Nearest Neighbour Search

One of the fundamental problems with diverse applications is to build a data structure for a set of points \( P \) that supports nearest neighbour search efficiently. Voronoi diagram is one such structure which is obtained by decomposition of a metric space determined by distances to a specified discrete set of points in the space. For a query point \( q \), to find a nearest point to it from a set of points \( S \), we just need to find the cell in the voronoi diagram of \( S \) that contains \( q \). Even though they are simple and elegant, they have a worst case complexity of \( O(n^{\frac{d}{2}}) \) which is exponential in \( d \). This makes it computationally infeasible with growing dimensions.

I propose to implement an alternate decomposition of space called an Approximate Voronoi Diagram that supports approximate nearest neighbour searching and has significantly lower space complexity. For this we do space decomposition that \( \epsilon \)-approximates the voronoi diagram and can be linear or near linear in size. We can also get a query time polynomial in \( \log n \).

References
