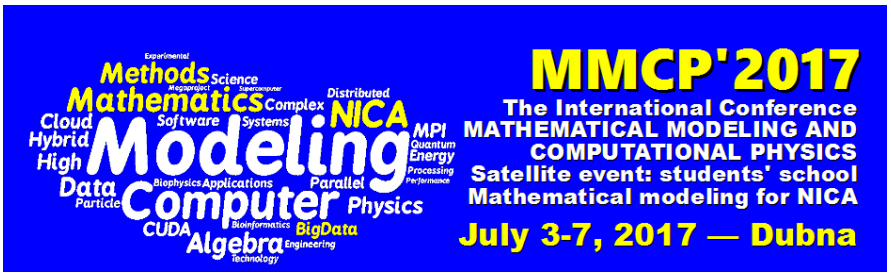

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Modeling turbulence via numerical functional integration

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We investigate the possibility of modeling turbulence via numerical functional integration. By transforming the incompressible stochastic Navier-Stokes equation into a functional integral we are able to calculate equal-time spatial correlation of system variables using standard methods of multidimensional integration. In contrast to direct numerical simulation, our method allows for simple parallelization of the problem as the value of the integral at any point is independent of other points. Thus the entire problem does not have to fit into available memory of any one computer but can be distributed even onto several supercomputers and the cloud.

We present the mathematical background of our method and its numerical implementation. The implementation is composed of a fast serial program for evaluating the integral over a given volume and a Python wrapper that divides the problem into subvolumes and distributes the work among available processes. We use various existing programs/libraries written mostly in C/C++ for integrating subvolumes. We show preliminary results obtained with our method and discuss its pros, cons and future developments.

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