ME 455 Homework 3 Xu Zhao

Problem 1: Rejection Sampling

The left panel shows the constructed probability density function where darker regions represent higher density. The center and right panels show 5000 accepted samples using a uniform proposal and a truncated Gaussian proposal, respectively.

Both methods successfully recover the underlying facial structure of the target distribution, with the Gaussian proposal being more concentrated around the high-probability regions.
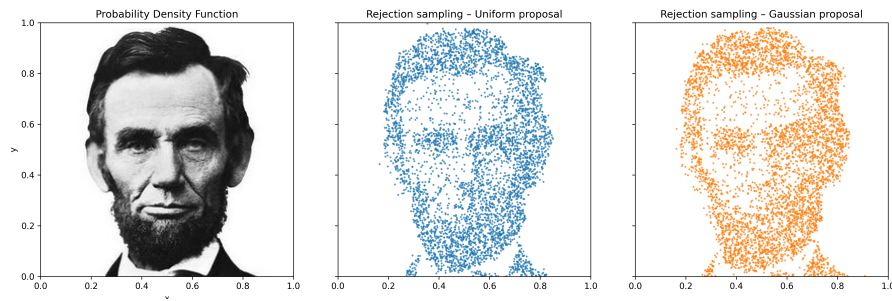

Figure 1: Rejection sampling from a grayscale image-based probability distribution.

Problem 2: Particle Filter − 1D Projection

Orange circles represent ground truth robot poses at six selected time steps, with arrowheads indicating the true heading.

Left: without measurement updates, the particle cloud grows and drifts over time.
Right: with measurement updates and resampling, particles remain concentrated around the true trajectory, demonstrating improved accuracy and stability.
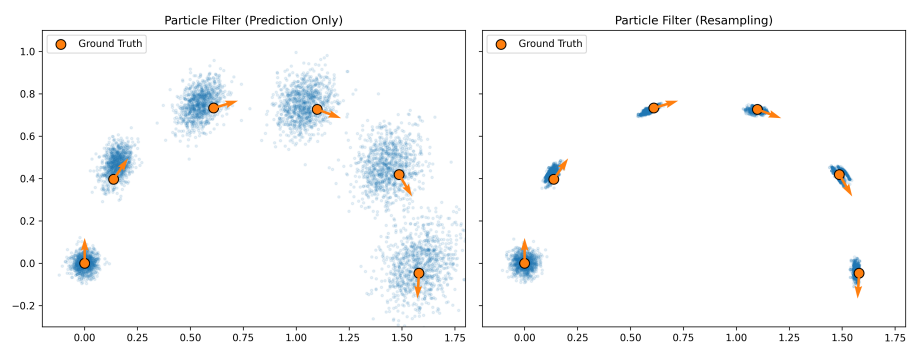
Figure 2: Particle filter results comparing prediction-only and measurement-updated modes.