CBGL: Fast Monte Carlo Passive Global Localisation of 2D LIDAR Sensor

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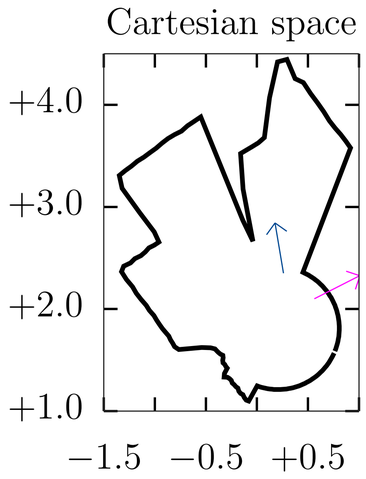
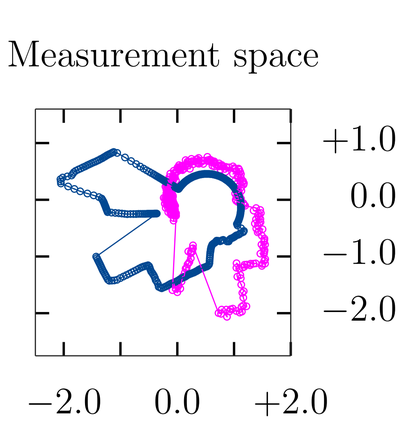
Setup & Motivation



Unknown LIDAR pose $\boldsymbol{p}(x, y, \theta)$ and estimate $\hat{\boldsymbol{p}}(\hat{x}, \hat{y}, \hat{\theta})$. $\boldsymbol{p} - \hat{\boldsymbol{p}} = (\Delta\hat{\boldsymbol{l}}, \Delta\hat{\theta})$



Real $\mathcal{S}_R(\boldsymbol{p})$ and virtual $\mathcal{S}_V(\hat{\boldsymbol{p}})$ scans, in the local coordinate frame of each sensor

Definition 1. The Cumulative Absolute Error per Ray (CAER) metric

$$\mathrm{CAER}(\mathcal{S}_R, \mathcal{S}_V) \triangleq \sum_{n=0}^{\text{scan rays}-1} \left| \mathcal{S}_R[n] - \mathcal{S}_V[n] \right|$$