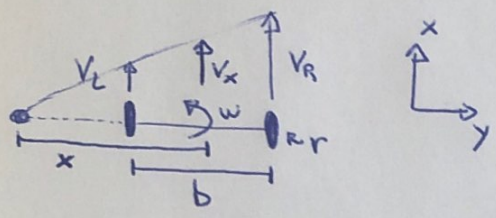

$$V_x = \frac{1}{2}(V_L + V_R) = \frac{1}{2}(\dot{\phi}_L r + \dot{\phi}_R r) = (\dot{\phi}_L + \dot{\phi}_R)\frac{r}{2} \qquad (1)$$

$$\frac{V_L}{x - \frac{b}{2}} = \frac{V_R}{x + \frac{b}{2}} = \omega \qquad (2)$$

$$V_L\left(x + \frac{b}{2}\right) = V_R\left(x - \frac{b}{2}\right) \qquad (3)$$

$$(V_L - V_R)x = -V_R\frac{b}{2} - V_L\frac{b}{2} \qquad (4)$$

$$x = \frac{(V_R + V_L)\frac{b}{2}}{V_R - V_L} \qquad (5)$$

$$\omega = \frac{V_R}{\frac{(V_R+V_L)\frac{b}{2}}{V_R - V_L} + \frac{b}{2}} = \frac{V_R}{\frac{(V_R+V_L)b + b(V_R - V_L)}{2(V_R - V_L)}} = \frac{2V_R(V_R - V_L)}{2bV_R} \qquad (6)$$

$$\omega = \frac{V_R - V_L}{b} \qquad (7)$$

$$\omega = \frac{r\dot{\phi}_R - r\dot{\phi}_L}{b} = \frac{r(\dot{\phi}_R - \dot{\phi}_L)}{b} \qquad (8)$$

$$\frac{2V_x}{r} = \dot{\phi}_R + \dot{\phi}_L \qquad (9)$$

$$\frac{\omega b}{r} = \dot{\phi}_R - \dot{\phi}_L \qquad (10)$$

$$\frac{2V_x + \omega b}{r} = 2\dot{\phi}_R \qquad (11)$$

$$\dot{\phi}_R = \frac{2V_x + \omega b}{2r} \qquad (12)$$

$$2\dot{\phi}_L = \frac{2V_x}{r} - \frac{\omega b}{r} \qquad (13)$$

$$\dot{\phi}_L = \frac{2V_x - \omega b}{2r} \qquad (14)$$