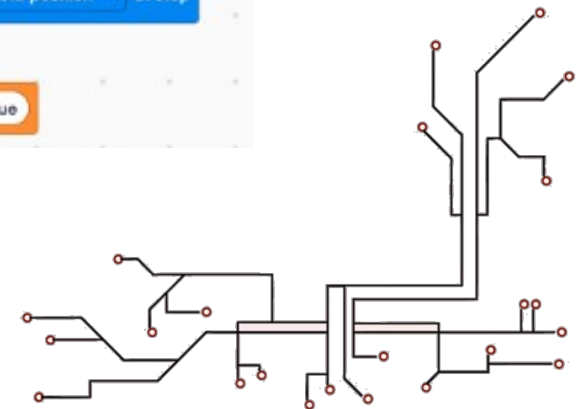
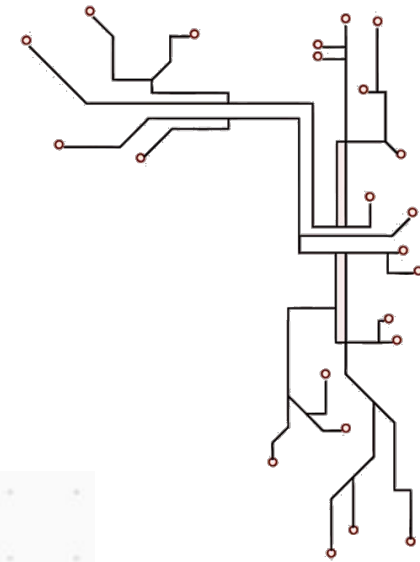


Gyro Move

- Moving Straight
- Wheel Rotations
- Creating “My Blocks”

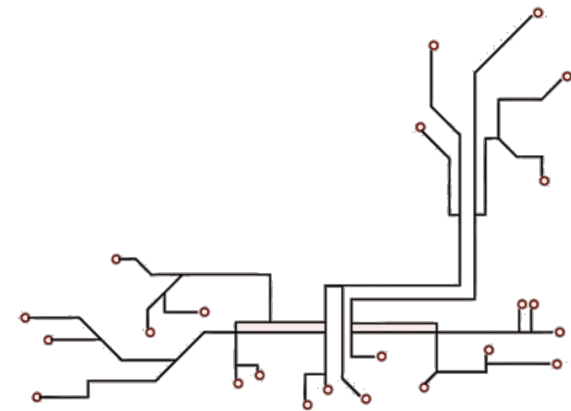
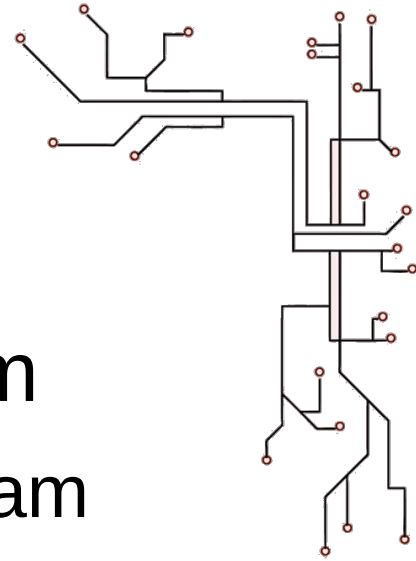


```
when I receive motor A up
  A reset degrees counted
  A set speed to 35 %
  A start motor counterclockwise
  wait until A degrees counted < -25
  A set motor to float at stop
  A stop motor
  A start motor at -15 % power
  wait until A degrees counted < -65
  A set motor to hold position at stop
  A stop motor
  set motor A is up to true
```



Before You Start

- Open up your earlier Gyro Turn program
 - You'll be adding gyro move into that program
 - If you want to, you can do a “File > Save as...” to save a separate copy of your program



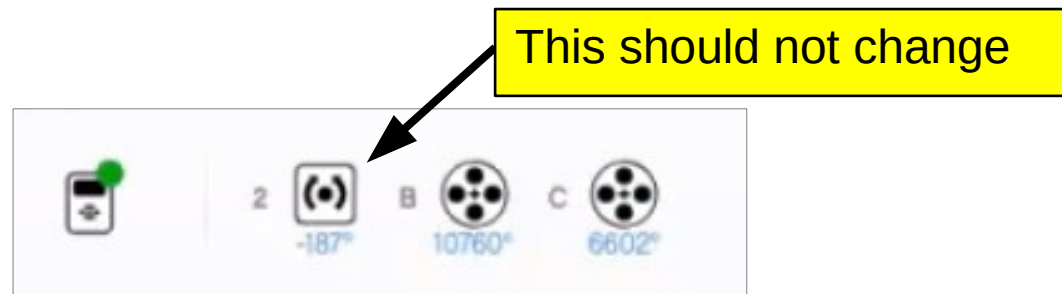
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Gyro Sensor

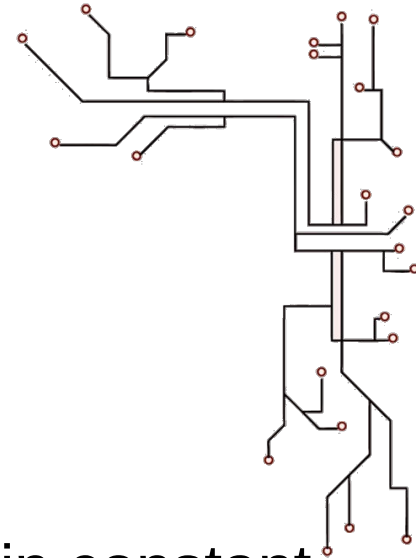
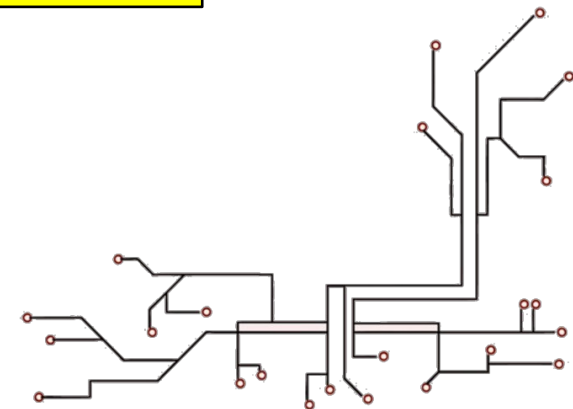
- **IMPORTANT!**

- The gyro is calibrated on start-up
- If correctly calibrated, the gyro angle should remain constant
- The value is not important as long as it doesn't change when the robot is stationary
- If it changes, recalibrate by unplugging and re-plugging the gyro (...or restart the device) while keeping it stationary



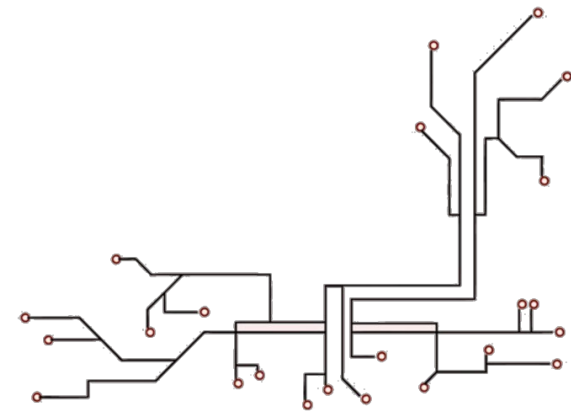
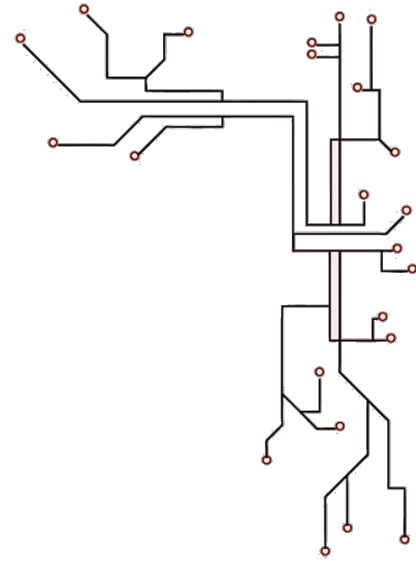
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Why Gyro Move?

