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Multi-cycle Periodic Solutions of a Differential Equation with Delay that Switches Periodically

We analyse the dynamics of a scalar Delay Differential Equation with delay that periodically switches between two constant values. Such an equation arises naturally from structured vector populations involved in a range of vector-borne diseases spreading in a periodically varying environment. In particular, we show the example of a tick population model and how it can be described by this equation.

Then, we examine if and how the two different time lags and the switching time influence the existence and patterns of periodic solutions. We pay particular attention to the patterns involving multi-cycles within the prime period of the periodic solutions.