Motion Planning

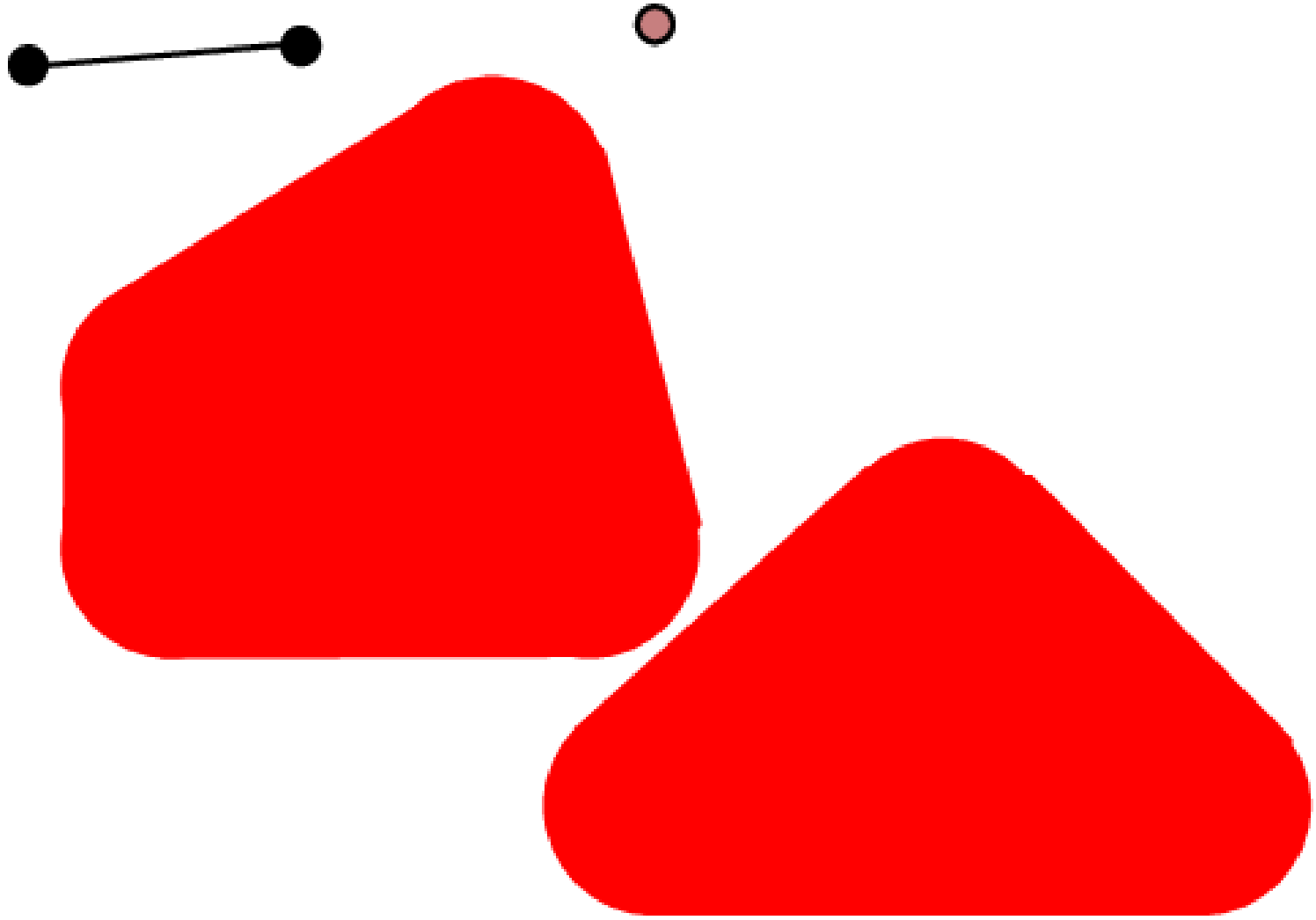
Rapidly-Exploring Random Trees

Rapidly-exploring random trees

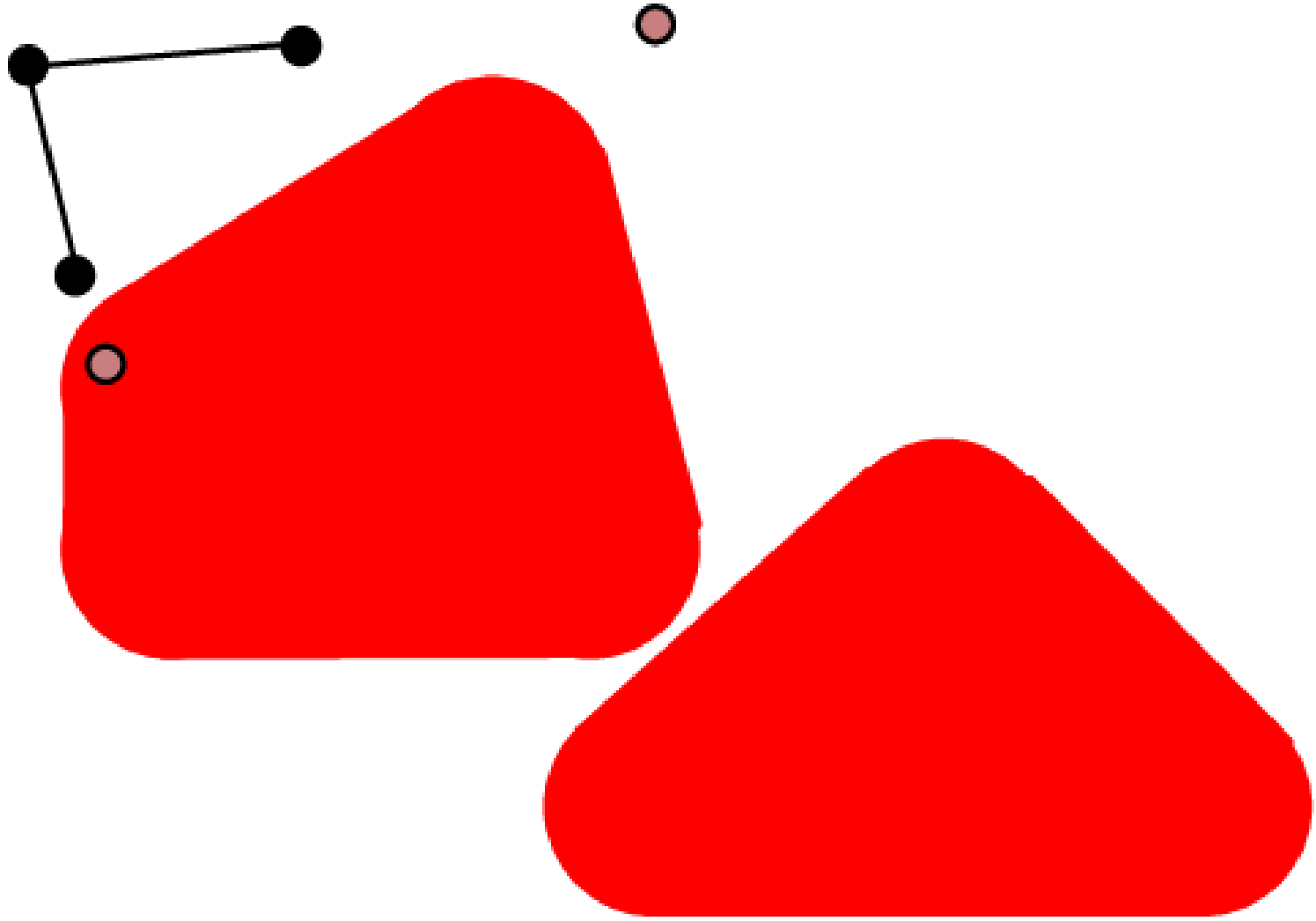
The **rapidly-exploring random tree** (RRT) builds a tree.

- Begin with the start configuration.
- Choose a random sample.
- Find the nearest configuration in the tree to this sample.
- Extend the tree from this configuration toward the sample, staying within $\mathcal{C}_{\text{free}}$.
- Repeat.

