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STOCHASTIC TECHNIQUES FOR THE NUMERICAL SOLUTION OF ENGINEERING BOUNDARY VALUE PROBLEMS.

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This paper describes a family of stochastic methods based on Itô's theorem for the numerical solution of Dirichlet, Neumann and mixed boundary value problems. The major advantages of these techniques are:

- No mesh is needed. Only the geometry of the domain and the boundary conditions should be defined.
- The solution can be obtained at any point or at any part of the integration domain. It is not necessary to solve the whole domain, which can be of special interest in 3D applications.
- The error threshold can be controlled mainly with the step width of the random walk generation
- The algorithms can be easily parallelized.
- The same approach could be used to the numerical solution of stochastic partial differential equations.

The theoretical approach is described, the corresponding algorithms are presented, and the general technique is applied to well-known engineering PDE equations of the elliptic and parabolic kind.