

RBE 550: Motion Planning

HW3 – PRM Implementation

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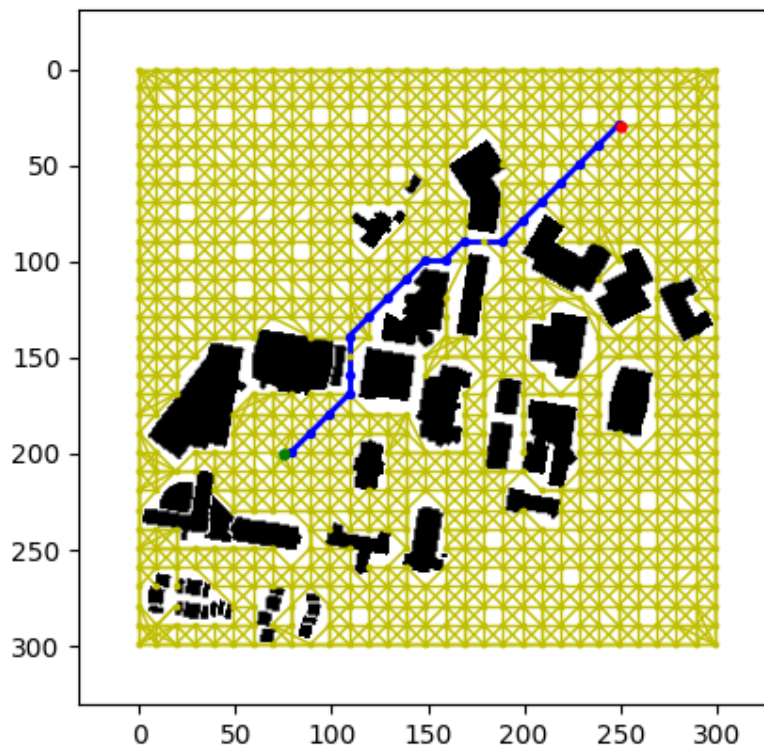
Different Sampling Methods:

1. **Uniform Sampling** - captures the complete map by evenly sampling points across the map. But may fail to capture points in narrow passages or around the obstacles.

Results:

The constructed graph has 816 nodes and 2991 edges

The path length is 263.53

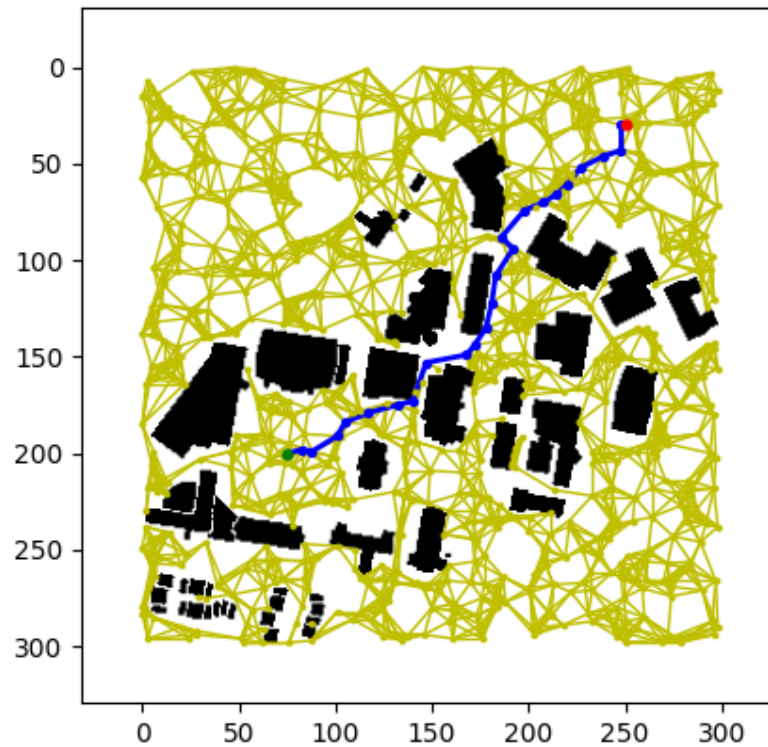


2. **Random Sampling** - purely random and has no heuristic to guide sampling. Points are sampled all across the map but uncertain whether a path would be found as the sampling is purely random.

