Robot turning
Understanding how your robot is turning
In LEGO MINDSTORMS NXT software, we are able to control (input) the movement of the individual motor or wheel.

How does it relate to movement of the Tribot when it is turning

Most students do guess and check approach

If one parameter change, need to redo guess and check

Would like robot to pivot or do an arc turn to desire angle with less (or no) guessing
Types of Turns

- To pivot you could stop one wheel and continue to run the other but for how long?
- To do an arc turn you need to know how wide you want to go, what tire to slow down, what tire to speed up and the distance each should travel.
- How would you go about doing such a thing? Stay tuned to find out.
Pivot Turn Around One Wheel

The ratio of diameter of the wheel over the distance between two wheels needs to be considered in the design.

\[ S = \theta L = \alpha \frac{D}{2} \]

\[ \theta = \frac{\alpha D}{2L} \]

Eq. (1)
General Arc Turn

\[ S_A = \theta d = \alpha_A \frac{D}{2} \]

\[ S_B = \theta (d + L) = \alpha_B \frac{D}{2} \]

\[ \theta = \frac{\alpha_B D}{2(d + L)} = \frac{\alpha_A D}{2d} \]

Eq. (2)

Pivot Point

Top view of wheels

Side view of wheels
Rearranging terms give the following ratio

\[ \frac{S_A}{S_B} = \frac{\alpha_A}{\alpha_B} = \frac{d}{d + L} \]

This ratio is the Turn Adjusting Bar (TAB), red dotted rectangle.

When \( d = 0 \), \( \frac{\alpha_A}{\alpha_B} = 0 \) recover pivot turn, Eq. (1) \( \theta = \frac{\alpha_D}{2L} \)

TAB switch all the way left

When \( d \rightarrow \infty \) Straight movement \( \frac{\alpha_A}{\alpha_B} = 1 \)

TAB switch stay in the middle

The ratio \( \frac{\alpha_A}{\alpha_B} \) is TAB from NXT software. There are 11 steps to one side of the TAB (total 21 steps - 10 steps to the right, 10 steps to the left and the middle one) and the ratio is from 0 to 1. Therefore, each step is the increment of 0.1. By using above equations, you can design your tribot turn more efficiently.
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