愛動智教育系統

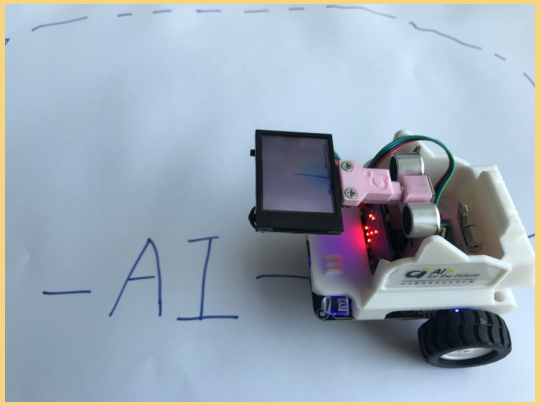
# CUHK iCar Experiment Manual

## Experiment 2: Line Tracking Experiment

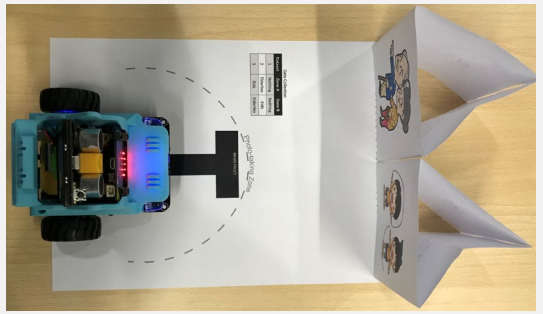
# Write Your Own Code

# CUHK iCar

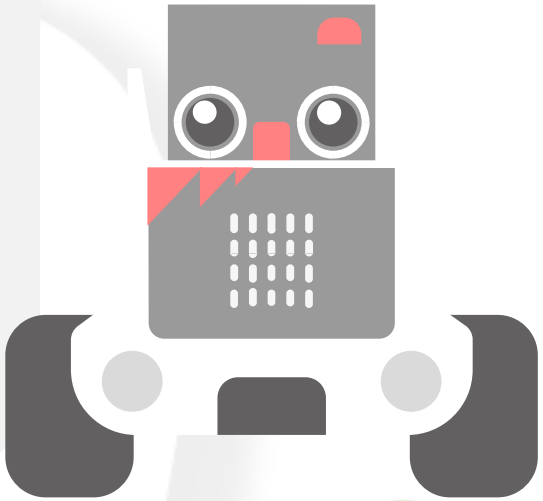
## Experiment 1
**Face Following**




## Experiment 2
**Line Tracking**



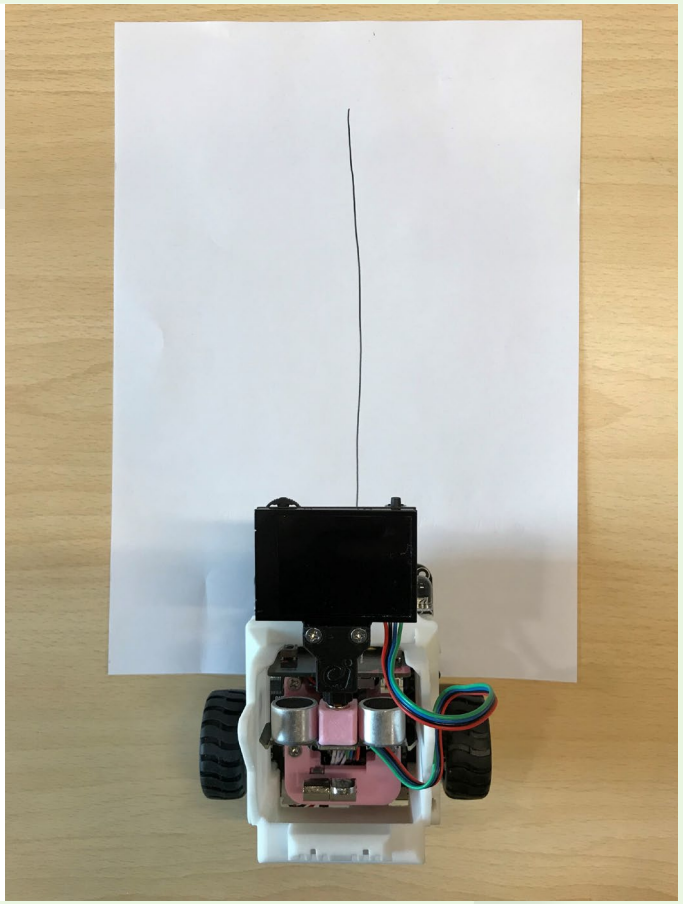
## Experiment 3
**Moral Dilemma**



# Line Tracking Experiment

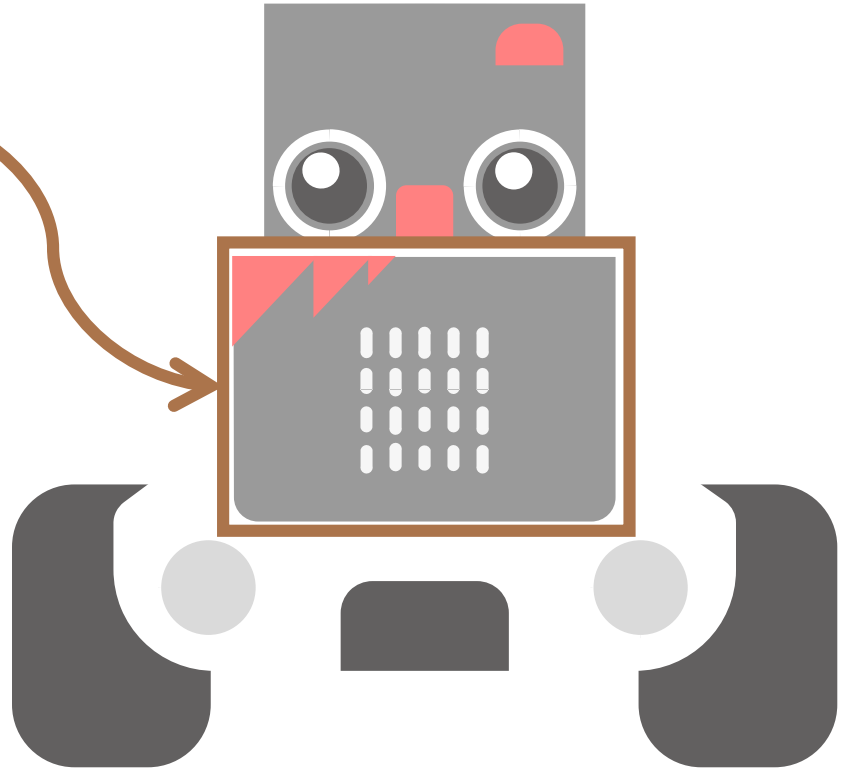
## Introduction Of The Experiment

This experiment showcases how the self-driving car tracks a black line.



