Voronoi Diagrams of Random Moving Points

(ABSTRACT)

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The worst-case and average complexities of the Voronoi diagram of n stationary point sites in R^d have been analyzed previously and are known to be $\Theta(n^{\lfloor (d+1)/2 \rfloor})$ and $\Theta(n)$ respectively. Recently, Albers and Roos [SWAT, 1992] considered the Voronoi diagram of moving points, and showed that the number of topological changes in the Voronoi diagram is $O(n^{d+2})$ in the worst-case. These topological changes occur precisely at times when $d+2$ points lie on a common sphere with no points inside.

This investigation considers the Voronoi diagram of n independent random moving point sites. The particular motions considered are motions with constant velocity along the line segment joining source and destination points chosen independently from the uniform distribution on the unit d-ball.

The main result is that the number of time instants when $d+2$ sites lie on a common empty sphere — and the overall topological complexity of the evolving Voronoi diagram — is $\Theta(n^{(d+1)/d})$.

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