## Lamplighter random walks: convergence and the Poisson boundary

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Let $\mathbb{T}_q$ be a homogeneous tree of degree $q \geq 3$, and imagine a lamp (which can be swiched on or off) sitting at each vertex of the tree. We think of a lamplighter person moving randomly in $\mathbb{T}_q$ and switching randomly lamps on or off. We investigate the following model: at each step the lamplighter may walk to some random neighbour vertex, and may change the state of some lamps in a bounded neighbourhood of his position. This model can be interpreted as a random walk $Z_n = (\eta_n, X_n)$ on the wreath product $\mathbb{Z}_2 \wr \mathbb{T}_q$, where $X_n$ represents the random position of the lamplighter and $\eta_n$ represents the random configuration of the lamps at time $n$.

For this class of random walks, we prove almost sure convergence to a natural geometric boundary. If the probability law governing the random walk has finite first moment, then the probability space formed by this geometric boundary together with the limit distribution of the random walk is proved to be maximal, that is, the Poisson boundary.

We generalize this results when the base tree $\mathbb{T}_q$ is replaced with some general graph (for example graphs with infinitely many ends, hyperbolic graphs, euclidean lattices) endowed with a rich boundary. For lamplighter random walks on this class of graphs we prove almost sure convergence. In order to find the Poisson boundary of this random walks we use the *Strip Criterion* of identification of the Poisson boundary for random walks on discrete groups due to Kaimanovich [2].


[1] KAIMANOVICH, V.A.: Poisson boundaries of random walks on discrete solvable groups. In: *Probability measures on Groups X (ed. H. Heyer)* Plenum, New York (1991), 205-238.

[2] KAIMANOVICH, V.A.: The Poisson formula for groups with hyperbolic properties. In: *Annals of Math.* **152** (2000), 659-692.

[3] KARLSSON, A., AND WOESS, W.: The Poisson boundary of lamplighter random walks on trees. In :*Geometriae Dedicata.* **124** (2007), 95-107.

[4] ECATERINA SAVA: A note on the Poisson boundary of lamplighter random walks. In: *Monatshefte für Mathematik (in print)*. (2009).