Subject: Bug (still) in NR_QROMB, QROMB
Posted by mallozzi on Wed, 30 Aug 1995 07:00:00 GMT
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; There appears to be a bug in the routines NR_QROMB and QROMB if you call
; the functions recursively.  I included a test program below.
; I notified RSI several months ago about this, but apparently the error
; never got corrected.  Be careful how you construct the calling sequences
; for these routines!
;
; If you are running IDL 4.0 and want to test the function QROMB (not
; available before 4.0) then uncomment the appropriate cases below.
;
; -Bob Mallozzi
;
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; Here is a sample program I used to test NR_QROMB.
; It computes an integral whose integrand contains a second integral:
;  I = int_0^2{ x^2 * [ int_0^1{y^3 * dy} ] * dx}
;    = 0.66666
;
; NOTE THE RECURSIVE CALLING SEQUENCE, WHICH PRODUCES THE ERROR.
;
; Calls to SIMPSON produce the correct result.
; Calls to NR_QROMB, QROMB produce the correct result only if
;  one of the calls (it doesn't matter which one) is DOUBLE precision.
;  If both calls are DOUBLE or both calls are FLOAT, the result is
;  not correct.
;
; Tested on following machines:
;  !VERSION = { vax vms 3.5.1}
;  !VERSION = { alpha vms 3.6}
;  !VERSION = { alpha vms vms 4.0.1}
;
; I tested several combinations of the integral limits; this
;  did not affect the results.
;
; Robert Mallozzi

; - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
function func1, x
common data, inner, select

; Get the inner integral
ll = 0.0
ul = 1.0
```

```
case select of
    1: inner = SIMPSON('func2', ll, ul, TOL = 0.001)
    2: inner = SIMPSON('func2', DOUBLE(ll), DOUBLE(ul), TOL = 0.001)
    3: inner = SIMPSON('func2', DOUBLE(ll), DOUBLE(ul), TOL = 0.001)

    4: inner = NR_QROMB('func2', ll, ul, EPS = 0.001)
    5: inner = NR_QROMB('func2', DOUBLE(ll), DOUBLE(ul), EPS = 0.001)
    6: inner = NR_QROMB('func2', DOUBLE(ll), DOUBLE(ul), EPS = 0.001)

;    7: inner = QROMB('func2', ll, ul, EPS = 0.001)
;    8: inner = QROMB('func2', DOUBLE(ll), DOUBLE(ul), EPS = 0.001)
;    9: inner = QROMB('func2', DOUBLE(ll), DOUBLE(ul), EPS = 0.001)
endcase

return, (x^2) * inner
end
; - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
function func2, y
return, y^3
end
; - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

common data, inner, select

choices = ['Select the integration routines: ', $
          'SIMPSON single, SIMPSON single', $
          'SIMPSON double, SIMPSON double', $
          'SIMPSON single, SIMPSON double', $
          'NR_QROMB single, NR_QROMB single', $
          'NR_QROMB double, NR_QROMB double', $
          'NR_QROMB single, NR_QROMB double']

;          'QROMB single, QROMB single', $
;          'QROMB double, QROMB double', $
;          'QROMB single, QROMB double']

select = WMENU(choices, title = 0, init = 1)


ll = 0.0
ul = 2.0
case select of
    1: BEGIN
       result = SIMPSON('func1', ll, ul, TOL = 0.001)
       print, choices(1)
       END
    2: BEGIN
       result = SIMPSON('func1', DOUBLE(ll), DOUBLE(ul), TOL = 0.001)
```

```
      print, choices(3)
      END
    3: BEGIN
      result = SIMPSON('func1', ll, ul, TOL = 0.001)
      print, choices(2)
      END

    4: BEGIN
      result = NR_QROMB('func1', ll, ul, EPS = 0.001)
      print, choices(4)
      END
    5: BEGIN
      result = NR_QROMB('func1', DOUBLE(ll), DOUBLE(ul), EPS = 0.001)
      print, choices(5)
      END
    6: BEGIN
      result = NR_QROMB('func1', ll, ul, EPS = 0.001)
      print, choices(6)
      END

;    7: BEGIN
;      result = QROMB('func1', ll, ul, EPS = 0.001)
;      print, choices(7)
;      END
;    8: BEGIN
;      result = QROMB('func1', DOUBLE(ll), DOUBLE(ul), EPS = 0.001)
;      print, choices(8)
;      END
;    9: BEGIN
;      result = QROMB('func1', ll, ul, EPS = 0.001)
;      print, choices(9)
;      END
endcase

print, '   Numerical result is ', result
print, '   Analytical result is ', (1.0 / 3) * (ul^3 - ll^3) * inner
print


END
; - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```