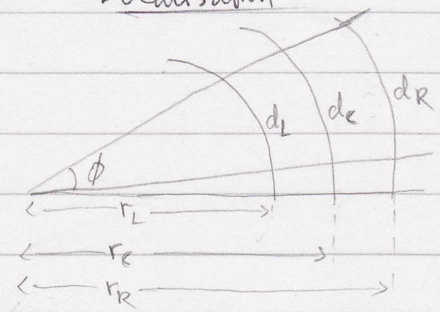
Localisation



$d_B = r_R - r_L$

$$d_c = r_c\phi = (r_L + \frac{d_B}{2})\phi = (r_L + \frac{r_R - r_L}{2})\phi = \frac{(r_L + r_R)\phi}{2} \quad -(i)$$

$$d_L = r_L\phi \Rightarrow r_L = d_L/\phi$$
$$d_R = r_R\phi \Rightarrow r_R = d_R/\phi$$

Subst. r_L & r_R in (i) $\Rightarrow d_c = \frac{(d_L + d_R)\phi}{2\phi} = \frac{d_L + d_R}{2}$ [SLAM3]

Subtract d_L from $d_R \Rightarrow d_R - d_L = \phi(r_R - r_L) \Rightarrow \phi = \frac{d_R - d_L}{r_R - r_L} = \frac{d_R - d_L}{d_B}$ [SLAM3]

$d_B = r_R - r_L$

The rest is just more math which leads to the final equations [SLAM3];

$$d_c = \frac{d_L + d_R}{2} \quad (1)$$

$$\phi = \frac{d_R - d_L}{d_B} \text{ (radians)} \quad (2)$$

$$\theta' = \theta + \phi \quad (3)$$

$$x' = x + d_c \cos\theta \quad (4)$$

$$y' = y + d_c \sin\theta \quad (5)$$

NOTE: Convert ϕ to degrees (so θ is also degrees).

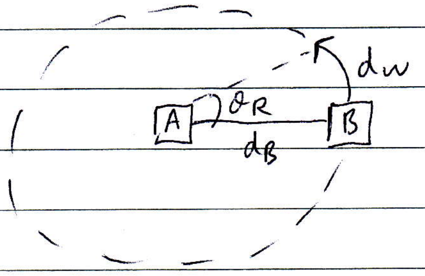
Convert θ to an angle between 0 & 360 (i.e account for $\theta < 0$ & $\theta > 360$)

Initially $\theta = 90$

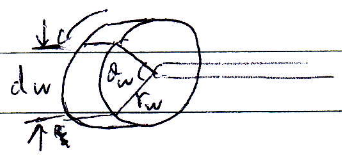
Turning/rotating by θ_R degrees

- Using 1 wheel (rotating the robot about a wheel)

where :
- A & B are the left & right motors respectively
- d_w = distance moved by 1 ~~wheel~~ motor.
- d_B = distance between motors
- ~~d_R~~ r_w = wheel radius
- θ_R = angle rotated by robot
- θ_w = angle rotated by motor.



$$d_w = \frac{\theta_R}{360} \times 2\pi d_B \quad \text{—(1)}$$

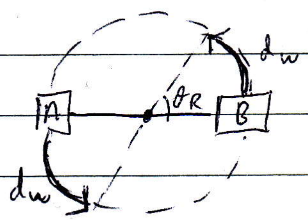


$$d_w = \frac{\theta_w}{360} \times 2\pi r_w \quad \text{—(2)}$$

$$(1) = (2) \Rightarrow \frac{\theta_R}{\cancel{360}} \times 2\pi d_B = \frac{\theta_w}{\cancel{360}} \times 2\pi r_w$$

$$\Rightarrow \theta_w = \frac{\theta_R d_B}{r_w} \quad (\text{for A OR B})$$

- using 2 wheels (rotating the robot on the spot)



$$\theta_w = \frac{\theta_R d_B}{2 r_w} \quad (\text{for A \& B})$$