Assignment 2

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To calculate the Forward kinematics on a differential drive robot we can use this equation:

$\xi = \begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{bmatrix} = f(l, r, \theta, \varphi_1, \varphi_2)$.

In our case the left wheel has diameter 2 and the right wheel has diameter 3. And the wheel placement from the robots center is the same on both wheels as well as the speed. Where l = 5 and $\varphi = 6$. The formula above can be written as this:

$$\xi = \begin{bmatrix} cos\theta & -sin\theta & 0 \\ sin\theta & cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \frac{r\varphi_1}{2} + \frac{r\varphi_2}{2} \\ 0 \\ \frac{r\varphi_1}{2l} + \frac{-r\varphi_2}{2l} \end{bmatrix}$$

When inserting the above values we get

$$\xi = \begin{bmatrix} cos(\frac{\pi}{4}) & -sin(\frac{\pi}{4}) & 0 \\ sin(\frac{\pi}{4}) & cos(\frac{\pi}{4}) & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \frac{3*6}{2} + \frac{2*6}{2} \\ 0 \\ \frac{3*6}{2*5} + \frac{-2*6}{2*5} \end{bmatrix} = \begin{bmatrix} 10.6066 \\ 10.6066 \\ 0.600 \end{bmatrix} = \begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{\theta} \end{bmatrix}$$

This means the robot moves 10.6 in the global x-direction, 10.6 in the global y-direction and turns 0.6 radians