- Because...
 - Real robots don't drive straight
 - Even if you turn accurately (...using gyro), you may still have errors when moving forward



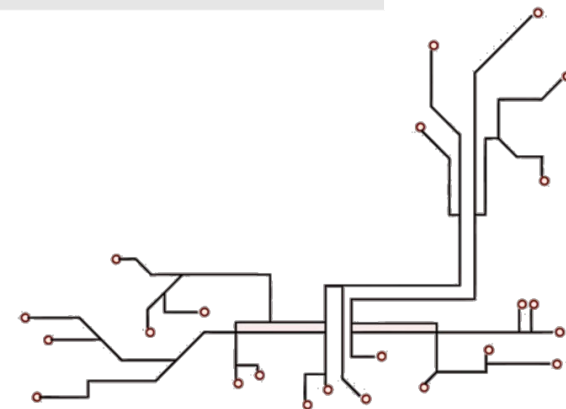
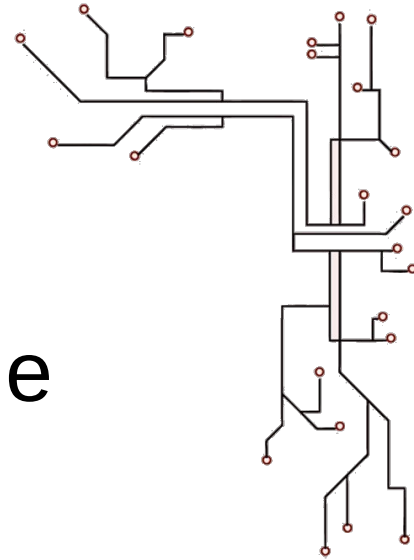
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How?

- Use a “3 States” program, just like in line following

Line Following	Gyro Move
Look at color sensor value	Look at gyro angle
Decide to turn left, right, or go straight	Decide to turn left, right or go straight

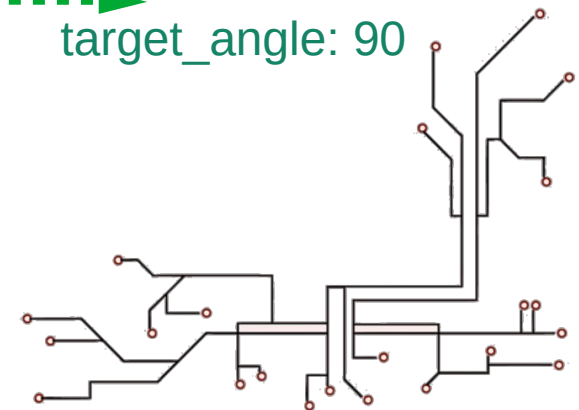
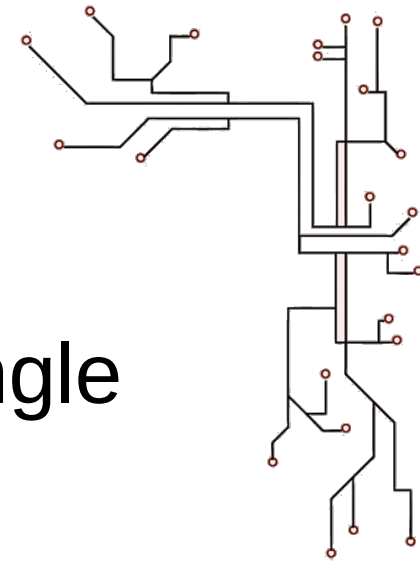
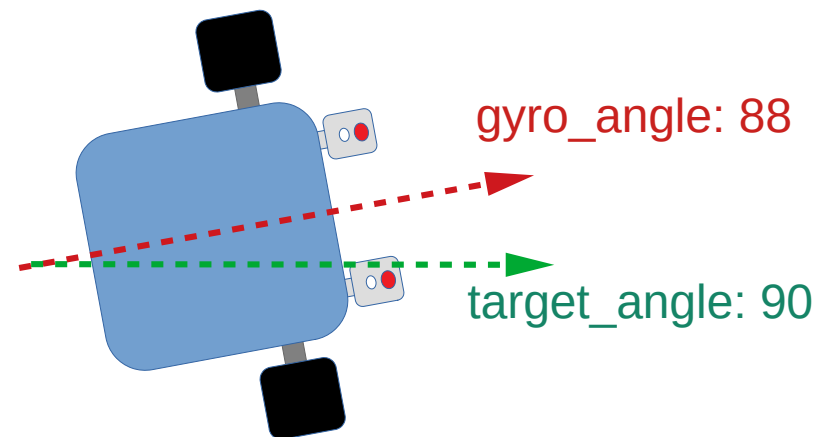


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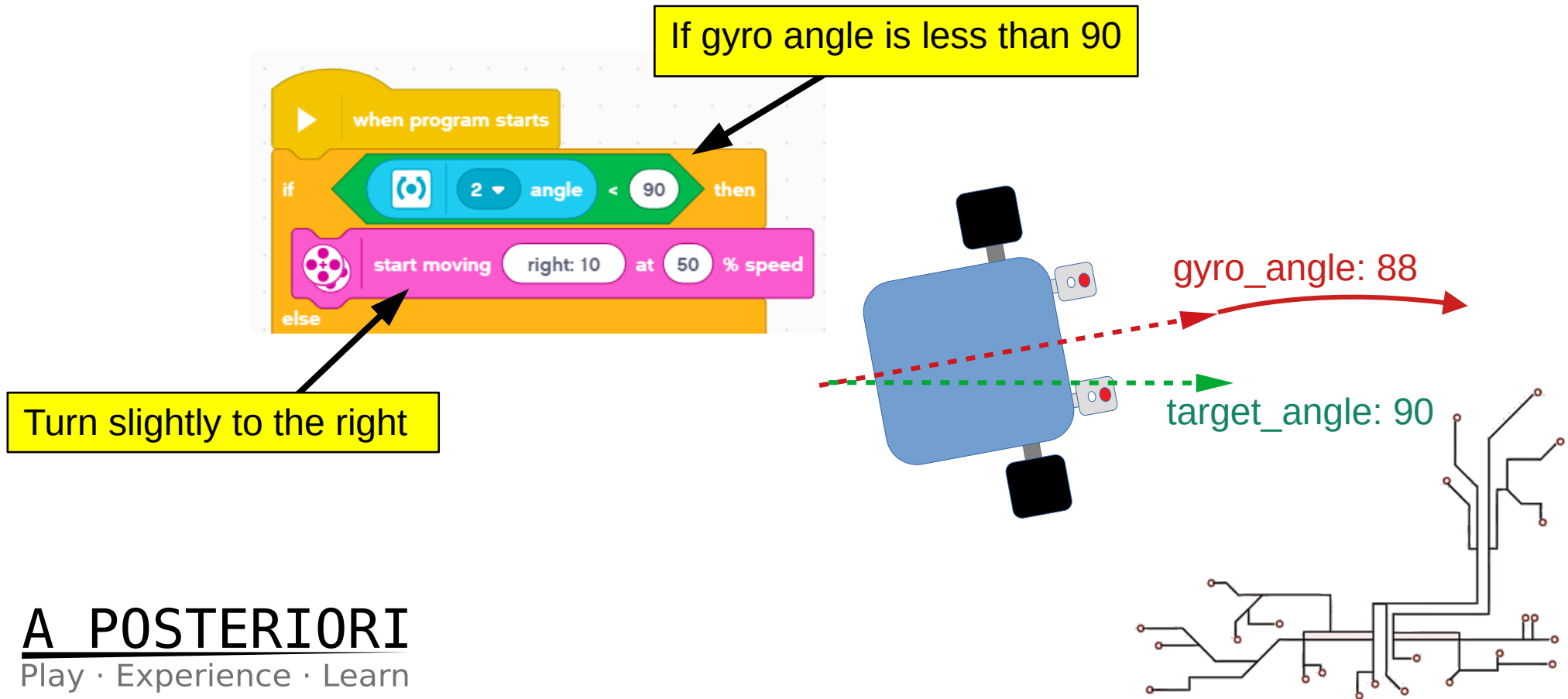
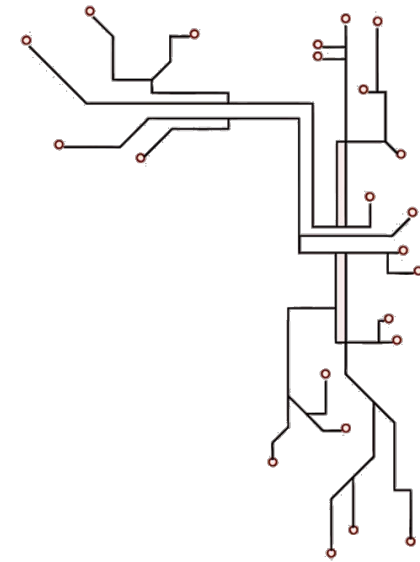
Gyro Move

- We want to head towards the Target Angle (90 degrees)...
- ...but the actual Gyro angle is 88 degrees
- What should the robot do?



