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A splitting method for partial differential equations with random parameters and random initial data

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Partial differential equations provide well-established models for many processes and phenomena in science and technology. In many real-life applications, however, some part of the information that is required to solve the mathematical problem is not available or cannot be measured with the desired accuracy. In this talk, we present a splitting method for time-dependent, semilinear partial differential equations with a number of random parameters and with random initial data. The main idea is to switch between two different discretizations of the stochastic variable, namely a stochastic Galerkin method on sparse grids for the linear parts of the right-hand side, and a stochastic collocation method for the nonlinear part. With this strategy each subproblem can be propagated very efficiently. The new method is computationally much cheaper than standard stochastic Galerkin methods, and numerical tests show that it outperforms standard stochastic collocation methods, too.

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