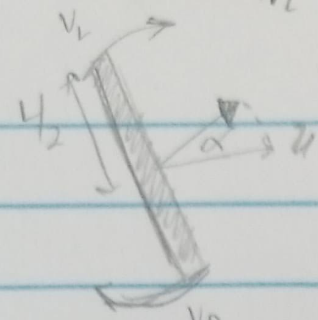
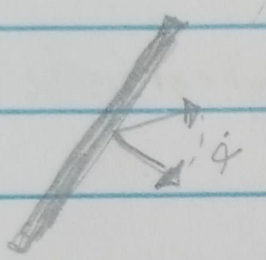
$u = RV_L - RV_R$



$u = r\omega$

$x = 0 \quad y = 0$

wheel velocity $= V_R R$
$= V_L R$

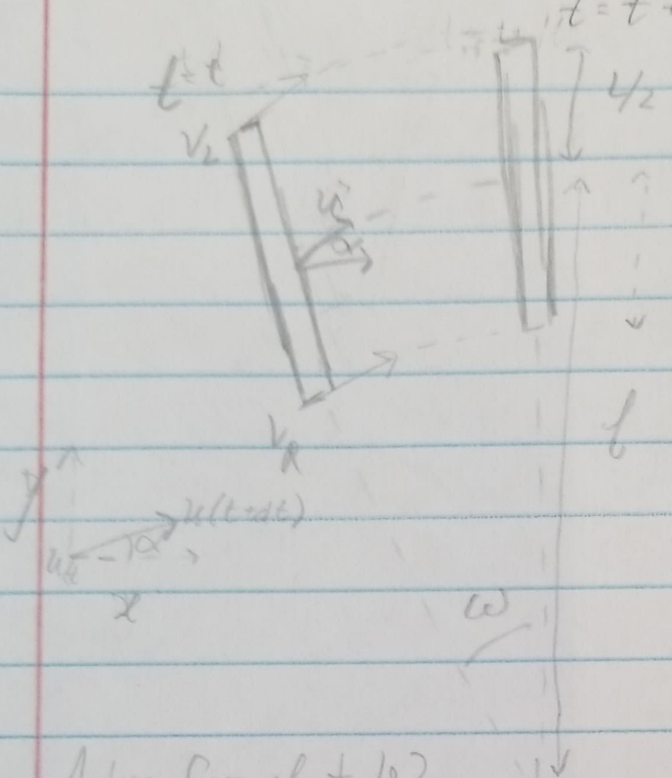


$u = r\omega = L \cdot \dot{\alpha}$

$RV_L - RV_R = L \cdot \dot{\alpha}$

$R(V_L - V_R) = L \cdot \dot{\alpha}$

$\dot{\alpha} = \frac{R}{L}(V_L - V_R)$



$y(t+dt) - y(t)$

$v = r\omega \qquad r = l \qquad v = u$

$\Downarrow$

$u = l\omega$ wheel velocity $= V_R R$

$= V_L R$

$V_R R = (l - L/2)\omega$

$V_L R = (l + L/2)\omega$

Solve for l + ω

$V_L R = (l + L/2)\omega \quad [l\omega + L/2\,\omega]$

$V_R R = (l - L/2)\omega \quad [l\omega - L/2\,\omega]$

$V_L R - V_R R = \cancel{l\omega} - \cancel{l\omega} + L/2\,\omega + L/2\,\omega$

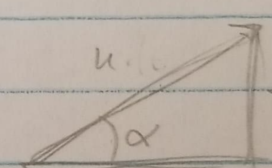
$= L\omega$

$\dfrac{V_L R - V_R R}{L} = \omega$

$R\left(\dfrac{V_L - V_R}{L}\right)$

$V_L R = (l + L/2)\left(\dfrac{V_L R - V_R R}{L}\right)$

$V_L R$



$\cos(\alpha) = \dfrac{x(t+dt) - x(t)}{u}$

$\sin(\alpha) = \dfrac{y(t+dt) - y(t)}{u}$

$x(t+dt) = x(t) + u\cos(\alpha)\,dt$

$y(t+dt) = y(t) + u\sin(\alpha)\,dt$

$\lim_{dt \to 0}\left[\dfrac{x(t+dt) - x(t)}{dt}\right] = u\cos(\alpha) \qquad \lim_{dt \to 0}\left[\dfrac{y(t+dt) - y(t)}{dt}\right] = u\sin(\alpha)$

$\dot{x} = R/2\,(V_L + V_R)\cos(\alpha) \qquad \dot{y} = \frac{R}{2}(V_L + V_R)\sin(\alpha)$