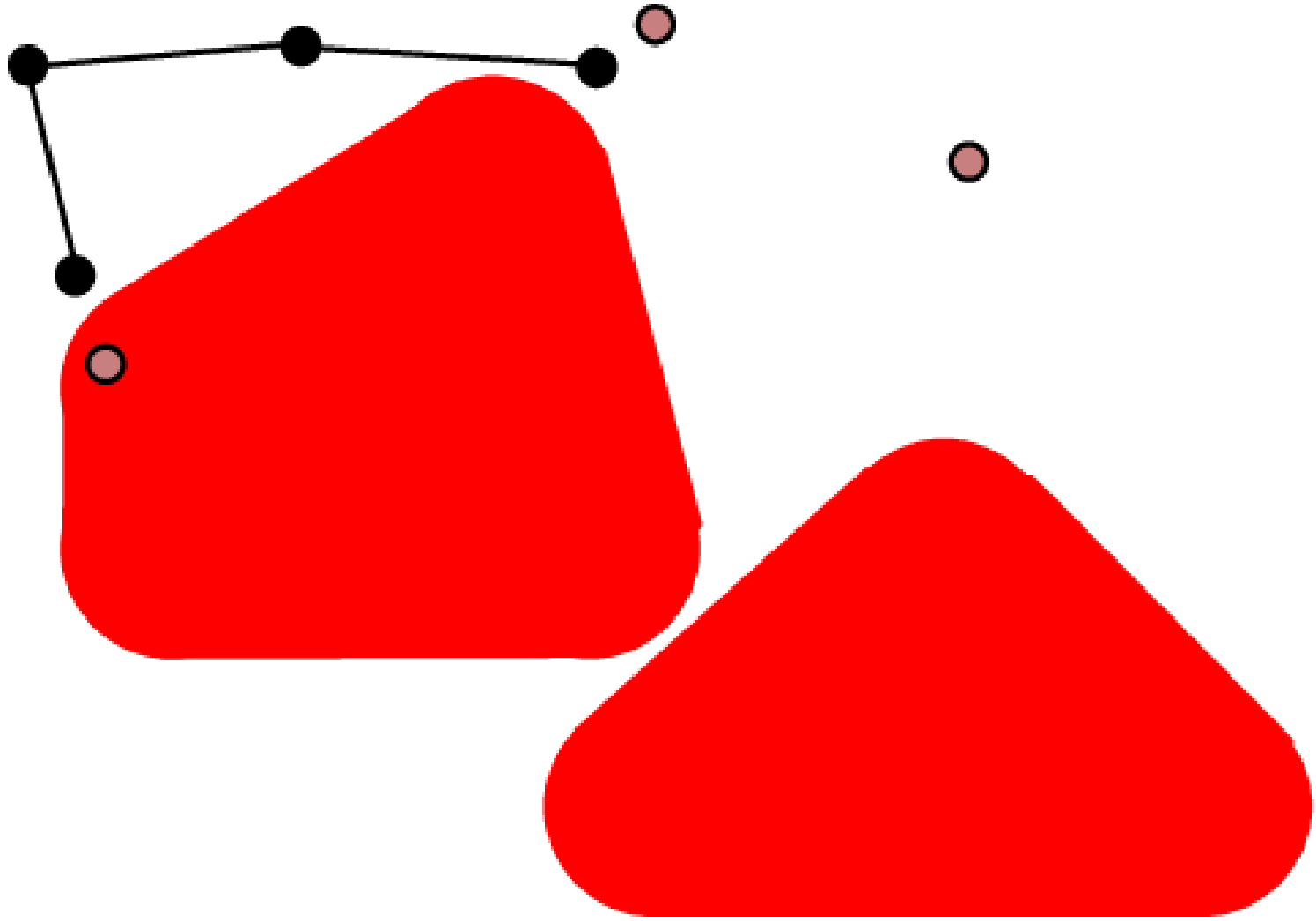
RRT Example



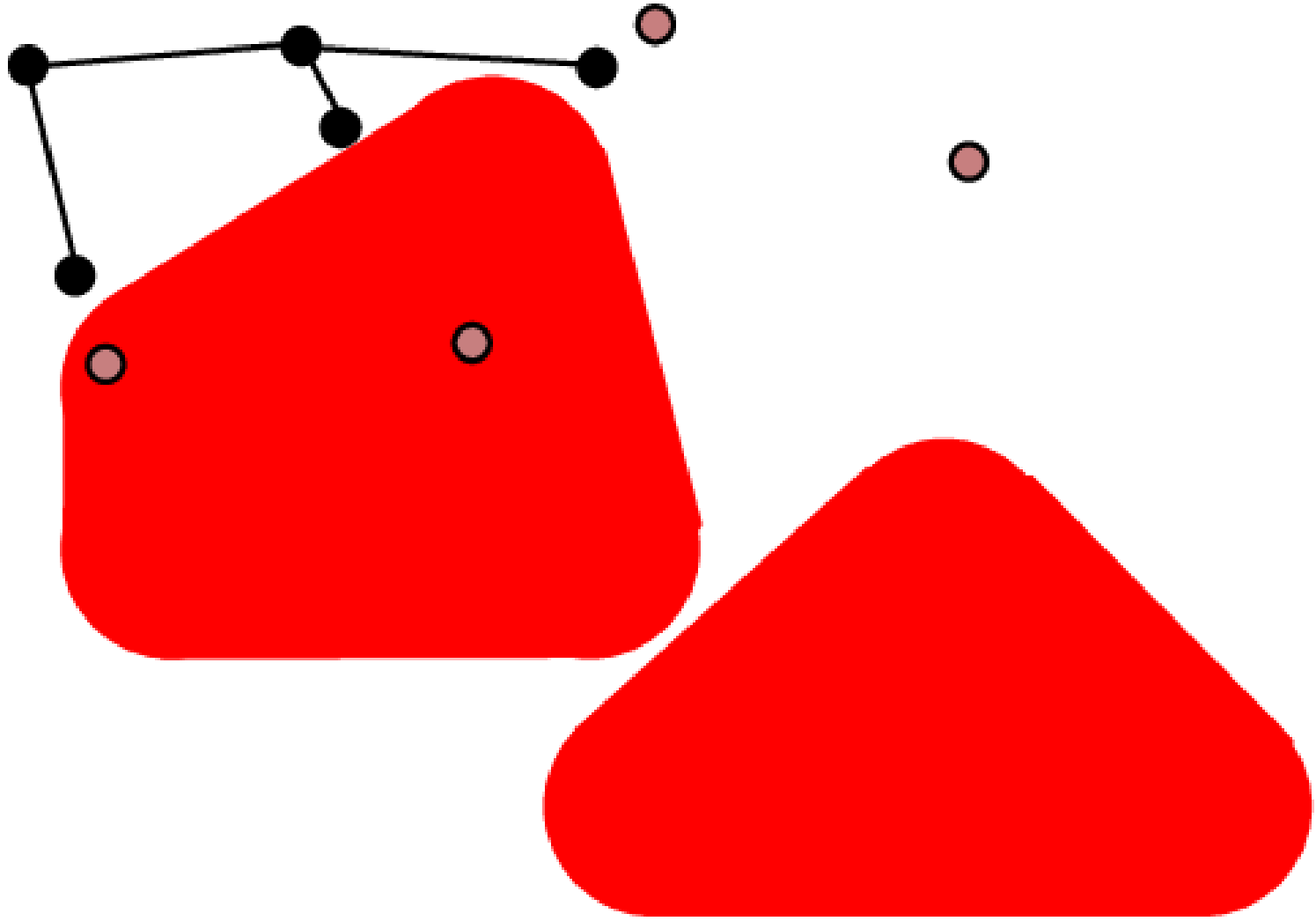
RRT Example



RRT Example



RRT Example



Bidirectional search

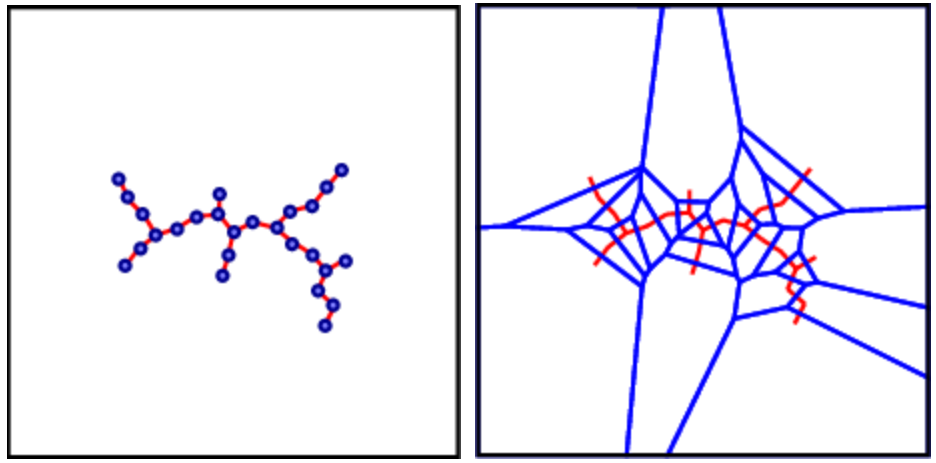
In practice, one uses (at least) two trees and alternates between extending toward random samples and attempting to connect the two trees. Thus, it becomes a **bidirectional search**.

Voronoi bias

The random samples “pull” the tree into the largest unexplored regions.

Tree nodes that are the closest to large unexplored regions are the most likely to have children added.

This is called **Voronoi bias**.



RRT example