



LEARNING BY COMPETING

M2 – Line Follower



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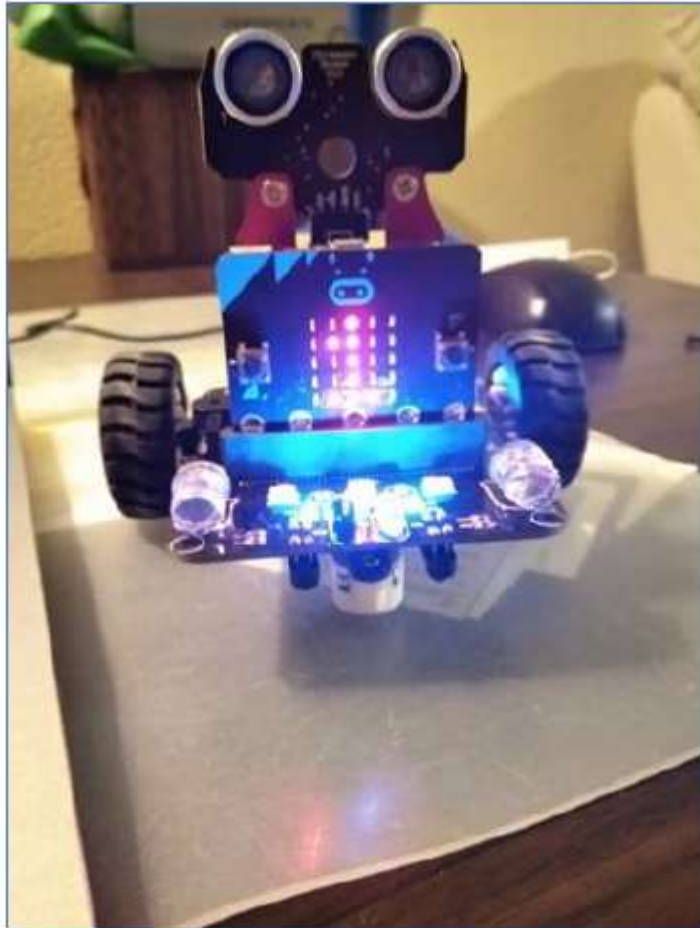
- In this session, we will program our robot to follow one black line in the ground
- This session is about the second module of our formation – Intermediate Level
- In the end, you will be capable to create your codes for the Micro:bit robot

The Module 2 will focus on “Programming a Line Tracking robot”

Summary:

- Components
- Line Follower sensor
- The process of color tracking

WHAT DO WE NEED?



1. The previously built robot
2. PC or Laptop
3. USB Cable



Ensure that you have all the material needed before you start!

If something is missing please tell us.



LET'S START



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LINE FOLLOWER SENSOR

The line follower sensor consists in two sets of infrared (IR) emitters and receivers



LINE FOLLOWER SENSOR

The infrared radiation is emitted from the LED emitter and, if the surface is white, the radiations will be reflected and received in the IR receiver.

If the surface is black or inexistent, the radiations are not reflected and nothing is received in our IR receiver.

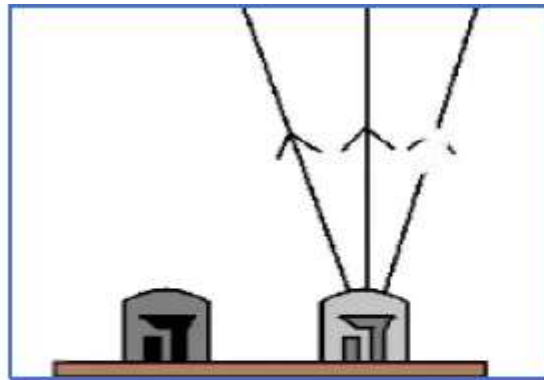


Fig. 3 - IR sensor reflecting on black surface (Retrieved from: <https://engineering.eckovation.com/10-ir-sensor-projects-that-you-can-do/>).

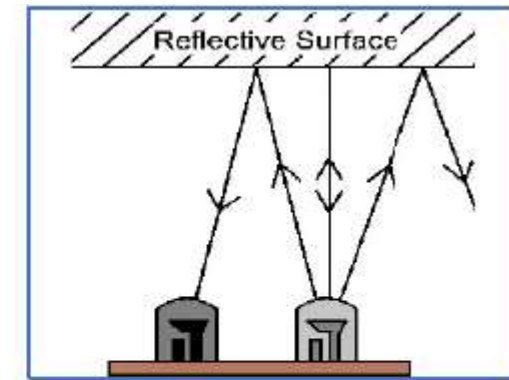


Fig. 4 - IR sensor reflecting on white surface (Retrieved from: <https://engineering.eckovation.com/10-ir-sensor-projects-that-you-can-do/>).



