



© G. Tardiani 2016

RoboCup Rescue Line

EV3 Workshop

Beginner



MINDSTORMS
EV3



Getting Started

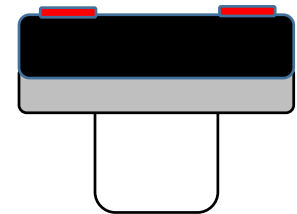
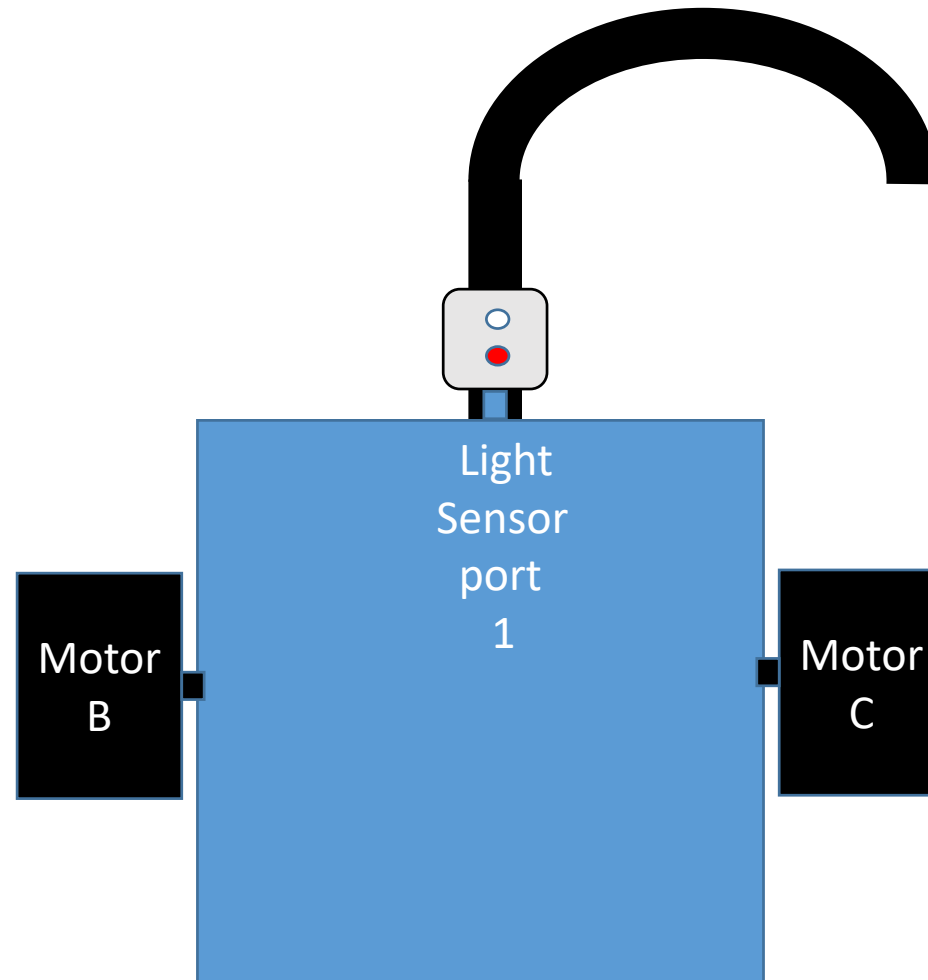
- The Robot needs to:-
 - Follow the Line
 - Detect Silver
 - Find the Victim
 - Push the victim out of the Spill
- Building your robot:-
 - Size
 - Centre of gravity
 - Rule limitations?