Results:

The constructed graph has 851 nodes and 3321 edges

The path length is 279.38

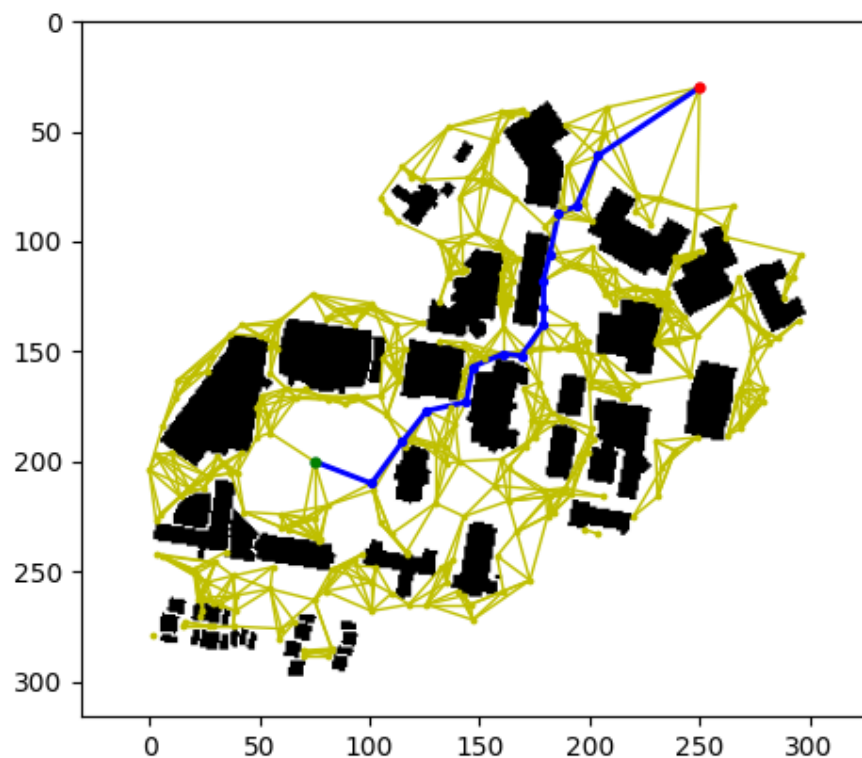


3. **Gaussian Sampling** - samples points around obstacles. This distance of the sampled points from the obstacles depends on the standard deviation of the gaussian distribution. Larger the standard deviation farther points are sampled. But may fail to capture points in narrow spaces and also in free spaces where there are no obstacles.

Results:

The constructed graph has 333 nodes and 1042 edges

The path length is 285.36

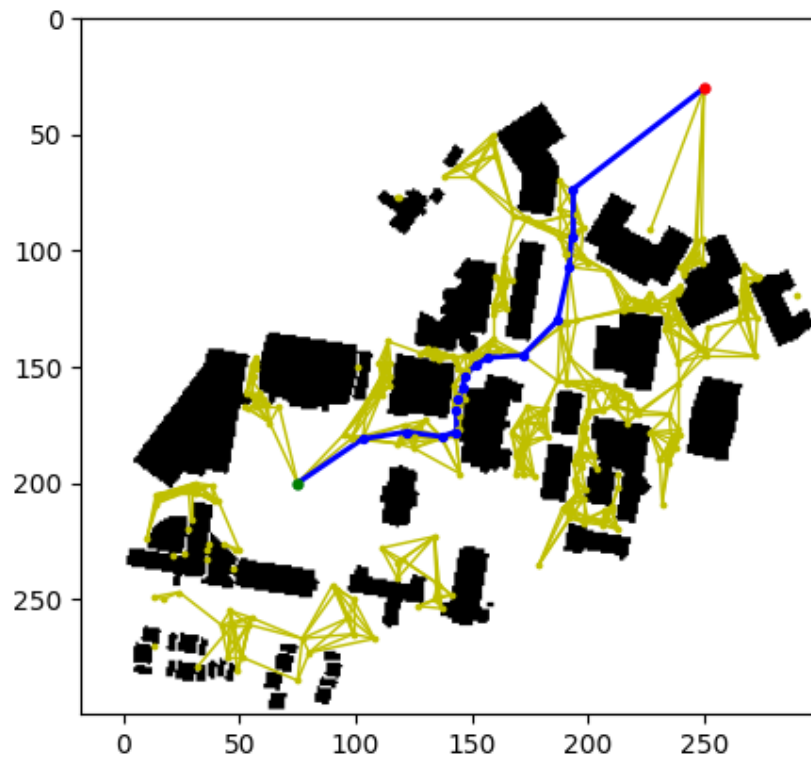


4. **Bridge Sampling** - samples points in narrow spaces in between obstacles. Fails to capture points in free space where there are no obstacles. Only suitable on maps where there are large number of obstacles and narrow spaces between the start and goal points. Requires large number of iterations during sampling to generate enough nodes for building the roadmap.

Results:

The constructed graph has 322 nodes and 1149 edges

The path length is 276.84



References:

1. <https://docs.scipy.org/doc/scipy/reference/generated/scipy.spatial.KDTree.html> - kdtree
2. <https://networkx.org/documentation/stable/reference/classes/graph.html> - networkx graph