1

We have $d = 0.4$ (m) is distance between wheels, $r = 0.1$ (m) is radius of wheels. ω_l and ω_r are rotation speed of left and right wheel.

$$
\begin{aligned}
u_1 &= 0.5 * (\omega_l * r + \omega_r * r) = 0.05 * (\omega_l + \omega_r) \\
u_2 &= \frac{1}{d} * (\omega_l * r + \omega_r * r) = 0.25 * (\omega_l + \omega_r) \\
x_1 &= u_1 * cos(x_3) = 0.05 * (\omega_l + \omega_r) * cos(0.25 * (\omega_l + \omega_r)) \\
x_2 &= u_1 * sin(x_3) = 0.05 * (\omega_l + \omega_r) * sin(0.25 * (\omega_l + \omega_r)) \\
x_3 &= u_2 = 0.25 * (\omega_l + \omega_r)
\end{aligned}
$$

Given Δt is the time increment.

$$
\begin{aligned}
\begin{pmatrix} \dot{x}_1(t) \\ \dot{x}_2(t) \\ \dot{x}_3(t) \end{pmatrix} &= \begin{pmatrix} \dot{x}_1(t-1) + x_1 * \Delta t \\ \dot{x}_2(t-1) + x_2 * \Delta t \\ \dot{x}_3(t-1) + x_3 * \Delta t \end{pmatrix} \\
&= \begin{pmatrix} \dot{x}_1(t-1) + 0.05 * (\omega_l + \omega_r) * cos(0.25 * (\omega_l + \omega_r)) * \Delta t \\ \dot{x}_2(t-1) + 0.05 * (\omega_l + \omega_r) * sin(0.25 * (\omega_l + \omega_r)) * \Delta t \\ \dot{x}_3(t-1) + 0.25 * (\omega_l + \omega_r) * \Delta t \end{pmatrix}
\end{aligned}
$$

2

To play rosbag run
$ ros2 bag play path/to/rosbag