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Chance-constrained optimal control of hyperbolic supply systems

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We are concerned with optimal control strategies subject to uncertain demands. In many real-world situations, taking uncertainty into account gains in importance. Supply chain management and the energy transition are just two examples where control strategies coping with uncertainties are of high practical importance. A compensation of deviations from the actual demand might be very costly and should be avoided. To address this problem, we control the inflow in the hyperbolic supply system at a given time to optimally meet an uncertain demand stream. To enhance supply reliability, we require demand satisfaction at a prescribed probability level, mathematically formulated in terms of a chance constraint. The stochastic optimal control framework has been set up in [LGK19]. The hyperbolic supply system is modeled by hyperbolic balance laws and the Ornstein-Uhlenbeck process represents the uncertain demand stream.

In future work, we would like to extend the setting to include uncertainty not only in the demand but also within the model of the supply system, where parameters shall be learned from data.

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[LGK19] Lux, K., Göttlich, S., and Korn, R. “Optimal control of electricity input given an uncertain demand.”, MMOR, 2019.

Primary author: LUX, Kerstin (Technical University of Munich)

Co-authors: Prof. GÖTTLICH, Simone (University of Mannheim); Prof. KOLB, Oliver (University of Mannheim)

Presenter: LUX, Kerstin (Technical University of Munich)

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