# Download Program To micro:bit

Line_tracking.hex



## Method 1

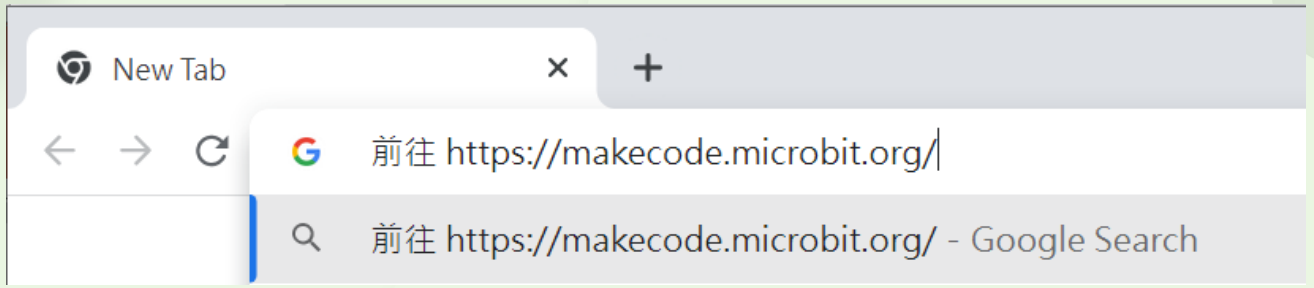
Clone the .hex to micro:bit directly

## Method 2

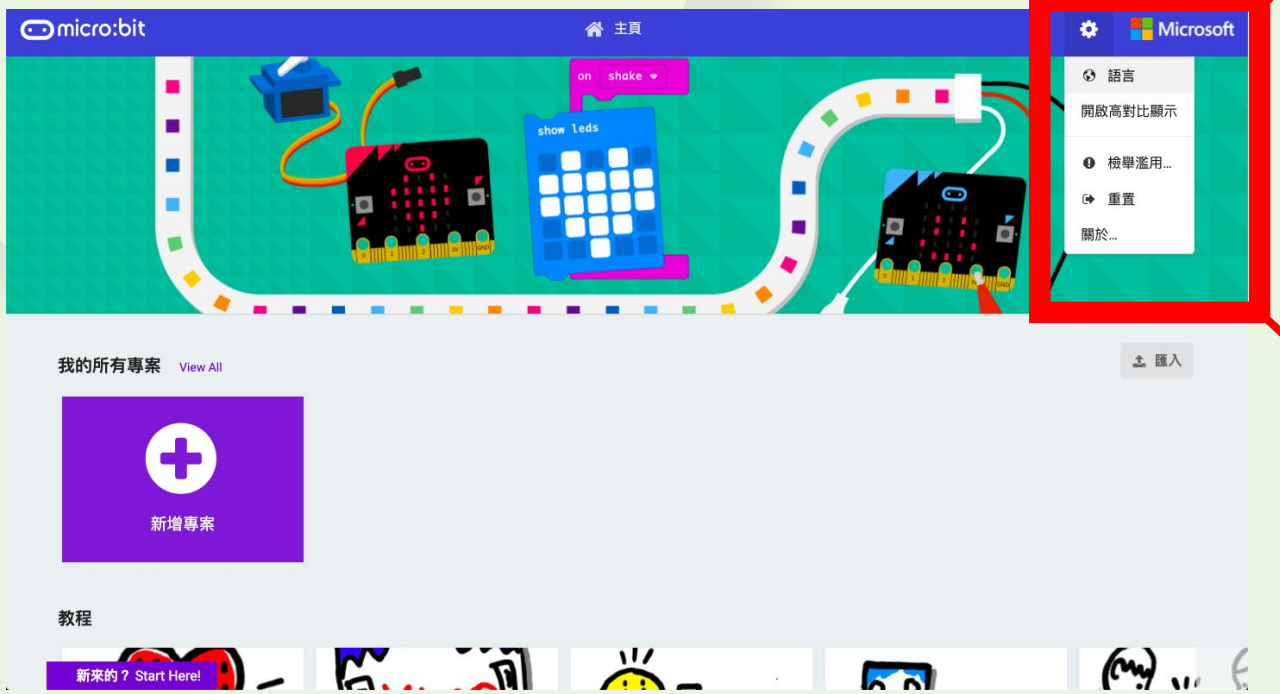
Write your own code on MakeCode

# Code On MakeCode

Browse https://makecode.microbit.org/



# Caution
# Please Set English As The Language!

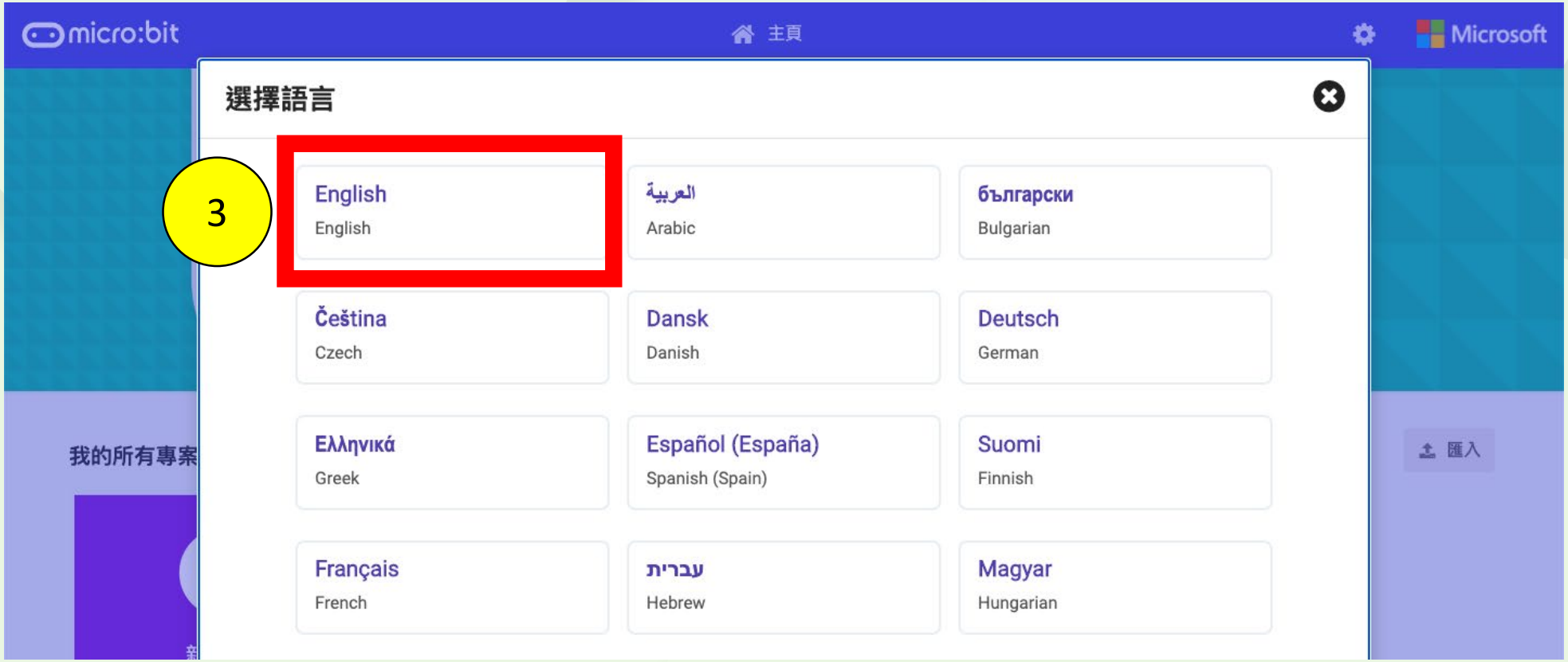




1. Click ⚙

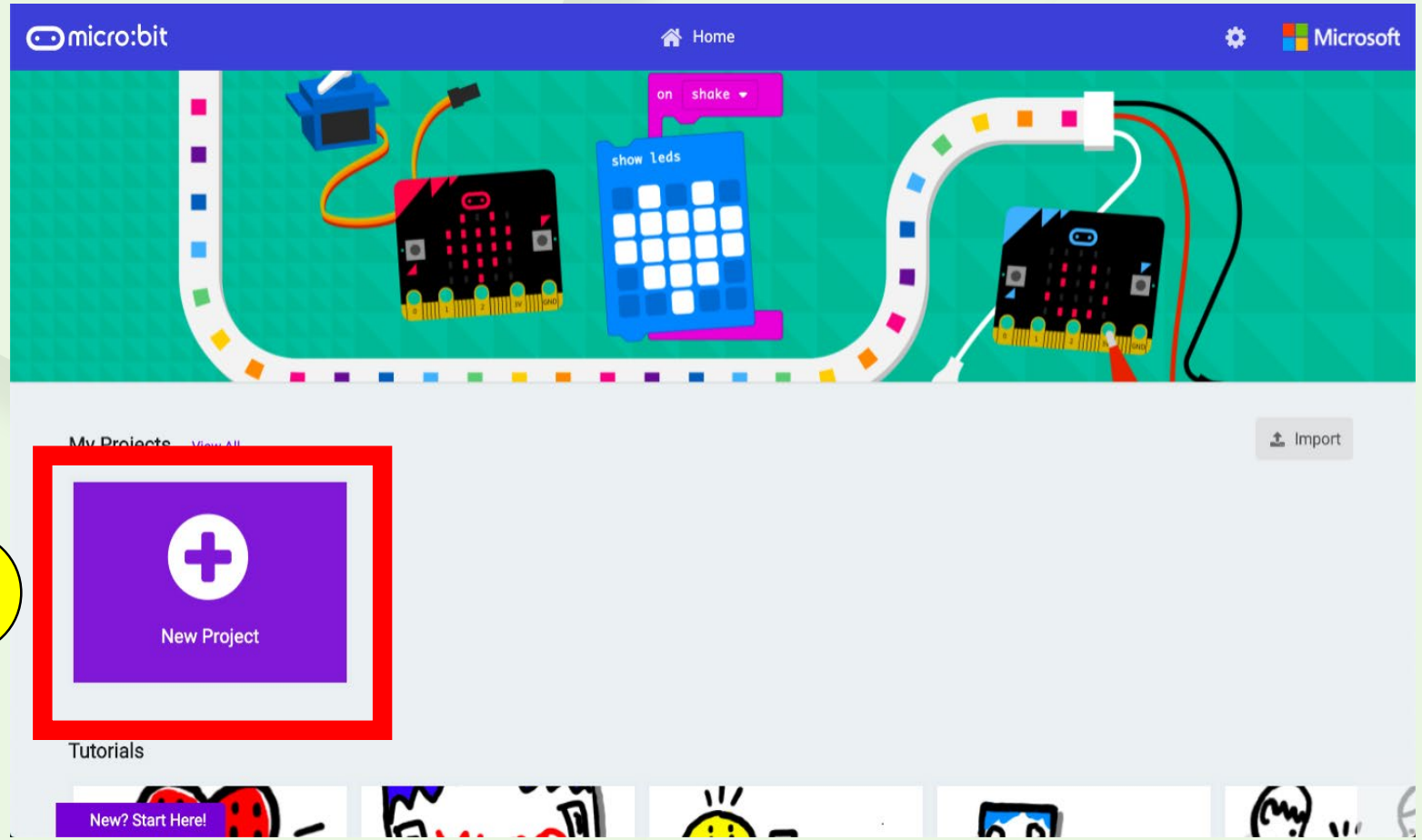
2. Click 語言

**English must be set as the language, otherwise the program may fail.**



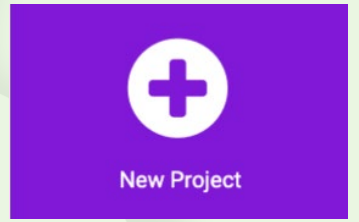

3. Click English

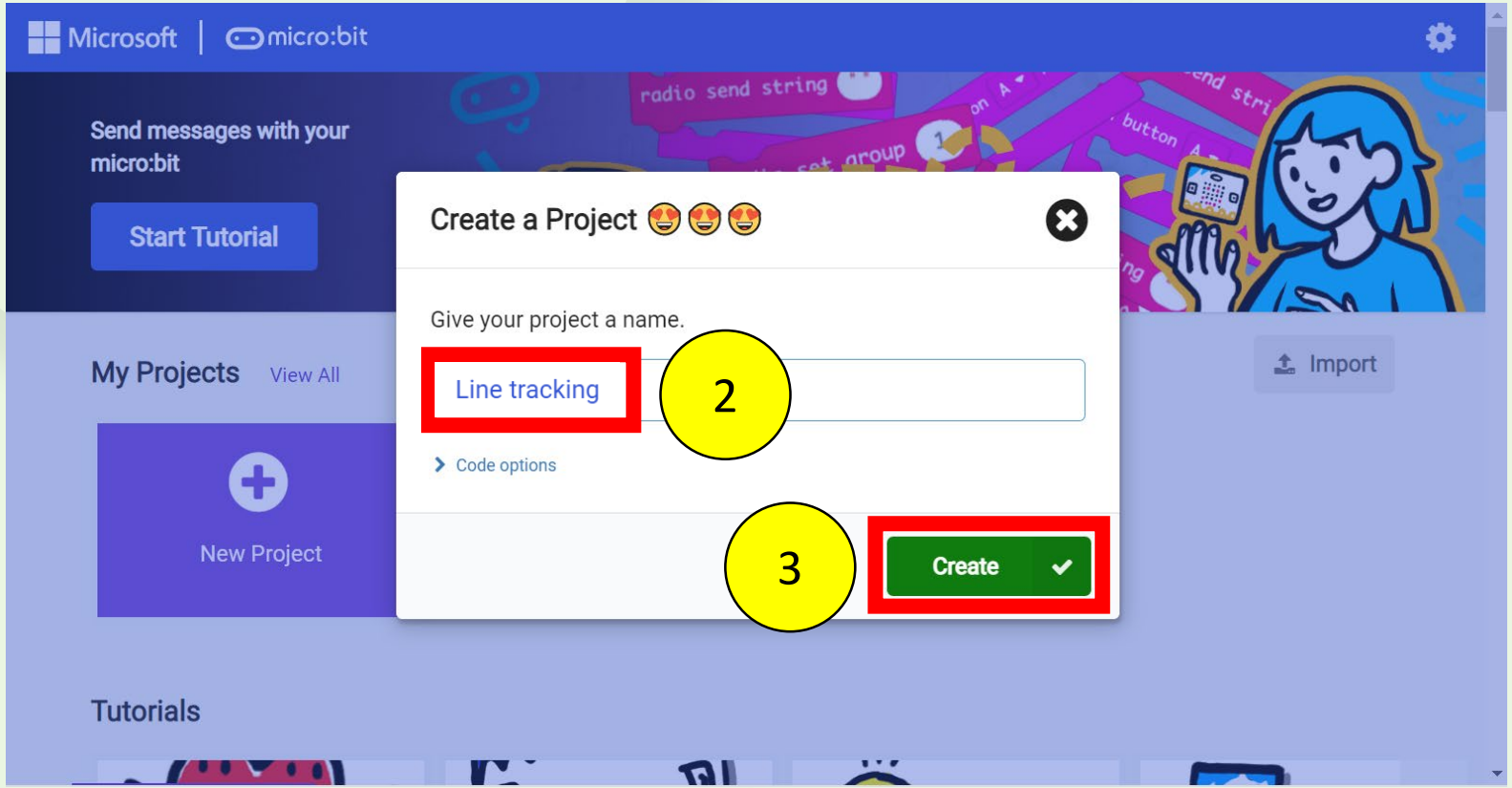
# New Project




1

1. Click New Project





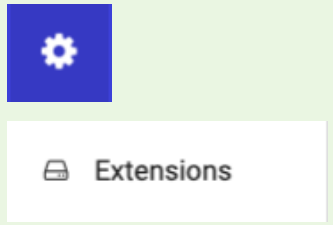

2. Enter “Line tracking”

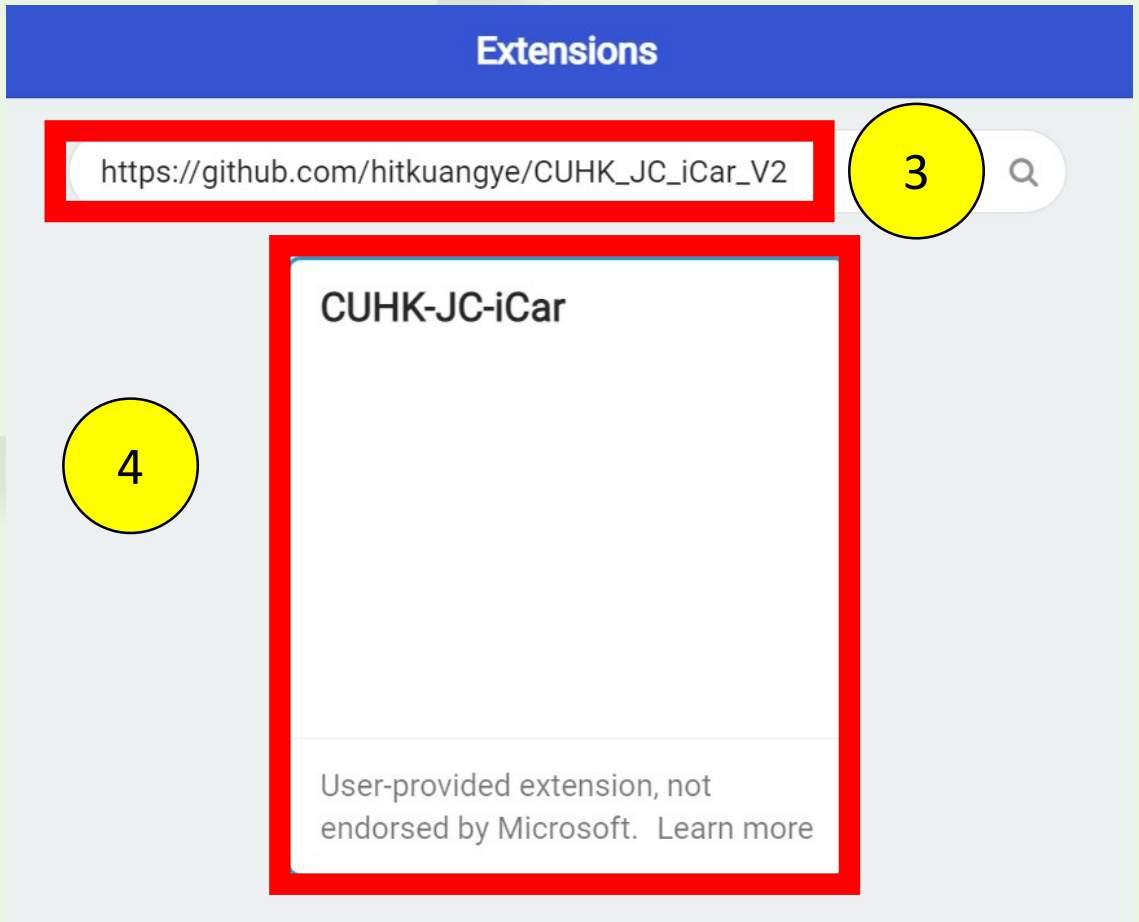
3. Click Create

# Prepare CUHK-JC-iCar Extension


1. Click

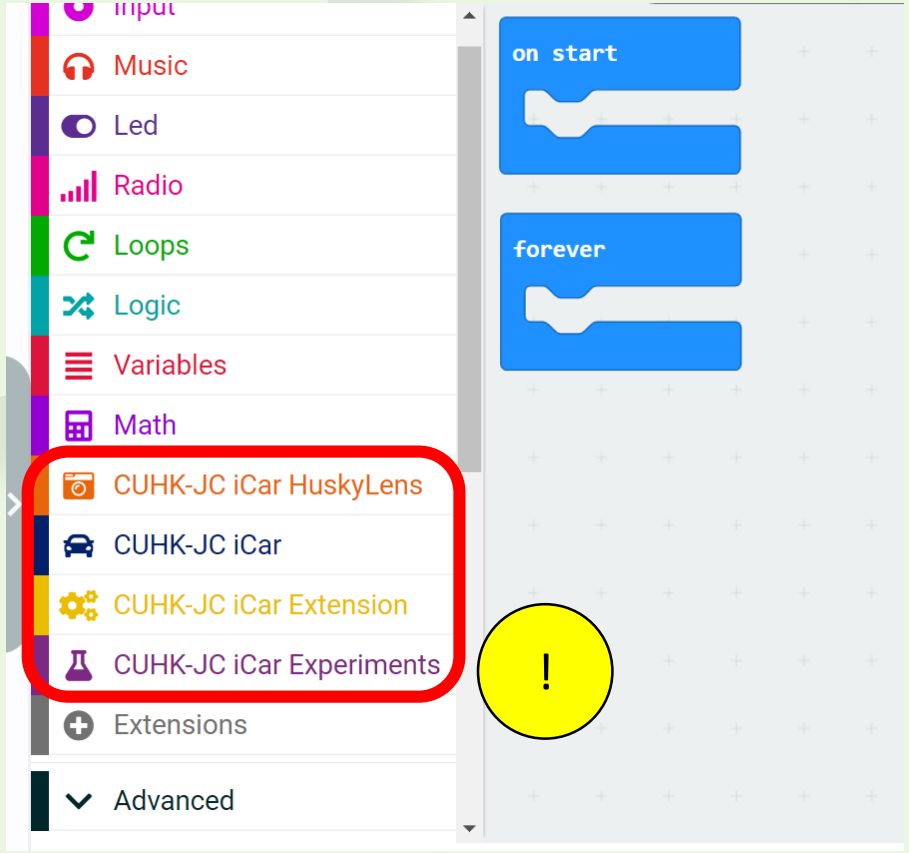
2. Click






3. Paste the following link https://github.com/hitkuangye/CUHK_JC_iCar_V2

4. Click CUHK-JC-iCar extension

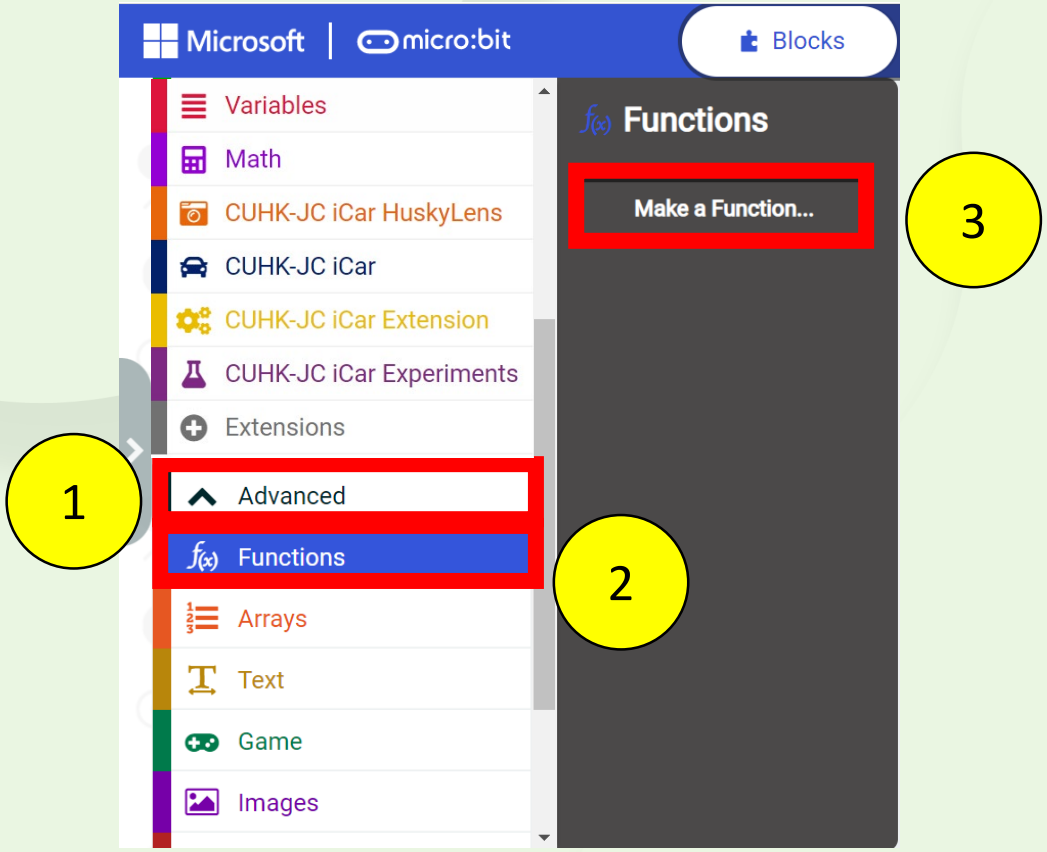



Extensions are included!

# Introduction To micro:bit

Before we start programming, let's learn more about micro:bit!