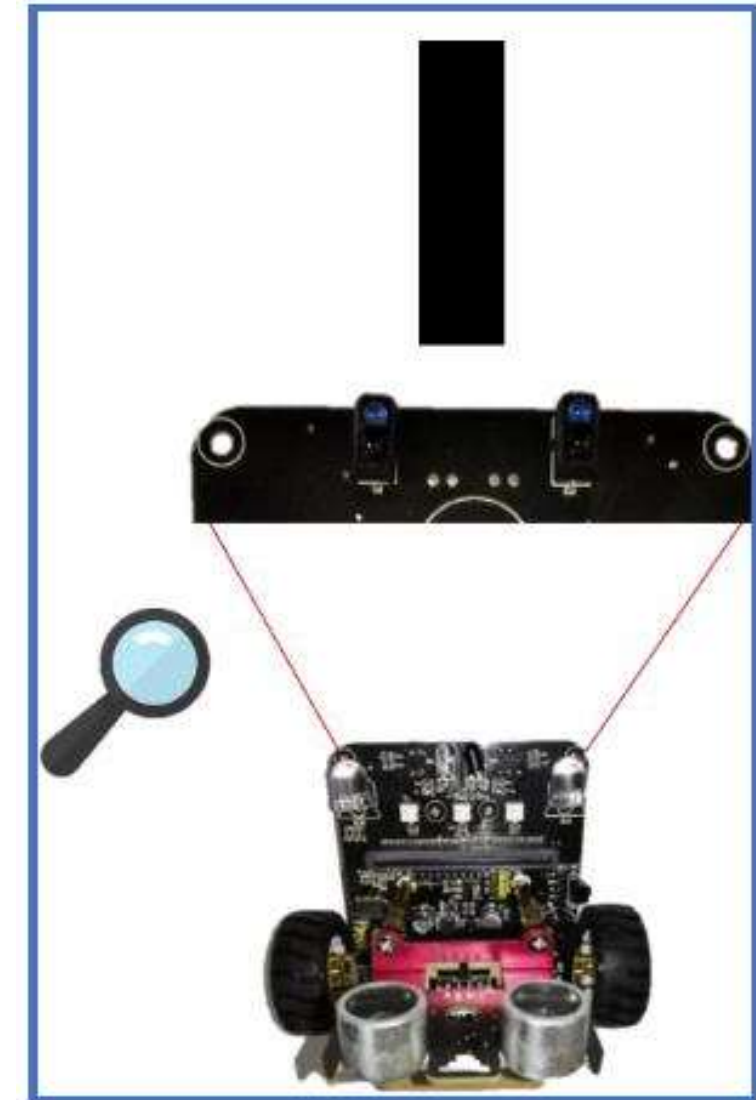
Knowing this, let's think together



IF sensor left detects *white* **and** sensor right detects *white* also,

Where is our robot and what he must be doing?

