Absorption in Stochastic Epidemics

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Abstract: A two dimensional stochastic differential equation is suggested as a stochastic model for the Kermack–McKendrick epidemics. Its strong (weak) existence and uniqueness and absorption properties are investigated. The examples presented in Section 5 are meant to illustrate possible different asymptotics of a solution to the equation.

References

[1] L. J. S. Allen and N. Kirupaharan: Asymptotic dynamics of deterministic and stochastic epidemic models with multiple pathogens. Internat. J. Numer. Anal. Modeling 3 (2005), 2, 329–344.

[2] A. N. Borodin and P. Salminen: Handbook of Brownian Motion-Facts and Formulae. Birkhäuser Verlag, Basel – Boston – Berlin 2002.

[3] S. Busenberg and C. Kenneth: Vertically Transmitted Diseases – Models and Dynamics. Springer-Verlag, Berlin – Heidelberg – New York 1993.

[4] D. J. Daley and J. Gani: Epidemic Modelling: An Introduction. Cambridge University Press, Cambridge 1999.

[5] P. Greenwood, L. F. Gordillo, and R. Kuske: Autonomous stochastic resonance produces epidemic oscillations of fluctuating Size. In: Proc. Prague Stochastics 2006 (M. Hušková and M. Janžura, eds.), Matfyzpress, Praha 2006.

[6] N. Ikeda and S. Watanabe: Stochastic Differential Equation and Diffusion Processes. North-Holland, Amsterdam 1981.

[7] J. Kalas and Z. Pospíšil: Continuous Models in Biology (in Czech).Masarykova Univerzita v Brně, Brno 2001.

[8] O. Kallenberg: Foundations of Modern Probability. Second edition. Springer, New York 2002.

[9] W. O. Kermack and A. G. McKendrick: A contribution to the mathematical theory of epidemics. Proc. Roy. Soc. London A 155 (1927), 700–721.

[10] L. C. G. Rogers and D. Williams: Diffusions, Markov Processes and Martingales. Cambridge University Press, Cambridge 2006.

[11] J. Štěpán and D. Hlubinka: Kermack–McKendrick epidemic model revisited. Kybernetika 43 (2007), 4, 395–414.

[12] T. Wai-Yuan and W. Hulin: Deterministic and Stochastic Models of AIDS Epidemics and HIV Infections with Intervention. World Scientific, Singapore 2005.