# Functions Modules

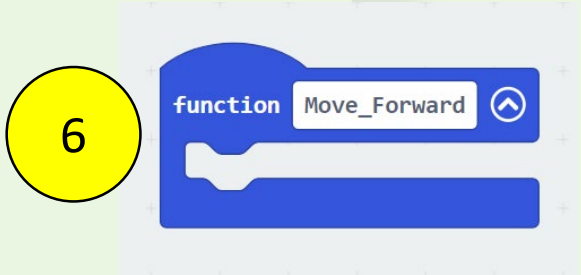



1. Scroll to the bottom of module list and click 

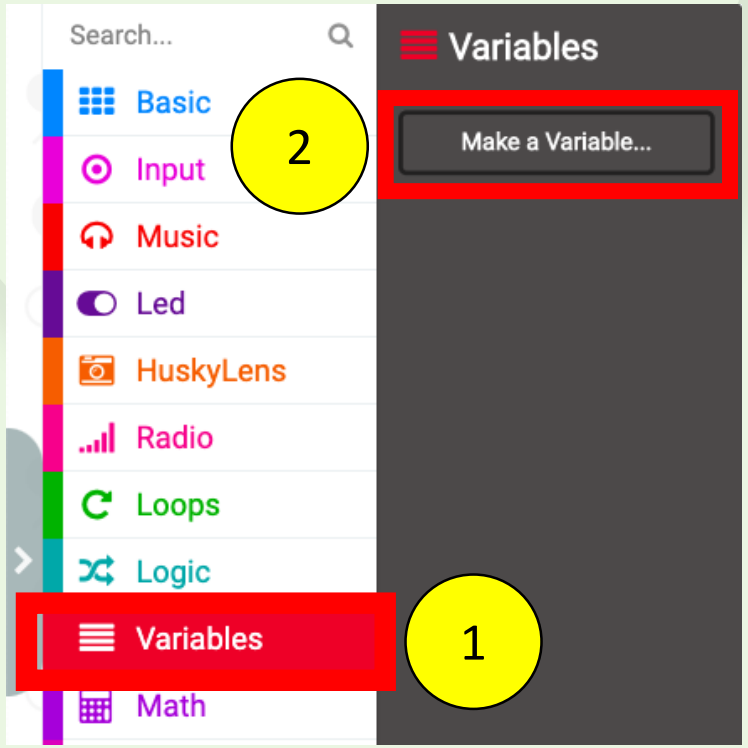

2. Click 

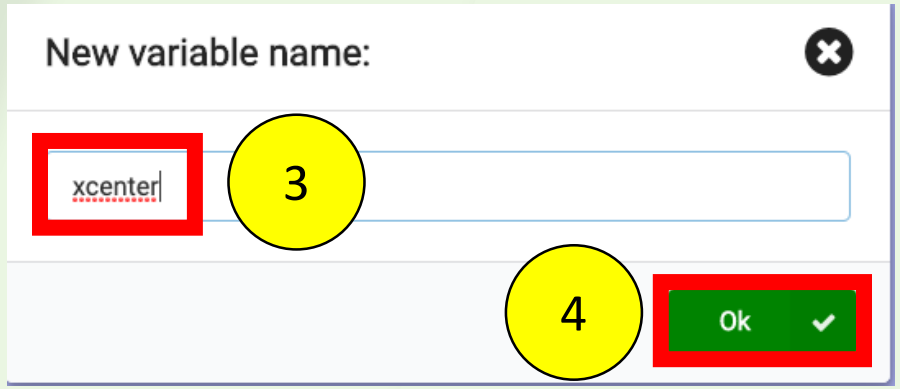

3. Click 

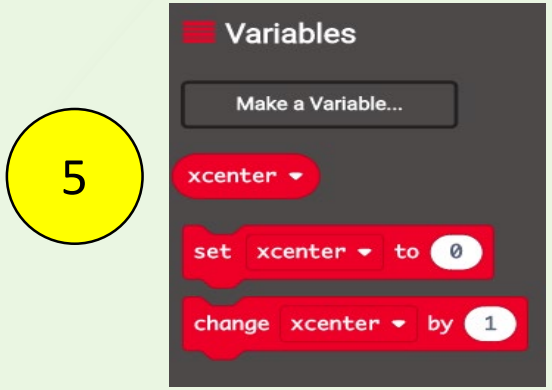

4. Name the function "Move_Forward"
5. Click Done
6. "Move_Forward" function will appear on the screen



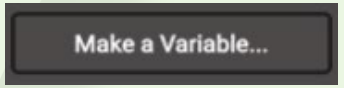
# Variables Modules



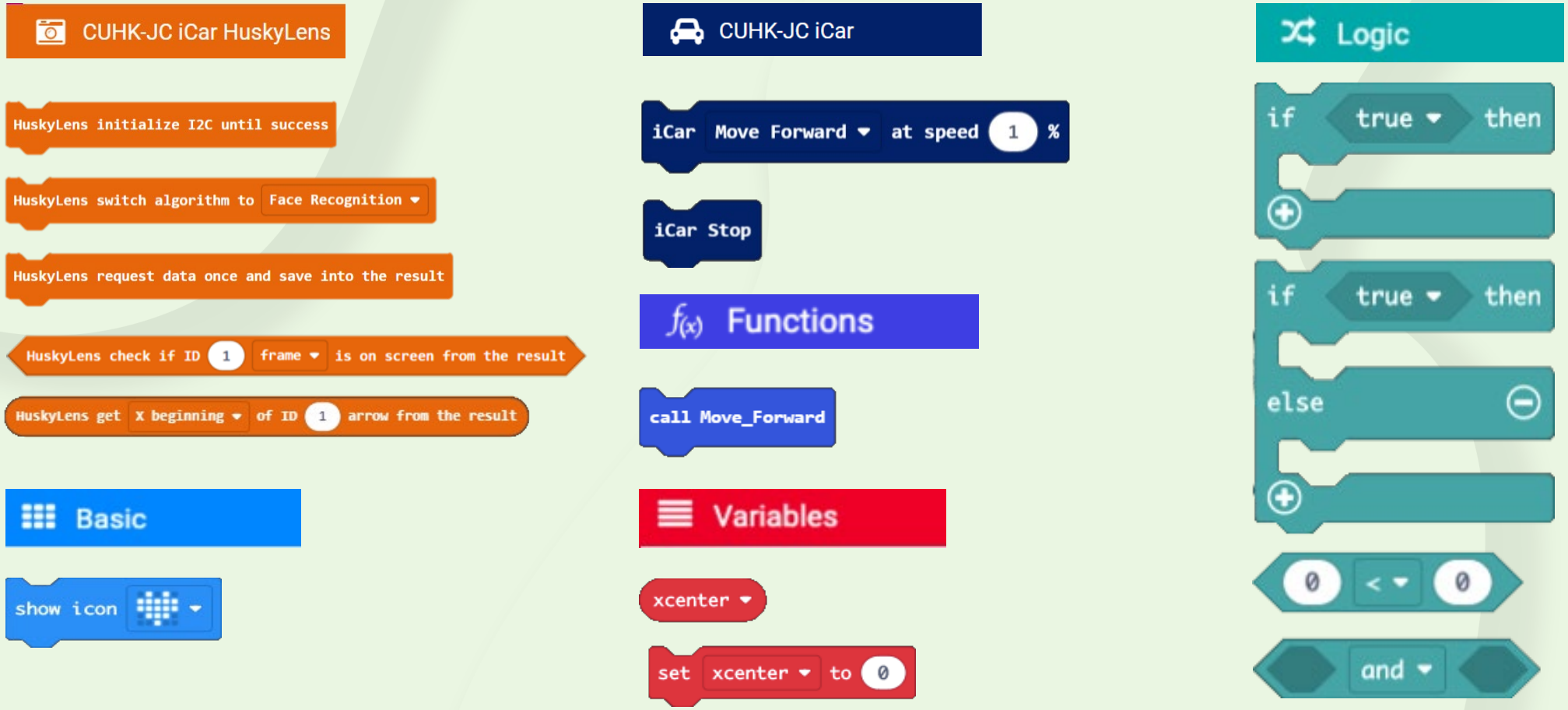

1. Click 

2. Click 

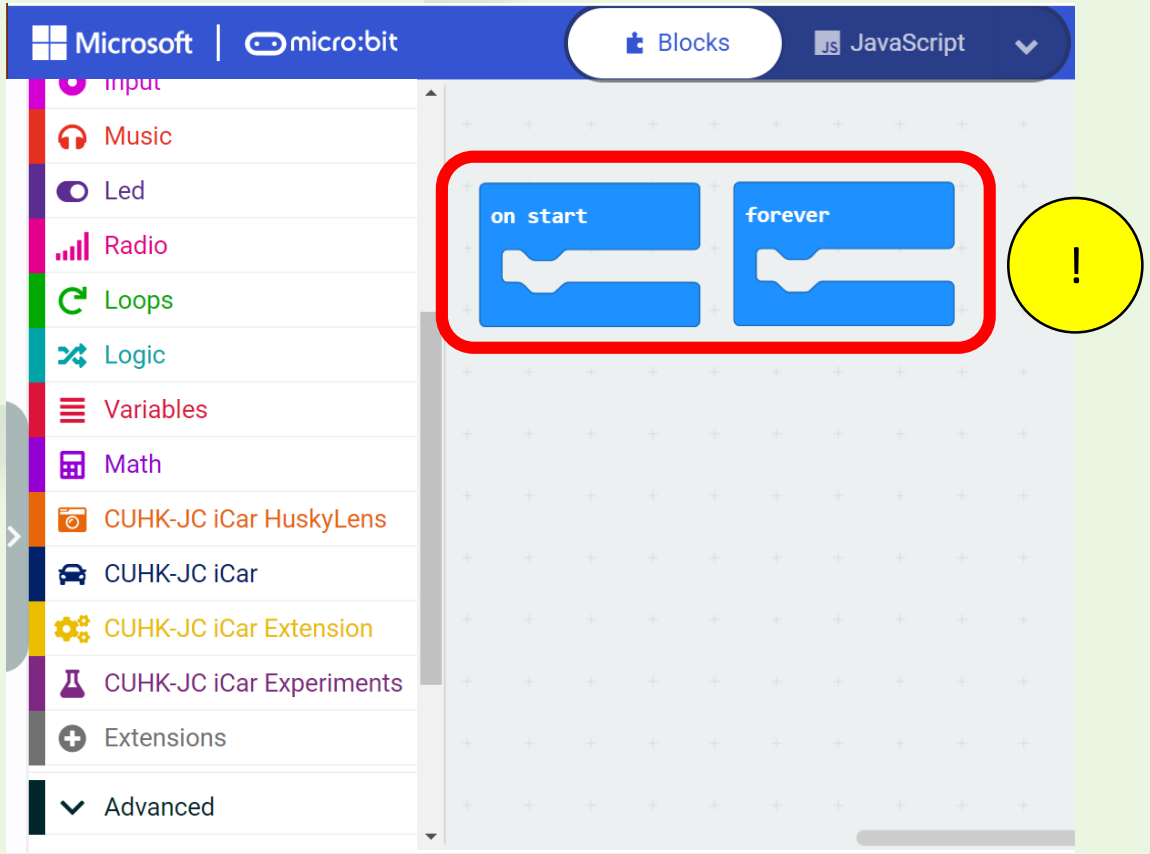
3. Name the variable “xcenter"
4. Click 

5. Programming blocks related to “xcenter” will appear on the list

# The Remaining Modules



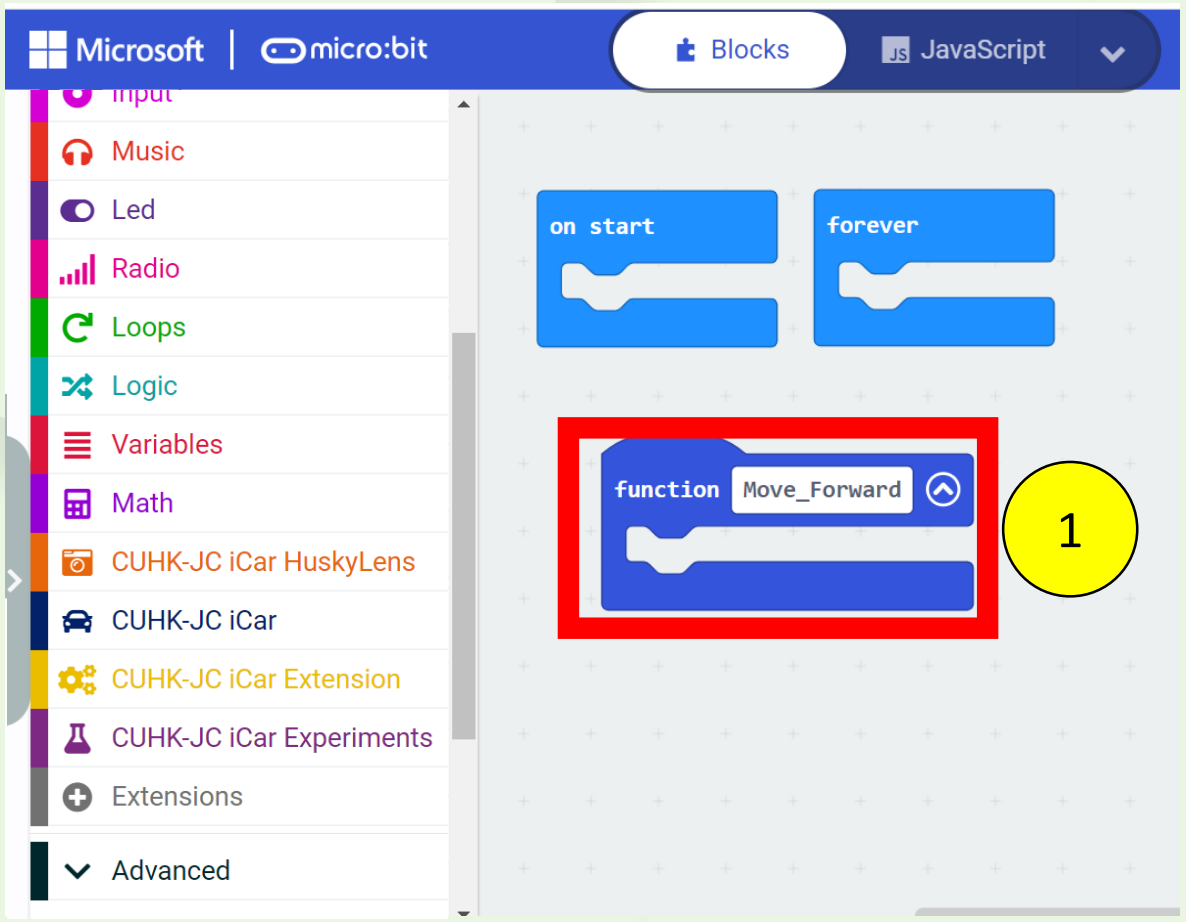
# Let's start coding!



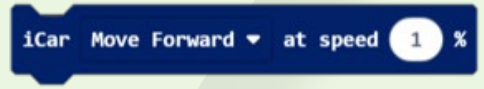

The program will pre-set "on start" and "forever" at the beginning.

We can ignore them for now.
Please don't delete!

# Step 1: Adding The “Move_Forward” Function

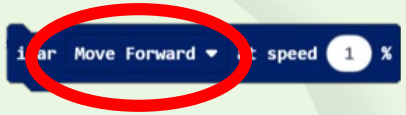



1. Add “Move_Forward” function


2. Drag 


from 


into "Move_Forward" function

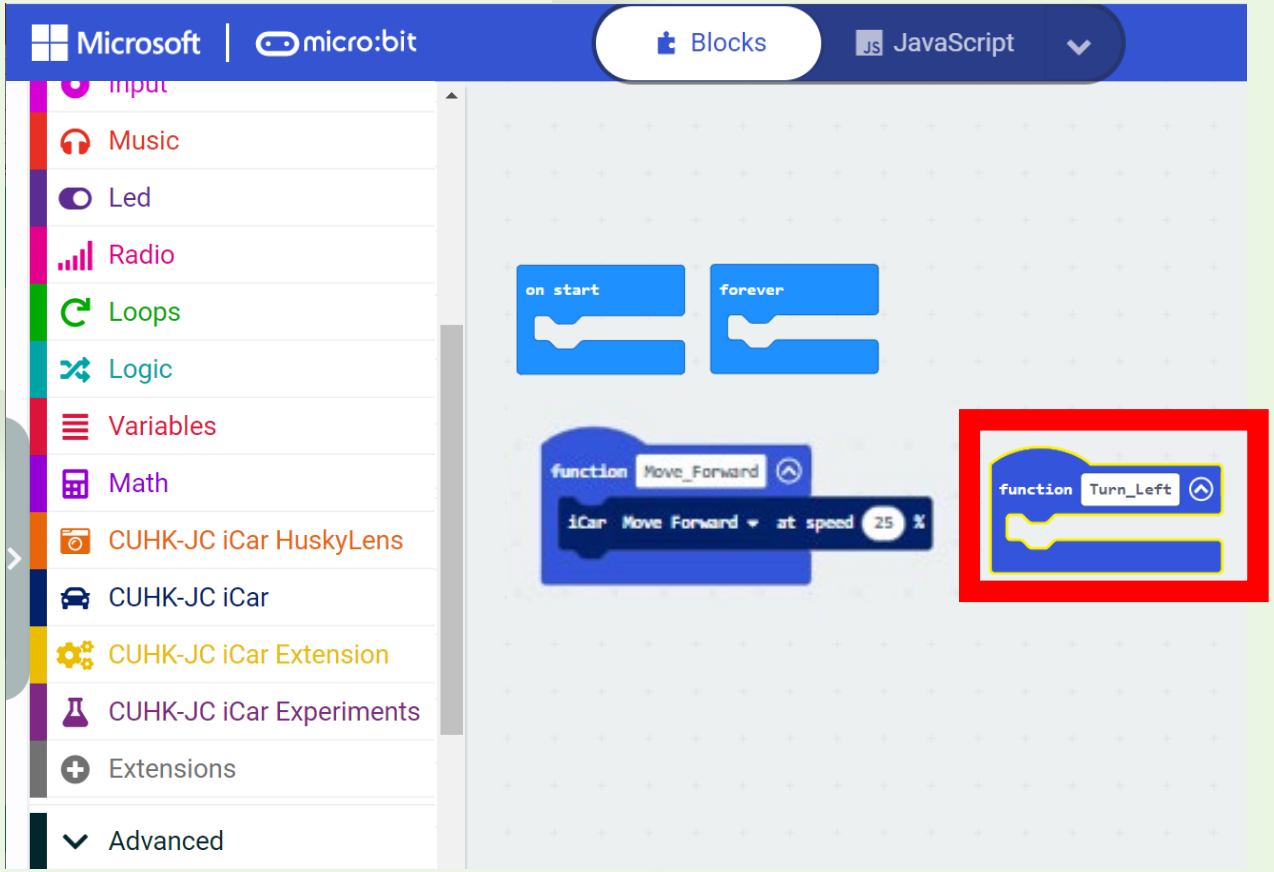
3. Inside 


set to "Move Forward"

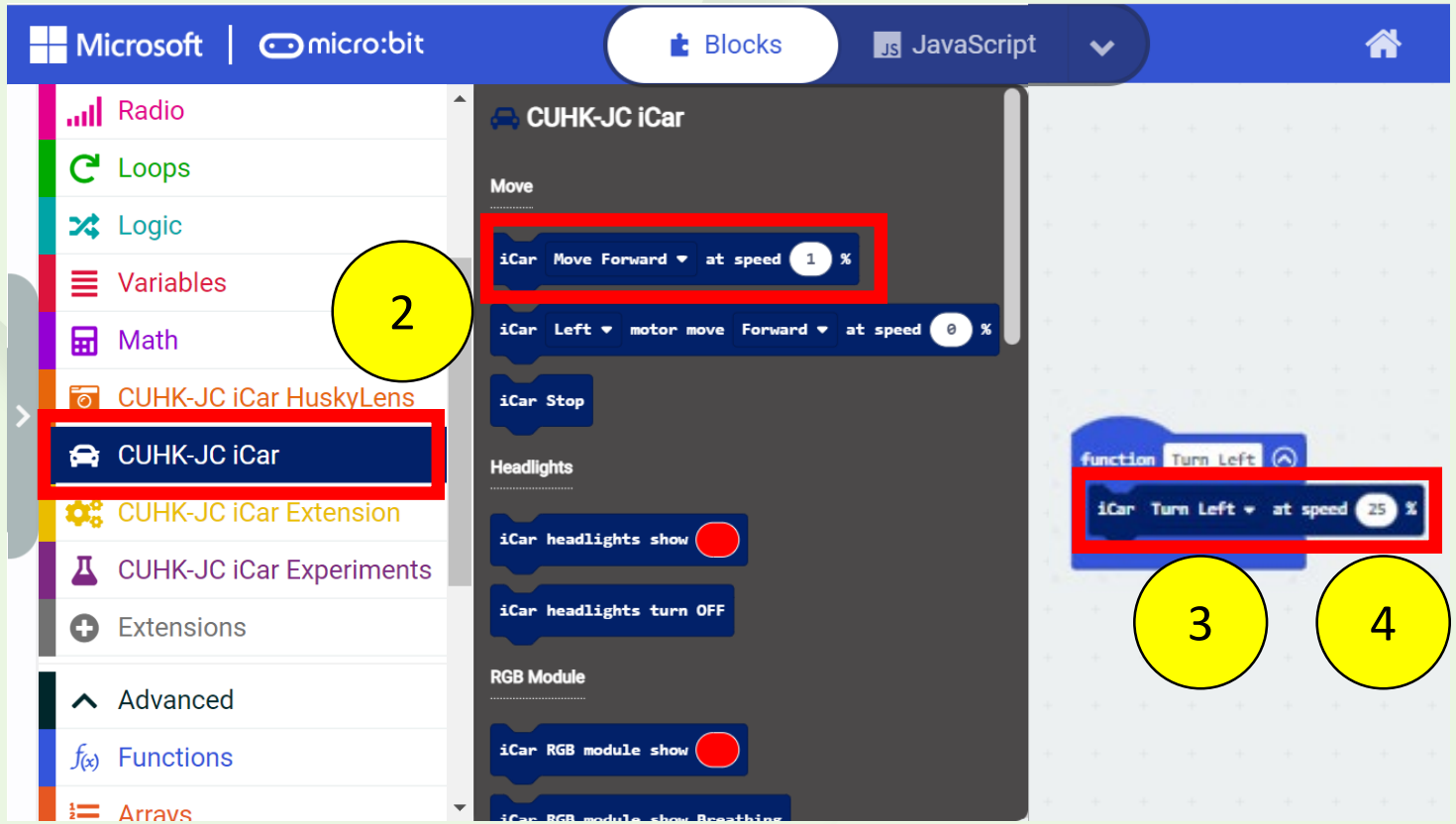
4. Inside 

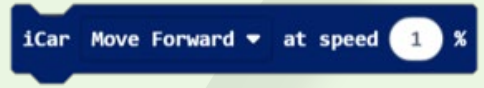

set the speed to "25"

# Step 2: Adding The “Turn_Left” Function



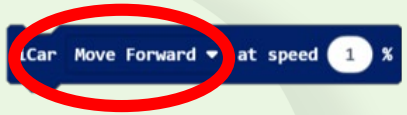

1. Add “Turn_Left” function




2. Drag 


from 


into “Turn_Left” function

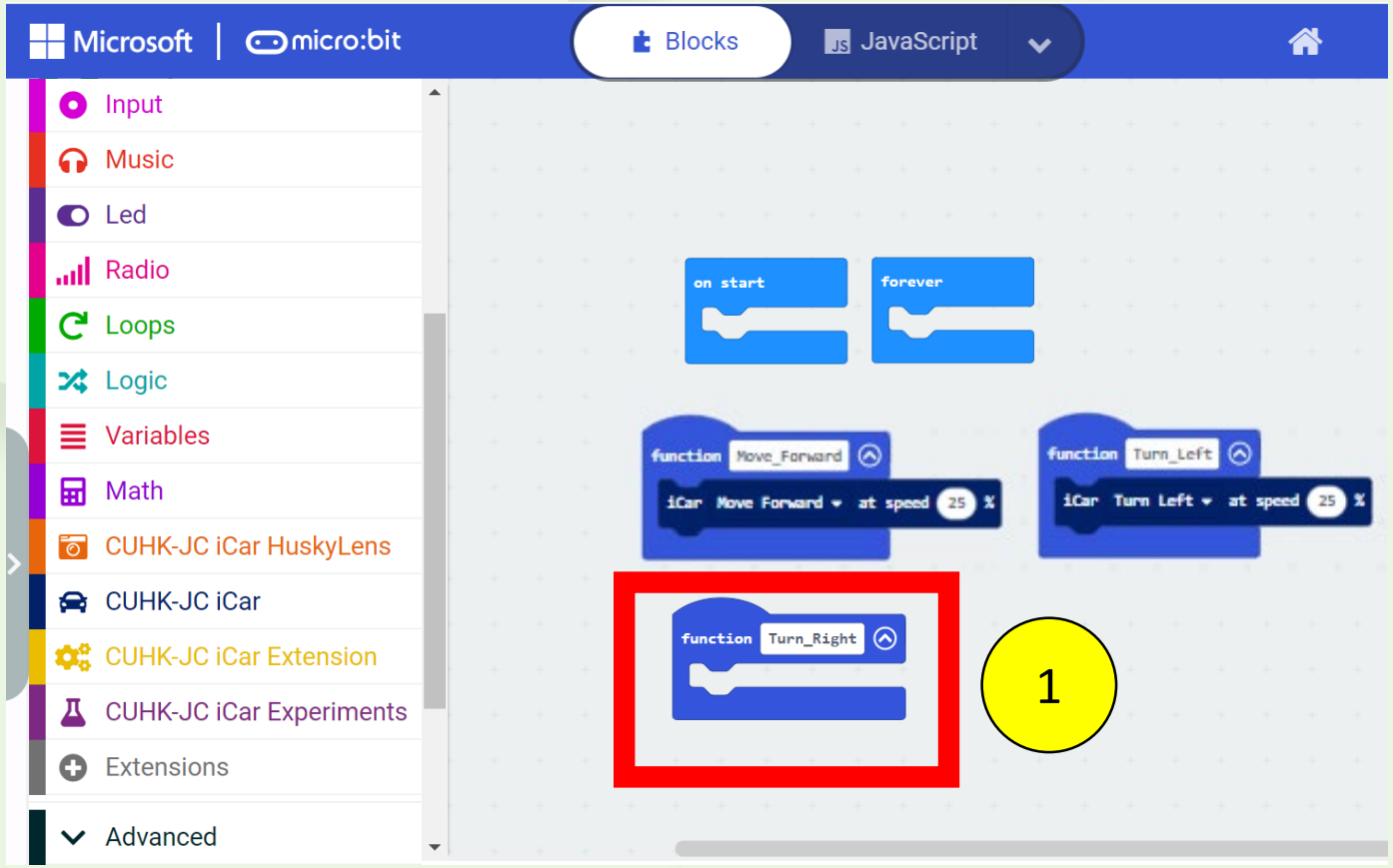
3. Inside 


set to “Turn Left”

