# Lane Guidance

Program rovers to stay in the middle of a lane marked out by walls. This is a simplification of the lane assist technology in cars. Use the front ultrasonic sensor and both IR sensors on either side of the rover to determine where walls are and drive as smoothly through the middle of the path as you can. Don't run into the walls!

### Relevant Coding Skills

Iteration   Branching   Algorithm Design   Maths

### Relevant Rover Concepts

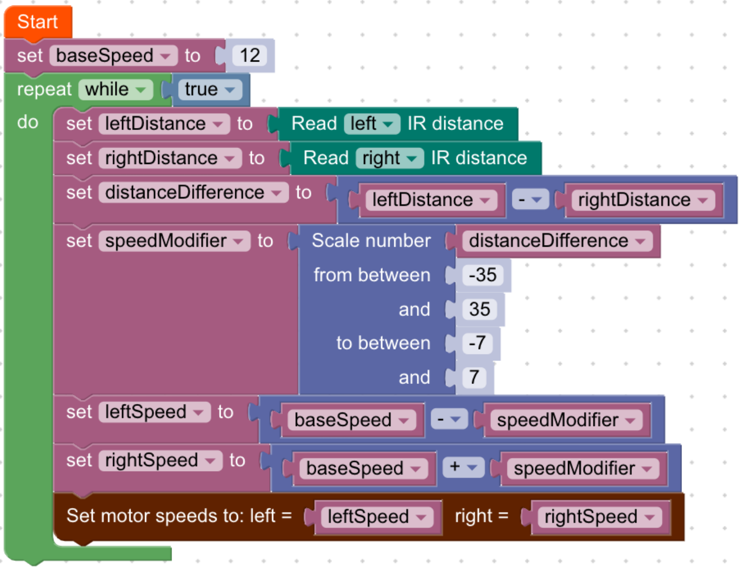
Motors   Ultrasonic   IR

### Exercise Setup

Create a curving walled passage on the floor. The walls can be anything from books to wooden blocks, as long as they are solid and high enough to be detected by the IR and ultrasonic sensors. Tight passages and sharp corners greatly increase the difficulty. You can also add coloured tape as traffic markers through the passage that the robot must stop or turn around at.

### Here's Our Approach

The core of this problem is that if the wall on the left is closer than the one on the right you need to turn right. This can be done with IF statements. Make sure you can do it with IF statements first before looking at this solution. Once you're confident with this check out the PID example to make it even smoother.



```
Start
set baseSpeed to 12
repeat while true
do  set leftDistance to Read left IR distance
    set rightDistance to Read right IR distance
    set distanceDifference to leftDistance - rightDistance
    set speedModifier to Scale number distanceDifference
                                 from between -35
                                          and 35
                                   to between -7
                                          and 7
    set leftSpeed to baseSpeed - speedModifier
    set rightSpeed to baseSpeed + speedModifier
    Set motor speeds to: left = leftSpeed right = rightSpeed
```

### Stage 1 - Read Sensors

Using clear **variable** names can make code easier to read and follow. We use variables to calculate the difference between the distances read by the two **IR distance sensors**.

### Stage 2 - Calculate Motor Speeds

The **math scale block** lets you convert a number from one range to another. We used -35 and 35 because that suited the width of the passage we were using. That was about the maximum difference that would be possible between the left and right distance sensor readings. We converted that to -7 and 7 so that there would be a maximum difference of 14cm/s between the motors speeds.
The left and right **motor** speeds are then calculated by adding/subtracting this value to a base forward speed so the rover always moves forward.