It is **centred** and can move **forward**





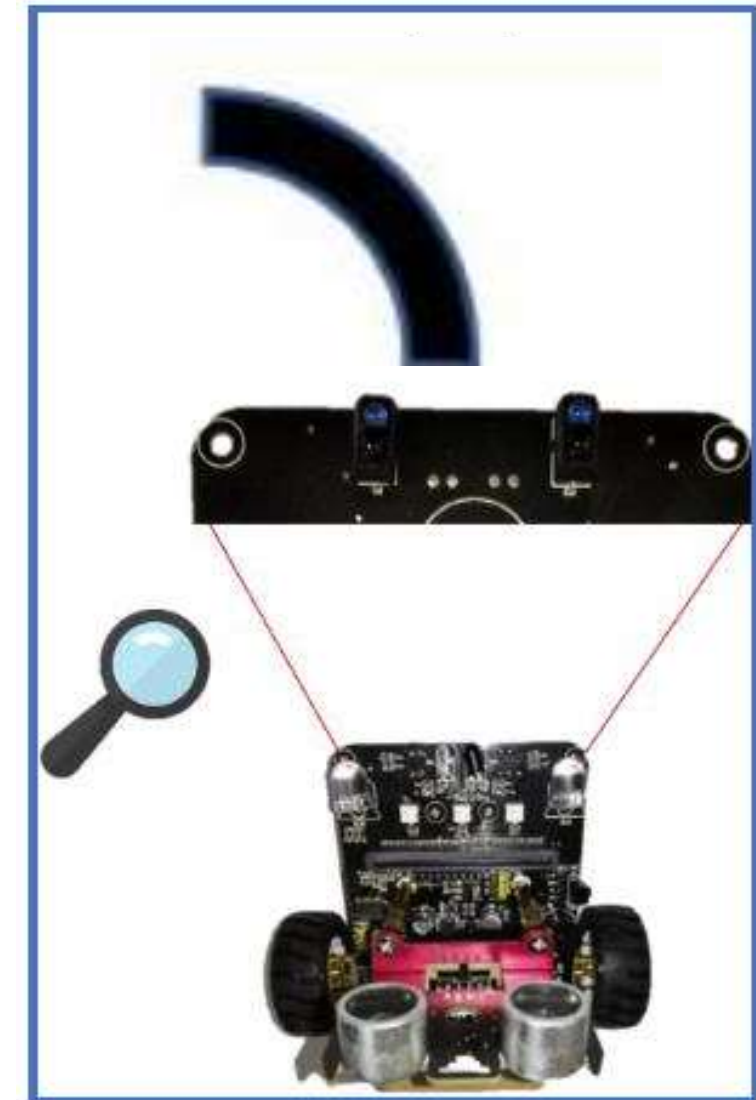
Knowing this, let's think together



IF sensor left detects *black* **and** sensor right detects *white*,

Where is our robot and what he must be doing?

It is in a curve and must turn to left





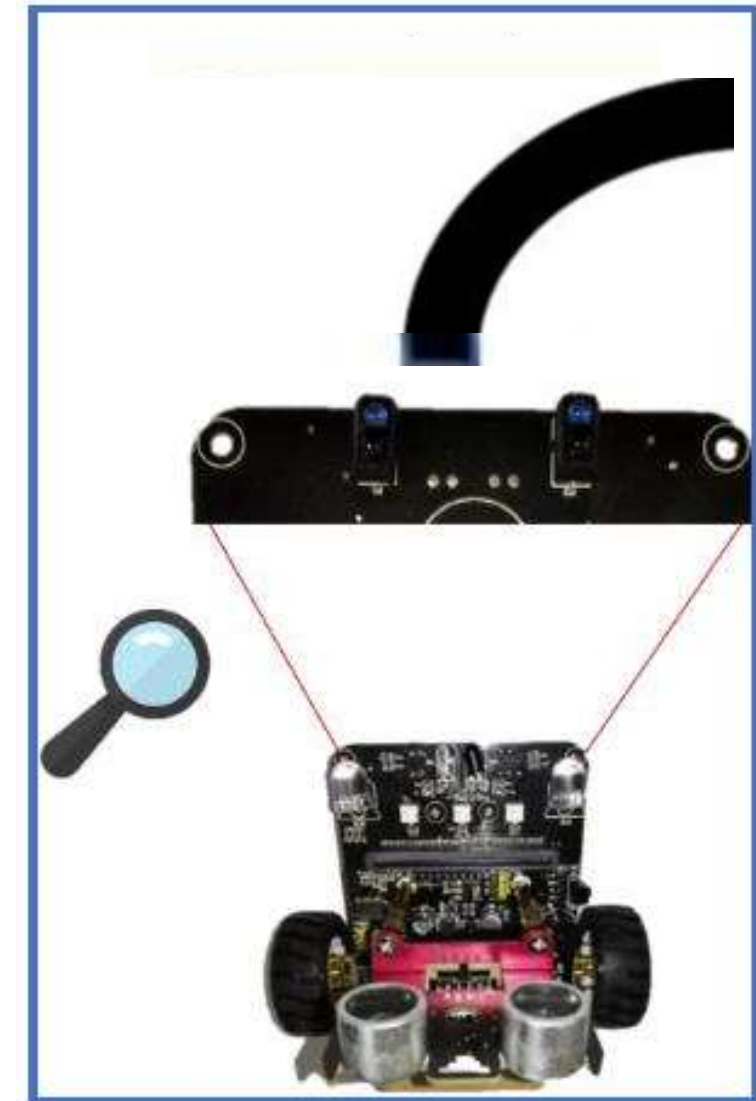
Knowing this, let's think together



IF sensor left detects *white* **and** sensor right detects *black*,

Where is our robot and what he must be doing?