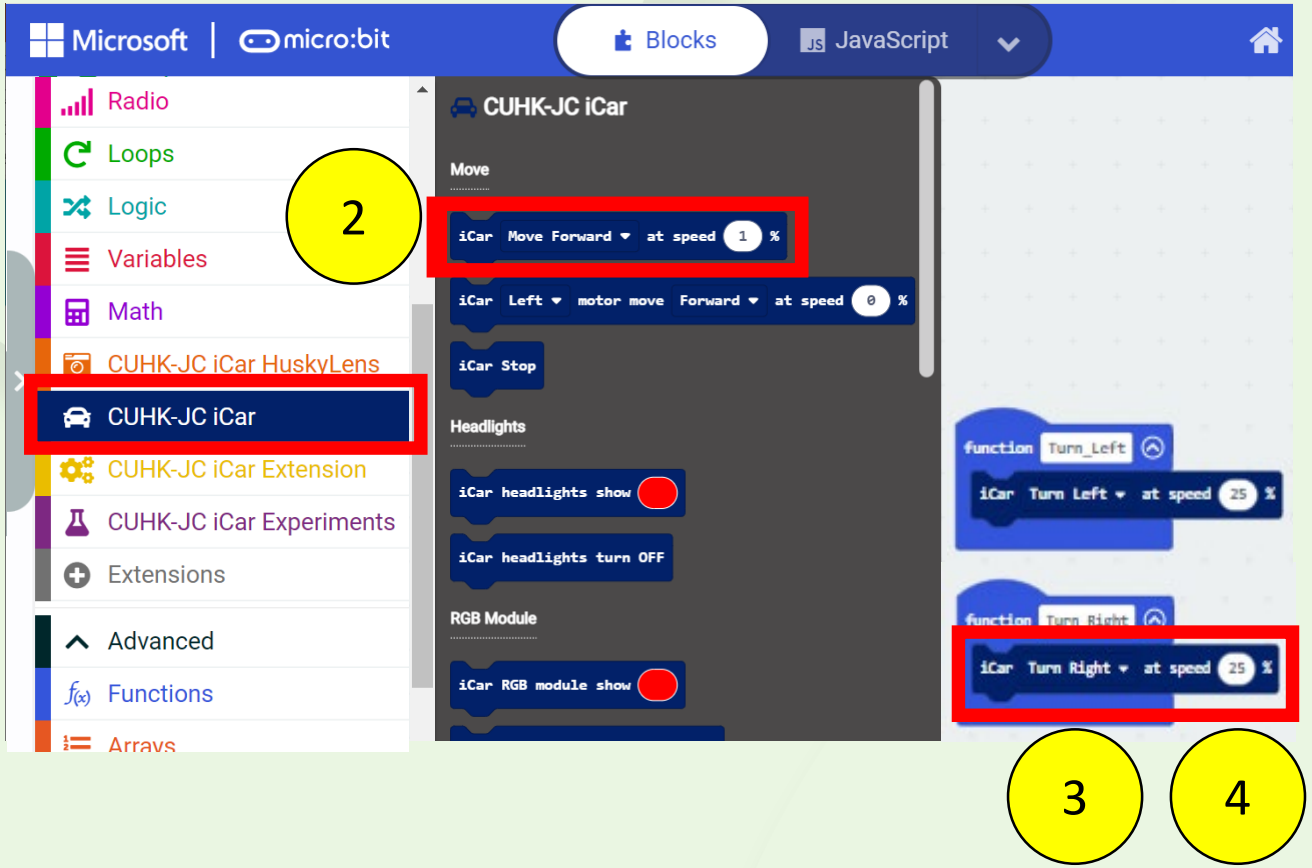
4. Inside 

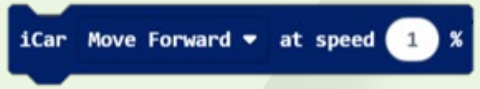

set the speed to “25”

# Step 3: Adding The "Turn_Right" Function




1. Add "Turn_Right" function




2. Drag 


from 


into "Turn_Right" function

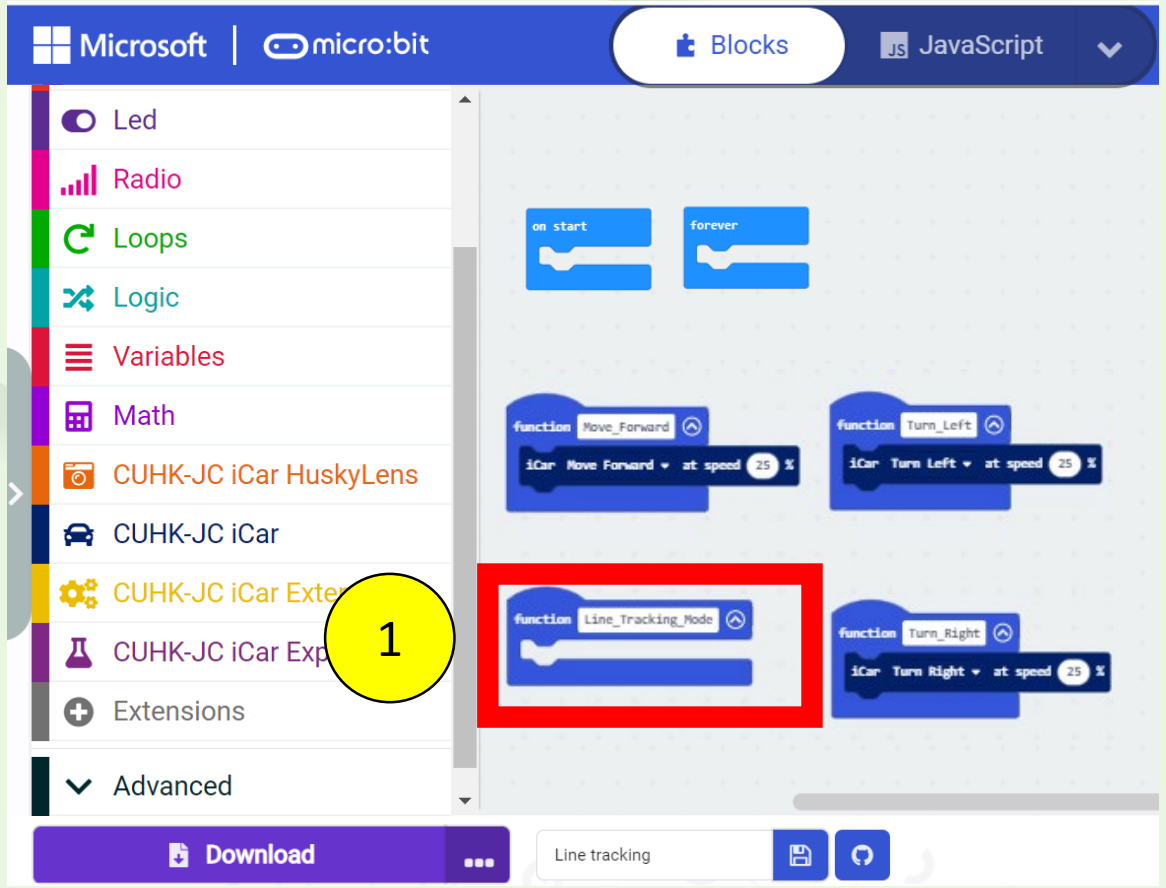
3. Inside 


set to "Turn Right"

4. Inside 


set the speed to "25"

# Step 4: Adding The “Line_Tracking_Mode” Function

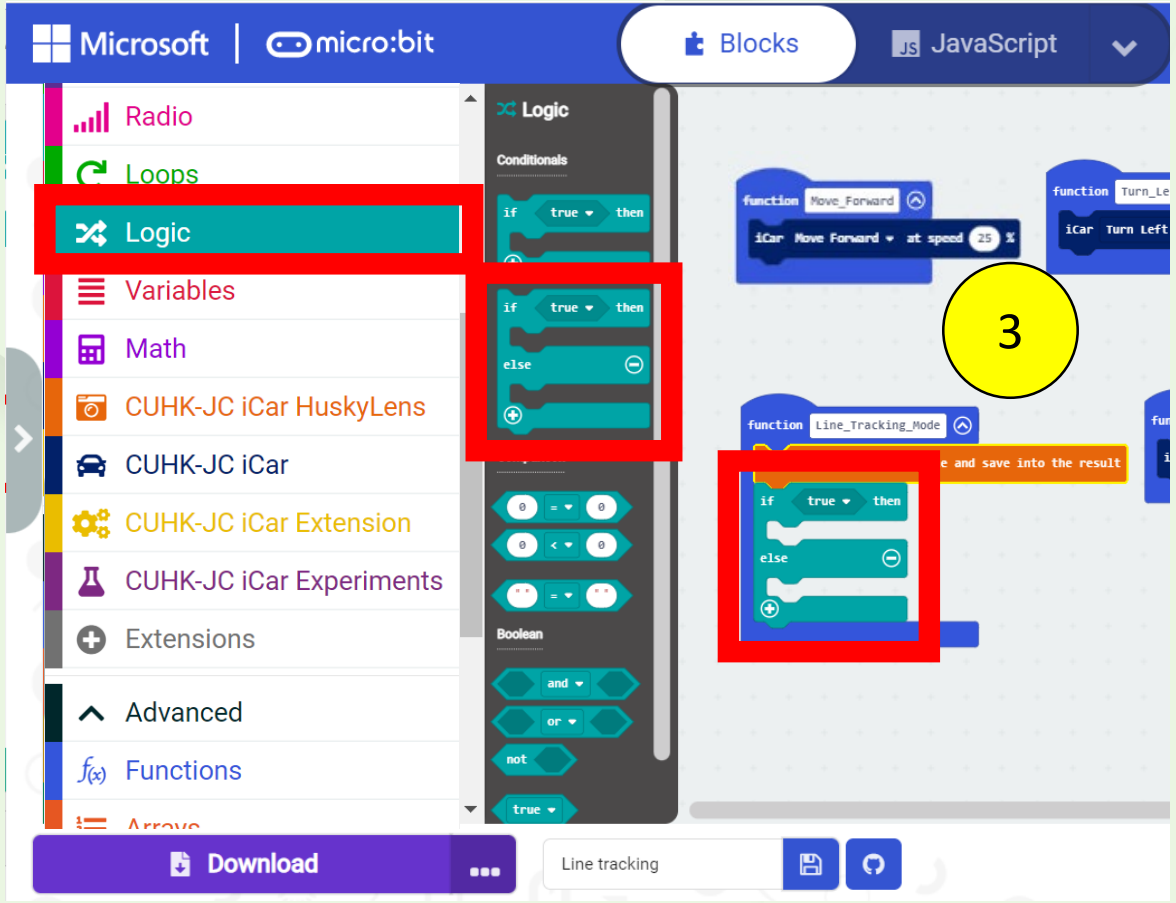



1. Add “Line_Tracking_Mode” function


2. Drag `HuskyLens request data once and save into the result`

from `CUHK-JC iCar HuskyLens`

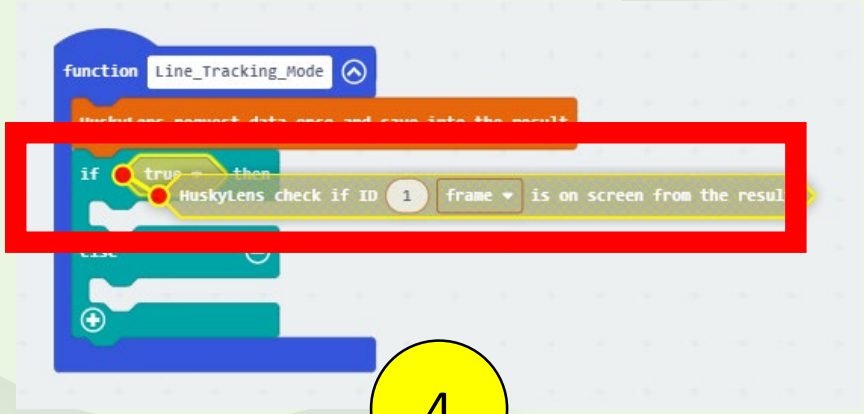
into "Line_Tracking_Mode" function

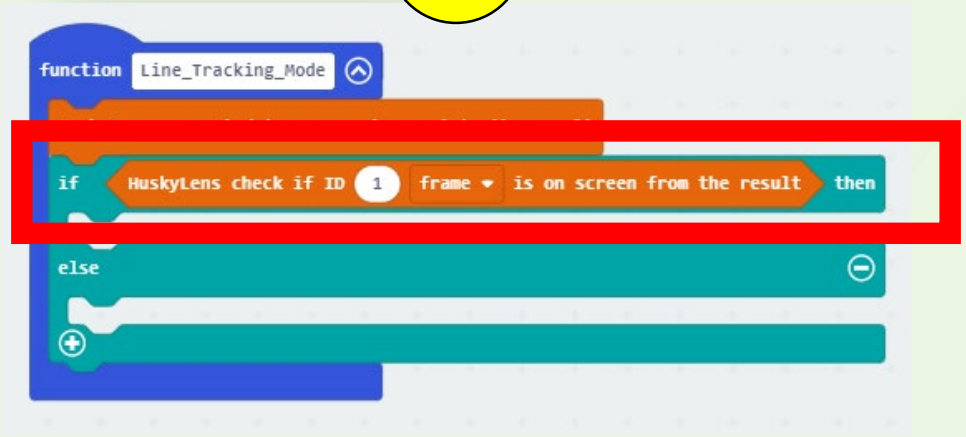


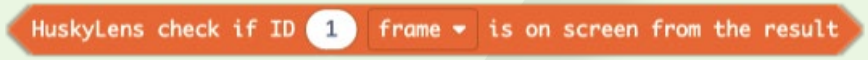

3. Drag 

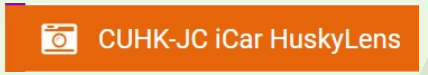

from 


into “Line_Tracking_Mode” function



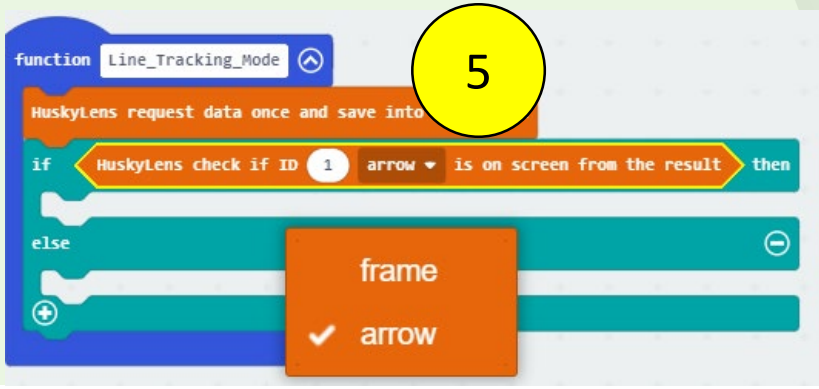

4. Drag 

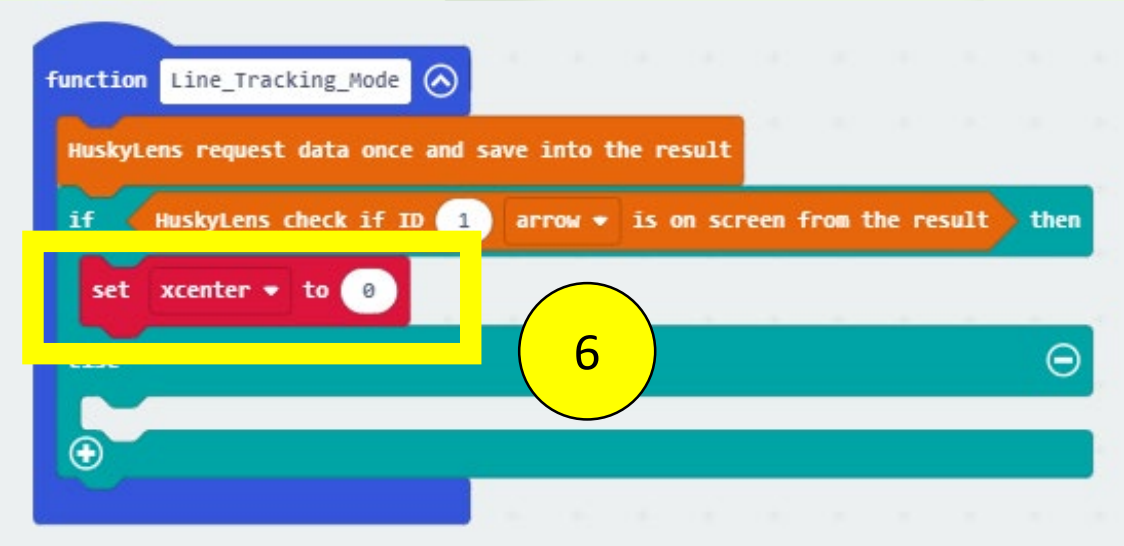

from 


into "if then else"

5. Inside 


click "arrow"

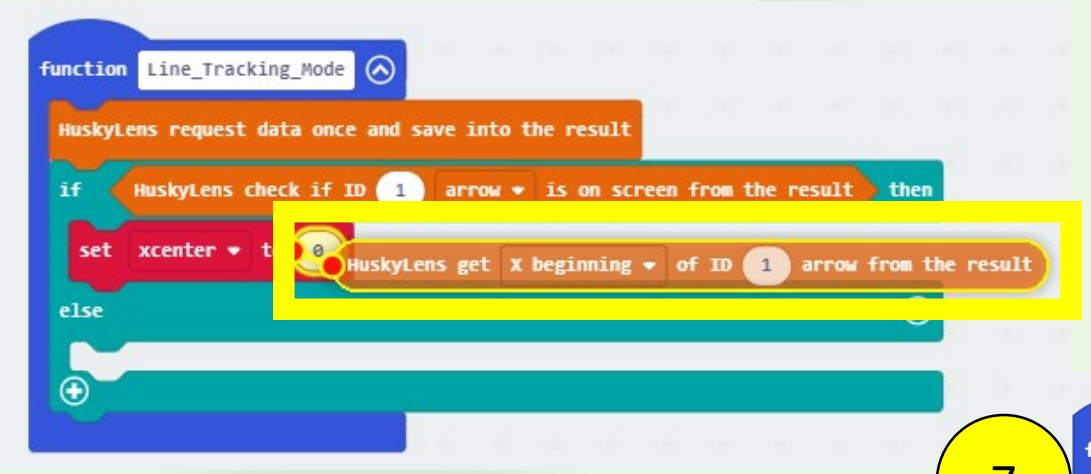





6. Drag 


from 

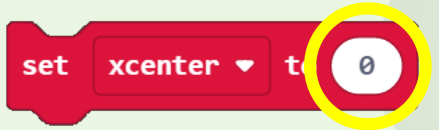

into “if then else”



