SCALING LIMIT OF A GENERALIZED CONTACT PROCESS

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Abstract. We derive macroscopic equations for a generalized contact process. The states at each lattice site can take values in $0, \dots, k$. The state k corresponds to the individual being infectious (all other states are noninfectious). In order to become infectious, the site must progress sequentially from 0 to k. The rate at which it climbs is determined by other neurons at state k, coupled to it through a Kac-type potential of range γ^{-1}. The hydrodynamic equations are obtained in the limit $\gamma \to 0$. For $k = 1$ the model is equivalent to the well known contact process with the state $j = 0$ corresponding to the healthy state and the state $j = 1$ to the infected one.

The system has also a natural interpretation in terms of neural models: the case $k = 1$ corresponds to the stochastic Wilson-Cowan model and is inspired by the analysis of neural networks proposed by Galves and Lockerbach. The analysis of the hydrodynamic limit follows the strategy used by De Masi, Galves, Lockerbach, Presutti, 2015 J.S.P. and by Duarte, Ost, Rodriguez, 2015, J.S.P.