

Solutions

Chapter 26: Robots walking the line

Skill builder 1, page 158

- 4 Presuming motor B is on driver's side (right) of robot (at the rear of the robot as illustrated in Figure 26.2), and C on passenger side, the robot must be placed over the right edge of line.
- 5 The following explanation will differ if you have your motors reversed or direction of motion reversed. Note the EV3 labels the outputs A to D from right to left!

Explanation:

The top branch is taken when the light reading is low (below the threshold value) so the robot swings right (motor B off, motor C on) away from the line and towards the white area. Thus, soon the sensor's light reading will move above the threshold value and the bottom branch in Figure 26.6 will be taken. The robot now swings left (motor B on, motor C off) towards the edge again. It will continue in this zigzag motion.

The top branch is followed if the light is less than threshold. Thus, the robot turns right when sensing a black line. This will mean it will soon 'see' white, which is greater brightness than the threshold and will turn left (bottom branch of code) towards it. The effect will be a constant zigzag along the right hand edge of the line. The robot must be placed with the sensor at the right edge of the line for this to work.

- 6 Hardware issues:

This greatly depends on arrangement of the sensor in relation to the robot's wheels and axis. These should form an isosceles triangle, with the sensor at the apex as shown in Figure 26.2.

If the sensor is at a distance from the wheel axis, then the sensor will turn in a wide arc and often miss tight curves. If the sensor is near the axis, then it can turn in a tighter arc and remain over the line. Even when this is true, the robot may not physically be able to turn tightly enough.

Algorithm/software issues:

On tight right curves the robot swings/turns left when it 'sees' white and the sensor swings over to the wrong side of the line. The reverse happens on tight left turns. This amount of turning may be too great for the robot to remain on the line. Therefore, it may be necessary to reduce the amount of steering.

Skill builder 2, page 159

- 2 The top branch is followed if the light is less than threshold and the robot steers smoothly right at 70 power, rather than being switched completely off. It then senses a white surface and steers left. The effect will be a constant zigzag along the right-hand edge of

the line, but one which is smoother than having motors switched completely off and on. The robot must be placed with the sensor at the right edge of the line for this to work.