Summary of Simode Experiments

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# Introduction

We want to understand the performance of the simode R package. To that end, we used simode to solve a collection of initial value problems. We chose some models with only linear parameters, and others with both linear and non-linear parameters. Our goals are exploratory, in order to come up with hypotheses about the performance profile of the separable least squares (SLS) method of finding the parameters of IVPs, and comparing it with non-linear least squares (SLS) regression. In particular, we are interested in the following questions:

1. Does SLS perform well in determining the linear and non-linear parameters of IVPs?
2. Under what conditions does SLS perform better than NLS, and vice versa?

# Setup:

MacBook Pro 2014

RStudio

R 3.4

# Method

We ran sets of simulations, based on the following known models of IVPs:

* S-Systems
* Lotka-Volterra
* Lotka-Volterra with sinusoidal seasonal adjustment
* FitzHugh-Nagumo
* SIR semi-linear.

# Results

## S-Systems



## SIR model





## Lotka-Volterra





## Lotka-Volterra Seasonal





## FitzHug-