Abstract

In this thesis we find a recurrence relation for the number of laces of memory four walk. Then find a general formula for the same. We apply the lace expansion technique as a tool. This result can be used to find the number of laces for memory six walk. Then find the number of laces for memory r walk (for any r).
General Conclusion

Research activities are going in the direction of solving the number of self avoiding random walk for large N. But due to the difficulty of non-markovian property of self-avoiding walks, the statistical analysis of the problem seems to be difficult. Our approach in this thesis is to find a recurrence relation for the number of laces for memory four walk. Here we use the technique lace expansion as a tool. We got a general formula for the number of laces for memory four walk.

Authors of the thesis are tried to prove the theorem: With probability 1, a random walk with finite memory in $Z^d$ is self-similar and has Hausdorff and box dimension equal to 2.

Future scope of the work

When the memory is equal to six, all contributing laces have all edges of length equal to six, four and two. Let us arrange the memory six walk as follows. Let $n_i$ be the number of laces that end in $[i, i + 6]$. Clearly such laces do not contain edges that begin from the second and fourth points of other edges of length six of the lace. Now each lace in $n_0, n_1, n_2, \ldots, n_{i-5}$ can be extended to a lace in $n_i$ by the addition of $[i, i + 6]$.

But no lace from $n_{i-4}$ can be extended to a lace in $n_i$ because $i$ is the fourth point of the edge $[i-4, i+2]$ which is present in the lace of $n_{i-4}$.
Also those laces in \( n_{i-3} \) which do not contain the edge \([i-4, i+2]\) can be extended to a lace in \( n_i \). Let the number of such laces be \( n_{i-3}^* \). Similarly no lace from \( n_{i-2} \) can be extended to a lace in \( n_i \) because \( i \) is the second point of the edge \([i-2, i+4]\) which is present in the lace of \( n_{i-2} \). Also those laces in \( n_{i-1} \) which do not contain the edge \([i-2, i+4]\) can be extended to a lace in \( n_i \). Let the number of such laces be \( n_{i-1}^* \). The lace containing the edge \([i, i+6]\) with all other edges are of length two or four or both is also counted in \( n_i \). No other lace can be extended to a lace in \( n_i \). Then we apply the extension technique which will be discussed in Chapter IV.

This result can be used to find the number of laces for memory six walk. Then find the number of laces for memory \( r \) walk (for any \( r \)).