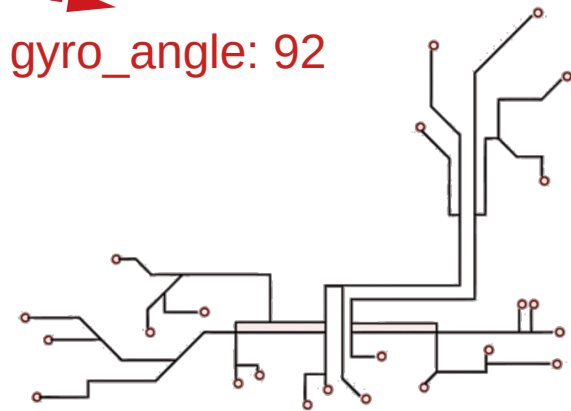
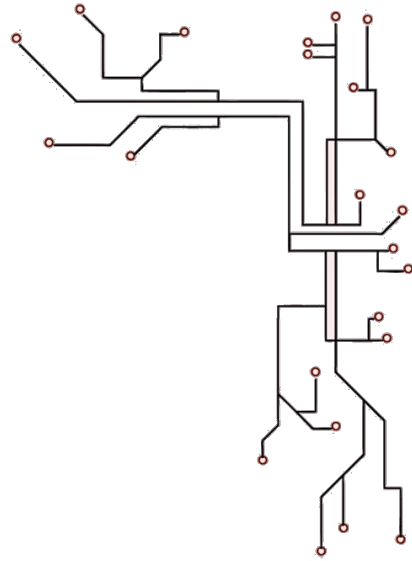
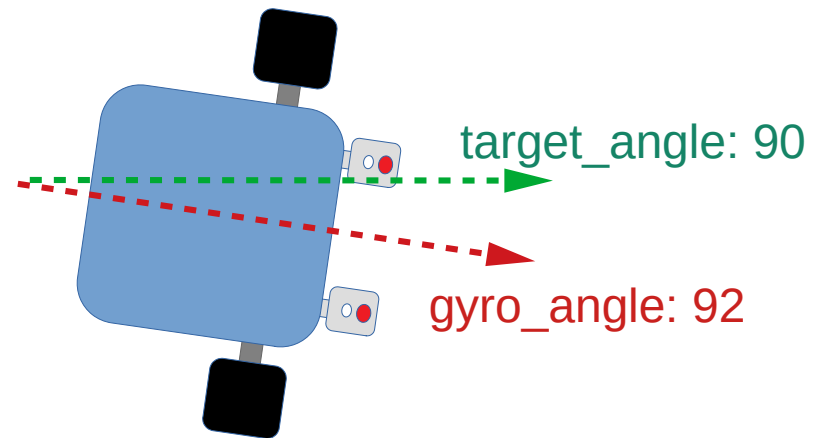
Gyro Move

- What should the robot do?
 - Robot should turn **Right**



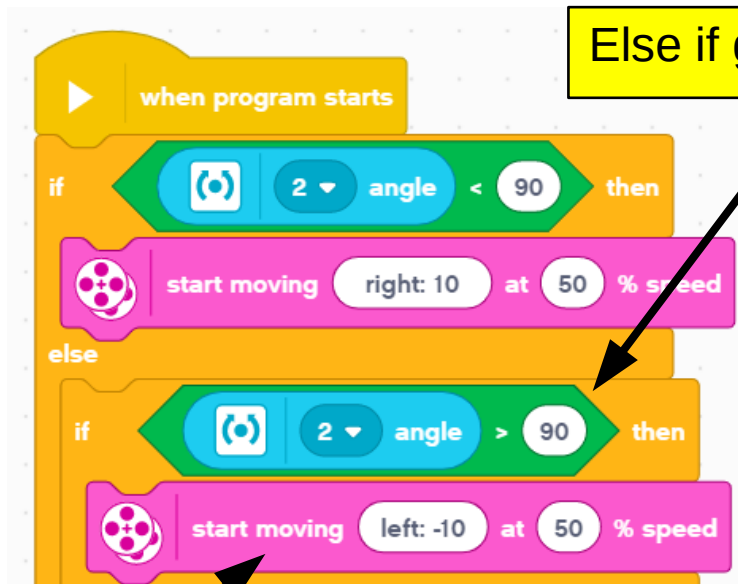
Gyro Move

- What should the robot do?



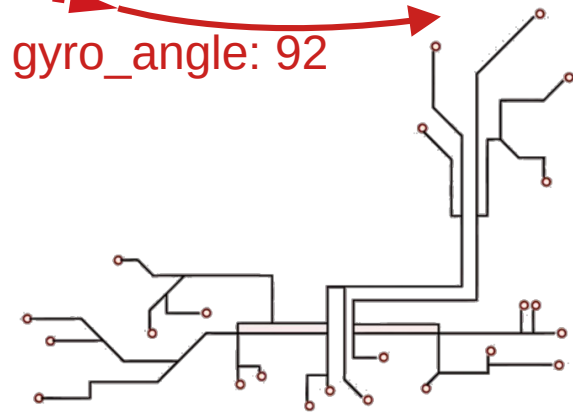
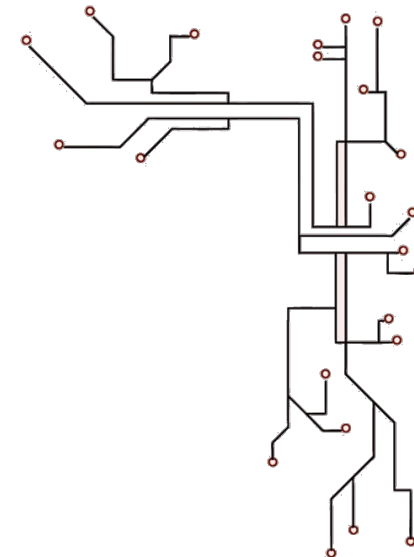
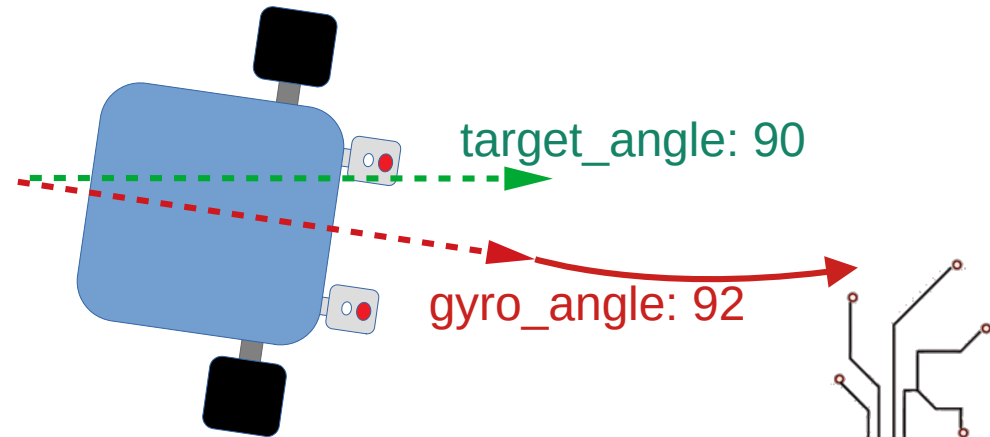
Gyro Move

