ON THE TRANSIENCE AND RECURRENCE FOR THE LAMPERTI'S RANDOM WALK ON GALTON-WATSON TREES

Wenming HONG *Beijing Normal University, PRC*, E-mail: wmhong@bnu.edu.cn

Abstract: Over Galton-Watson trees generated by a supercritical branching process with offspring N and $EN := m > 1$, $C(x)$ is the conductance assigned to the edge between the vertex x and its parent x_* given by

$$C(x) = \left(\lambda + \frac{A}{|x|^\alpha}\right)^{-|x|},$$

where $|x| := |x - \rho|$ is the number of edges on the unique self-avoiding path connecting x to the root ρ. $(X_n)_{n\geq 0}$ is a $C(x)$-biased random walk on the tree, we show that

(1) when $\lambda \neq m$, $\alpha > 0$, $(X_n)_{n\geq 0}$ is transience/ recurrent according $\lambda < m$ or $\lambda > m$ respectively.

(2) when $\lambda = m$, $0 < \alpha < 1$, $(X_n)_{n\geq 0}$ is transience/ recurrent according $A < 0$ or $A > 0$ respectively.

In particular, if $P(N = 1) = 1$, the $C(x)$-biased random walk is the Lamperti's random walk on the nonnegative integers, which can be dated back to Lamperti (1960). This is a joint work with Minzhi Liu.