UNIVERSITY OF OSLO

CONTROL OF MOBILE ROBOTS

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An Unnecessarily Extra Long Convoluted Academic Title That Makes Little Sense

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Some Heading

Figure 1: 4 by 4 Rover

Tasks

1. Move the robot to a pose
2. Implement odometric localization
3. Implement motor control for each wheel
4. Implement posture regulation motion control In general the posture regulation controller takes in the configuration variables, $q = [x, y, \theta]^T$, and outputs $vand\omega$. It is assumed that the desired variables are $q_d = [0, 0and0]^T$ and the error from q_d is represented by following variables:

$$\rho = \sqrt{x^2 + y^2}$$

$$\gamma = Atan2(y, x) - \theta + \pi$$

$$\delta = \gamma + \theta$$

Where $\rho = ||e_p||$ is the distance between current point (x, y) and desired point $(0, 0)$, γ is the angle between $\vec{e_p}$ and the sagittal axis of the vehicle and δ is the axis between $\vec{e_p}$ and the x-axis. $vand\omega$ are found by:

$$v = k_1 \rho cos(\gamma) \tag{1}$$

$$\omega = k_2 \gamma + k_1 \frac{sin(\gamma) cos(\gamma)}{\gamma} (\gamma + k_3 \delta) \tag{2}$$

In our implementation of the controller we get $\vec{q}$ from the odometric module and output ω_R and ω_L to the motor controller. Equations for ω_R and ω_L expressed by error variables ρ, γ and δ, by setting the following equations (3) and (4) equal to equations (1) and (2) respectively,

$$v = \frac{r(\omega_R + \omega_L)}{2} \tag{3}$$

$$\omega = \frac{r(\omega_R - \omega_L)}{d} \tag{4}$$

and then solve for ω_R and ω_L by the inserting method. This yields:

$$\omega_R = \frac{2k_1 \rho cos(\gamma)}{2r} + \frac{dk2\gamma}{2r} + \frac{dsin(\gamma)cos(\gamma)(\gamma + k_3\delta)}{2r\gamma} \tag{5}$$

$$\omega_L = \frac{2k_1\rho cos(\gamma)}{2r} - \frac{dk_2\gamma}{2r} - \frac{dsin(\gamma)cos(\gamma)(\gamma + k_3\delta)}{2r\gamma} \tag{6}$$