He is in a **curve** and must **turn to right**





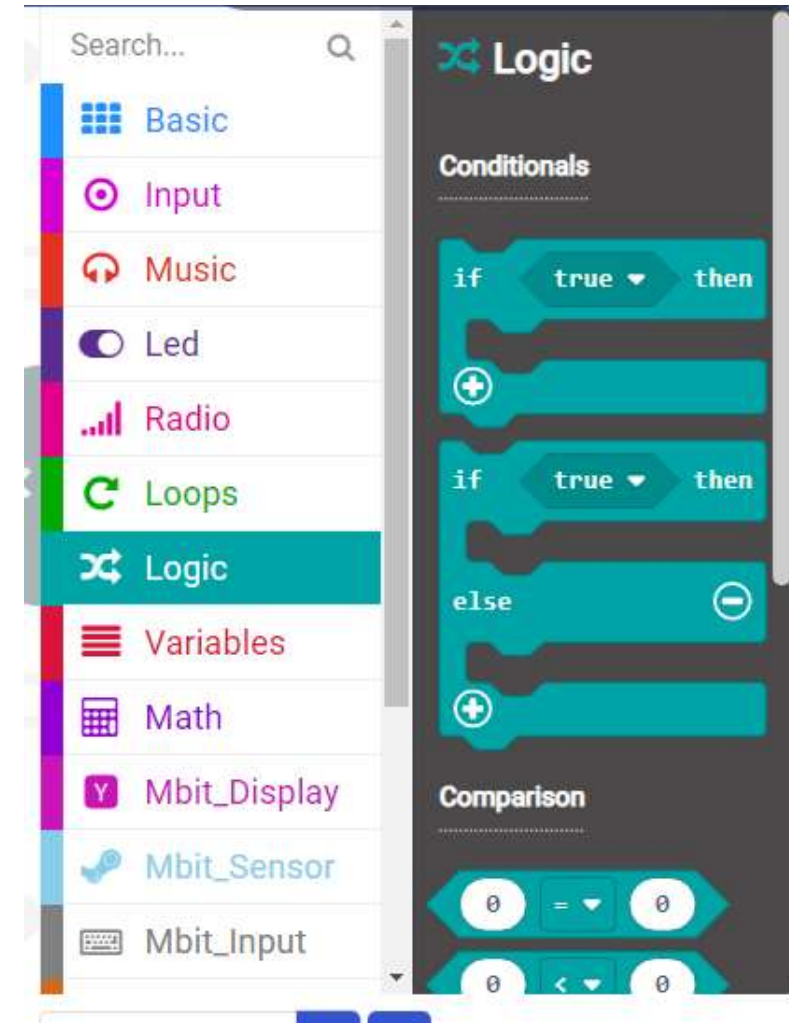
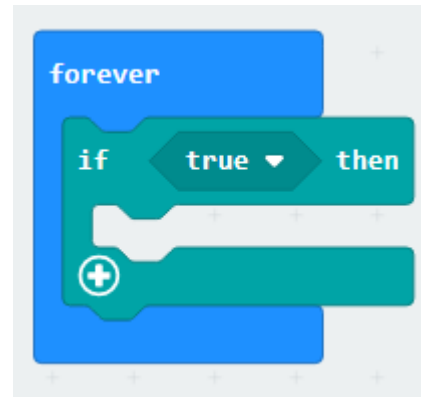
All right! But how do I program that?

Like we write!

(IF sensor left is white **and** sensor right is white)

Go to the “Logical” tab pick up the “if” block and place him inside the “**forever**” block.

Like that :





All right! But how do I program that?

Like we write!

