

mindsterms

Dealing with Spike Gyro





EV3 vs Spike Gyro

- EV3 gyro
 - <u>Always</u> increase when turning clockwise and decrease when turning counter-clockwise
 - No upper or lower limit (ie. can be greater than 360 and less than -360)
 - Example: 178, 179, 180, 181..., 359, 360, 361...

EV3 vs Spike Gyro

- Spike gyro
 - <u>Usually</u> increase when turning clockwise and decrease when turning counter-clockwise
 - Rolls over at 180/-180 degrees
 - Max of 179 and min of -180
 - Example: 178, 179, -180, -179, -178



- Consider...
 - You want to turn towards 50 degrees...



- Consider...
 - All angles within the green area are less than 50...
 - ...and we need to turn right



- Consider...
 - All angles within the blue area are more than 50...
 - ...and we need to turn left



- Consider...
 - Angles within the red area are less than 50...
 - ...but we need to turn left!
 - Conflicts with the first condition!



- This gets worse as the angle approaches 180 degrees
 - Red area gets bigger
 - Blue area gets smaller



- Reset the gyro
 - Resetting the gyro sets the current direction to 0
 - Do this before a gyro turn...
 - Works as long as turn is less than 180 degrees
 - Do this before a gyro move...
 - Simple solution, but will have some drawbacks...

- Drawbacks
 - Every reset will introduce some errors
 - Consider:
 - Perform a gyro turn to 90, but the robot overshoots and turns to 91 instead
 - When gyro is reset, 91 will now be treated as 0 and there will be a permanent 1 degree error
 - The above error can be corrected with code, but...
 - ...overshoot may be less than 1 degree (eg. 0.4 deg) and may not be detectable, and hence uncorrectable in code

- Modify the angles in the red region so that...
 - Angles to the <u>left</u> of the target is always <u>less</u>
 - Angles to the <u>right</u> of the target is always <u>more</u>
- Angles can be modified by adding / subtracting 360 degrees
- More complicated, but avoids accumulating errors through resets

- How to modify the angles in the red region?
 1) Identify angles in red region
 2) Modify angles by adding / subtracting 360
- Two cases...
 - Target > 0
 - Target < 0



Identify angle in red region (target angle > 0)

 a) Gyro angle – Target < -180
 Add 360 degrees to gyro
 Target: 5





1) Identify angle in red region (target angle < 0) a) Gyro angle – Target > 180 2) Subtract 360 degrees () Target: -50 Eq. 160 - (-50) = 210210 > 180if gyro_angle - target < -180: Hence in red region gyro_angle += 360 else if gyro_angle - target > 180: -90 90 gyro_angle -= 360 Gyro: 160 -180

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