- What should the robot do?
 - Robot should turn **Left**



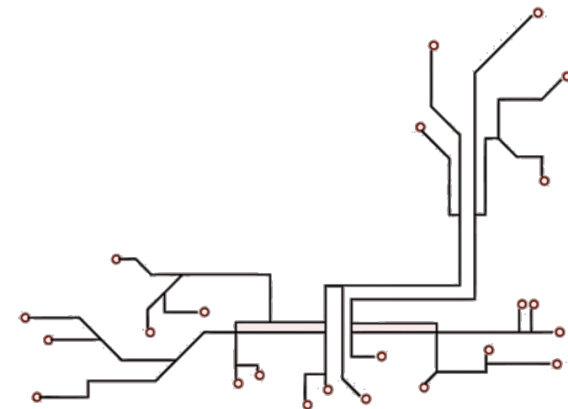
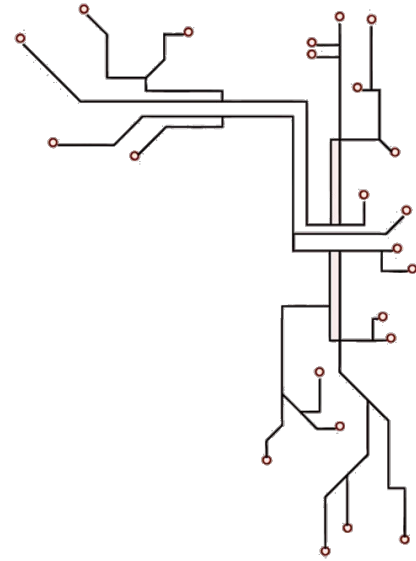
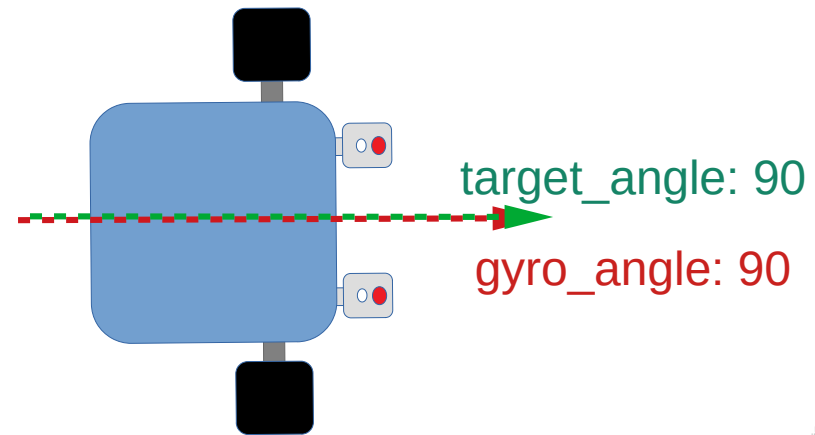
Else if gyro angle is greater than 90

Turn slightly to the left



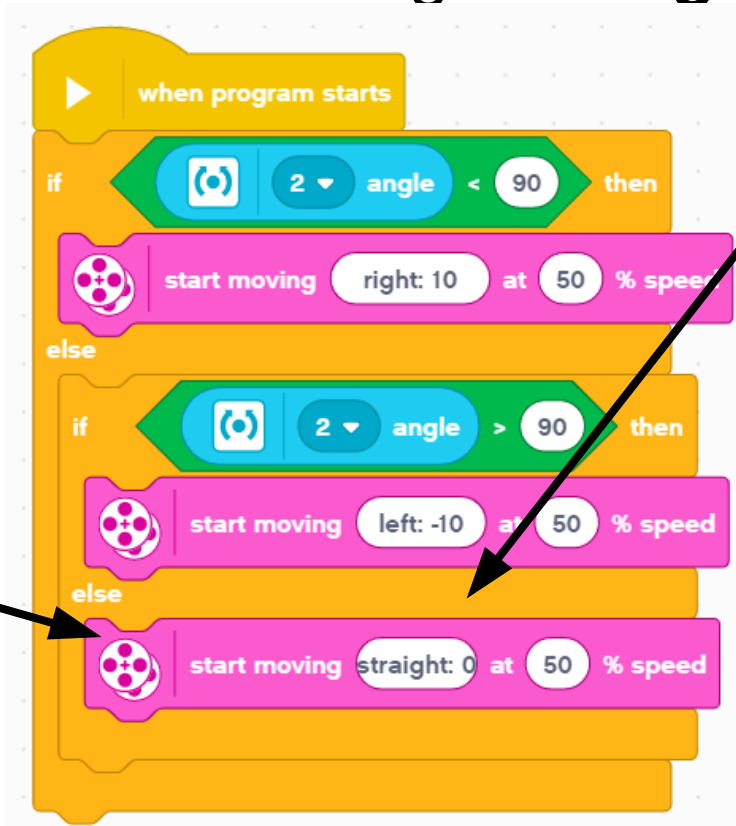
Gyro Move

- What should the robot do?



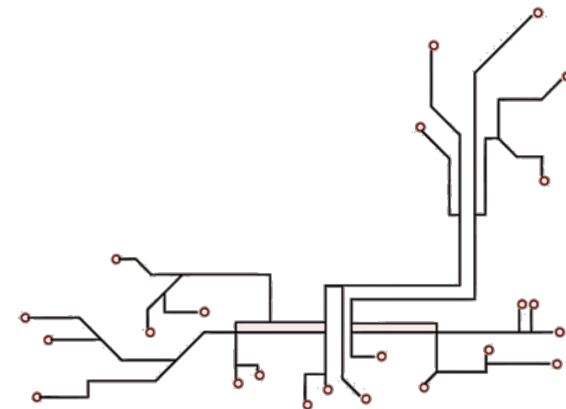
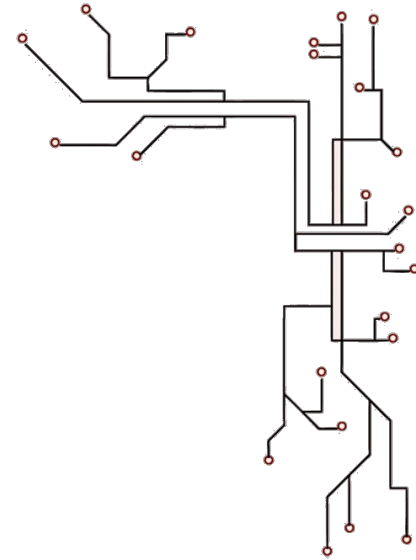
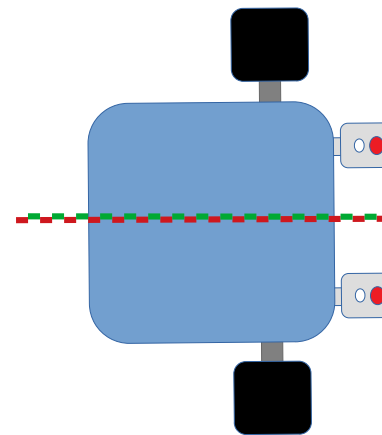
Gyro Move

- What should the robot do?
 - Robot should go **straight**



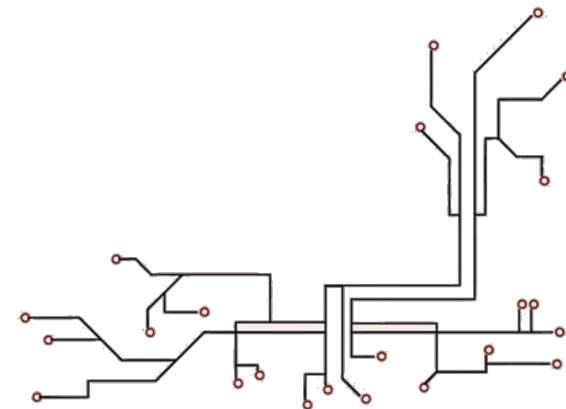
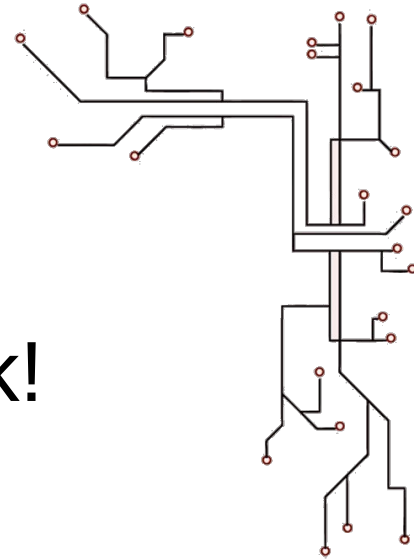
Else...

Go straight



Gyro Move

- If you try the program now, it won't work!
- Why!!!!
- Because there is no **loop**.
 - Program checks the gyro **once**, decide which way to turn, then it doesn't check the gyro anymore
 - We can use a “forever” loop, but then the robot will never stop



Motor Degrees

LEGO®

File Help



MOTORS



MOVEMENT



DISPLAY



SOUND



EVENTS



CONTROL



SENSORS



OPERATORS



VARIABLES

Find it under "Motors"

Set the port correctly
(...needs to be one of the
motors for the wheels)



A ▾

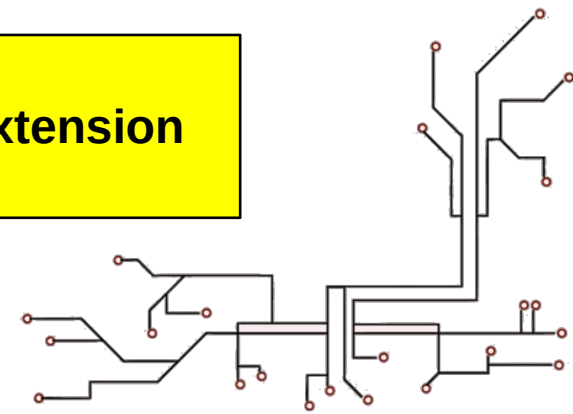
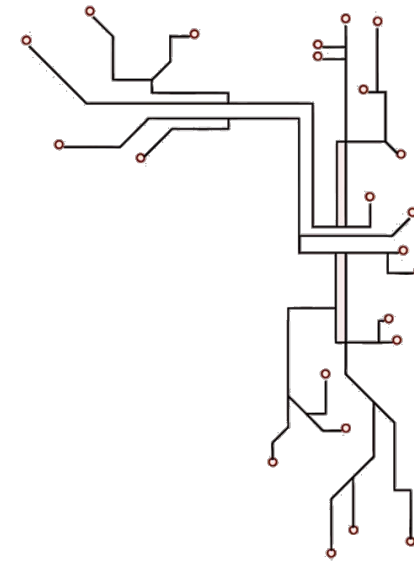
degrees counted



A ▾

relative position

Spike prime version.
You'll need to add the "More Motors" extension
to find this block.



