1098-37-294 **Michael Marcondes de Freitas*** (marcfrei@math.rutgers.edu) and **Eduardo D. Sontag**.
Existence and uniqueness of an invariant point, and global attractiveness for a class of nonlinear, random difference equations. Preliminary report.

We present a decomposition-based approach to the study of the asymptotic behavior of solutions of autonomous random difference equations of the form

$$x_{n+1} = g(\theta_n \omega, x_n)\,,$$

where $\theta : \Omega \times \mathbb{Z}_{\geqslant 0} \to \Omega$ is a stationary noise process. When this system can be realized as the "closed-loop" of the "random difference equation with inputs and outputs"

$$\begin{aligned} x_{n+1} &= f(\theta_n \omega, x_n, u_n(\omega)) \\ u_n(\omega) &= h(\theta_n \omega, x_n)\,, \end{aligned}$$

we may apply the stochastic "Small-Gain" Theorem proven for our newly developed concept of random dynamical systems with inputs and outputs (MMF & EDS, 2013) to establish global attractiveness for a class of monotone righthand-sides f and anti-monotone output functions h.

(MMF & EDS, 2013) Michael Marcondes de Freitas and Eduardo D. Sontag. **Random dynamical systems with inputs**. In Christian Poetzsche and Peter E. Kloeden, editors, *Nonautonomous Dynamical Systems in the Life Sciences*, volume 1202 of *Lecture Notes in Mathematics, Mathematical Biosciences Subseries*, chapter 2, pages 41–87. Springer, 2013.

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