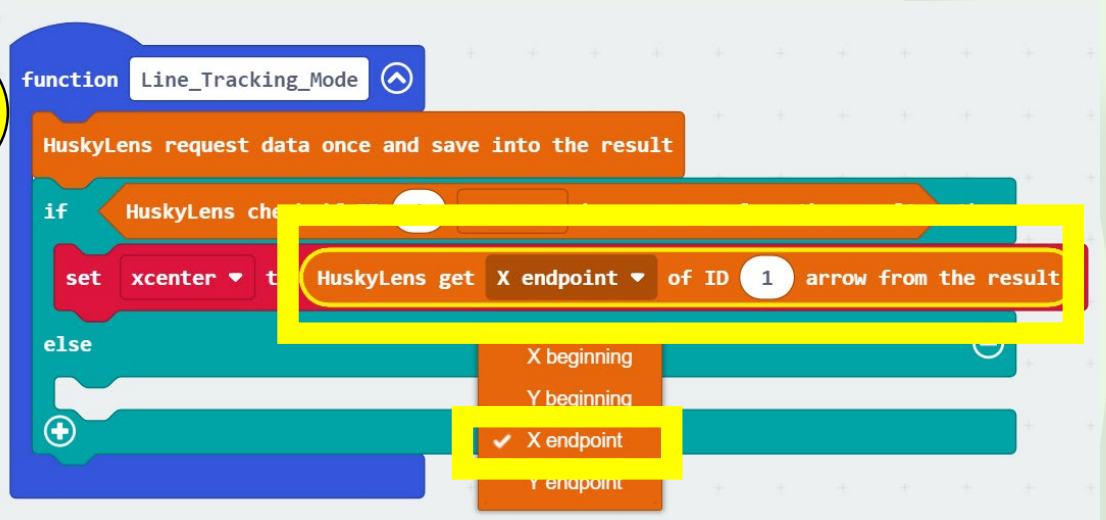

7. Drag

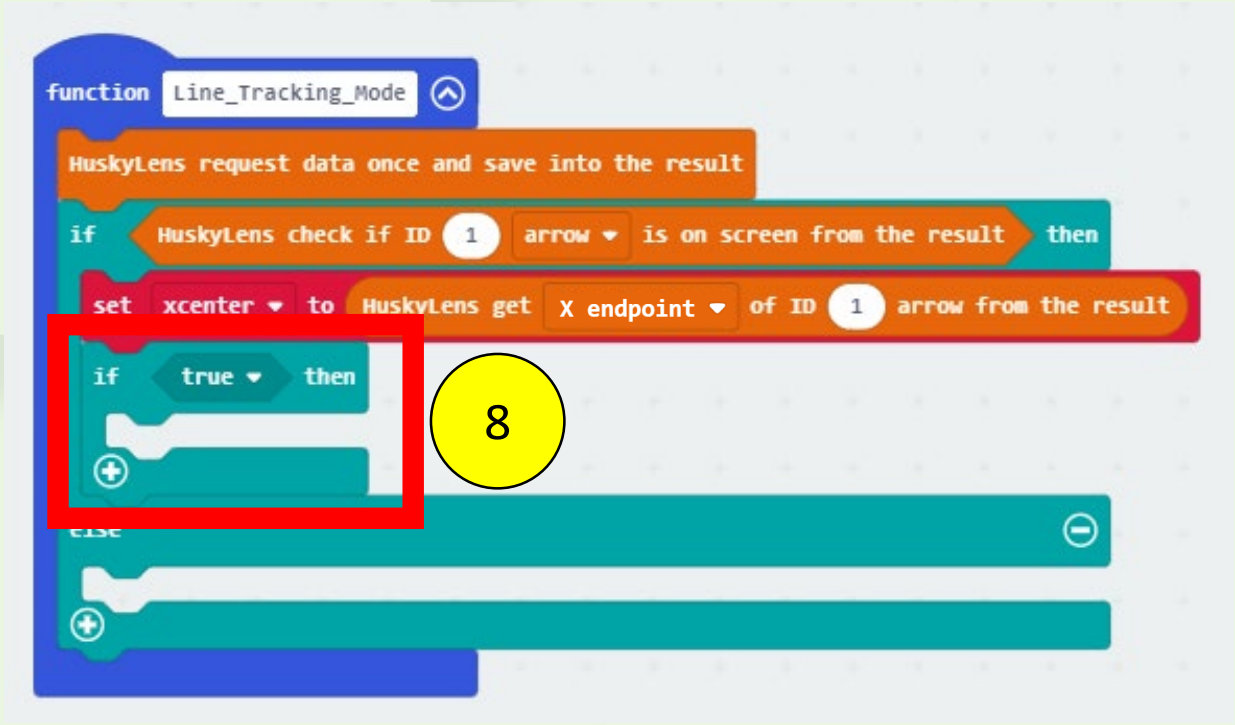

from

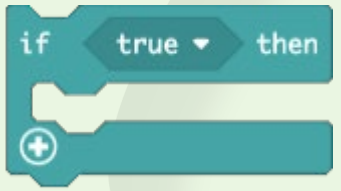

into




7

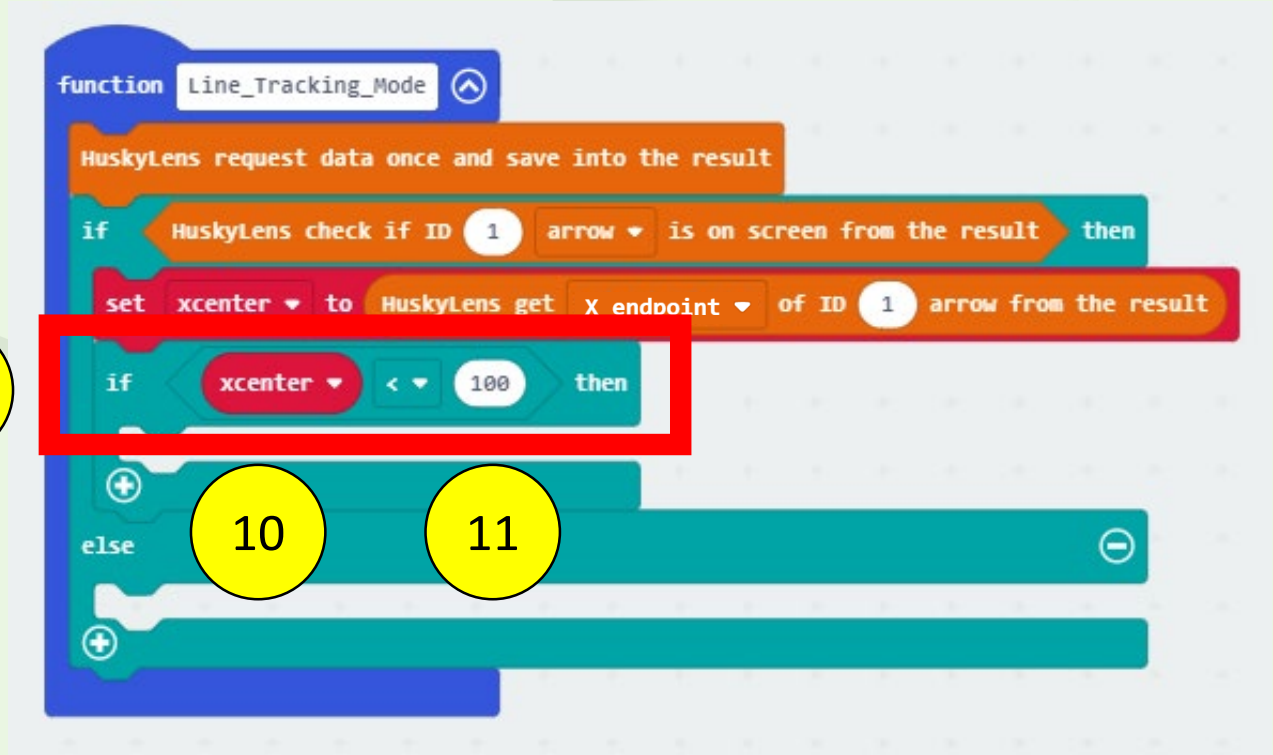




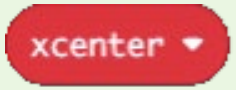
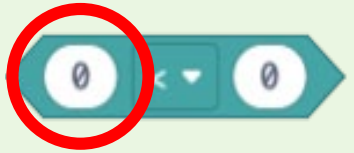

8. Drag 

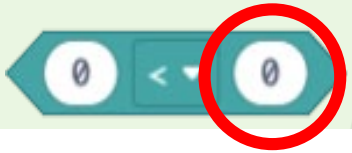

from 


into “if then else”

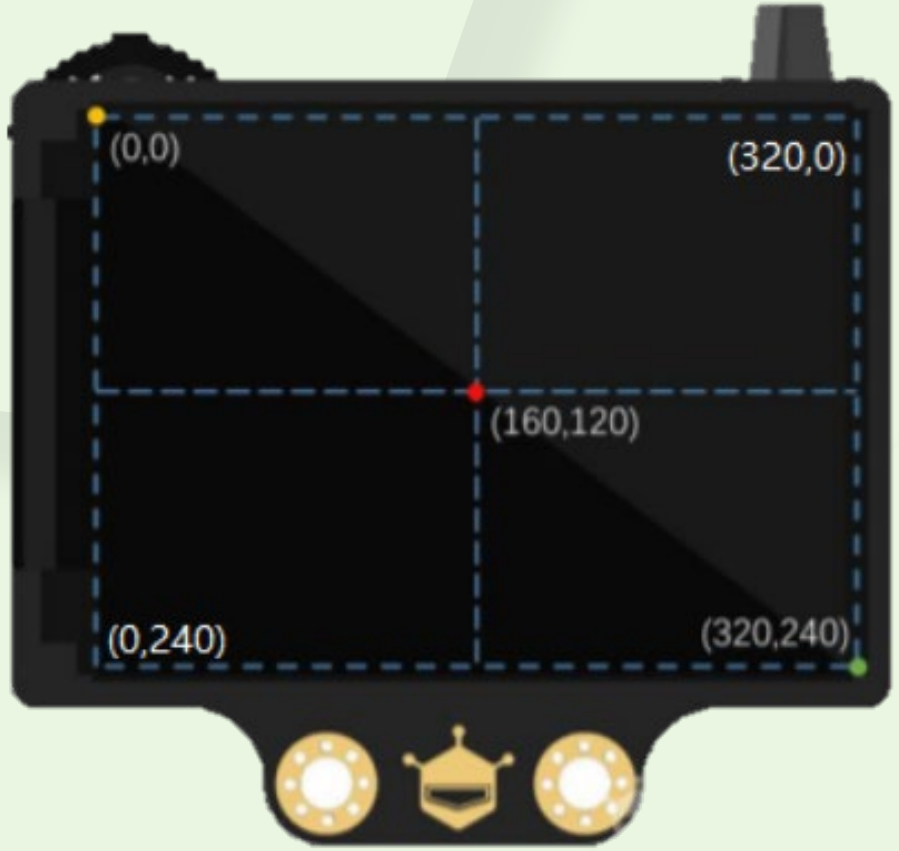



9. Drag  from Logic into "if then"

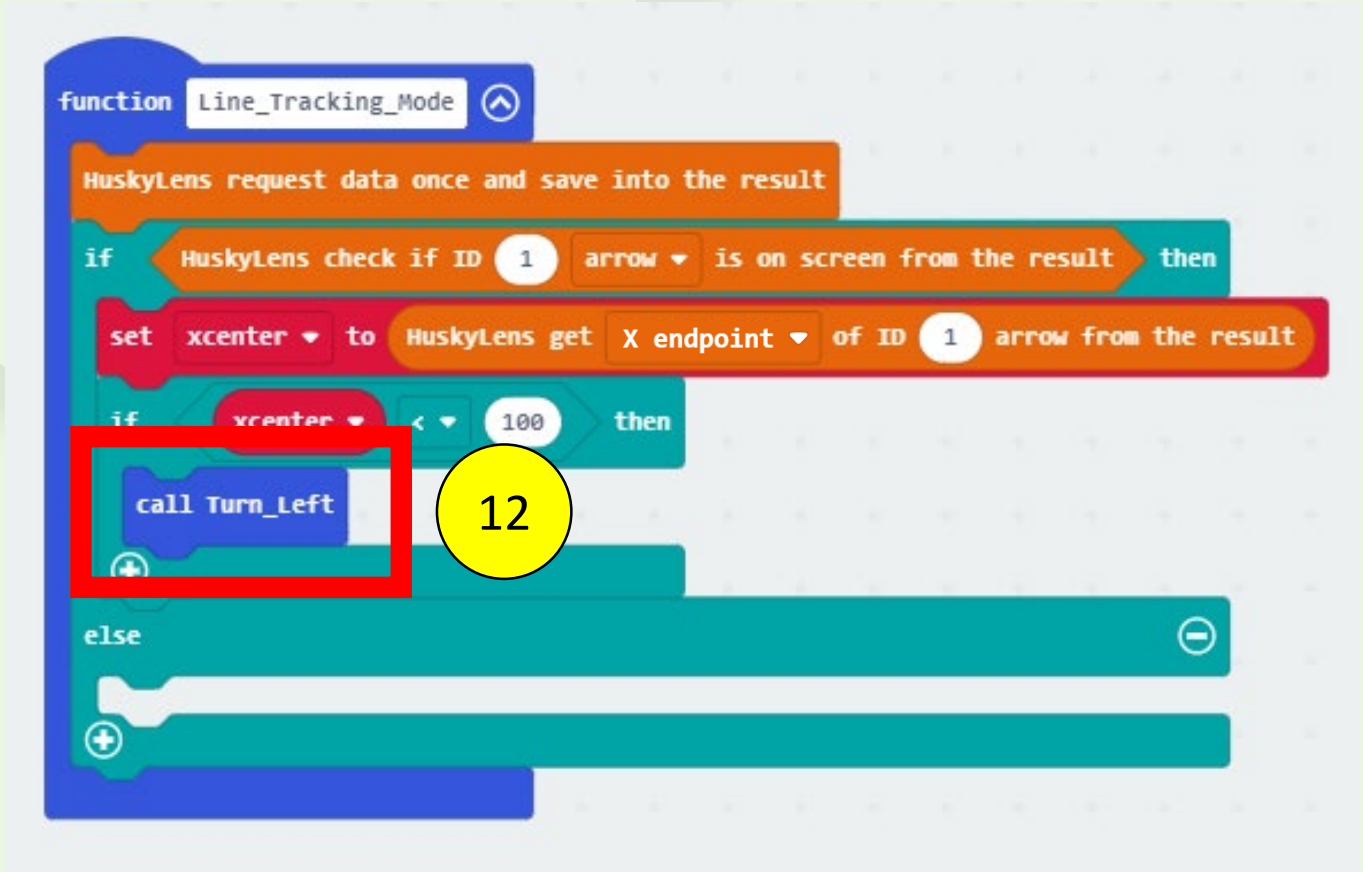
10. Drag  from Variables into 

11. Inside  enter "100"

# Remark: HuskyLens' coordinates



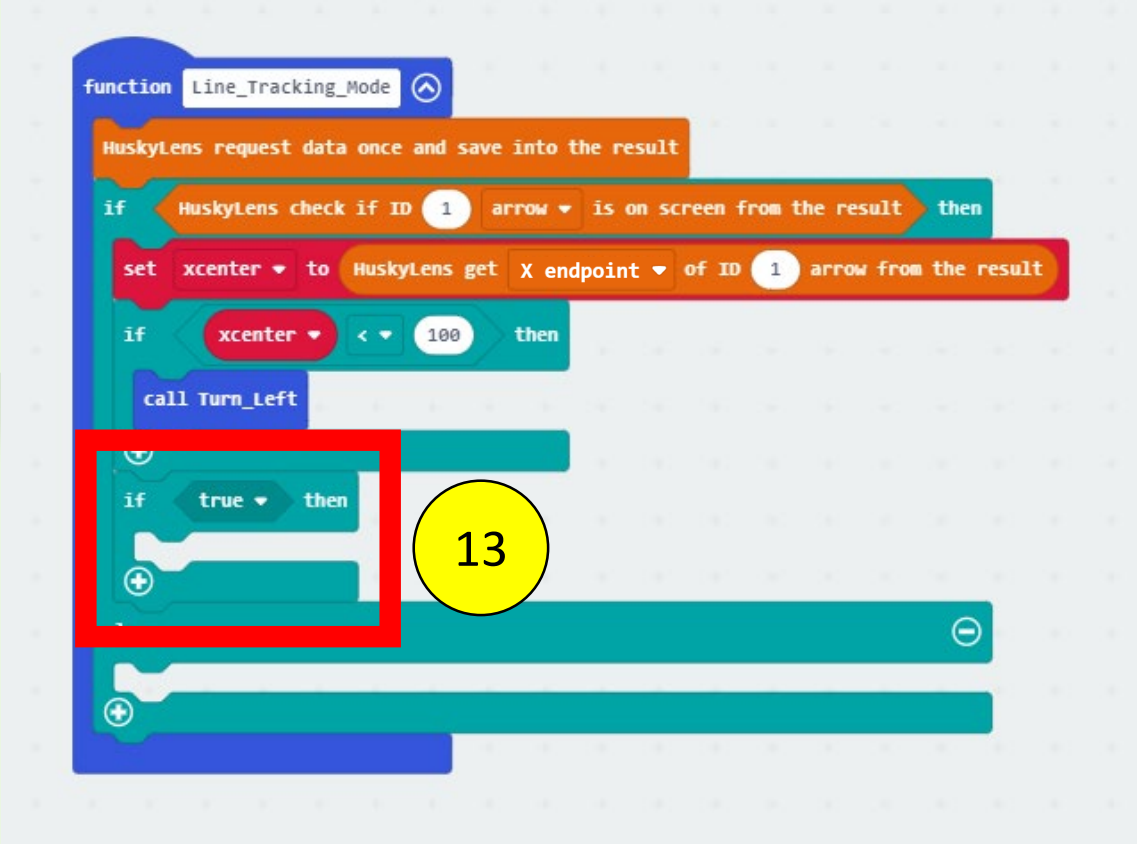

- The object's coordinates will be displayed when HuskyLens detects an object
- Format: (x, y)

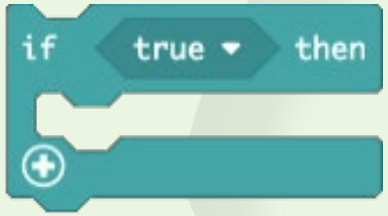



12. Drag `call Turn_Left`

from `f(x) Functions`

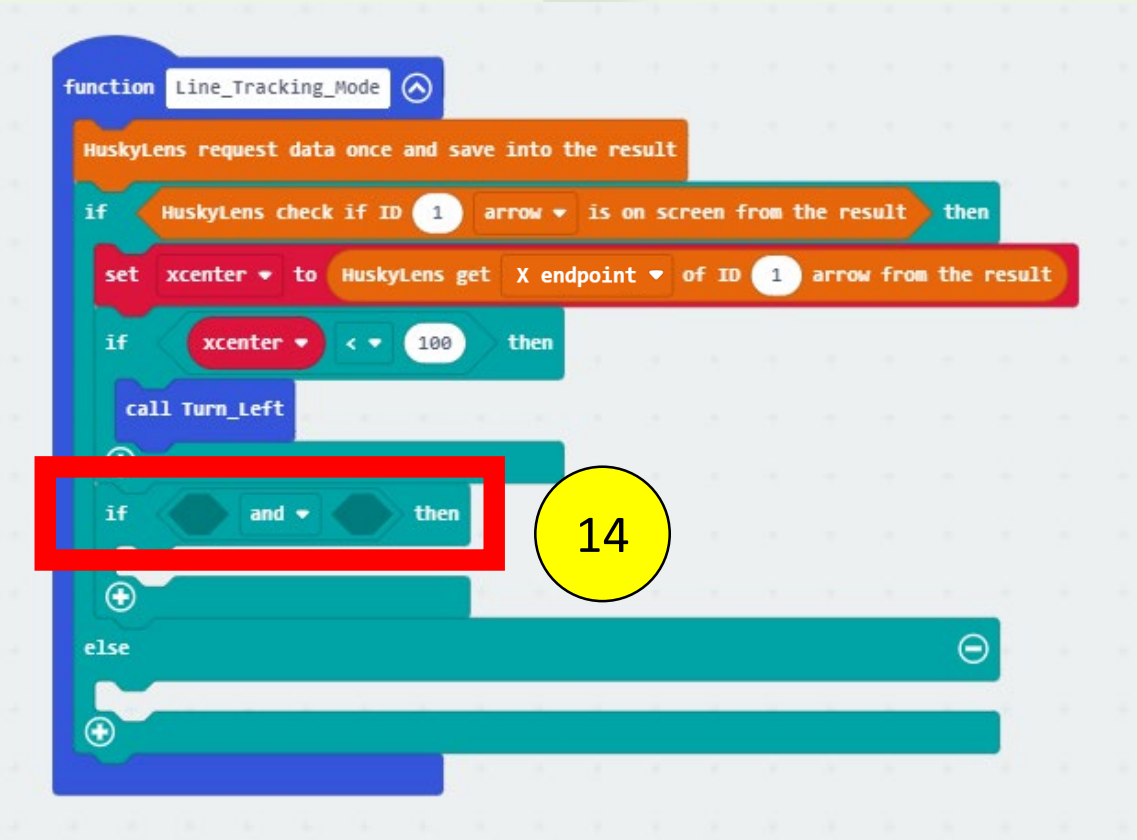
into “if then”