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Reset Degrees

LEGO®

File Help



MOTORS



MOVEMENT



DISPLAY



SOUND



EVENTS



CONTROL



SENSORS



OPERATORS



VARIABLES

Find it under "Motors"

Reset the degrees back to zero



A ▾

reset degrees counted

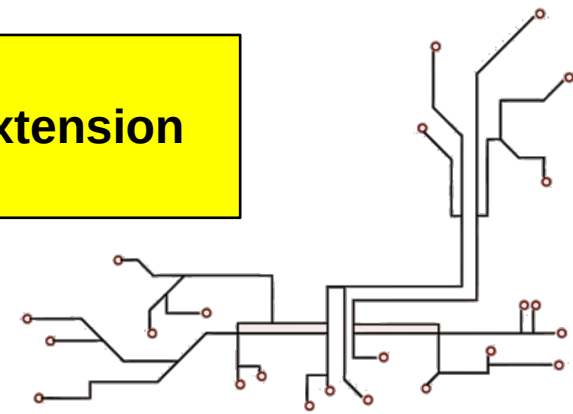
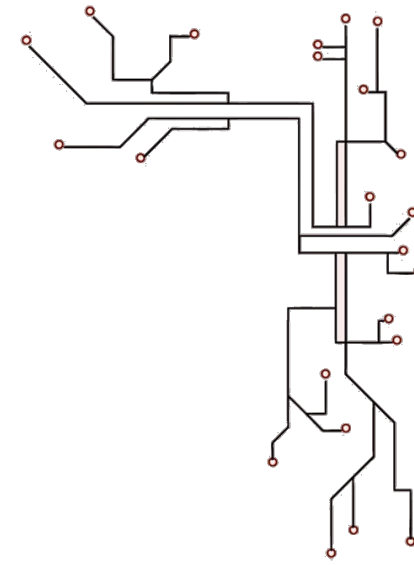


A ▾

set relative position to

0

Spike prime version.
You'll need to add the "More Motors" extension to find this block.



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Repeat Until

LEGO®

File Help



MOTORS



MOVEMENT



DISPLAY



SOUND



EVENTS



CONTROL



SENSORS



OPERATORS



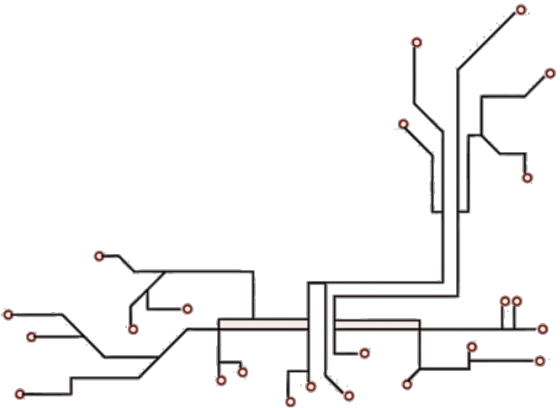
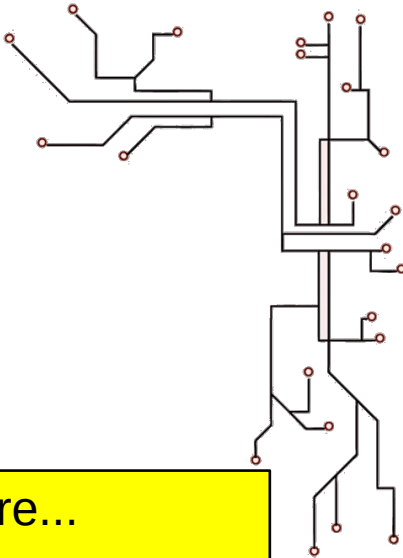
VARIABLES

Repeats everything inside the block until the condition is met

Condition goes here...

Stuff to repeat goes here...

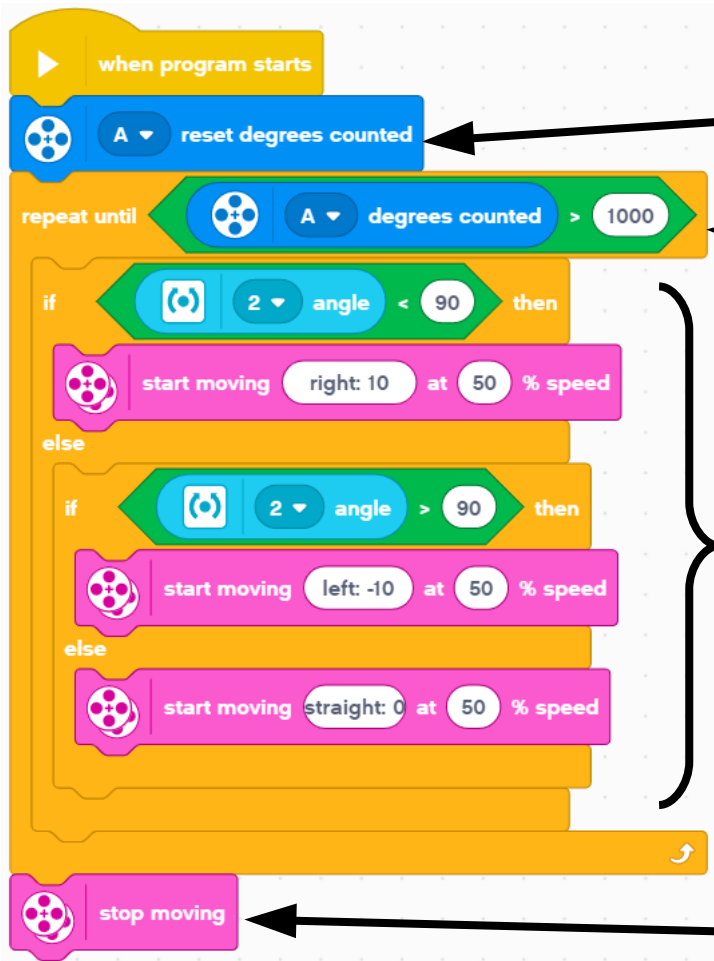
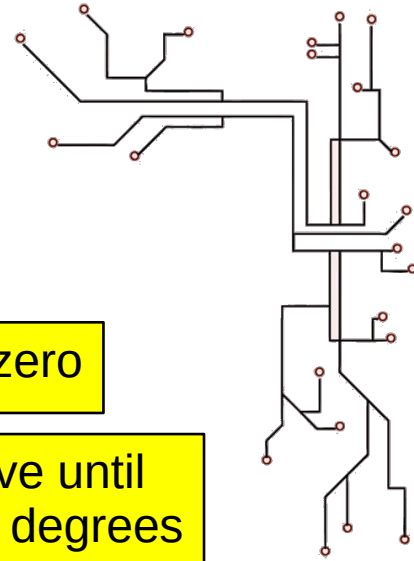
Find it under "Control"