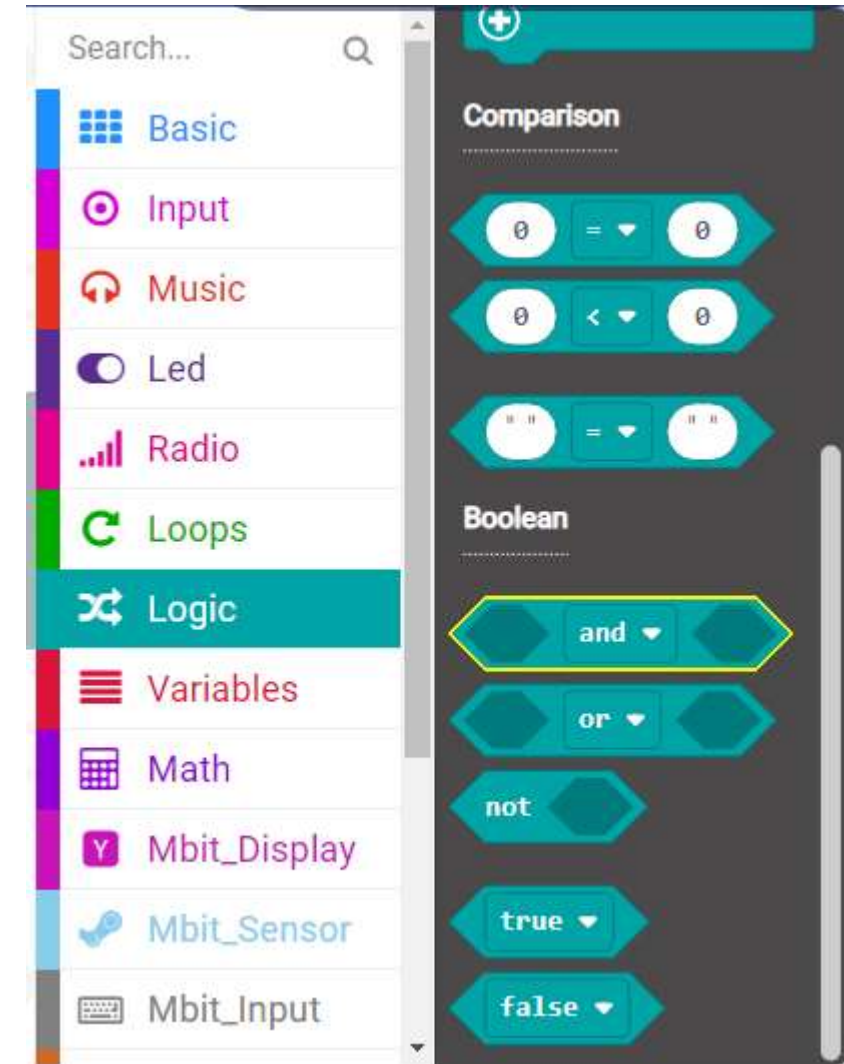
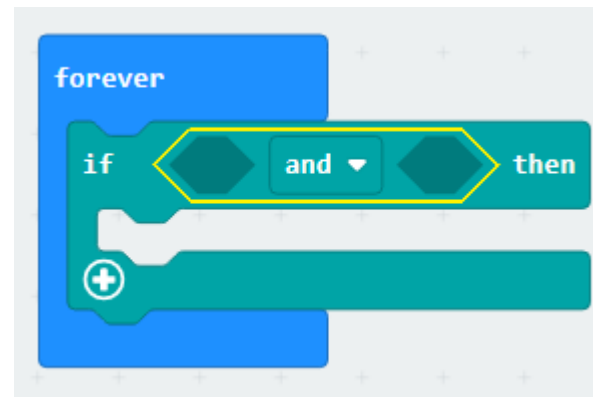
(IF sensor left is white **and** sensor right is white)



Now, you will need the “**and**” before placing the condition of the sensor.

Go to the “logical” tab again, scroll down and you will find the “**and**” condition. Place it into the “if”

Like that:



LINE FOLLOWER SENSOR



All right! But how do I program that?

Like we write!

