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 $\omega$

Figure 5.3  The velocity motion model, for different noise parameter settings.
Sampling from Velocity Motion Model

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

\text{sample}(v)\text{ 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.