



Stochastic Port-Hamiltonian Systems

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Received: 18 February 2020 / Accepted: 25 August 2022
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Abstract

In the present work we formally extend the theory of port-Hamiltonian systems to include random perturbations. In particular, suitably choosing the space of flow and effort variables we will show how several elements coming from possibly different physical domains can be interconnected in order to describe a dynamic system perturbed by general continuous semimartingale. Relevant enough, the noise does not enter into the system solely as an external random perturbation, since each port is itself intrinsically stochastic. Coherently to the classical deterministic setting, we will show how such an approach extends existing literature of stochastic Hamiltonian systems on pseudo-Poisson and pre-symplectic manifolds. Moreover, we will prove that a power-preserving interconnection of stochastic port-Hamiltonian systems is a stochastic port-Hamiltonian system as well.

Keywords Stochastic geometric mechanics · Port-Hamiltonian systems · Stochastic equations on manifold · Dirac manifold

Mathematics Subject Classification 34G20 · 34F05 · 37N35

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Communicated by Alain Goriely.

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Léo Pomar

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