13. Drag 


from 

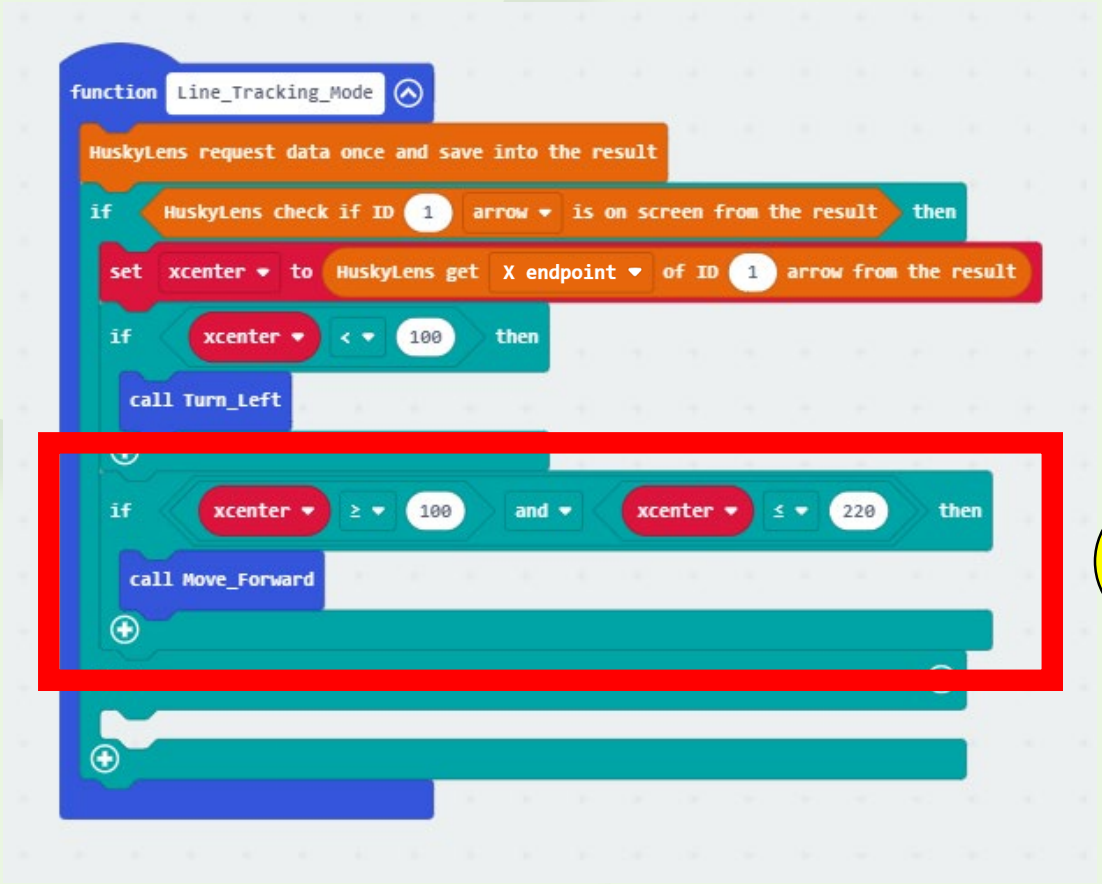

into “if then else”




14. Drag 

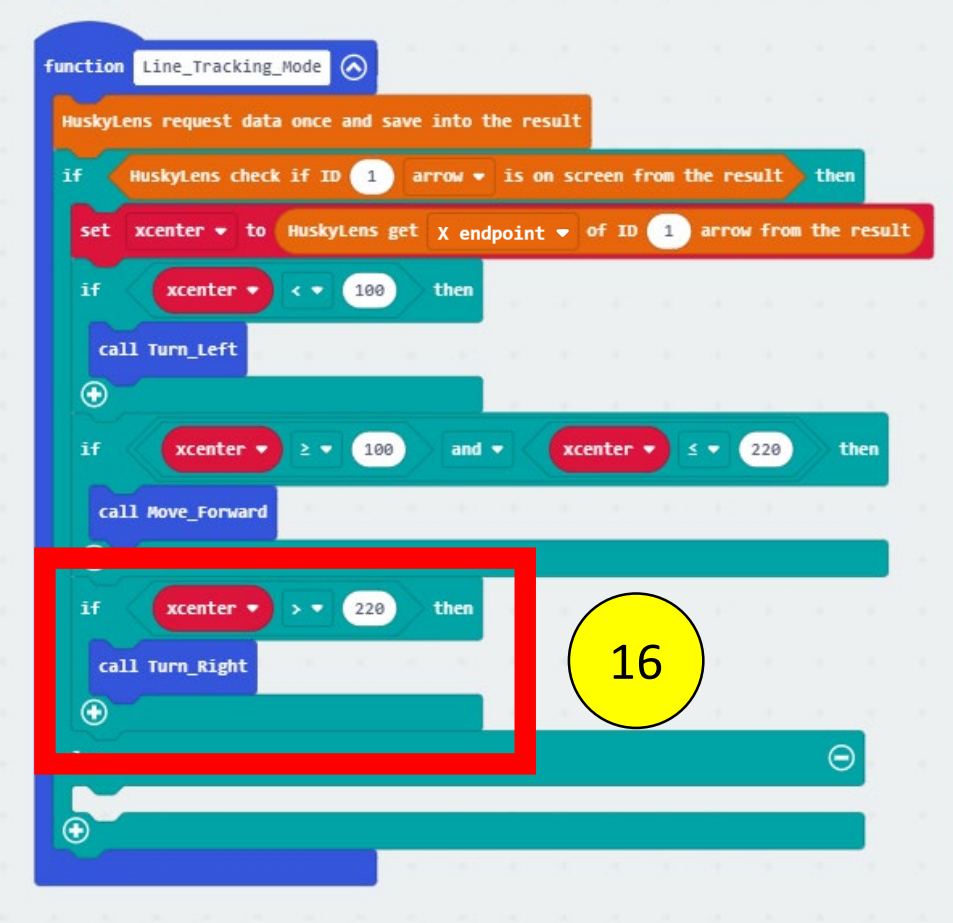

from 


into “if then”

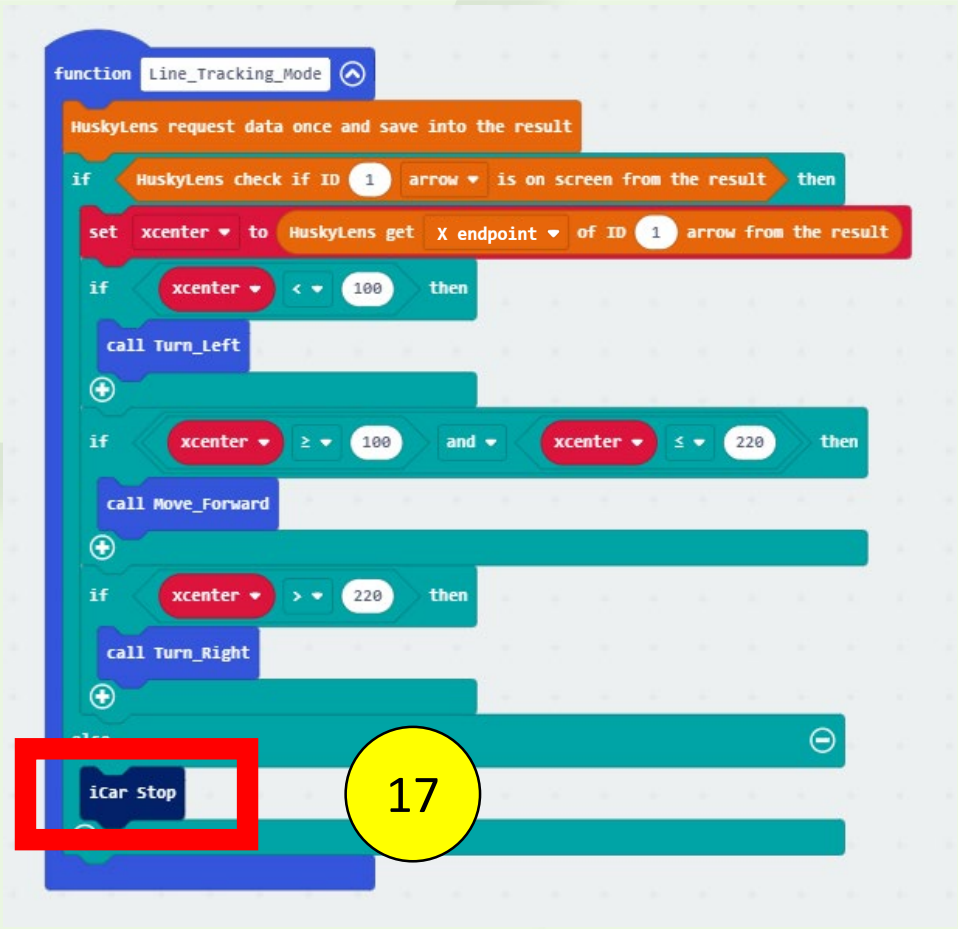



15

15. Set as follows




16. Set as follows

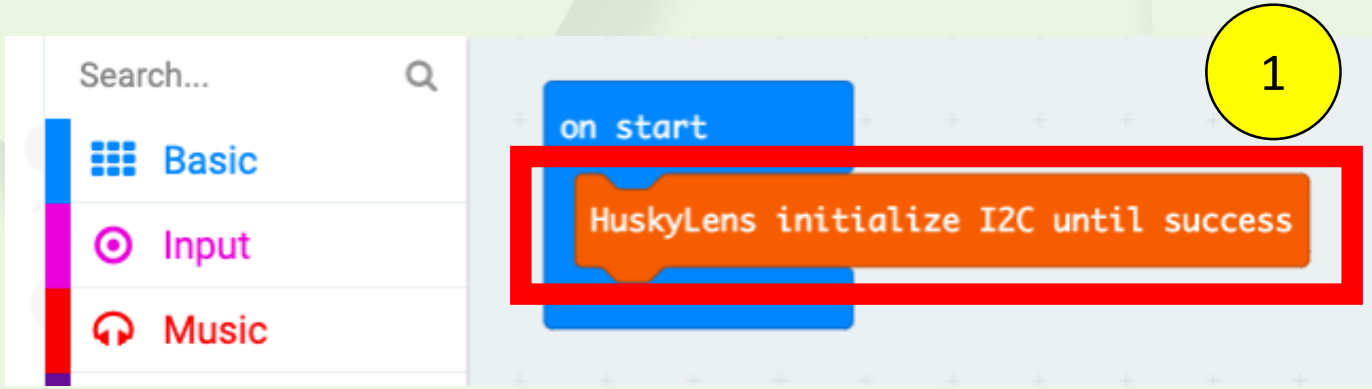


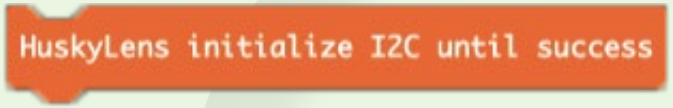

17. Drag **iCar Stop**

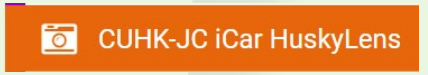
from **CUHK-JC iCar**

into “if then else”

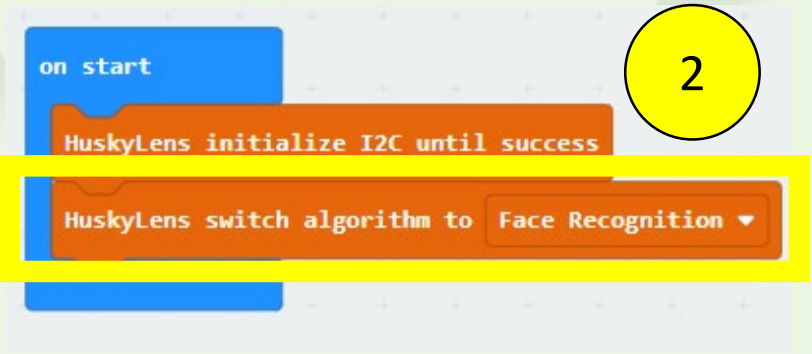
# Step 5: Setting Up The “on start”

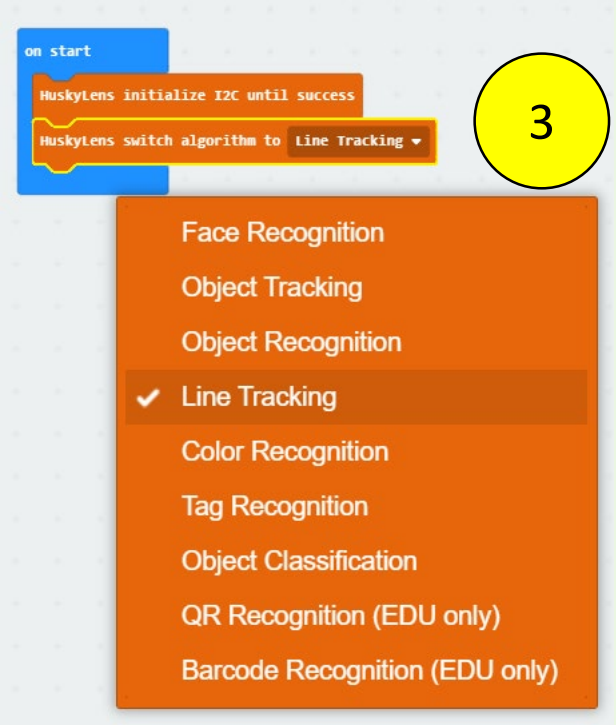


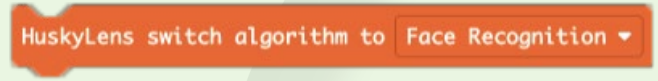

1. Drag 

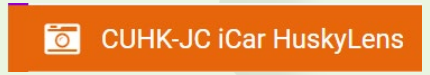

   from 


   into “on start”



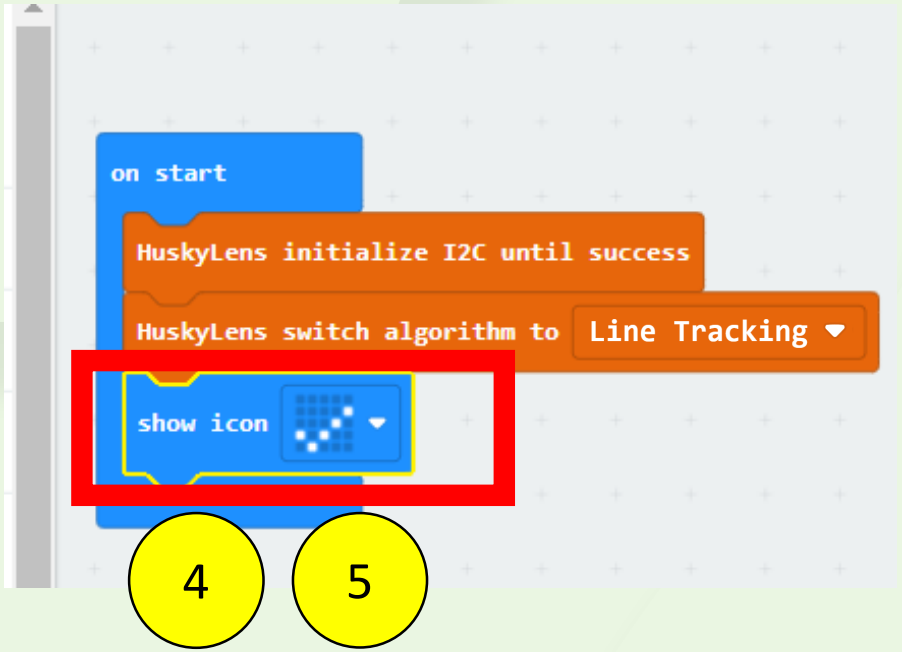

2. Drag 

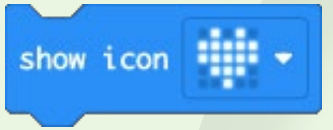

from 

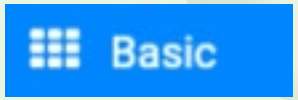

into “on start”

3. Inside 


click “Line Tracking” .



