Synchronisation in nonautonomous networks of oscillators

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Networks of oscillators have been used extensively as a framework to understand natural and man-made systems. Synchronisation and stability are of key importance in such systems. Synchronisation can be beneficial for the system, as the heart cells beating together, or detrimental, as in epileptic seizures.

Although many systems are thermodynamically open – they exchange energy and matter with their environment – they are mostly modelled as thermodynamically isolated, by autonomous systems. However, living systems cannot realistically be modelled as isolated – how would they stay alive without external input?

Here, we present results about synchronisation in network of oscillators with either time-varying frequencies or time-varying topology of the network (temporal networks). We study the short- and long-term stability via the computation of Lyapunov exponents. We show that openness, and here time-variability, can stabilise or destabilise the dynamics, and discuss under which conditions.