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Example 1

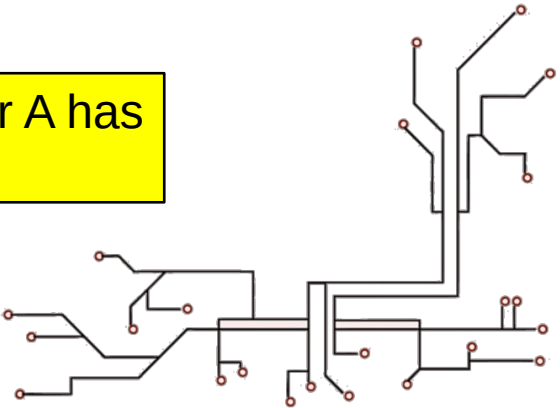


Start by resetting the degrees to zero

We'll repeat the gyro move until motor A has turned 1000 degrees

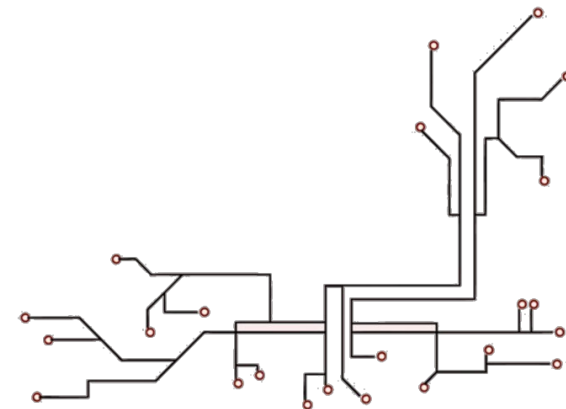
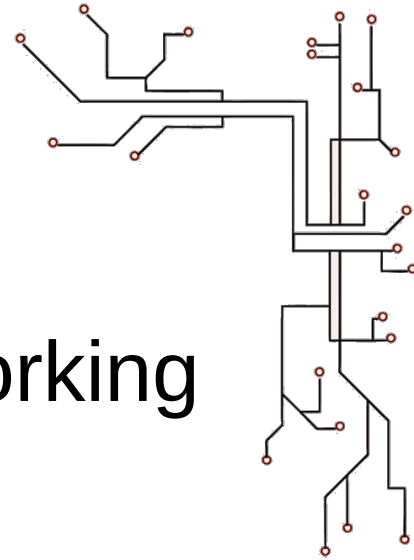
This part is the same as before

Stop the robot when motor A has turned 1000 degrees

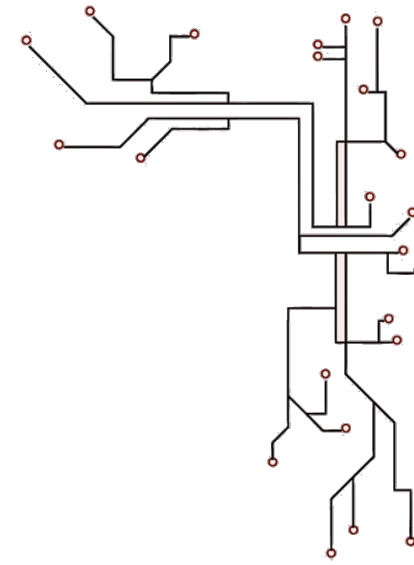


Gyro Move

- The program is almost, but not quite working yet... Why!!!!
- Because we told it to move at direction **90 degrees**
- The starting angle is **zero degrees**
- Let's make this into a My Block so we can set any direction we want



Gyro Move My Block



Give your My Block a name. Something like "gyro forward"



It'll have 3 inputs, for "direction", "degrees", and "speed"


Add an input
number or text


Add an input
boolean


Add a label

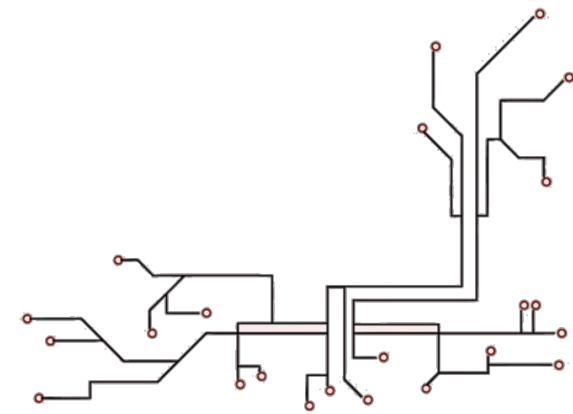
Click "SAVE" when done

CANCEL

SAVE

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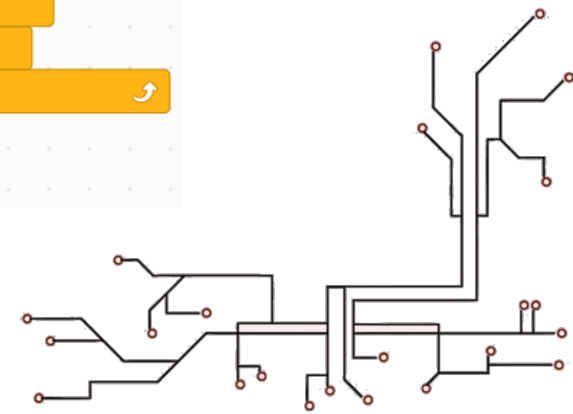
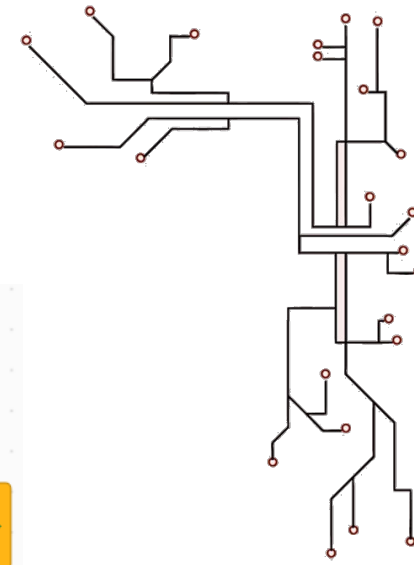
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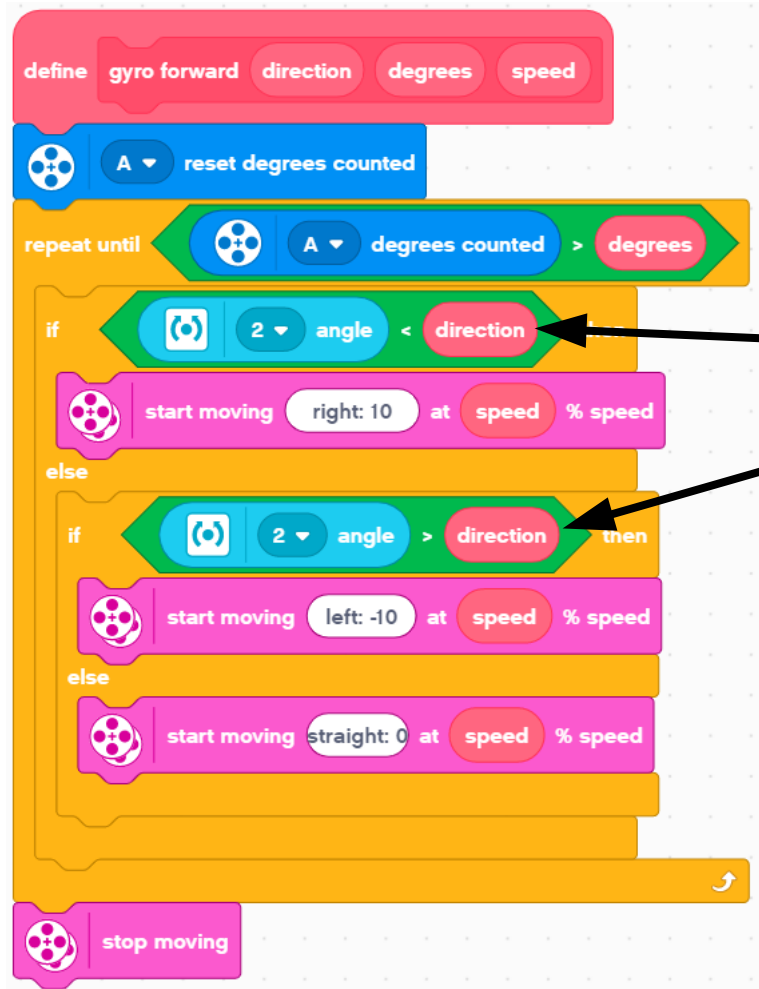
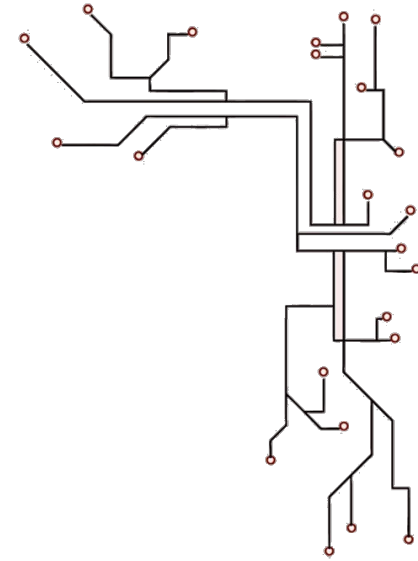
Creating a “My Block”

Move all the blocks and place it under “define gyro forward”