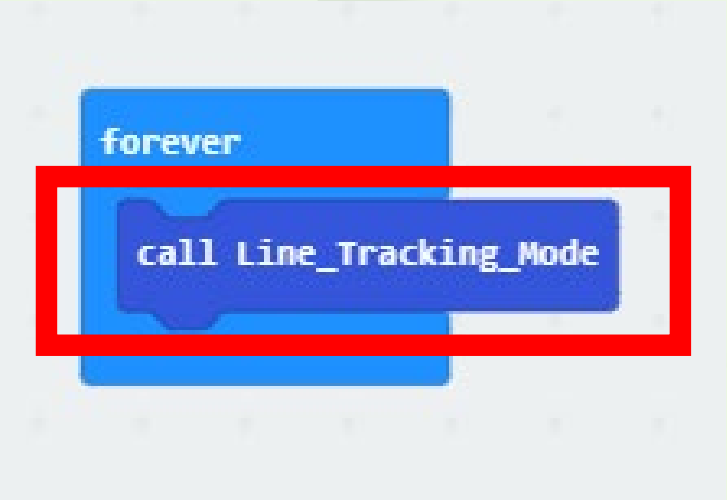

4. Drag 


from 

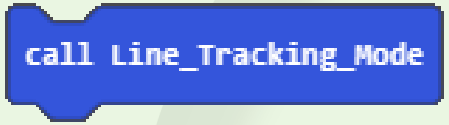

into “on start”

5. Click 

# Step 6: Setting Up The “forever”



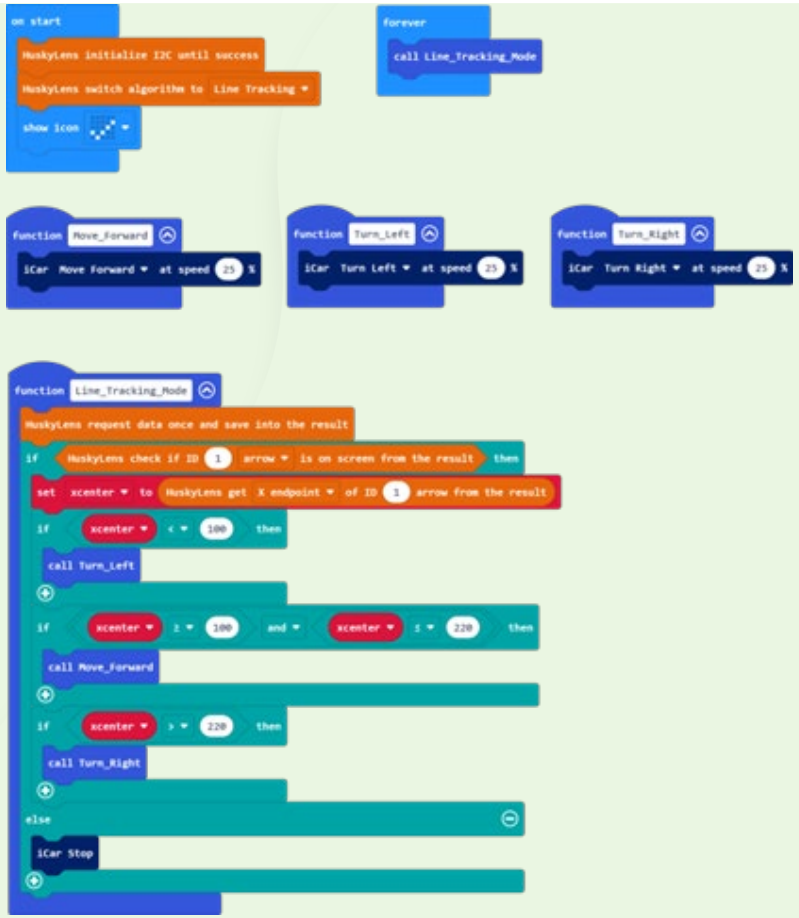

1

1. Drag 

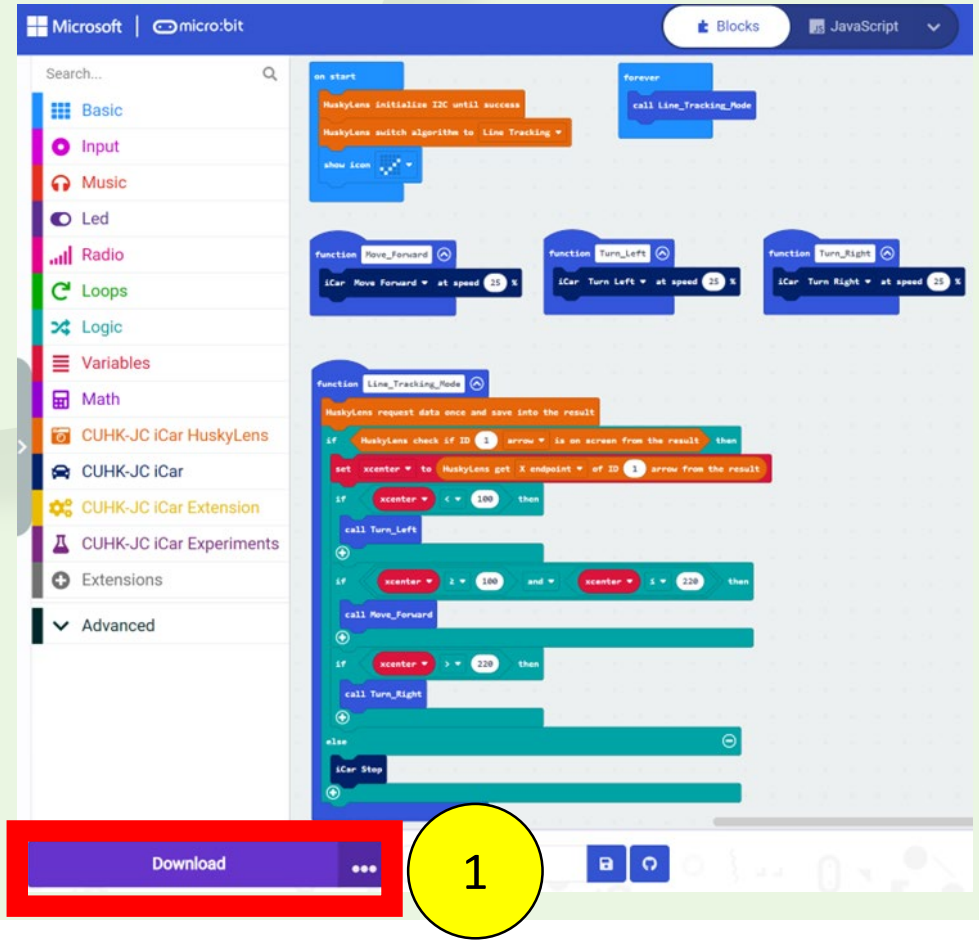

   from 


   into “forever”

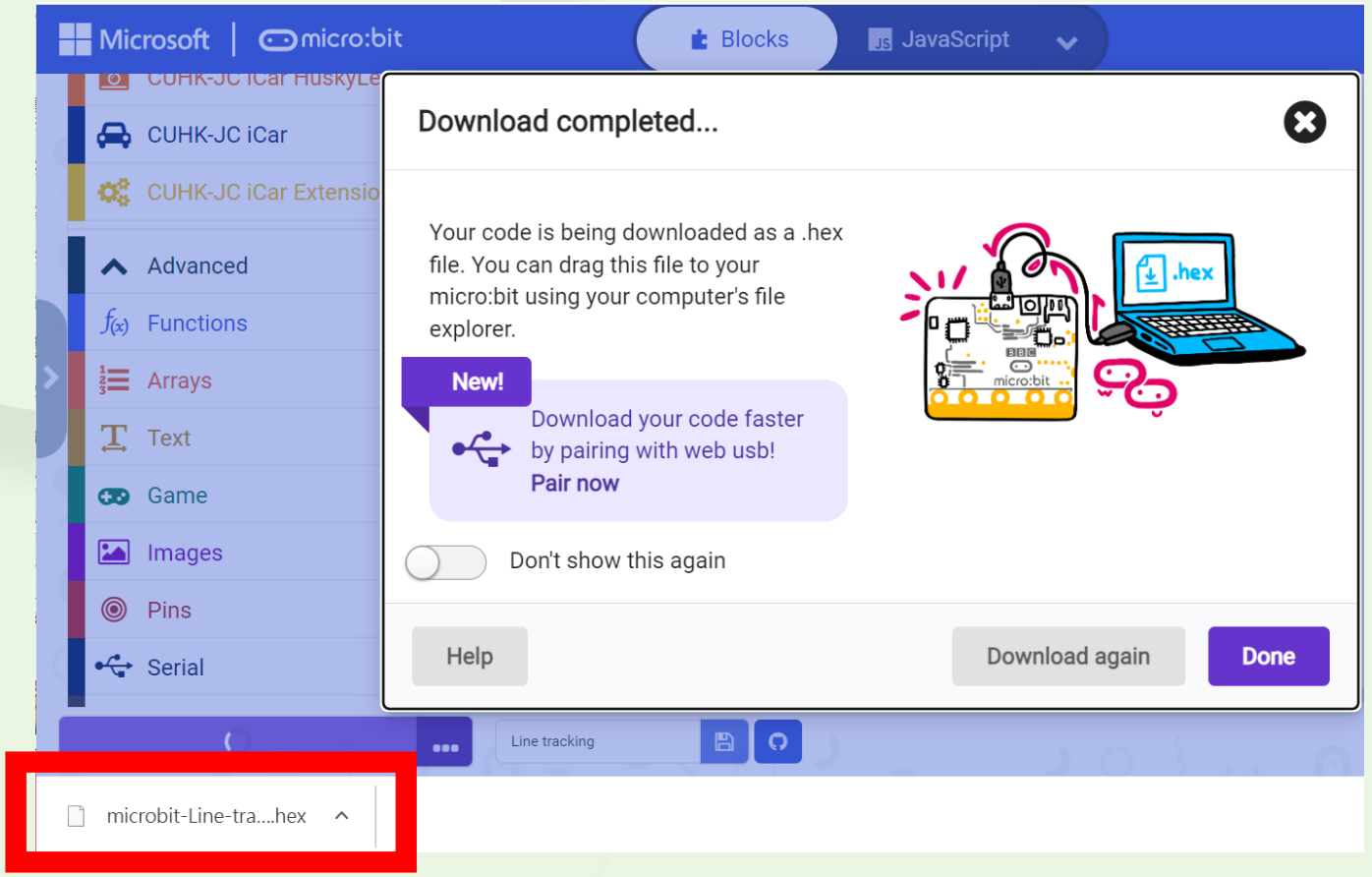
# Finished!



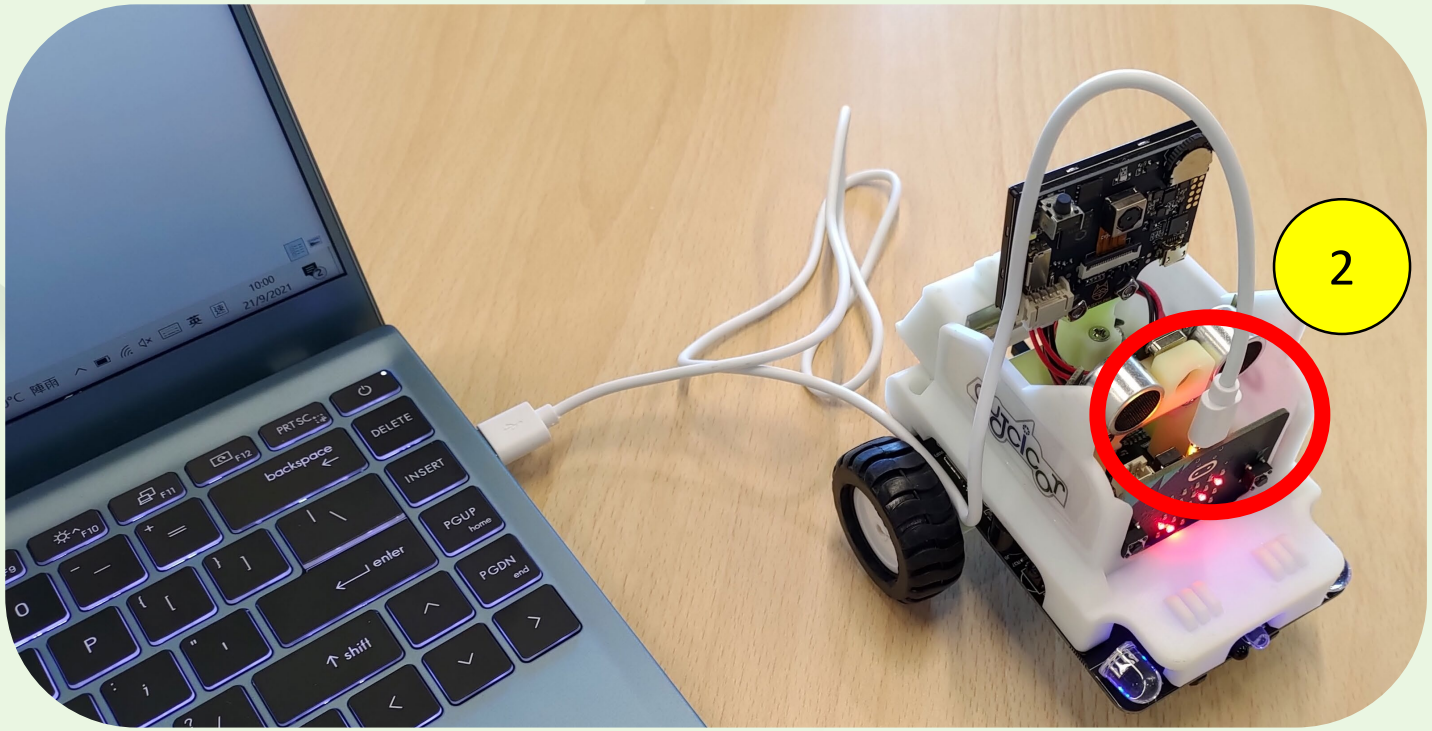
# Step 7: Download The Program To CUHK iCar



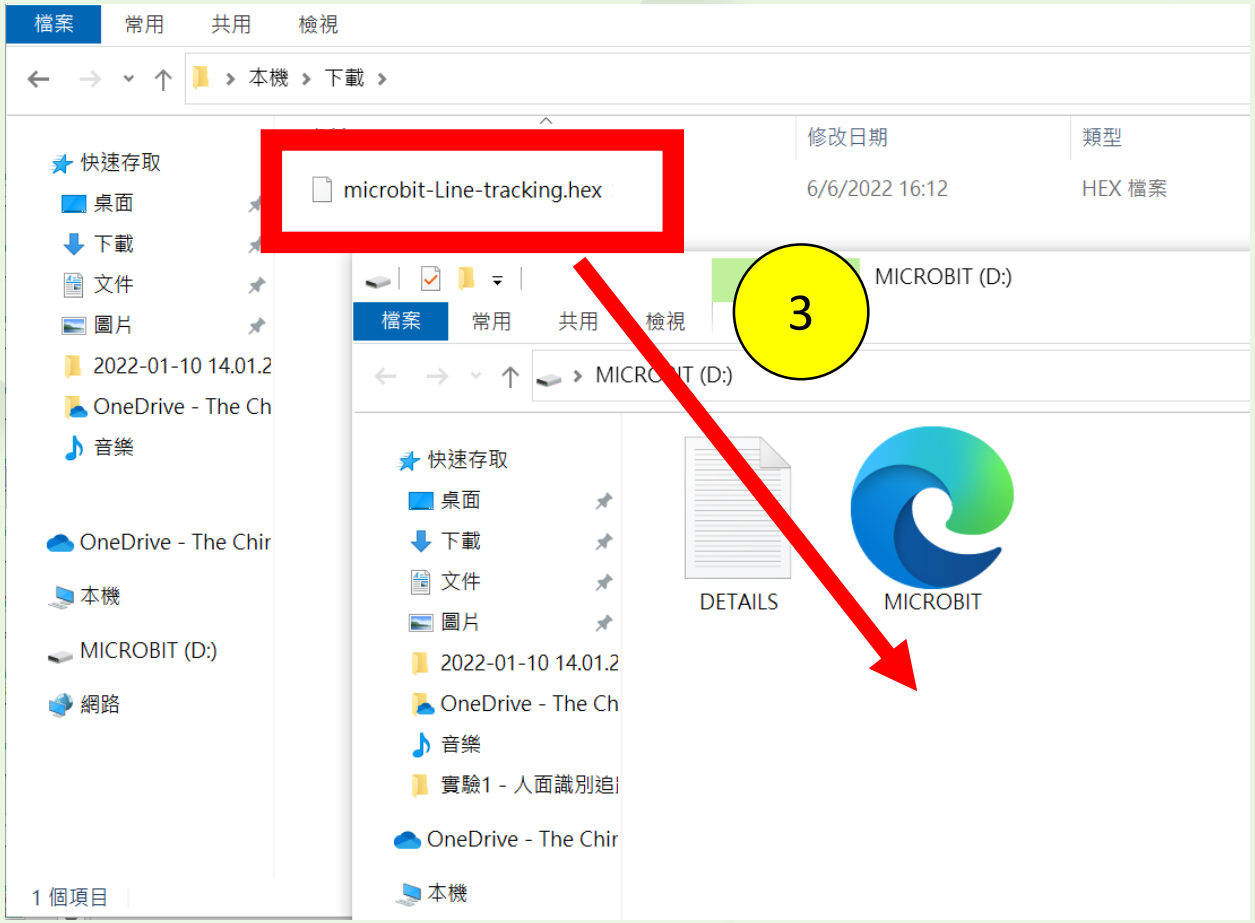

1. Click **Download**



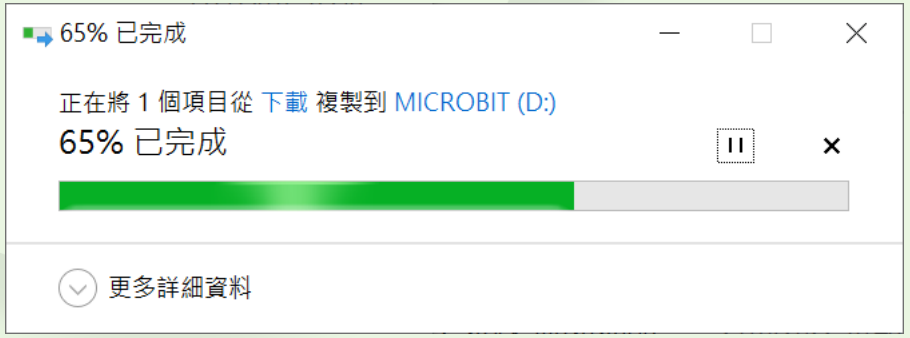

The hex file is downloaded!




2. Connect the micro:bit to computer by a micro USB cable




3. Drag the downloaded hex file into the micro:bit window




4. Wait for the completion of cloning process

Caution:

- The micro:bit window will potentially disappear after the completion
- After the completion of cloning process, the hex file will not be displayed in the micro:bit window

5. Disconnect the micro:bit from your computer

# If the connection between CUHK iCar and the computer is failed:

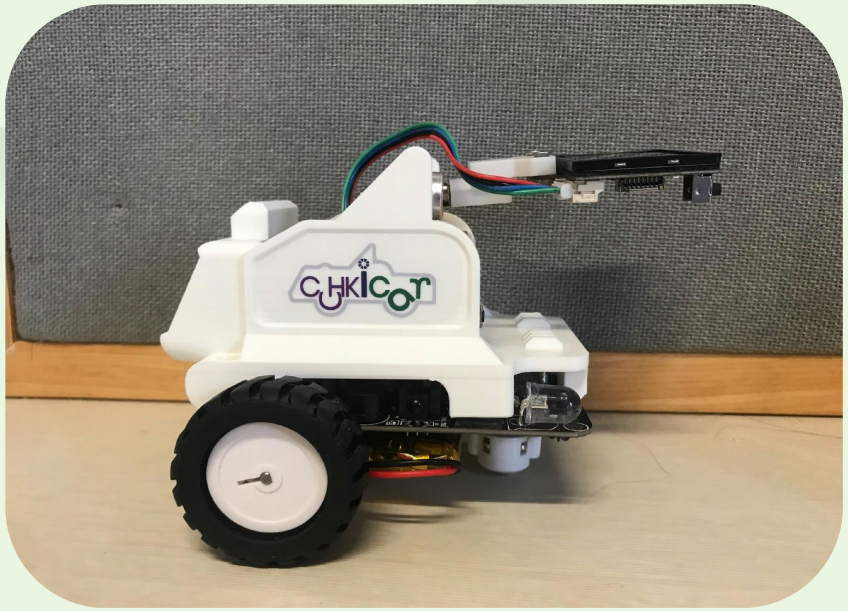
- Restart the computer
- Try another USB port
- Change the micro USB cable

# You have finished programming!

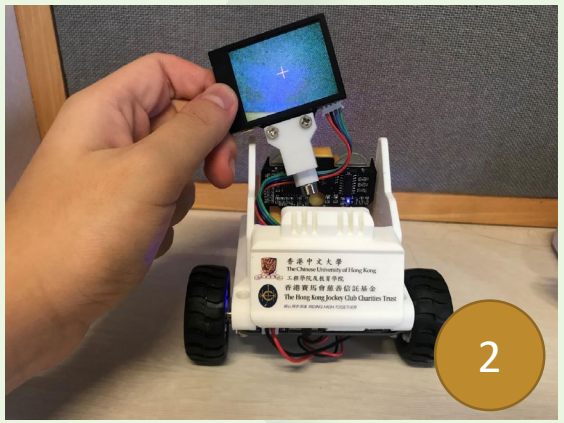
Let’s start the experiment!

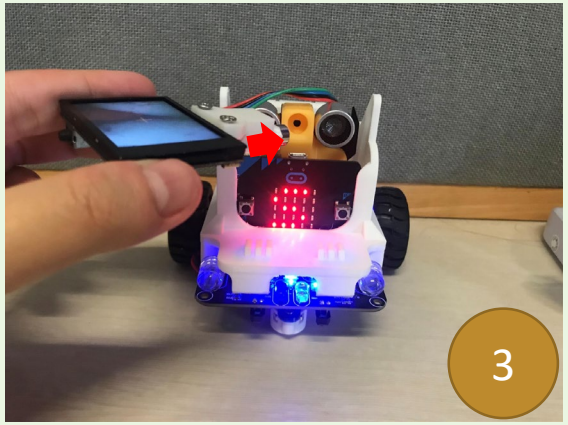
# Switch On Your CUHK iCar


Change the position of HuskyLens to face the ground.