- Working towards:-
 - Detecting Intersections
 - Need more than one Colour Sensor
 - Detecting Obstacles
 - What's the best sensor to use?
 - Making your robot autonomous
 - Getting all your code to work together



Robot Design

- Motivation
 - Motors B and C
- Line Following
 - Colour Sensor
- Detecting Silver
 - Colour Sensor
- Finding the Can
 - Ultra Sonic Sensor



Line Following

- Single Colour/Light Sensor
 - This is called Edge Following
- Programming Logic

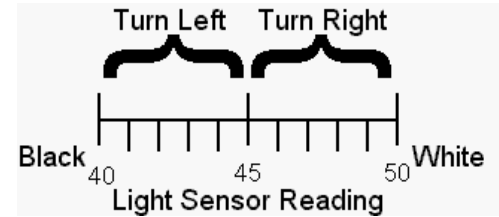
```
IF Sensor = Black THEN
    TurnLeft
ELSE
    TurnRight
ENDIF
```

- To turn the robot we can
 1. One motor ON, the other motor OFF
 - Wiggles a lot
 2. One motor ON, the other motor SLOW
 - Wiggles less
 3. One motor ON, the other motor BACK
 - Wiggles a real lot, but can get around tight corners
 4. Use Maths to control the motors
- Which one to use?

