

Motion Planning

Probabilistic Roadmaps

Sampling based motion planning

Using collision detection queries, we can design algorithms that work well for many common types of instances.

The best existing algorithms of this type are **sampling-based** algorithms.

- The algorithm chooses a sequence of (random) samples that are well-distributed throughout the C-space.
- Using these samples as a guide, the algorithm constructs a graph in $\mathcal{C}_{\text{free}}$, attempting to connect the initial and goal configurations.

The differences between sampling based algorithms are in the details of how the samples are used, and in what kind of graph is constructed.

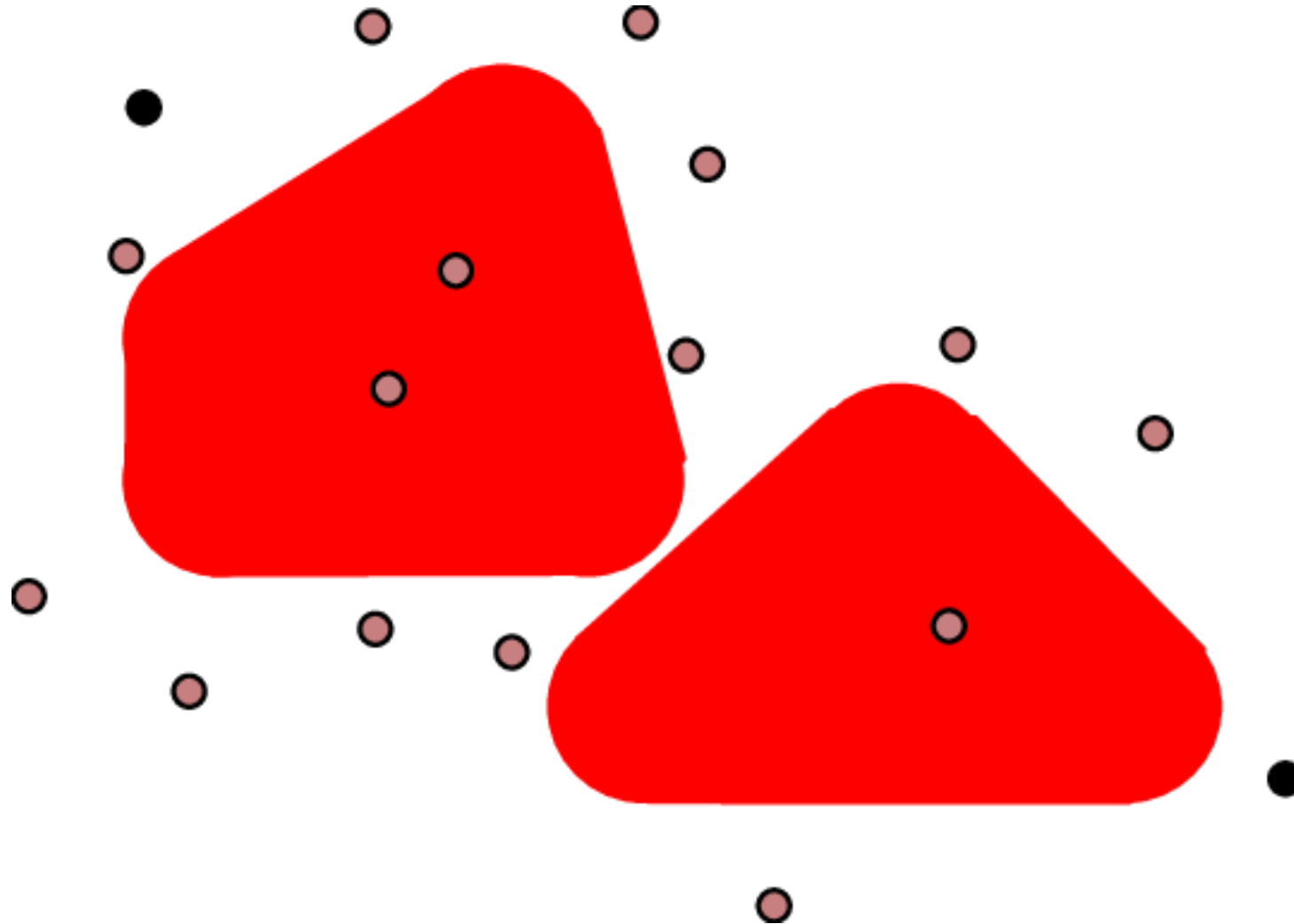
Probabilistic roadmaps

The **probabilistic roadmap** (PRM) builds an arbitrary graph.

