Using Symmetry and Dynamical System Methods to Study Differential Equations

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ABSTRACT:

We calculate Lie symmetries and a center manifold for a set of nonlinear differential equations that model the growth-death kinetics of *Staphylococcus aureus* in foods. This is of interest to the food scientists at the US Army Natick Soldier Research Center. The goal of our study is to contribute to the results on the behavior of the system derived from numerical analysis. Lie symmetries can be a useful tool in the study of the behavior of a system that is not easily solved. The existence of a center manifold and the study of solutions restricted to it can provide insight into the overall behavior of the system. We link these two concepts by focusing in particular on the symmetries inherited by a center manifold.

KEY WORDS: differential equations, Lie symmetries, center manifold

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