Fluctuating barrier problem and BVP

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Please, do criticise and ask questions!



Background and motivation

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Backgroun Problem

Brownian lynamics wp5c Results

Questions

The problem

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The problem

"Resonant activation over a fluctuating barrier" (C.R. Doering, J.C. Gadoua, 1992)

Fluctuations of potential with exponential distribution.

$$egin{aligned} V_- &= U(x) = 1 - x^2 \ V_+ &= (1+\epsilon)U(x) \end{aligned}$$



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Formulation

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Langevin eq:

$$\frac{dx}{dt} = -DV'(x,t) + \sqrt{2D}\xi(t),$$

Equation:

$$\frac{\partial}{\partial x} \begin{pmatrix} \rho_+\\ \rho_- \end{pmatrix} = \begin{pmatrix} -\gamma + \frac{\partial}{\partial x} D\left(V'_+(x) + \frac{\partial}{\partial x}\right) & \gamma \\ \gamma & -\gamma + \frac{\partial}{\partial x} D\left(V'_-(x) + \frac{\partial}{\partial x}\right) \end{pmatrix} \begin{pmatrix} \rho_+\\ \rho_- \end{pmatrix}$$
(4)

Boundary conditions:

$$-\left(V'_{\pm}(x)\rho_{\pm}(x,t)+\frac{\partial\rho_{\pm}(x,t)}{\partial x}\right)\Big|_{x=\pm L}=0, \tag{4.a}$$

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Fluctuating barrier

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Background Problem SVP Brownian ynamics

Function bvp5c in MATLAB

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Solution using MATLAB's bvp5c

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New variables

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$$y_1 = \rho_+, \ y_2 = \rho'_+, \ y_3 = \rho_-, \ y_4 = \rho'_-$$

Eq.(4) rewritten

$$\begin{array}{l} y_{1}^{'} = y_{2}, \\ y_{2}^{'} = -(V_{+}^{''}y_{1} + V_{+}^{'}y_{2}) - \frac{\gamma}{D}(y_{3} - y_{1}), \\ y_{3}^{'} = y_{4}, \\ y_{4}^{'} = -(V_{-}^{''}y_{3} + V_{-}^{'}y_{4}) - \frac{\gamma}{D}(y_{1} - y_{3}), \end{array}$$

Boundary conditions:

$$\left(V'_{+}y_{1}+y_{2}\right)\Big|_{x=\pm 1}=0,$$

 $\left(V'_{+}y_{3}+y_{4}\right)\Big|_{x=\pm 1}=0$

+ Normalization

Results



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Results (continued)



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Questions

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- Boundary conditions
- Probability current
- Current through the system

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Background Problem BYP Brownian Jynamics Dyp5c

Questions

Please, do criticise and ask questions!

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