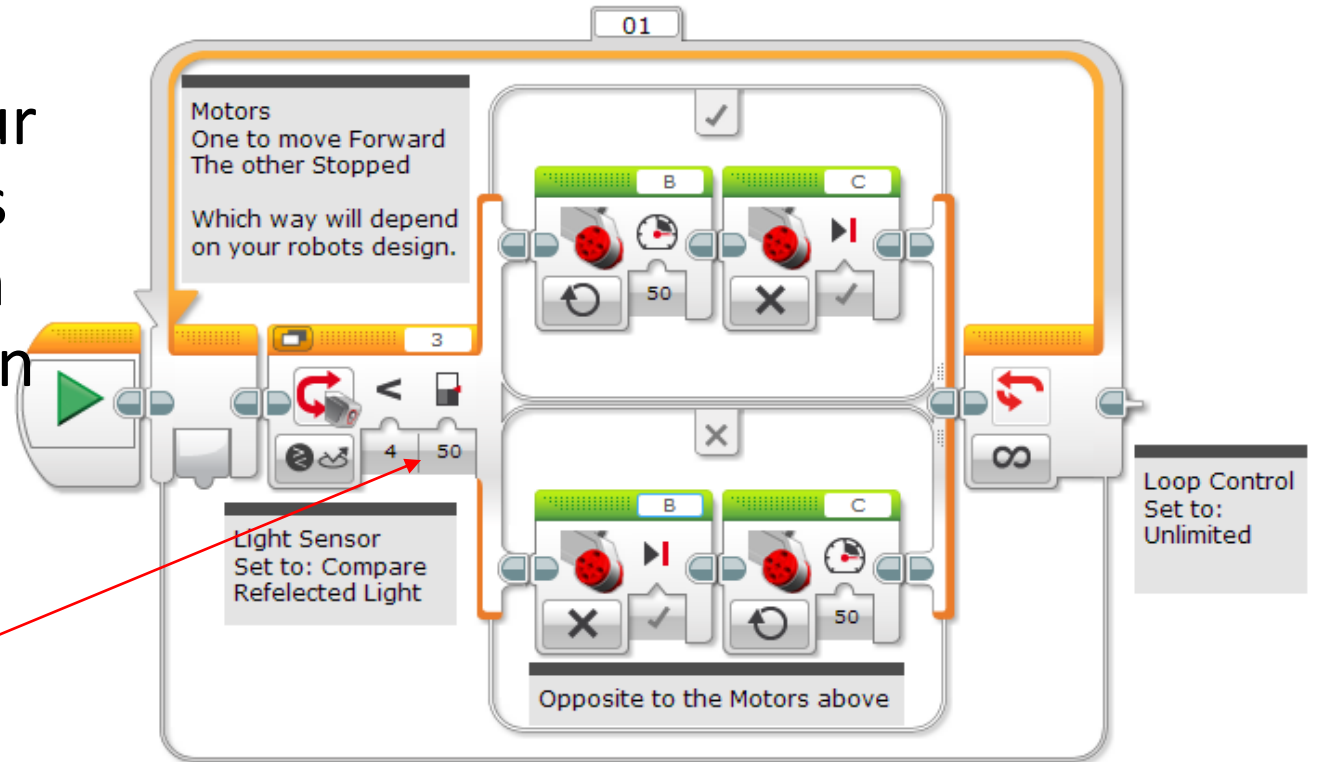




EV3 Code – Simple Line Follower



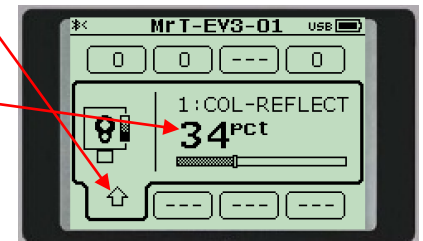
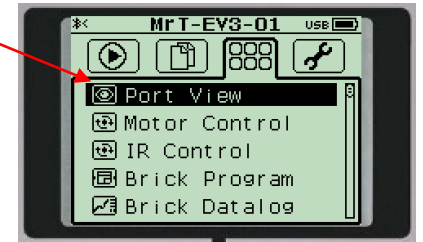
- The Loop allows the program to repeat infinitely
- The Switch monitors the Colour Sensor changing which motors to turn on or off depending on what colour is underneath it on the Rescue tile
- How do we work out what the comparison value should be





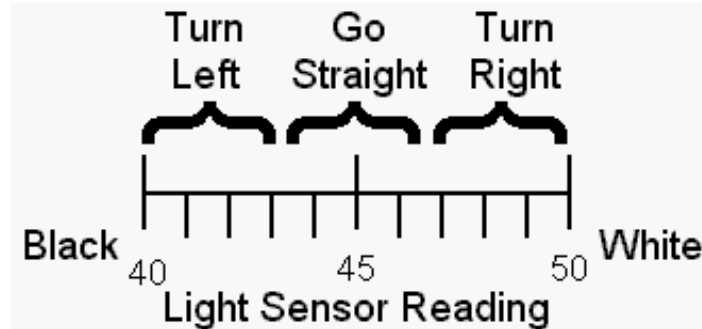
Thresholds

- You need to be able to know what the Colour Sensor is seeing
- Place your robot so that the Colour Sensor is over White
- Right arrow 3 clicks to the right, select Port View
- Use the arrow buttons to see the Colour Sensor port
- Make sure its on Col-Reflect
- Record the reading
- Do the same for Black
- Calculate $\text{White} + \text{Black} / 2$
- This value is your White/Black threshold