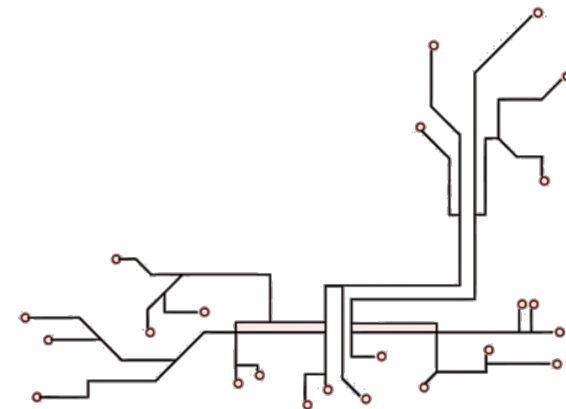
```
define gyro forward direction degrees speed
  A reset degrees counted
  repeat until A degrees counted > 1000
    if 2 angle < 90 then
      start moving right: 10 at 50 % speed
    else
      if 2 angle > 90 then
        start moving left: -10 at 50 % speed
      else
        start moving straight: 0 at 50 % speed
  stop moving
```



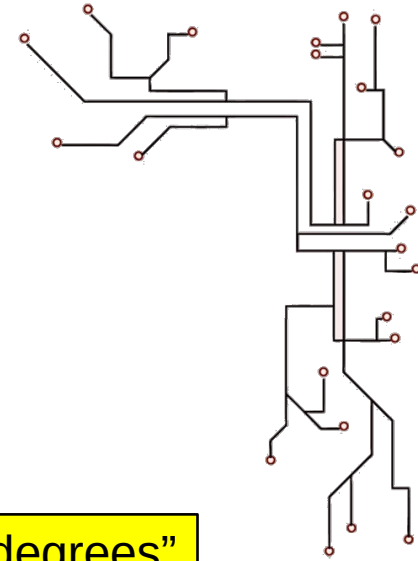
Creating a “My Block”



Replace the “90” with “direction”

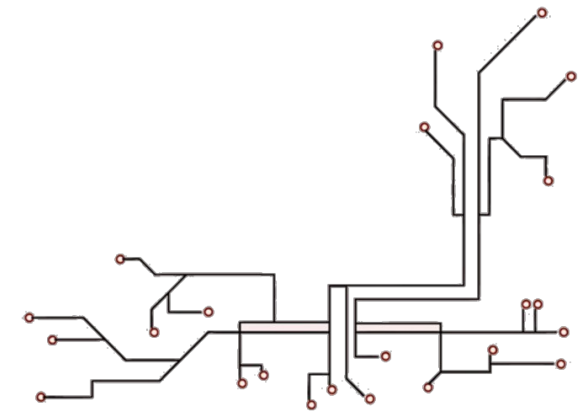


Creating a “My Block”

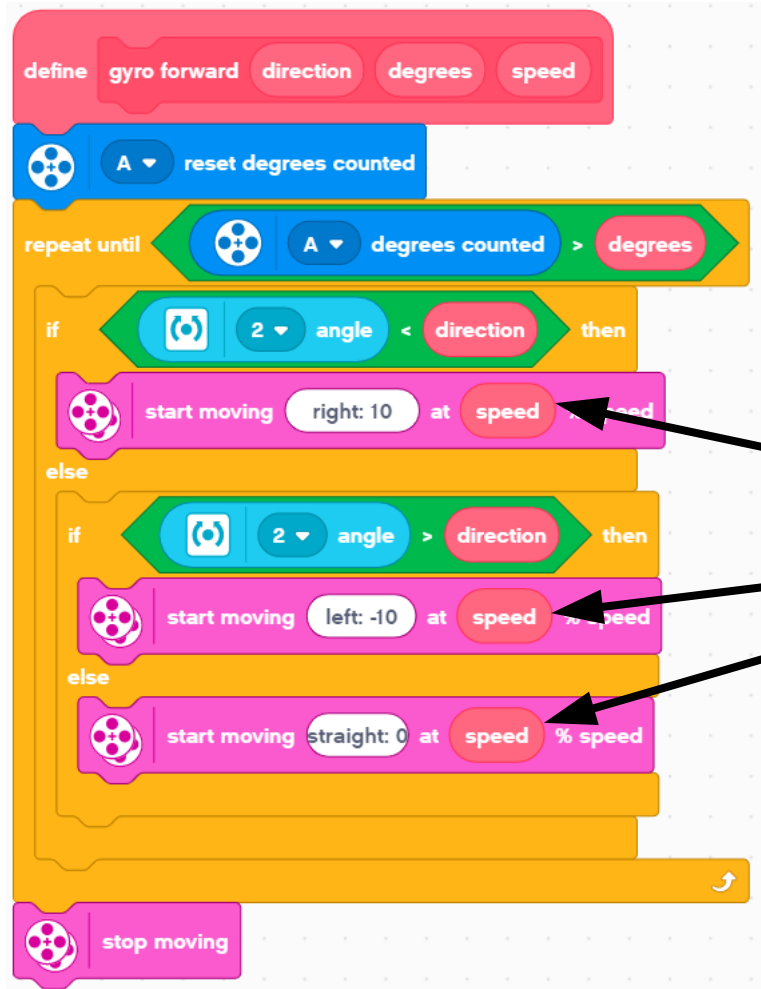
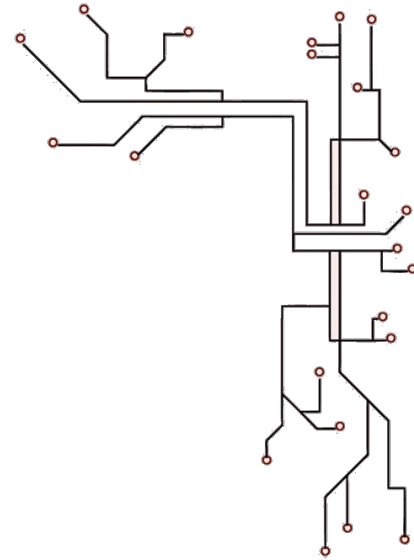


```
define gyro forward direction degrees speed
  A reset degrees counted
  repeat until A degrees counted > degrees
    if 2 angle < direction then
      start moving right: 10 at speed % speed
    else
      if 2 angle > direction then
        start moving left: -10 at speed % speed
      else
        start moving straight: 0 at speed % speed
  stop moving
```

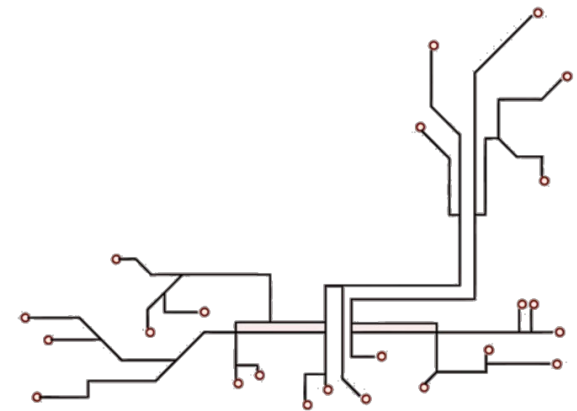
Replace the “1000” with “degrees”



Creating a “My Block”



Replace the “50” with “speed”



Creating a “My Block”

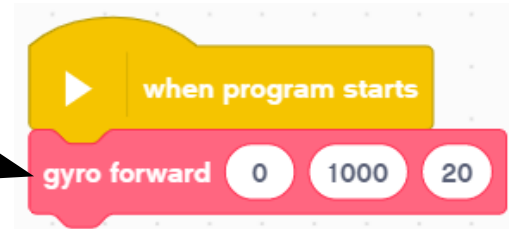
Finally, call the “gyro forward” my block

We'll set...

direction : 0

degrees : 1000

speed : 20

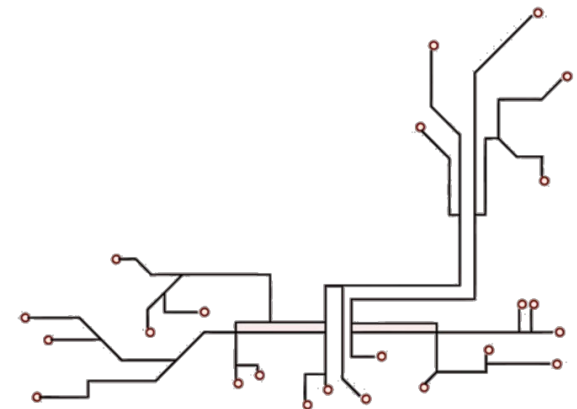
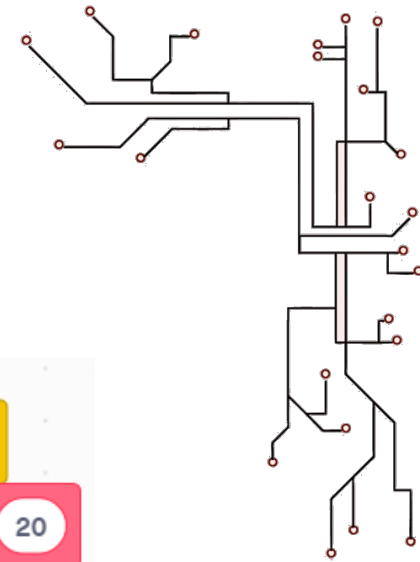


Try it out!