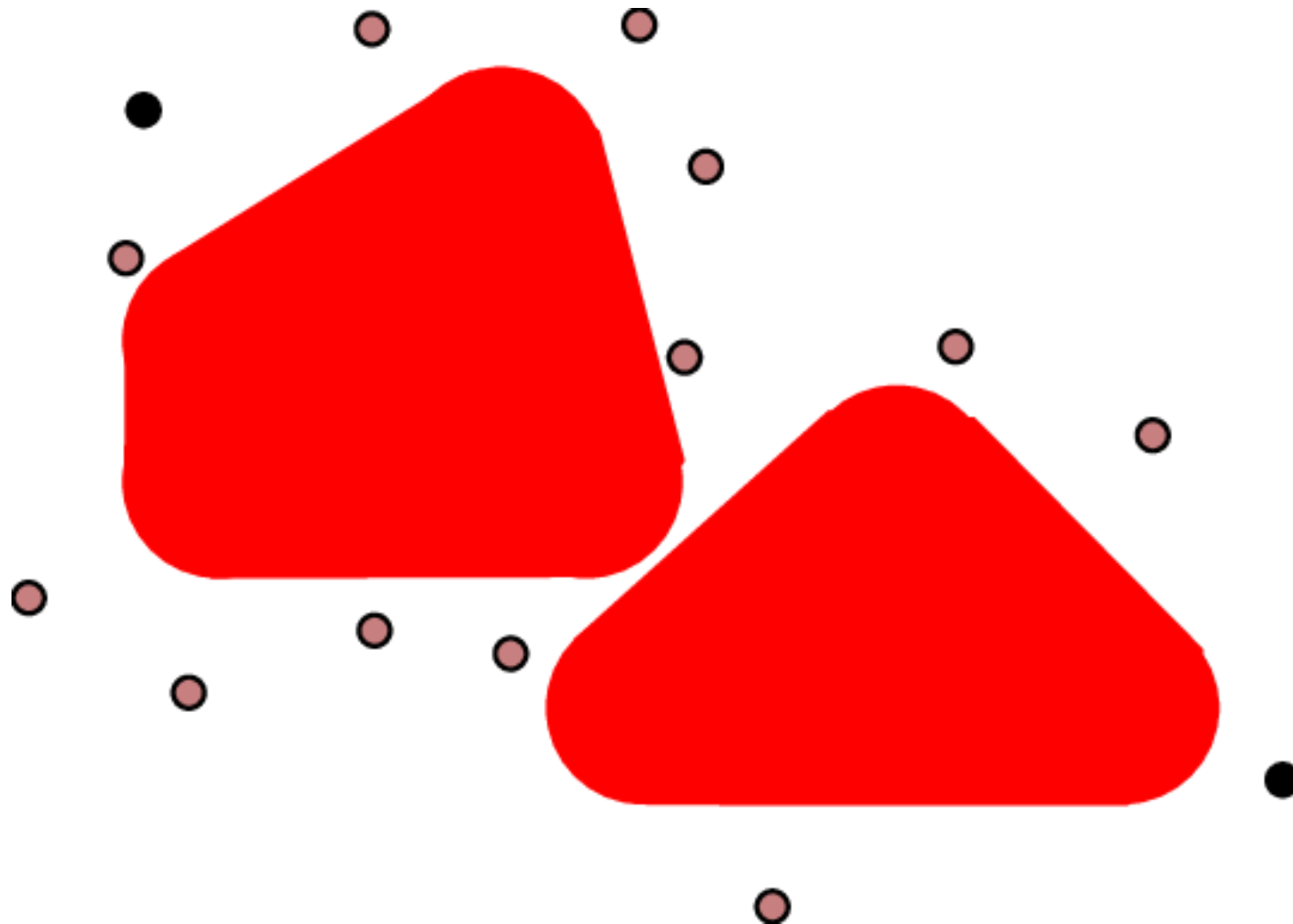
- Use a collection of samples, plus the initial and final configurations, as nodes in the graph.
- Use the collision checker to discard samples that are in obstacles.
- Attempt to connect pairs of nodes that are within the **connection distance** of each other. Use the collision detector to determine whether a connection can be made.

Sampling can be done **all at once** or **incrementally**.

PRM example



PRM example



PRM example