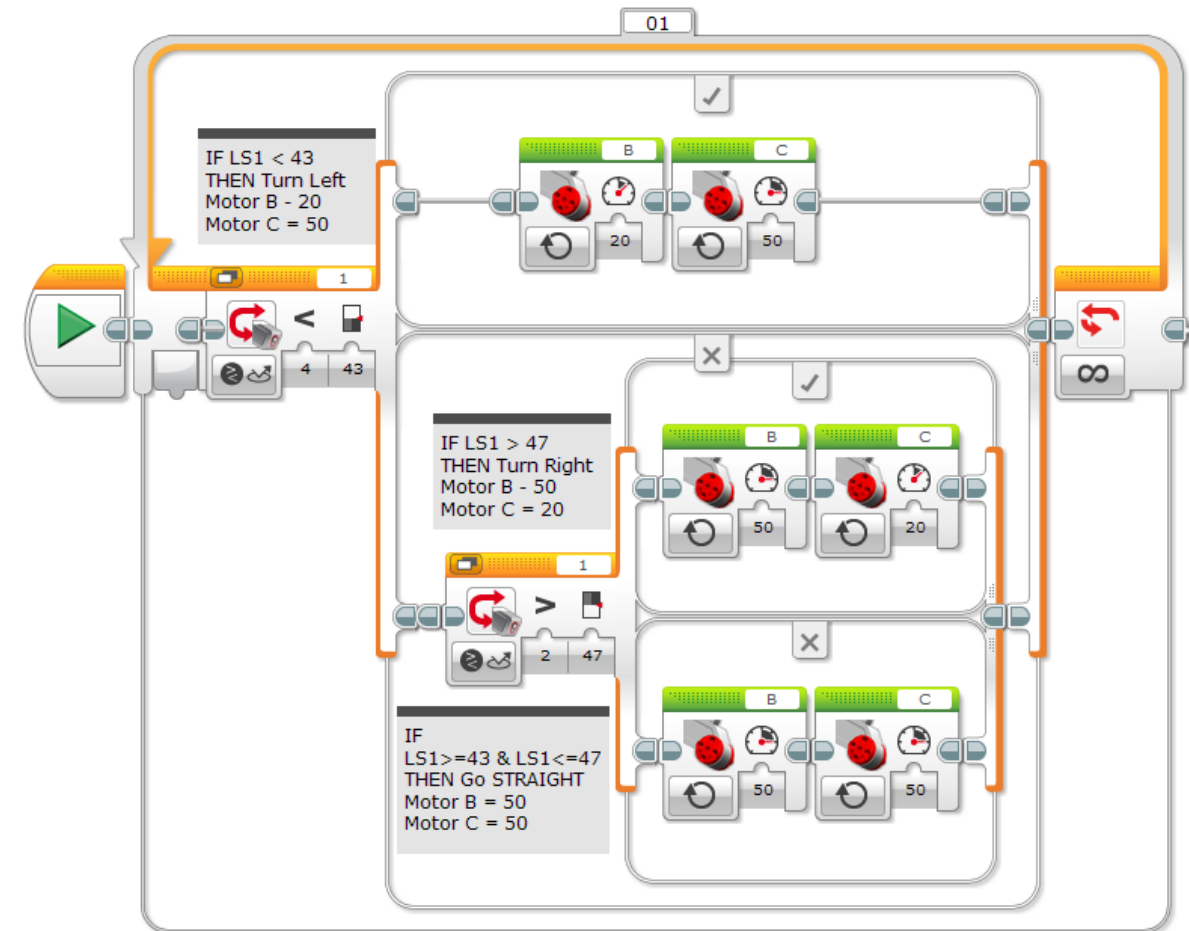




EV3 Code – Better Line Follower



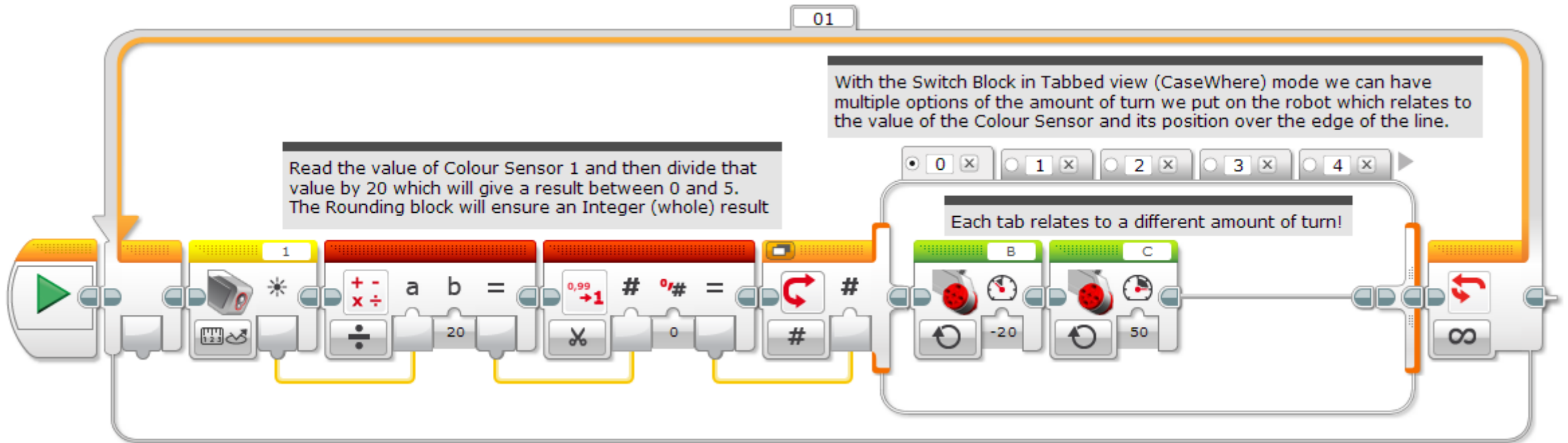
- We need to reduce the wiggle
- Lets break the edge of the line up into three parts
 - When the sensor is over White
 - When the sensor is over Black
 - When the sensor is half way which we can call Grey





