Assignment 6

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Contents

1 Outputs

1.1 idir=+1

```
henry.mauricio.ortiz@fme-desktop:~/Desktop$ ./main_rtbp_flow
 muu
9.538750000000000E-004
 ti,np (number of points)
0,100
 idir (1 or -1)
1
   0.0000000000000000          initial t, initial cond:
   1.0010050214942841         0.0000000000000000
   0.0000000000000000        -1.2159765727346740E-003
   1.0000000000000000         0.0000000000000000
   0.0000000000000000         0.0000000000000000
   0.0000000000000000         1.0000000000000000
   0.0000000000000000         0.0000000000000000
   0.0000000000000000         0.0000000000000000
   1.0000000000000000         0.0000000000000000
   0.0000000000000000         0.0000000000000000
   0.0000000000000000         1.0000000000000000
   6.2779540788778050         final t,  final point:
   1.0010050214942869        -4.9694609863780437E-013
   -1.5562634595725142E-013 -1.2159765727387431E-003
   1.1981155159836339        -1.0637317370840258E-002
   2.1227941548761460E-002   9.9005210339539684E-002
   -38.094402589560069        1.0496114921986557
   -9.9005210346032102E-002  -19.037097235011466
   4.0437692304492401E-002  -5.2663237224370492E-005
   1.0001050953044994         2.0208119536935853E-002
   -0.29695538436468721       1.5944277017500404E-002
   -3.1818565726749820E-002  0.85160107150359265
```

1.2 idir=-1

```
henry.mauricio.ortiz@fme-desktop:~/Desktop$ ./main_rtbp_flow
 muu
9.538750000000000E-004
 ti,np (number of points)
0,100
 idir (1 or -1)
-1
   0.0000000000000000         initial t, initial cond:
   1.0010050214942841         0.0000000000000000
   0.0000000000000000        -1.2159765727346740E-003
   1.0000000000000000         0.0000000000000000
   0.0000000000000000         0.0000000000000000
   0.0000000000000000         1.0000000000000000
   0.0000000000000000         0.0000000000000000
   0.0000000000000000         0.0000000000000000
   1.0000000000000000         0.0000000000000000
   0.0000000000000000         0.0000000000000000
   0.0000000000000000         1.0000000000000000
  -6.2779540788778050         final t,  final point:
   1.0010050214942869         4.9694609863780437E-013
   1.5562634595725142E-013   -1.2159765727387431E-003
   1.1981155159836339         1.0637317370840258E-002
   -2.1227941548761460E-002   9.9005210339539684E-002
   38.094402589560069         1.0496114921986557
   -9.9005210346032102E-002   19.037097235011466
   -4.0437692304492401E-002   -5.2663237224370492E-005
   1.0001050953044994         -2.0208119536935853E-002
   -0.29695538436468721       -1.5944277017500404E-002
   3.1818565726749820E-002    0.85160107150359265
```

2 MAIN-RTBP-20EQS-FLOW CODE

```
c*****************************************************************
c
c  MAIN_RTBP_FLOW.f
c
c       We integrate the RTBP flow field with Taylor
c       from t=ti up to t=tmax
c       idir= +1 (integration forward in time); =-1 (backward)
c       np= number of intermediate points (apart from the initial one)
c           that we want to write on the file orbit.d. If np=1
c           only the initial and final points are written
c
c  input: xi,ti,tmax,idir,np
c*****************************************************************
        implicit real*8 (a-h,o-z)
        parameter (n=20,m=4)
        dimension xi(n),x(n),TM(m,m)
        common/param/xmu
        open(10,file='orbit.d',status='unknown')
        write(*,*) 'muu'
        read(*,*) xmu
        xi(1)=0.1001005021494284d+01
        xi(2)=0.d0
        xi(3)=0.d0
        xi(4)=-.1215976572734674d-02
        xi(5)=1.d0
        xi(6)=0.d0
        xi(7)=0.d0
        xi(8)=0.d0
        xi(9)=0.d0
        xi(10)=1.d0
        xi(11)=0.d0
        xi(12)=0.d0
        xi(13)=0.d0
        xi(14)=0.d0
        xi(15)=1.d0
```

```
      xi(16)=0.d0
      xi(17)=0.d0
      xi(18)=0.d0
      xi(19)=0.d0
      xi(20)=1.d0
      write(*,*) 'ti,np (number of points)'
      read(*,*)ti,np
      tmax=-2*.3138977039438897D+01
      call jac(xi,c_in,n)
      write(*,*) 'idir (1 or -1)'
      read(*,*) idir
      do i=1,n
       x(i)=xi(i)
      enddo
       write(*,*)ti,'   initial t, initial cond:'
       write(*,*)(x(i),i=1,n)

       xinctime=dabs(tmax-ti)/np
       write (10,*)ti,(x(ii),ii=1,n)
     do 20 i=1,np
       call flow(ti,n,x,idir,xinctime)
       write (10,*)ti,(x(ii),ii=1,n),c
         call jac(x,c,n)
         diff=dabs(c-c_in)
c         write(*,*) 'diff'
c         write(*,*) diff
         if (diff.gt.1.D-11)then
         write(*,*)c
         write(*,*) 'error in first integral'
         stop
         endif
        call matrix(x,m,n)

 20    continue
c     write(*,*)c
      write(*,*)ti,'  final t,  final point:'
      write(*,*)(x(i),i=1,n)
      end
```

```
c       Test on determinant of M
        subroutine matrix(x,m,n)
        implicit real*8 (a-h,o-z)
        dimension x(n),TM(m,m)
        do k=1,m
        do l=1,m
         TM(k,l) = x(4*k+l)
        end do
        end do
c        write(*,*) TM

        call DET(TM,DETA,m)
        difff = DETA - 1.
c        write(*,*) 'diff'
c        write(*,*) difff

        if(difff.gt.1.d-10) then
        write(*,*) 'Determinant of M is not zero'
        endif
        end

        subroutine jac(x,c,n)
        IMPLICIT REAL*8 (A-H,O-Z)
        dimension x(n)
        common/param/xmu
        r1=dsqrt((x(1)-xmu)*(x(1)-mu) + (x(2)*x(2)))
        r2=dsqrt((x(1)-xmu+1)*(x(1)-mu+1) + (x(2)*x(2)))
        c = 2.d0*(0.5d0*(x(1)*x(1) + x(2)*x(2)) + ((1.d0-xmu)/r1)
     .  + (xmu/r2) + 0.5d0*(1.d0-xmu)*xmu) -x(3)*x(3) -x(4)*x(4)
        return
        end

        subroutine flow(t,n,x,idir,xinctemps)
        IMPLICIT REAL*8 (A-H,O-Z)
        dimension x(n)
        tmax=t+idir*xinctemps
```

```
      hab=0.1e-16
      hre=0.1e-16
      pabs=dlog10(hab)
      prel=dlog10(hre)
      istep=1
      ht=0.d0
1       CALL taylor_f77_eq_rtbpvar_(t,x,idir,istep,pabs,prel,
     &  tmax,ht,iordre,ifl)
      if (idir.eq.1.and.t.lt.tmax)go to 1
      if (idir.eq.-1.and.t.gt.tmax)go to 1
      if (dabs(t-tmax).le.1.d-13)return
      write(*,*)'problems in taylor'
      stop
      return
      end
```