Hiroe Oka* (oka@rins.ryukoku.ac.jp), Department of Applied Mathematics, and Informatics, Ryukoku University, Otsu, Shiga 520-2194, Japan. Morse decomposition of regulatory networks via determining nodes.

The regulatory network is a coupled ODE system associated with a network representing regulation relations among variables. This is a mathematical formulation of a biological regulatory network, given by Fiedler et al. (JDDE 2013). One of the main theorems of their paper is that the global attractor of a regulatory network can be reconstructed if one monitors all the information of solutions on the negative real line only at a suitable subset of nodes called the feedback vertex set (abbrev. FVS). This means that one can understand the nontrivial global dynamics of regulatory networks only from their FVS variables.

This result is, unfortunately, not very useful for practical applications, as one needs to monitor infinitely long time. In this talk, we shall show that, if one restricts attention to only a coarse information of global dynamics, namely its Morse decomposition, it is sufficient to monitor only on a finite time interval, or even at finitely many sample time points, at the FVS. We shall also show a result of numerical computation for Mirsky’s circadian rhythm network as a test example.

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