

Worries with state-dependent delays

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There are many systems where delays are not constant and discrete, but rather depend on the state of the system. But introducing state-dependency into existing population models is not as straightforward as just rewriting the delay term to be dependent on the state of the system. In this talk we will highlight some of the issues that arise in modelling and simulating with state-dependent delays. We will show that additional terms need to be incorporated into the model to correctly treat the state-dependency. Care also needs to be taken to ensure that delayed terms do not become advanced. Even when the model is correct there are issues in the numerical simulation because of breaking points, where the solution has reduced regularity. These points need to be included in the computational mesh to avoid loss of order in the numerical simulation, but their location is solution dependent. We show how to compute them efficiently to sufficient accuracy to maintain the global order of the method.