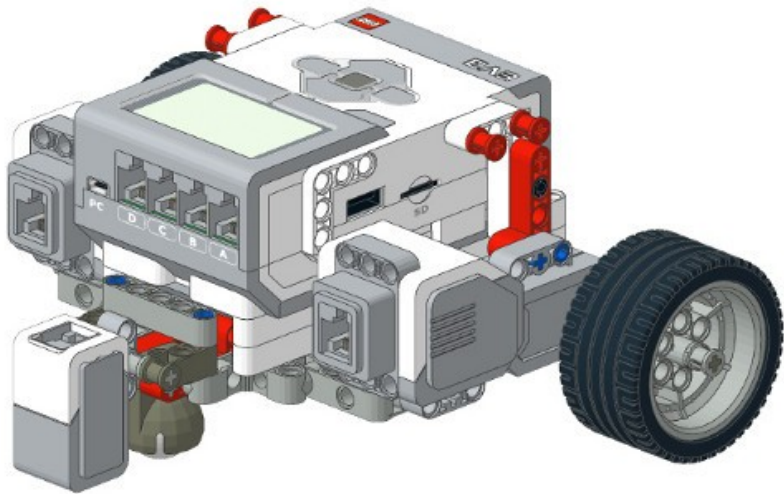




MINDSTORMS
EV3

Backlash and Wheels Positioning

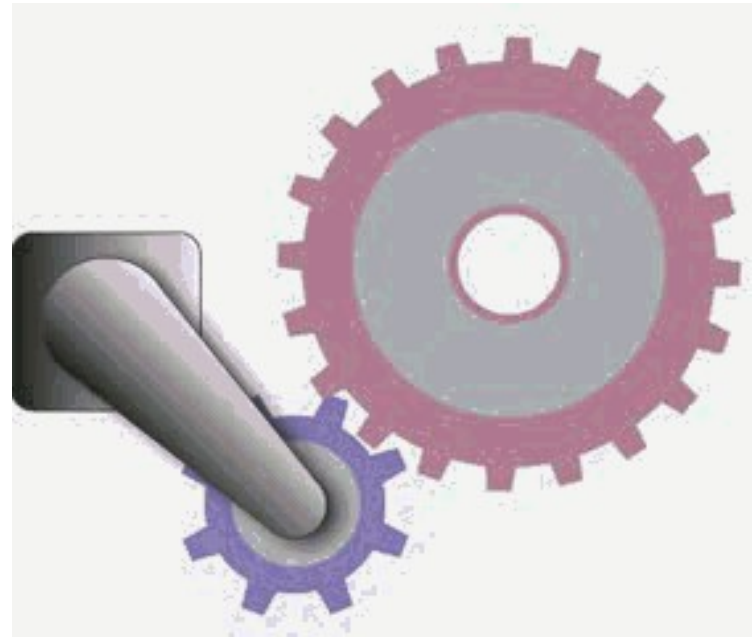
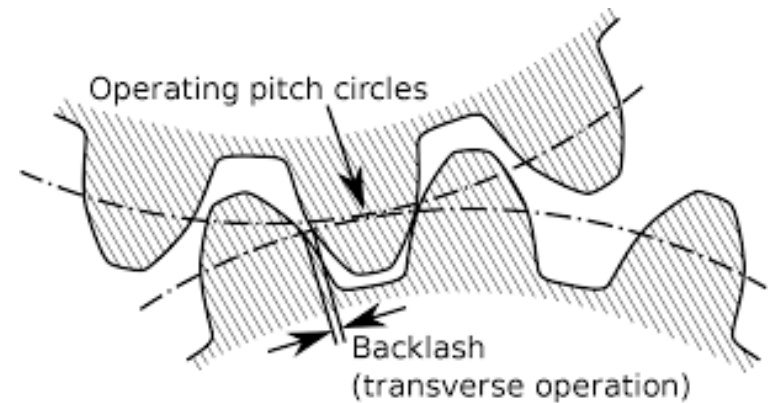


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What is Backlash?

- Gaps in the gears
- Causes a slight delay in movement
- About 12 degree for an EV3 large motor
- Much less for a medium motor
- **Occurs when direction of rotation changes!**

