

Comp3302 Computer Vision: Line Following

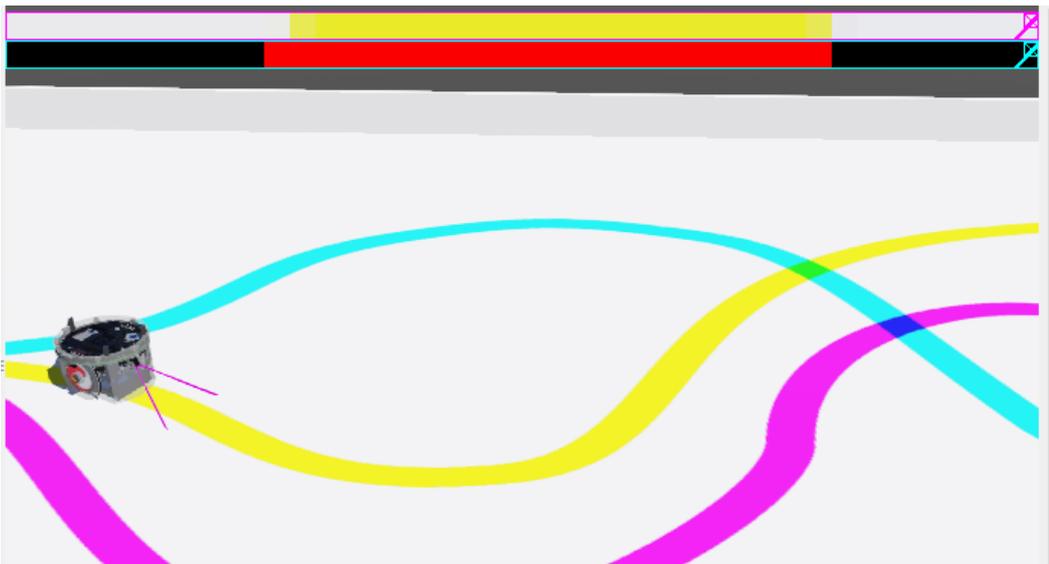
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Purpose	To use color information from a linear camera to follow a line.
Files Required	Webots project folders on website. Use the world CBP_3302_LinearCamera_1.wbt Controller is CBP_3302_LinearCamera_1.c
PP Contribution	PP2
Send to Me	If you are working online, please send movie-clip of your solution.
Homework	

Activities

1 Coding the Controller

Let's start by getting the robot to follow the yellow line. So it's a good idea for it to start on the line like this



The camera has width 40 pixels and height 1 pixel, so is a “linear camera” and is pointing down as the camera frustrum shows above. The image seen by the camera is shown at the top of the screen, and the image segmented into yellow pixels is shown underneath, represented as red pixels.

The code gets the RGB **image** from the camera, then segments it into **lineImage** when the pixel color has yellow hue, and its saturation is above 0.7 (min is 0.0, max is 1.) This avoids responding to image noise. It then gets the centre location **loc** of the yellow pixels with a call to **getAvLocation(...)**.

How does this work? Well the camera image has **width** and **loc** is in the range 0 to width. If the robot is correctly centred on the line, then **loc** should be at the centre of the image of **width**.

(a) Decide how to compute a value for the variable **error**, how far the camera image is off the line centre. This error value should have a meaningful range e.g., 0.0 – 1.0 or something thereabouts.

(b) Decide how to use the **error** signal to produce **omegaL** and **omegaR**. The error should rotate the robot to reduce itself and centre the image.

Also remember the robot should move forward when the error is zero, so you will need to add a constant value to both omegas to achieve this. Also remember the motors have a **MAX_SPEED** so you should use this.

I've given you a variable **gain** which you can use to multiply the error correction. This has default value 1.0

2 Possible Investigations – just for fun!

(a) Try to get the robot following the other lines

(b) Modify the controller so the robot can jump across intersecting colored lines and stay on the yellow line.