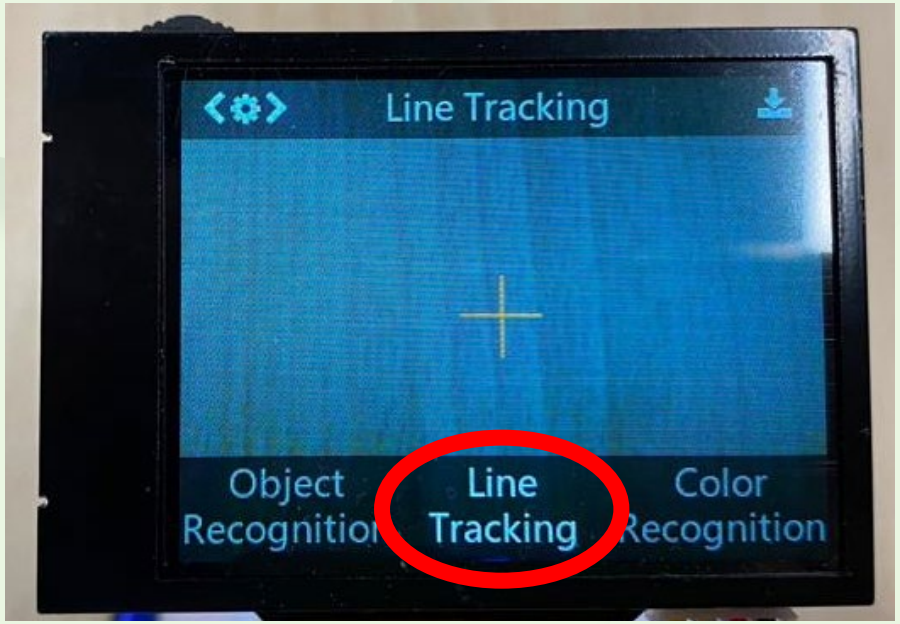






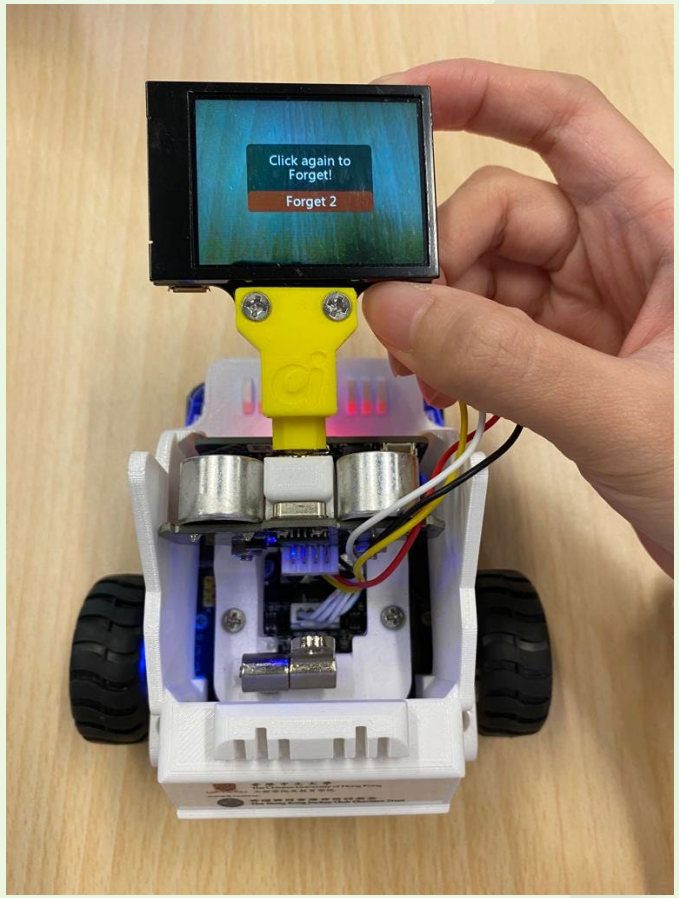




Once it is switched on, the HuskyLens will automatically adjust to Line Tracking Mode.

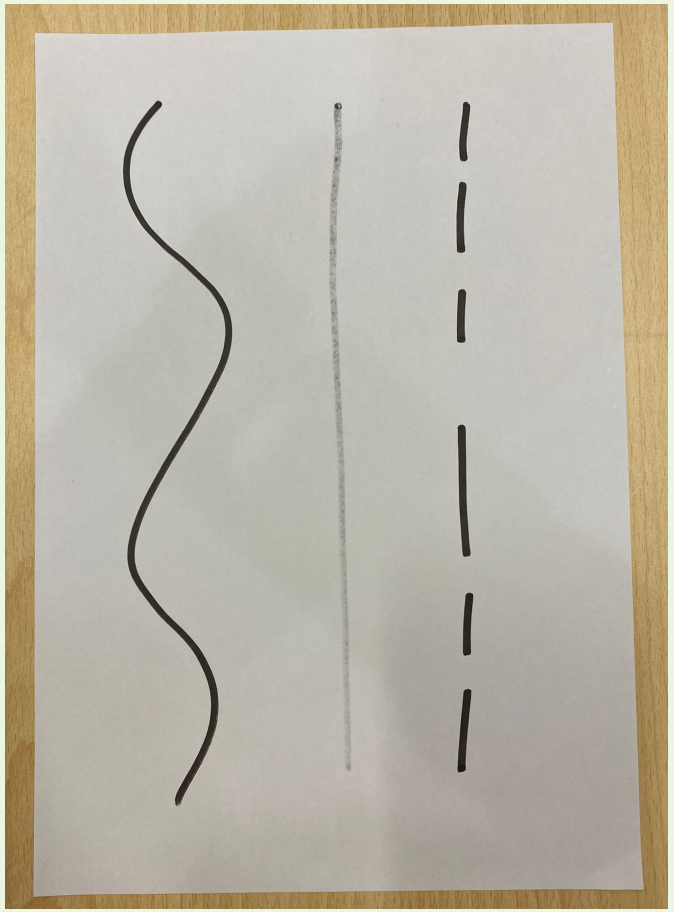


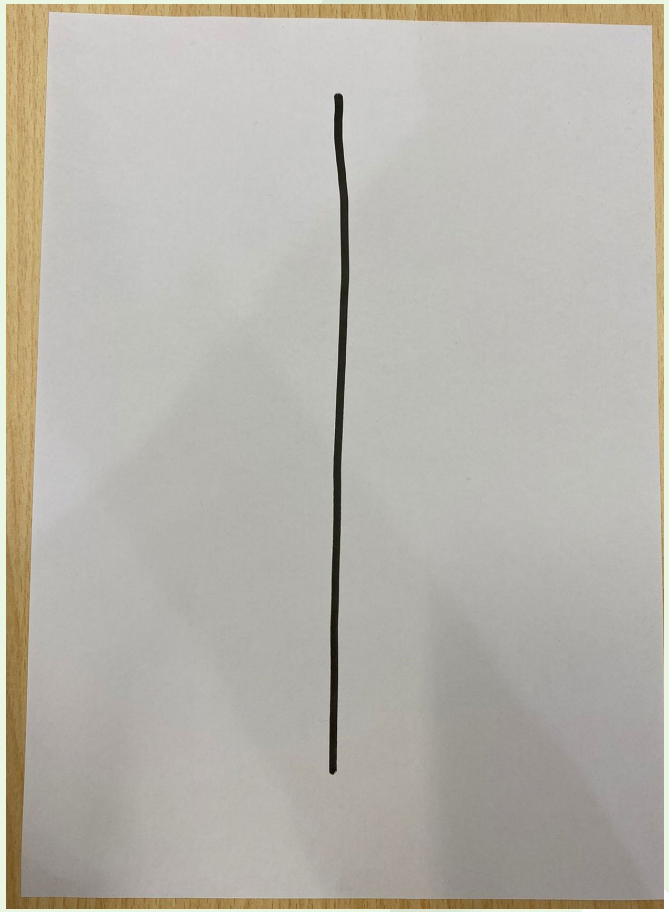

# Clear The Previous Data

Press the learning button.
Then, press the button again when the confirmation box is appeared to “Forget” the data.

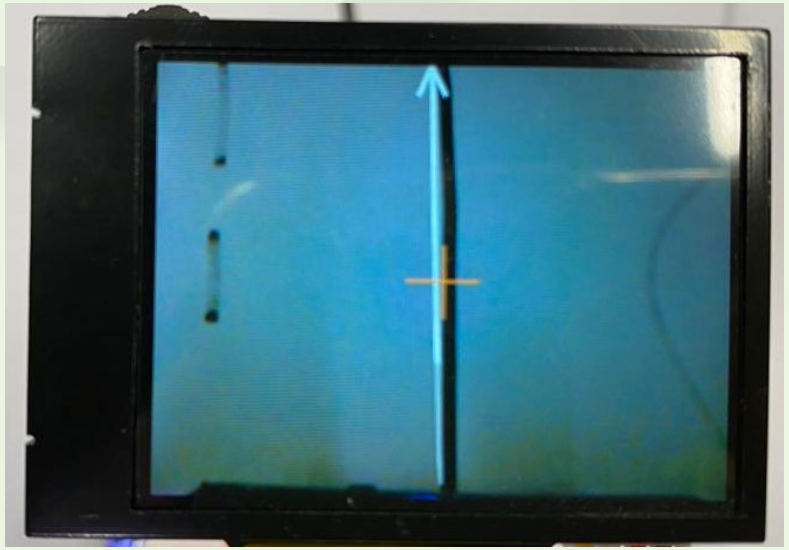


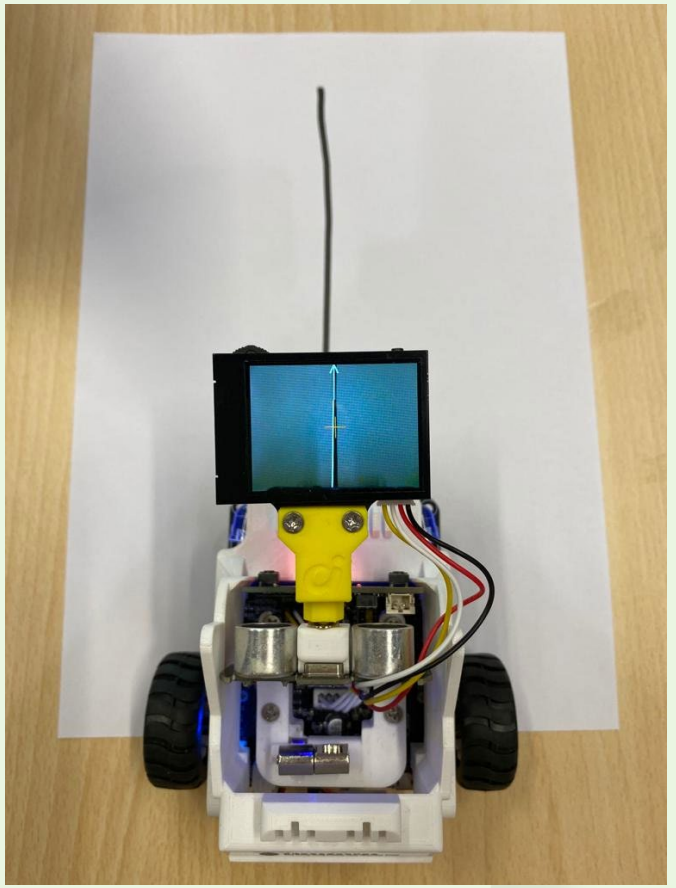
Draw black lines on the white paper.





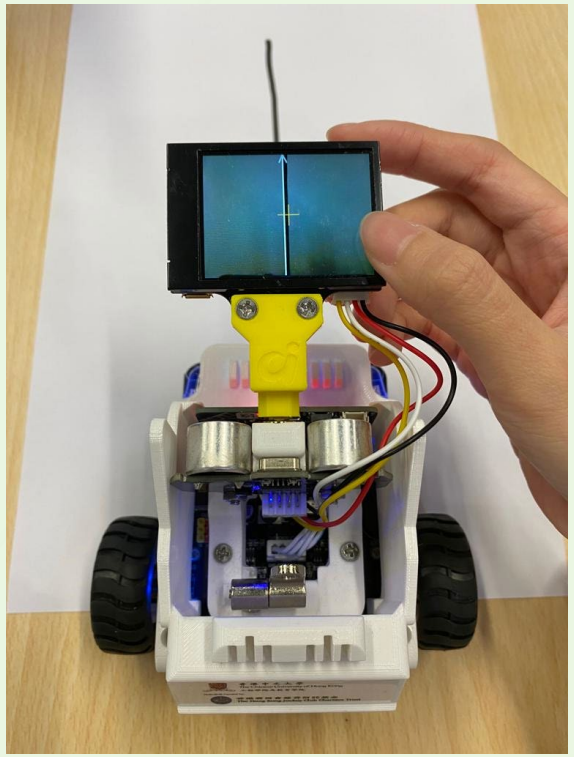
The line should be spotted by the camera of HuskyLens.
Make sure the white arrow on the monitor is aligned with the black line.

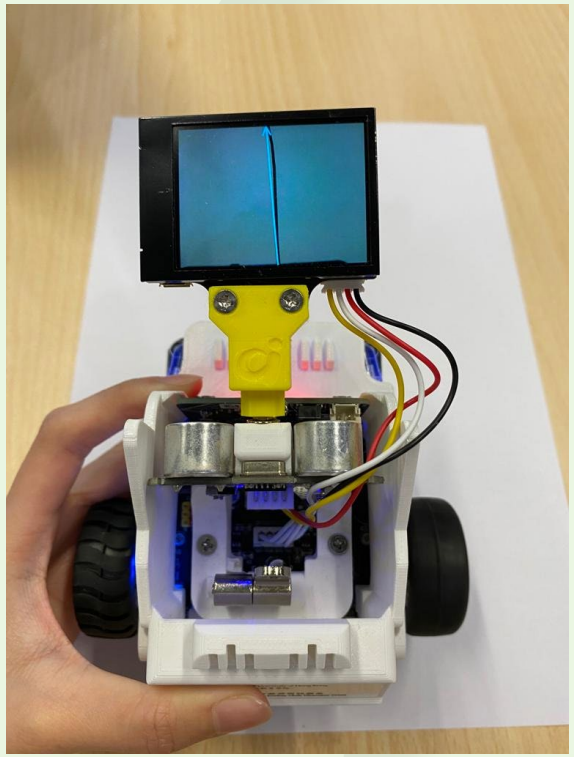




Once the line and the camera are aligned, press the learning button.

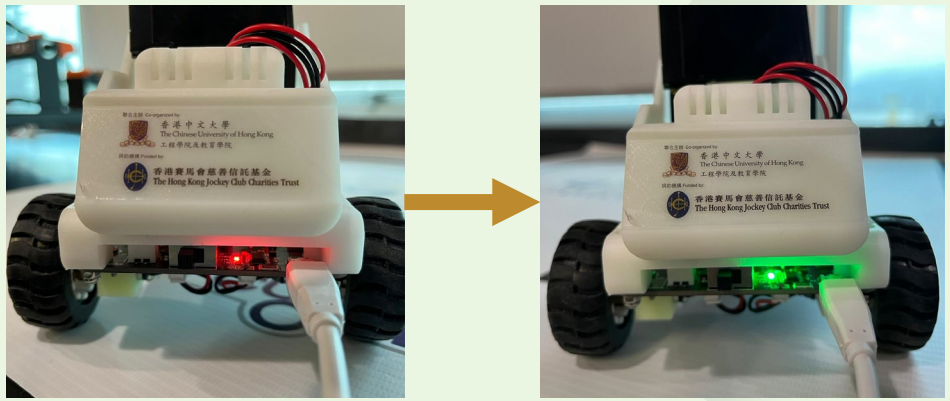
The white arrow will then change to blue arrow, and the CUHK iCar will track the line automatically.



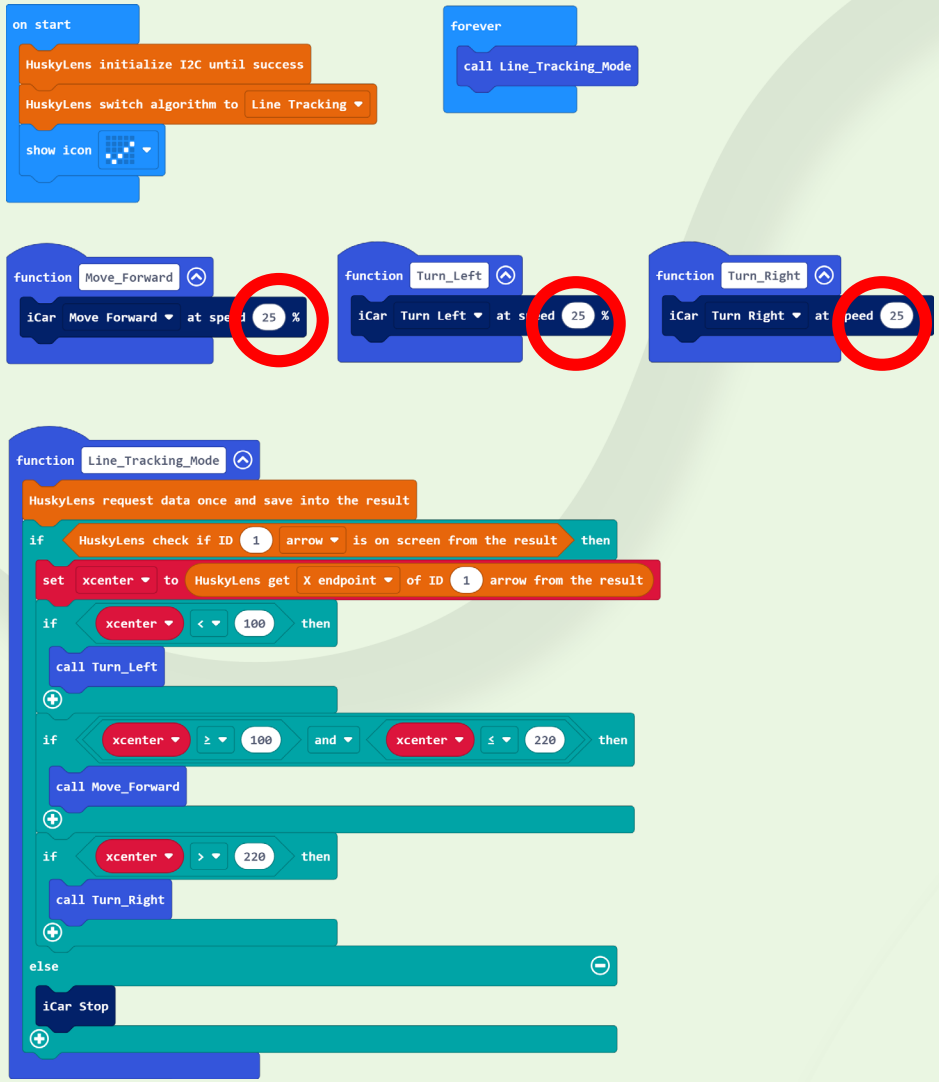


# If CUHK iCar does not work as expected:

- Try to fully charge the CUHK iCar



- If the CUHK iCar still does not work as expected, then you can try to revise the program by yourself. For details, please refer to the next slide




## The numbers circled in red are the recommended speeds when the battery is fully charged

- Please adjust the speed gradually by +/- 5 according to the battery capacity or battery age, then re-enter the adjusted value to the position marked by the red circle

- After the adjustment, download the program to the micro:bit again. For details, please refer to slide 45