Velocity Motion Model

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Many slides adapted from Thrun, Burgard and Fox, Probabilistic Robotics

Velocity Motion Model

- Assumes:
  - Can control robot through two velocities:
    - Translational velocity *v*
    - Rotational velocity ω

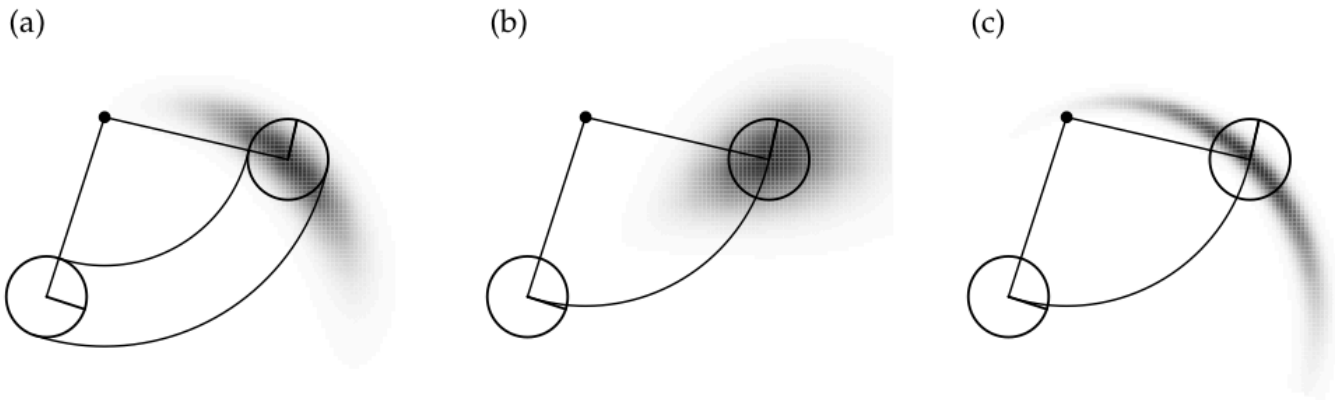

Figure 5.3 The velocity motion model, for different noise parameter settings.

Sampling from Velocity Motion Model

$$\hat{v} = v + \text{sample}(\alpha_1 v^2 + \alpha_2 \omega^2)$$
$$\hat{\omega} = \omega + \text{sample}(\alpha_3 v^2 + \alpha_4 \omega^2)$$
$$\hat{\gamma} = \text{sample}(\alpha_5 v^2 + \alpha_6 \omega^2)$$
$$x' = x + \frac{\hat{v}}{\hat{\omega}} (\sin(\theta + \hat{\omega}\Delta t) - \sin(\theta))$$
$$y' = y + \frac{\hat{v}}{\hat{\omega}} (\cos(\theta) - \cos(\theta + \hat{\omega}\Delta t))$$
$$\theta' = \theta + \hat{\omega}\Delta t + \hat{\gamma}\Delta t$$

sample(*v*) provides a sample from a distribution with mean zero and variance *v*

Samples from Velocity Motion Model

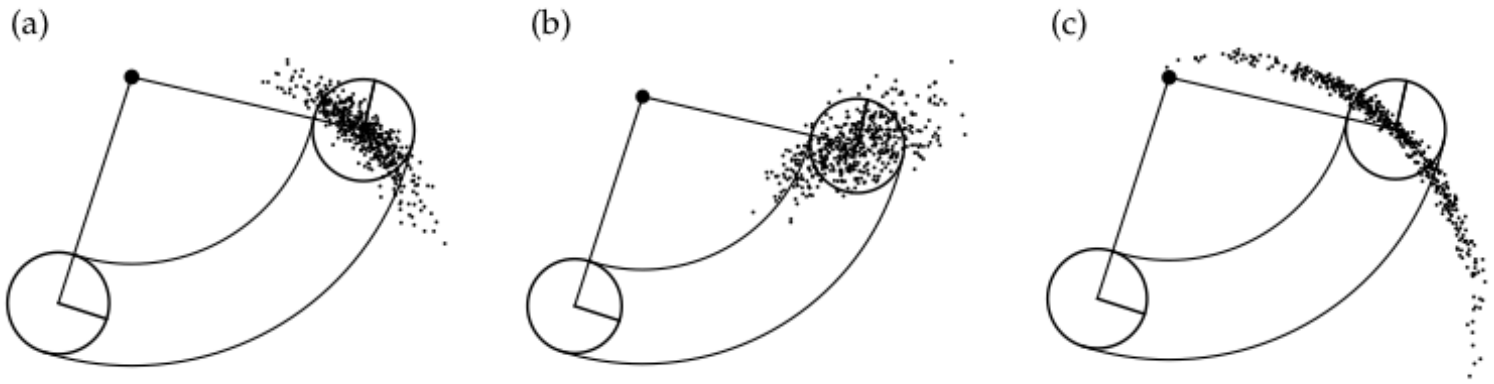

Figure 5.4 Sampling from the velocity motion model, using the same parameters as in Figure 5.3. Each diagram shows 500 samples.