Chapter 6

Outlook

In this thesis, we only studied a single stochastic oscillator and two coupled oscillators. It will be interesting now to see if we can extent our methods to other network motifs (three or four coupled oscillators with directed or undirected coupling) or even large networks to find similar results for some general statements. Different network topologies or coupling schemes could be studied to find out whether and how the noise effects are affected by the structure of the network. The studies on the ghost weight could be applied to larger systems to check, if it is still a suitable way to provide an explanation of the mechanism of coherence resonance. It is also necessary to prove the statement that coherence resonance is most pronounced in the regime of a bimodal probability distribution for coupled systems.

Another aspect for further investigations could be the development of a suitable approach of the probability distribution for higher time delays for the single oscillator with self-feedback and for coupled oscillator systems. For large networks, the methods presented in [100–103] might be useful to derive an analytical expression for the probability distribution. Otherwise the investigations on stochastic networks would be restricted to numerical simulations. The stochastic impact of the coupled oscillators could be modelled with delayed noise terms [104–107], or a description with coloured noise for the interplay of different stochastic forces might be helpful. We only made use of Gaussian white noise in our studies. The connection between other types of noise, e.g. coloured noise, and time delay could be investigated.

Stochastic D-bifurcations were not considered in our work. In the context of larger networks, it might be important to check how the stability is affected in the presence of many stochastic forces. The influence of time delay to this type of bifurcation could also play an interesting role [108].

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