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Using Markov Chain Monte Carlo Simulation for Heat Conduction Problems JOZEF GEMBAROVIC, Thermal Insulation Research LLP — In our Damped Heat Wave (DHW) algorithm for calculation of temperature distribution in a one-dimensional finite medium, the space and time is discretized using N nodal points with steps Δx and Δt. Heat propagates through the medium due to temperature differences between divisions. At any instant of time a certain portion (given by the inner heat transfer coefficient) of the excessive heat energy moves from one division to its neighbour division thus lowering temperature difference between those two divisions. We will show that our DHW algorithm represents a special case of *time-space* Markov Chain Monte Carlo (MCMC) simulation with a simple random number generator for the redistribution sequence. This is a very unique and distinctive feature. All today existing numerical methods used in heat conduction calculations (e.g. explicit or implicit finite differences method, finite elements methods, etc.) are Markov Chains in time, but not simultaneously in space. We will show that in a general case, when we choose a different random number generator for the redistribution sequence, with randomly chosen neighbor, with the inner heat transfer coefficient also a random number drawn from Gaussian distribution, the MCMC simulation is rapidly converging to the analytical solution of transient heat conduction equation.

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