

# Re: How to deal with such ODE with fortran?

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*Source:* <http://coding.derkeiler.com/Archive/Fortran/comp.lang.fortran/2006-10/msg01207.html>

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  - *Date:* 27 Oct 2006 04:04:01 -0700
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Nye schreef:

Hi all, I will try to make myself understood as clearly as possible, though the problem is a little complicated, and, my English is not very well.

the ODE has a form like this:

$$d P(t,k)/ d t = \text{RHS}(P,t,k)$$

what is weird here is that RHS(P,t,k) is a function of the concrete form of function P(t,x) at certain step t, not merely the value of it.

$$\int_0^{\text{inf}} \text{RHS}(P,t,k) = \int_0^{\text{inf}} | P(t,k*y)F(y) dy$$

given the initial conditions:  $P(t=0,x)=P1(x)$ ,  $\text{RHS}(P=P1,t=0,k)=\text{RHS1}(k)$

when  $t=tn$ ,  
 $Pn(tn,x) = Pm(tm,x) + (\text{STEP SIZE of } t) * \text{RHS}(Pm,tm,x)$   
where  $m=n-1$ , the formula above gives the recursive procedure I should follow in the program.

please take notice of the confusability of k and x, in the output of the program, I want to get a series of  $P(t=t\_end,k)$ ,  $k = k1,k2,k3....kp...k60$ , i.e. a series of points on the output curve of function  $P(t=t\_end, x)$ . That is to say, I have to an integrate different ODE for each  $kp$ .

so far, the problem is that, how to transfer the parameters effectively, without causing confusion in the recursive procedure. For example, there is an integration for RHS,

$\text{RHs}(Pn,tn,k)$  calls  $P(tn,x)$ , but the subroutine doing integration only accept single value func as its parameter, so I should transform  $P(tn,x)$  to  $P(x) |_{t=tn}$ , where COMMON block would be used. How to make a common

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block available and correct in a recursive procedure, given that the block would change its value in different period of recursion?

I have thought of a method to crack the integration subroutine to accept  $tn$  as a parameter, but that would destroy its stability, which I don't prefer to.

any suggestions or comments on the algorithm? I will greatly appreciate them since I haven't start my code yet....:) thanks

This is known as a integro–differential equation. Have you checked the available literature for suitable numerical methods?

If you want help on your current program, however, I suggest you show us at least the structure – the description you gave does not make it easy to understand what you are after.

Regards,

Arjen

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