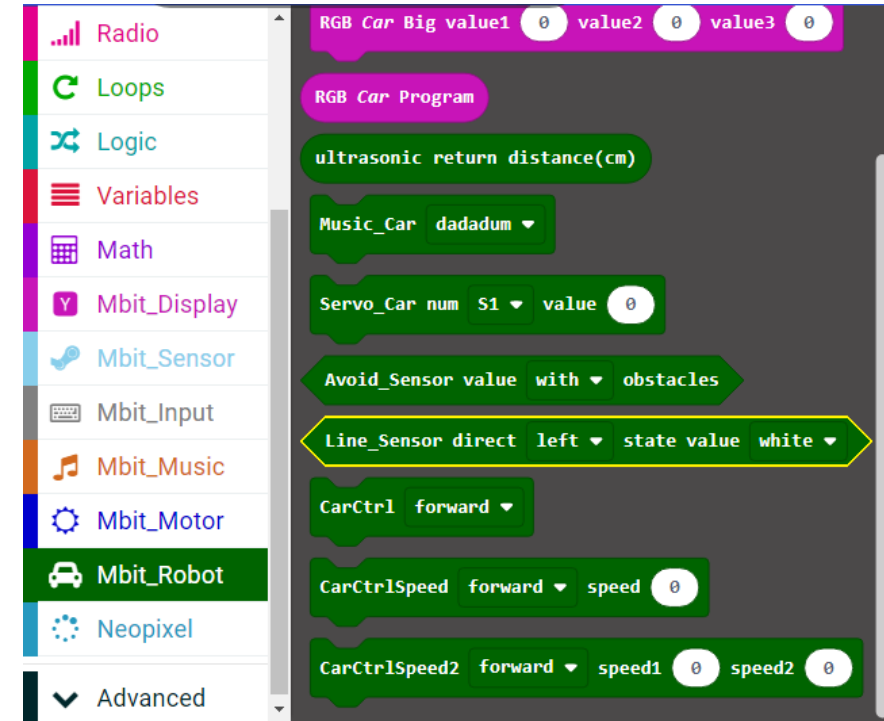
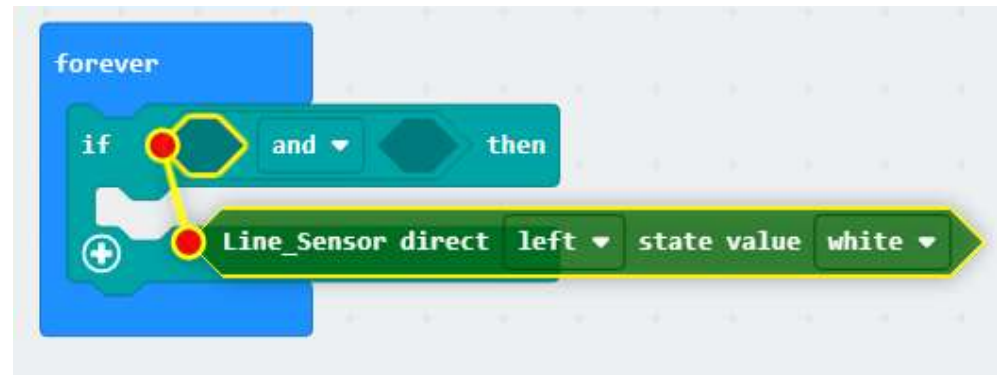
(IF sensor left is white **and** sensor right is white)

Very nice!

You have already the “if” and the “and”, only missing the sensor’s reading

Go to the “Mbit_Robot” tab and you’ll find the sensor condition. Place it into the “and”

Like that:





All right! But how do I program that?

Like we write!

(**IF** sensor left is white **and** sensor right is white)



Now, do not forget to repeat for the other side!

Like that!





All right! But how do I program that?

Like we write!

(IF sensor left is white **and** sensor right is white)



NOTE: You always have **selection arrows** like you can see in the image below, meaning you can change the value inside.





All right! But how do I program that?

Like we write!

(**IF** sensor left is white **and** sensor right is white)



Now, we must configure the values to make sense of our condition

Like that!

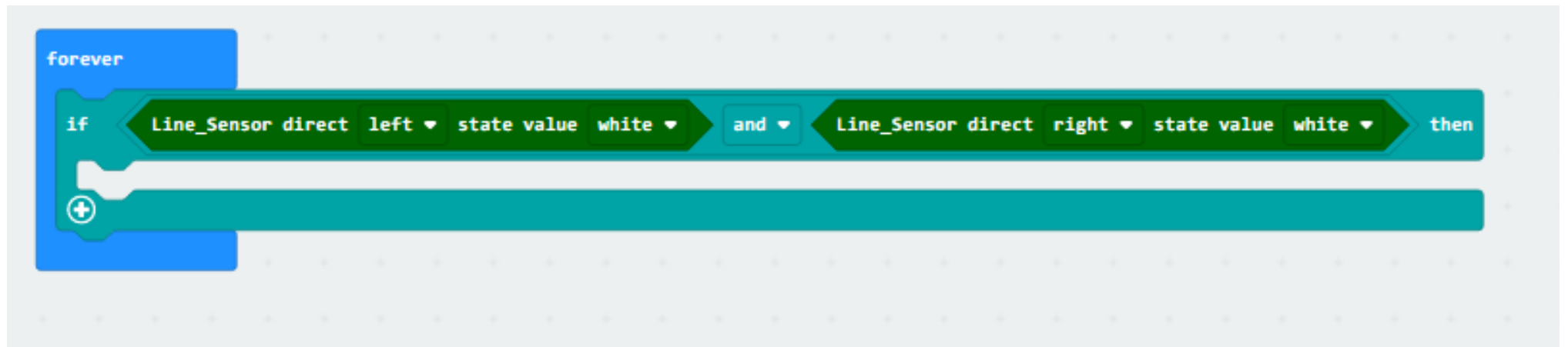


We have now our "if" condition complete!



