NOISE-INDUCED PHASE TRANSITIONS IN SPATIALLY EXTENDED SYSTEM

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We investigate the noise-induced phase transitions in the model:

$$\frac{\partial}{\partial t}x(\mathbf{r},t) = ax - x^3 + D\frac{\partial^2}{\partial \mathbf{r}^2}x(\mathbf{r},t) + x\zeta_1(t) + \zeta_2(t),$$

where D is the coupling constant, a – control parameter. Stochastic terms ζ_1 and ζ_2 account external and internal fluctuations accordingly which are Gaussian distributed with exponential correlations:

$$C_{i,j}(t,t') = \frac{\sigma_i \sigma_j}{\tau_{i,j}} \exp\left(-\frac{|t-t'|}{\tau_{i,j}}\right), \qquad i, j = \{1,2\},$$

where σ_i, τ_i – intensities and correlations times.

A procedure for deriving the effective Fokker-Planck equation to consider phase transitions in the framework of Curie-Weiss-like mean-field approximation is shown. The result of analytical approach was confirmed by the numeric simulations.

To find an effect of cross-correlation we, firstly, investigate the picture of two noises without cross correlation and, secondly, explore an effect of the cross correlation. In the first case we get the standard synergetic picture of phase transition in the presence of external force: a change of the intensity of external force (at small values of control parameter) stipulates the ordering process in the system. Here the noise induced phase transition is of the soft character and can be classified as a second order phase transition. In the second case a chain of reentrant phase transitions is observed; internal fluctuations promote the reconstruction of the noise induced phase transition if the cross-correlations between them are existed. It was shown that the reentrance is a result of the collaboration/competition between the character of the noises and the spatial coupling.