Generalizing Potential Fields

SECTION 4.3

Generalizing Potential Fields

- One approach to generalizing artificial potential fields to more complicated robotic systems which can involve many degrees of freedom is by considering a set of control points distributed over the surface of the robot.

- The position of each of these control points can be computed as a function of the configuration space parameters, $P_i(\mathbf{x})$.

- For each of the control points we can construct an artificial potential field which repels it from obstacles and guides it to its desired location, $f_i(P_i(\mathbf{x}))$

- The final artificial potential function is computed by simply summing over all of the control points: $f(\mathbf{x}) = \sum_i f_i(P_i(\mathbf{x}))$.

- Once again we can construct a control law to move the robot by considering the gradient of the potential field with respect to the configuration space parameters.

$$\mathbf{v} \propto -\nabla f(\mathbf{x}) = -\begin{pmatrix} \frac{f(\mathbf{x})}{\partial x_1} \\ \vdots \\ \frac{f(\mathbf{x})}{\partial x_n} \end{pmatrix} \tag{1}$$

Visualizing Control Points on a robot