(**IF** sensor left detects *white* **and** sensor right detects *white*)

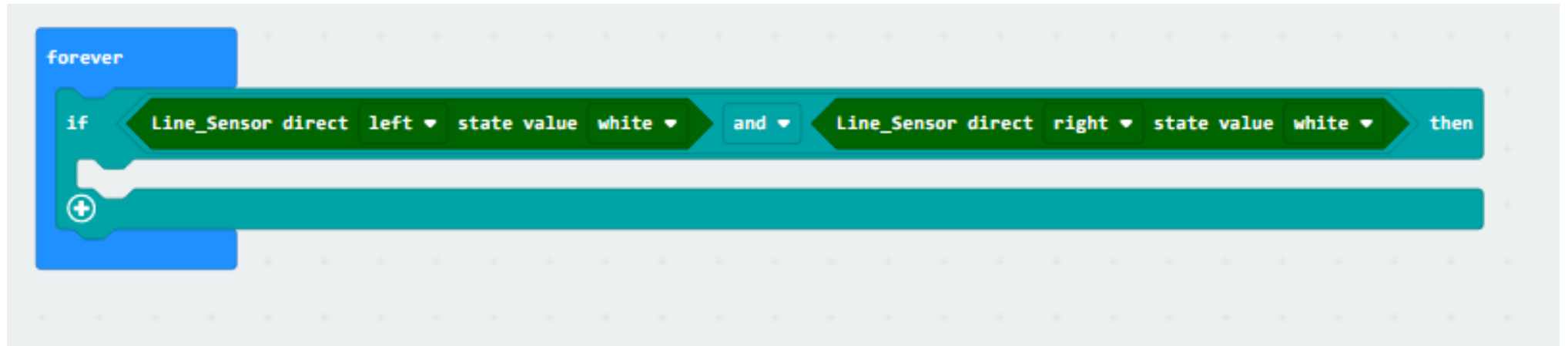
=



So, if our “if” condition is true, what must our robot do?



Go forward, right!



LINE FOLLOWER SENSOR

So, if our “if” condition is true, what must our robot do?

