TUE/BE01
16:30–16:50

Random Walks on Directed Covers of Graphs

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Suppose we are given a connected, directed graph G with vertex set V, edge set E (without multiple edges), and root i_0. We construct a labelled tree $\mathscr{T}$ from G as follows: the root is labelled with i_0; recursively, if x is a vertex in the tree with label $i \in V$, then x has a successor with label j if and only if there is an edge from i to j in G. The tree $\mathscr{T}$ is called the *directed cover* of G, or also known as *periodic tree*. We consider a nearest neighbour random walk on $\mathscr{T}$ which arises in a natural way from a nearest neighbour random walk on G.

We expand the existing theory of directed covers of finite graphs to those of infinite graphs. We give a short comparision of behaviour in the finite setting, when G is finite, and in our more general setting of infinite G. This comparision includes the classification of recurrence/transience behaviour and (in)equality of upper and lower growth rate of $\mathscr{T}$. The main result is the proof of existence and positivity of the the asymptotic entropy under reasonable assumptions. That is, we prove that there is a number $h > 0$ such that $h = \lim_{n\to\infty} n^{-1} \log \pi^{(n)}(X_n)$, where X_n is the random vertex at which the random walk is at time n and $\pi^{(n)}(\cdot)$ is the distribution of X_n. Moreover, our proof gives an explicit formula which is also a new result for directed covers of finite graphs.

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