Using maths to smooth the movements

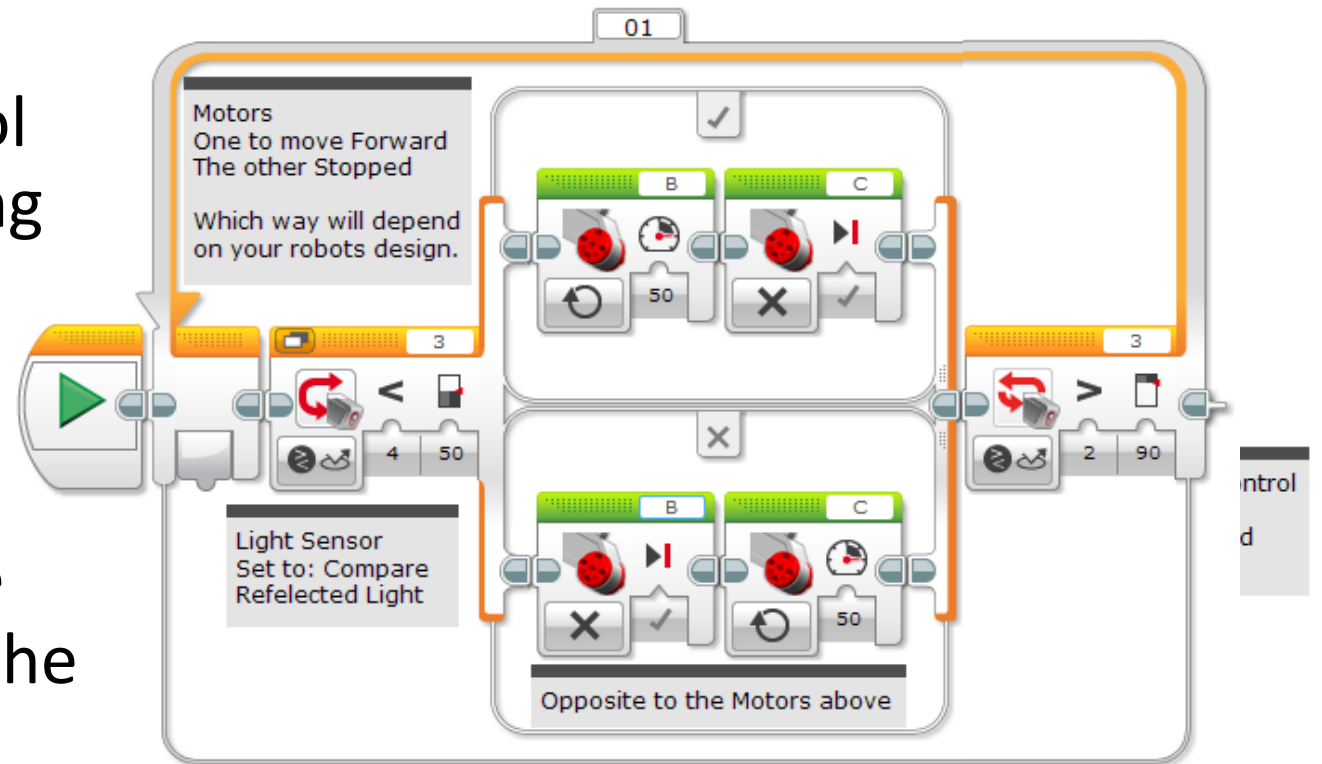
- Build in some smoothness using the Switch block, in Tabbed view
- Adjust the speed of the motors to get the robot following the line
- Try increasing the number of tabs to further smooth out the robot
 - Note: You may need to calibrate the sensor for this to work well





Detecting Silver at the Chemical Spill

- Where can we get this program to look for Silver?
- We can use the Loop to control when the Robot stops following the line.
- Change the infinite to Colour Sensor Reflective Compare
- Change the mode to $>$ and the threshold value to just under the port view value for Silver



Lets Find the Victim



© G. Tardiani 2016