ID de Contribution: **13** Type: **Non spécifié**

# Inversion, duality and h-processes of self-similar Markov processes

*lundi 30 novembre 2015 17:00 (40 minutes)*

We show that any $\mathbb{R}^d$-valued self-similar Markov process $X$ with index $\alpha > 0$ absorbed at 0, can be represented as a path transformation of some Markov additive process (MAP) $(\theta, \xi)$ in $S_{d-1} \times \mathbb{R}$. This result extends the well known Lamperti transformation. Then we prove that the same transformation of the dual MAP in the weak sense of $(\theta, \xi)$ is itself in weak duality with $X$, with respect to the measure $\pi(x/\|x\|)\|x\|^{\alpha-d}dx$, if and only if $(\theta, \xi)$ is reversible with respect to the measure $\pi(s)ds$, where $ds$ is the Lebesgue measure on $S_{d-1}$. Besides, the dual process $\widehat{X}$ has the same law as the inversion $(X_{\gamma_t}/\|X_{\gamma_t}\|^2, t \geq 0)$ of $X$, where $\gamma_t$ is the inverse of $t \mapsto \int_0^t \|X\|_s^{-2\alpha}\, ds$.
As an application, we prove that in some instances, the Kelvin transform of $X$ can be obtained as an $h$-transform of some functional of $X$.

This is a joint work with Larbi Alili, Piotr Graczyk and Tomasz Zak.

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