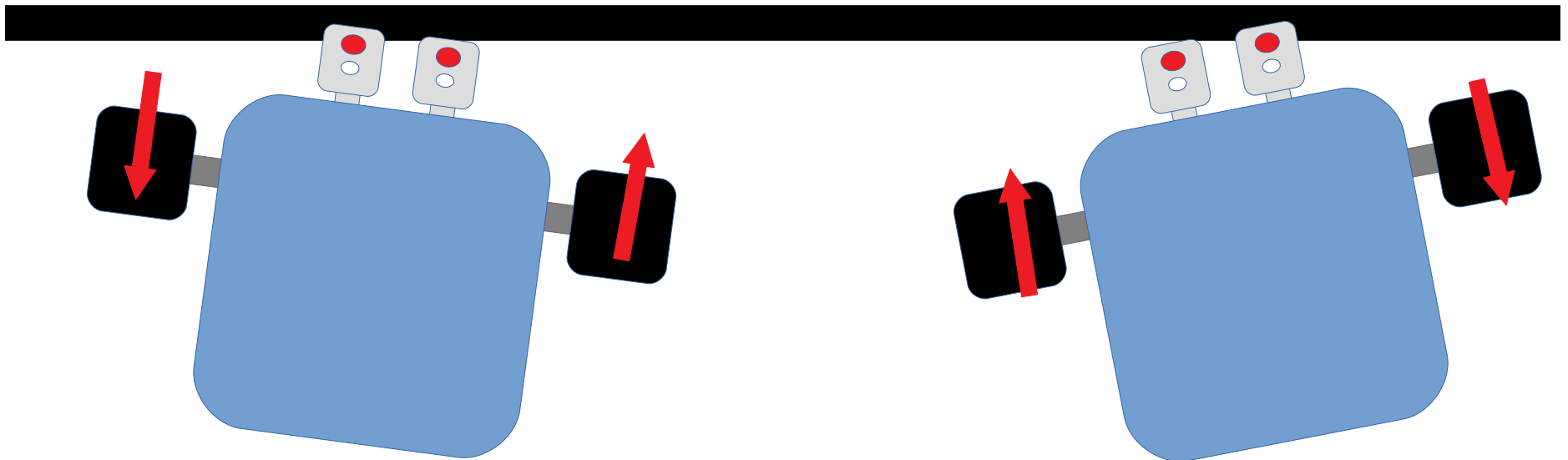


Impact of Backlash

- Causes error in distance traveled
- Magnified by wheel size
 - EV3 Wheels: 5.9mm error
 - Motorcycle Wheels: 8.5mm error
- Causes error in turning angle
 - Worse case, up to 5 degrees error*
 - * Assumes EV3 wheels, 150mm apart

Impact of Backlash

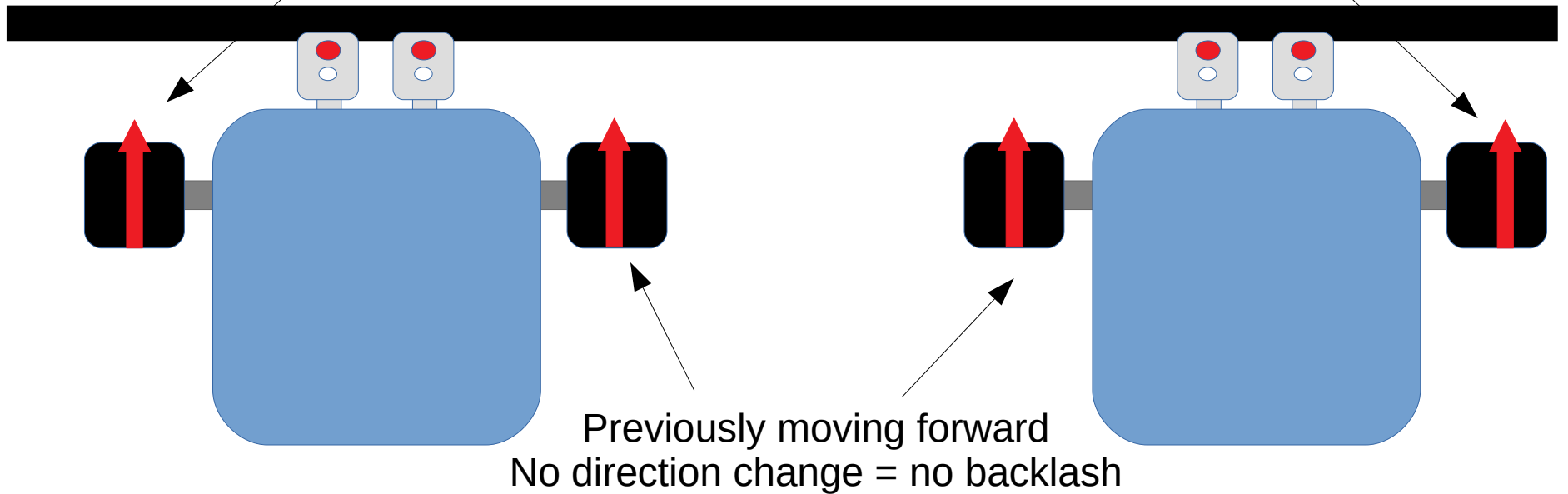
- Errors can be corrected if it is consistent...
- ...but backlash depends on direction change!



These will not behave the same after aligning to the line!

Impact of Backlash

Previously moving backwards
Direction change = Affected by backlash



Robot 1 has its left wheel affected by backlash, while robot 2 has its right wheel affected by backlash. They will not behave identically when moving forward after aligning to the line.

Minimizing Impact

- Use smaller wheels
 - Nearly 90% difference between largest and smallest wheels
 - Reduces your max speed
- Place wheels further apart
 - 150mm apart: 5 degrees turning error
 - 250mm apart: 2.7 degrees turning error

Minimizing Impact

- Always turn in the same direction
 - Don't try to hit the line as straight as possible
 - Deliberately hit it at an angle, then do line alignment
- Use the gyro
 - Waste 1 port
 - More complicated
 - Accurate to around 1 degree (short duration)

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