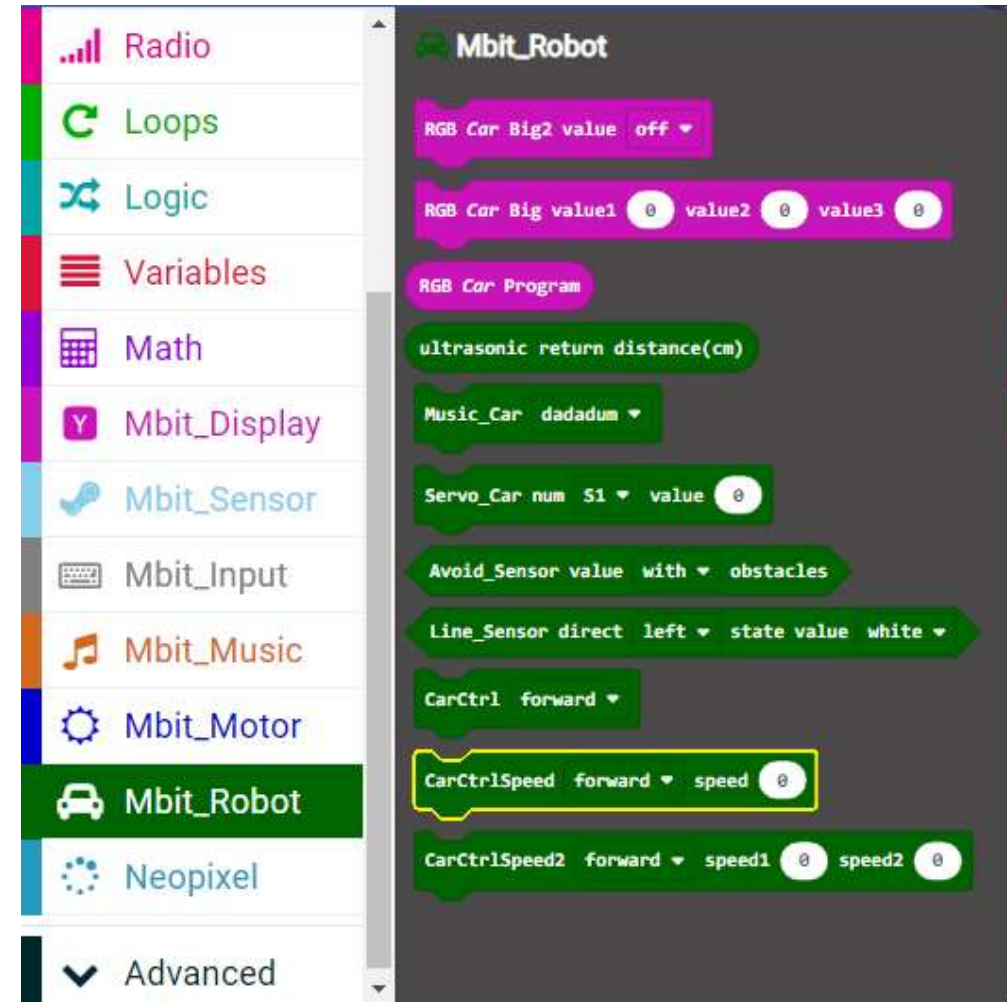


To do that, you can go “Mbit_Robot” tab and use the function “CarCtrlSpeed”

Put “if” inside

Like that!

```
forever
  if Line_Sensor direct left state value
    CarCtrlSpeed forward speed 45
```



So, if our “if” condition is true, what must our robot do?

In the CarCtrlSpeed” function, you can configure the speed



You can choose one value between 0 (nothing) and 255 (Top speed)

We will use now the value of “45”





So, if our “if” condition is true, what must our robot do?

What we have...

“Forever” “if” line sensor left detects white “and” line sensor right detects white also

(if it is true), my robot will go “forward” with a speed of “45”



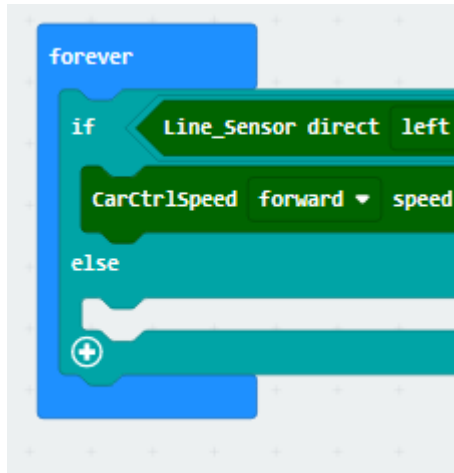
```
forever
  if Line_Sensor direct left state value white and Line_Sensor direct right state value white then
    CarCtrlSpeed forward speed 45
```



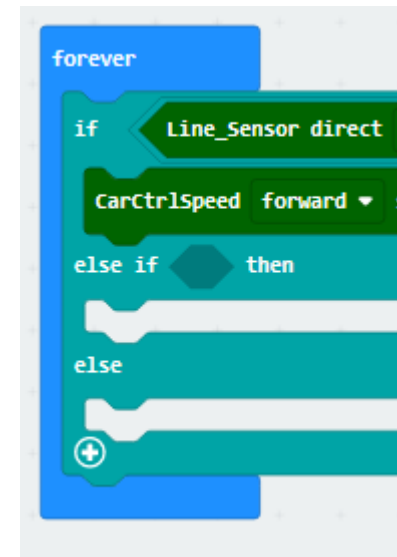
And the other conditions?

We will do more “if’s”!

TIP: We can use the “plus” sign to add a new “if condition” but attention, not all do the same.



If <something> **is true**, do <that>
else
<do the second>



If <something> **is true**, do <that>
else if <2nd something> **is true**, do <2nd that>
else
<do the the last>



And the other conditions?

Knowing that, we can now start coding the other conditions

(IF sensor left detects black **and** sensor right detects white)

(IF sensor left detects white **and** sensor right detects black)

Turn to left

Turn to right

```
forever
  if Line_Sensor direct left state value white and Line_Sensor direct right state value white then
    CarCtrlSpeed forward speed 45
  else if Line_Sensor direct left state value black and Line_Sensor direct right state value white then
    CarCtrlSpeed turn left speed 45
  else if Line_Sensor direct left state value white and Line_Sensor direct right state value black then
    CarCtrlSpeed turn right speed 45
  else
```





And the other conditions?

For safety, we must put the STOP block on the end.

In other words, if all our “if’s” are not true, our robot stop.



```
CarCtrlSpeed turn Right ▾  
else  
CarCtrl stop ▾  
+
```



WELL DONE!



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**TRANSFER YOUR CODE TO
THE ROBOT AND TEST IT**



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Thank you for your attention

Feel free to improve your code