- Run the program on your robot
- While the robot is moving, turn it (...by hand) slight to the left and right; you should see the robot turn back and continue going straight

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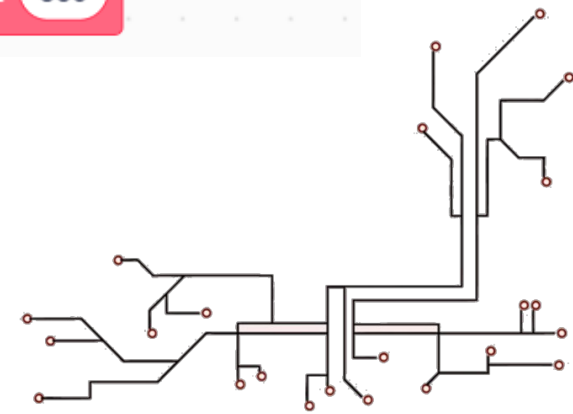
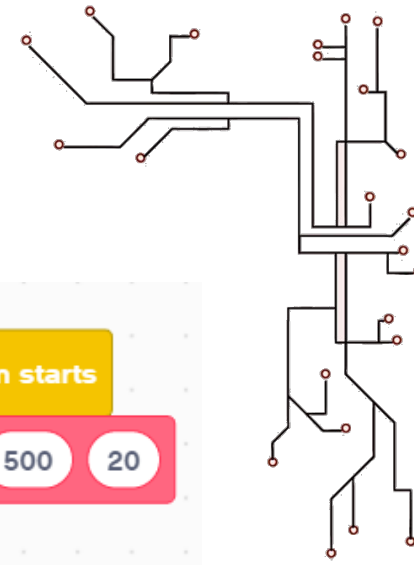
Experiment

- Try this program...
- ...what did the robot do?
- Challenges:
 - Make the robot move in a...
 - Triangle
 - Pentagon
 - Hexagon



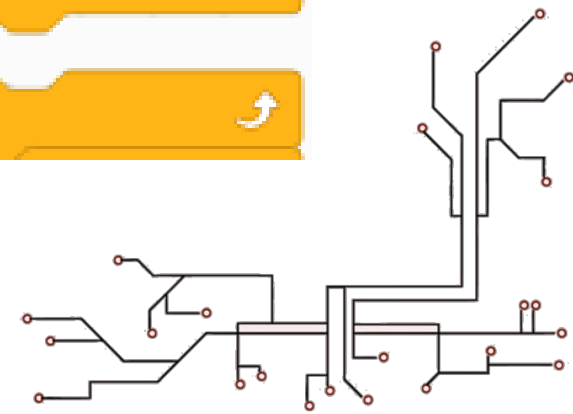
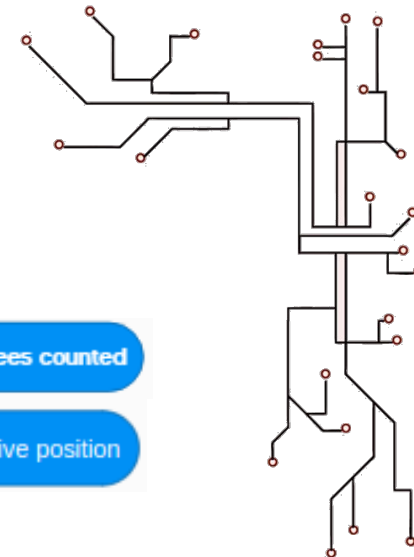
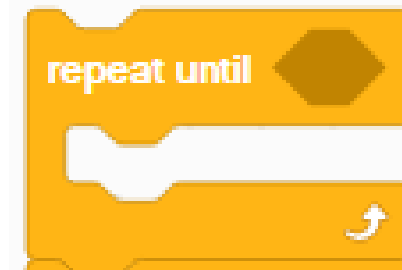
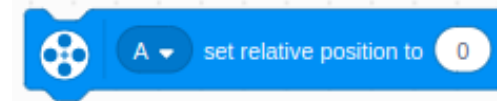
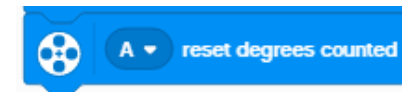
```
when program starts
gyro forward 0 500 20
Right Turn 90
gyro forward 90 500 20
Right Turn 180
gyro forward 180 500 20
Right Turn 270
gyro forward 270 500 20
Right Turn 360
```

The image shows a sequence of code blocks for a robot program. It starts with a yellow 'when program starts' block. This is followed by a series of red blocks: 'gyro forward' with parameters 0, 500, and 20; 'Right Turn' with 90; 'gyro forward' with 90, 500, and 20; 'Right Turn' with 180; 'gyro forward' with 180, 500, and 20; 'Right Turn' with 270; 'gyro forward' with 270, 500, and 20; and finally 'Right Turn' with 360.



Summary

- Use the “degrees counted” / “relative position” blocks to check how much the motor has rotated
- Use “reset degrees” / “set relative position” blocks to set the degrees to zero
- Use the “repeat until” block to repeat some code until a condition is met

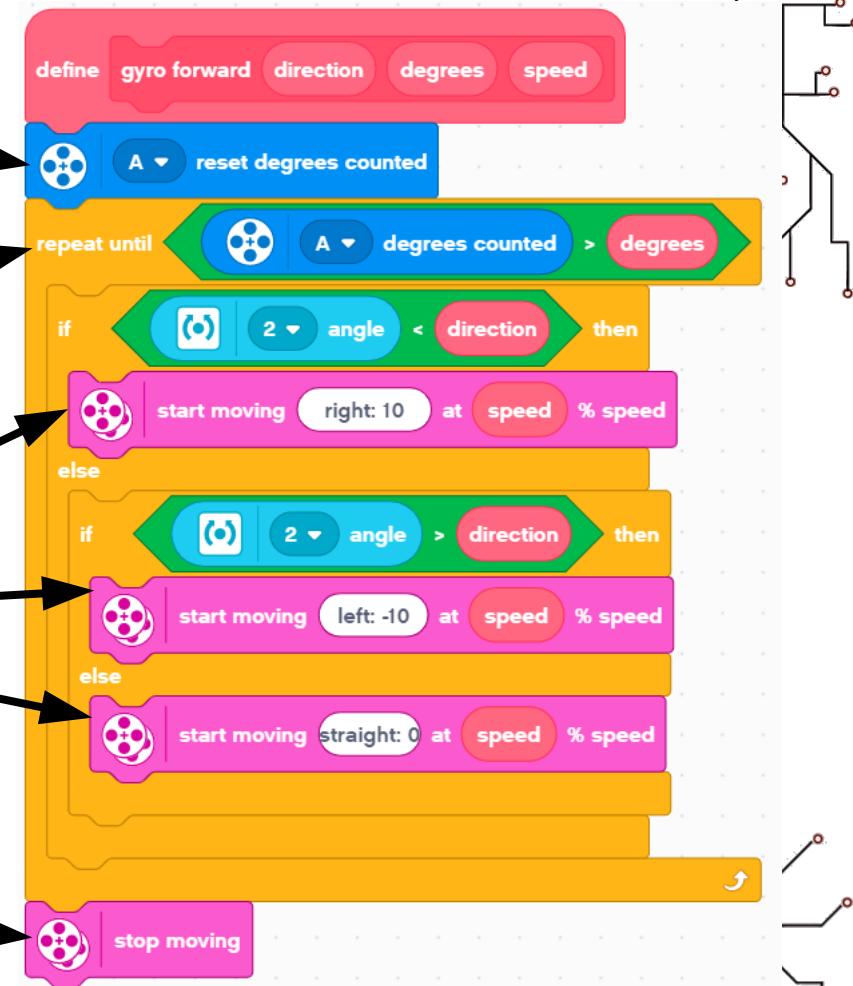


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Summary

- Reset motor degrees to zero
- Repeat until motor degrees is reached
- Turn left, right, or straight, depending on the gyro angle
- Finally, stop



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