues. Before we press any button of remote control, robot will keep the previous moving status, won't stop moving. When we write codes, the coding block "stop dc motors" must be added.

### Learn the case structure of coding.

To make robot choose direction automatically, we need to use case structure of coding. Case structure is a branching control mechanism that allows different executions depending on the value of the case. Let's learn case structure through a sample in life. As below, decide if you need to go school by telling today is weekday or weekend.




### Learn the program flow chart and use it to prepare coding


We call above graphic "Program Flow Chart". Program flow chart is a description of the algorithm, workflow, or process of solving problem. It uses various kinds of boxes and flow lines to representing different steps and orders. Before designing a program or solving a problem, we can use flow chart to help visualize what to do and thereby help get a solution to a given problem.

Program flow chart has below kinds of symbols:

: this is the start/end box, representing the start or the end of program.

: this is the activity box, representing the processing step.

: this is the decision box.

: this is input/output box.

: this is flow line, representing the order of executing.

Tips: the drawing order of program flow chart is from top to bottom, from left to right.

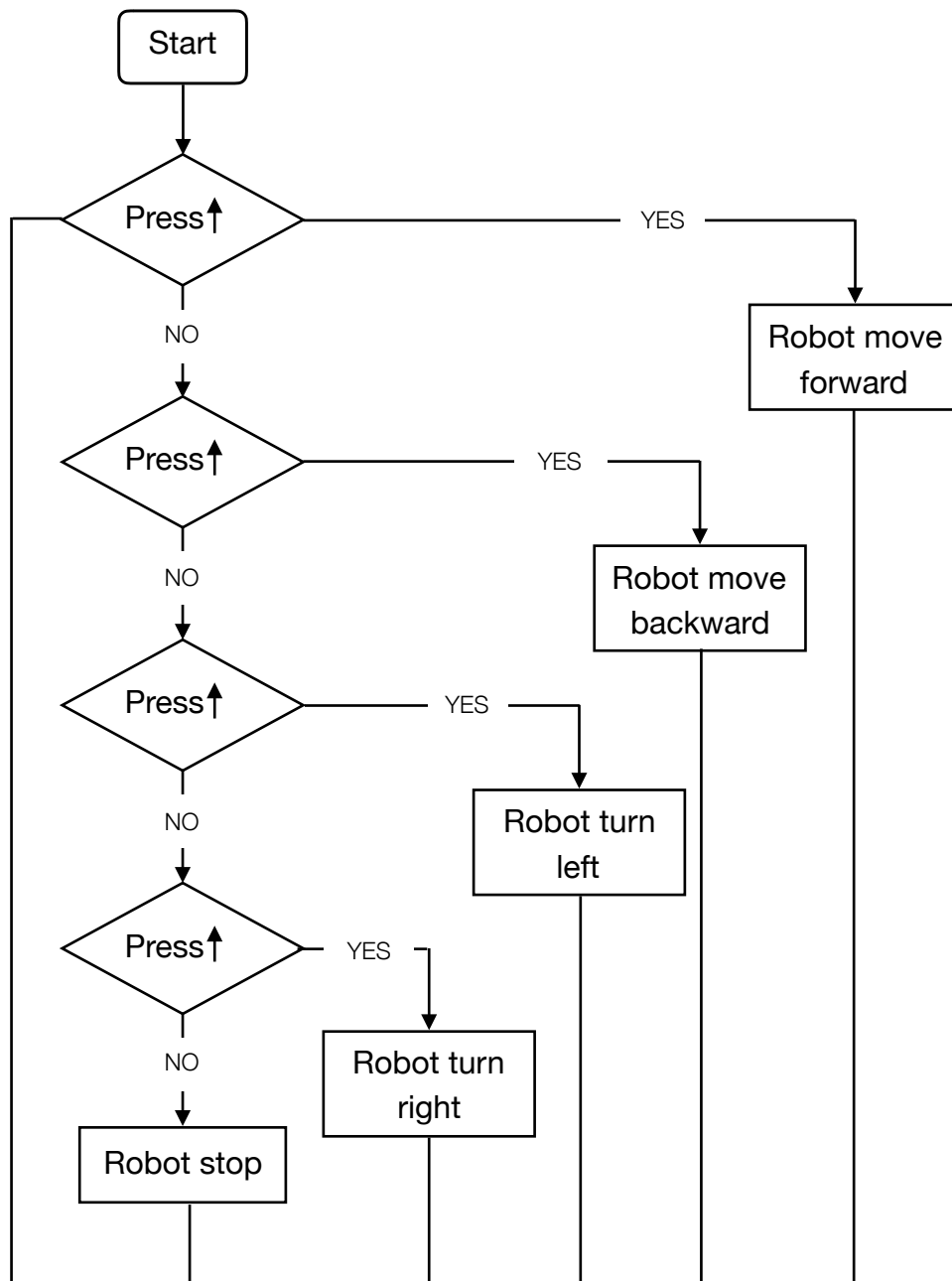
### Draw a program flow chart, optimize the remote control program

Let's start over on IR remote control robot program. The requirements are: when press button "↑", "↓", "←"

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“→”, robot will move to according direction; when press other button, or press no button, robot should stop. The program need to be repeated.

Now we can get below program flow chart:

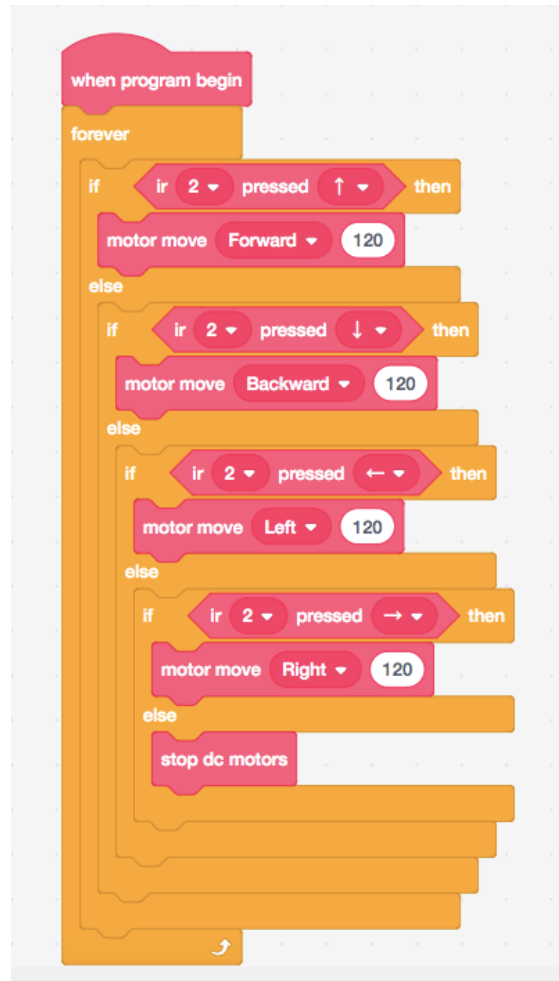


### Exercise:

According to above program flow chart, write code to make a IR remote control robot.

Tips: use “if...else” block in Control category.

[Sample program](#)



#### 4. REMIX



##### Exercise:

We learnt the codes to control RGB LED in lesson 2, now make a program to use remote control change RGB LED light.

A. Write codes to using IR remote control button 1-7 control seven different colors of RGB LED.

[Sample program](#)

B. Write a program, use robot to tell a story, and remote control the robot on stage.