

Balance algorithm for time scale analysis of stiff metabolic system

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In complex metabolic system, reaction rate equation is inherently nonlinear and stiff. Several numerical approximation methods are used to handle this stiff dynamic model of metabolic system. Among them, quasi-steady state approximation (QSSA) method has an advantage of alleviating stiffness of the dynamic model. To apply QSSA method correctly, each variable should be carefully scaled. First of all, we selected appropriate time scale which might be the basis for deriving necessary condition for the validity of the QSSA method. Then scales of other variables can be determined by balance of reaction terms in each rate equation. In this work, we constructed balance algorithm for time scale analysis and derived necessary condition for validity of QSSA method.