
Subject: Re: Solving system of ODEs backwards in time?

Posted by [BLesht](#) on Fri, 04 Aug 2017 20:01:10 GMT

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Hi Craig,

I'm sorry to seem dense, but I don't see how that applies. Perhaps I haven't explained my problem sufficiently, or perhaps I really don't understand the nuances, or maybe I've been misapplying LSODE (or all the above).

I have a system of 19 coupled ODEs. Let C be the 19 element vector representing the state of the system at time point i . The vector of derivatives is $dC(i)/dt = (W(i) + A(i) \cdot C(i)) / V$ in which W is a 19-element vector that changes at every point i , A is a 19x19 "transfer" matrix expressing the couplings among the state variables (many zeros) but which also changes at every point i , and V is a 19-element constant vector. Given an initial condition C_0 , I have been using LSODE to advance the solution from time i to time $i+1$ (calculating $C(i+1)$) using a time step of $i/4$. I repeated those steps for the desired number of i steps.

This seems to work (at least provides answers that agree well with observations) going forward. What I want to do now is start with a known state at time i , and sets of known W vectors and A matrices for times $i-1$, $i-2$, ... $i-n$ and find what $C(i-n)$ would have had to be to result in the observed $C(i)$ given that set of W vectors and A matrices.

What confused me when I was trying to set this up myself was that the state at time i , depends on both the state at time $i-1$ and the derivatives based on the state at time $i-1$. That is, the derivative at time $i-1$ can't be computed without knowing the state at time $i-1$ because of the $A \cdot C$ term.

Thanks, Barry
