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require 'plot numeric trig'

NB. common utility
mp=: +/ . *

NB. *****sabun*****
NB. lorenz(1)
dt=: 0.02 NB. or 0.01
NB.'noaxes' plot {@|: 10 50 8r3 lorenz1 0.1 0.2 0.3

lorenz1=: 4 : 0
dt=. 0.01 NB. dt
's r b'=. x NB. sigma gamma b
'X0 Y0 Z0'=. y
NB. using only once /next XX,YY,ZZ
XX=.X0 + dt * s *(Y0-X0)
YY=.Y0 + dt * ((r*X0)-(Y0+X0*Z0))
ZZ=.Z0 + dt * ((X0*Y0)-b*Z0)
XX,YY,ZZ
)

lz=:4 : 0
NB. Lorenz attracta
's r b'=. x NB. parameter NB. 10 8r3 28
'xx yy zz'=: y NB. initial 5 8 10 or 1 1 1
X=. xx + dt*s*(yy-xx)
Y=. yy + dt*((r*xx)-(yy+xx*zz))
Z=. zz + dt*((xx*yy)-b*zz)
X,Y,Z
)
NB. -----
NB. Lorenz(2)
NB.maybe C.Reiter
NB. Lorenz2
'X Y Z'=: (0&{) '(1&{) '(2&{)
's b r'=: 10 8r3 28

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dx=: s * (Y - X)
dy=: (X * r - Z) - Y
dz=: (X*Y) - b*Z

dt2=: 0.005
I=: + (dt * dx, dy, dz)

NB. plot {0|: I^(i.<1e4) 0 1 0 NB. <1e4 is 10000

NB. Usage: 'noaxes' plot <"1|: I^(i.5000) 0 1 0

NB. -----
NB. Muta

NB. =====
NB. Matrix method of Lorenz

NB. Runge Kutter
NB. by C.Reiter

    rk=:1 : 0
:
h2=. -: x
k1=. u y
k2=. u y + h2*k1
k3=. u y + h2*k2
k4=. u y + x *k3
y+(x%6)*k1+k4++:k2+k3
)

NB. lorenz(3)
NB. x is 0.02
NB. u is 10 8r3 28

lorenz3=: 1 : 0
'S B R'=. m NB. s b r
M=: ((-S),S,0 0 0),(R,_1 0 0 _1),: 0 0 ,(-B),1 0 NB. make matrix

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M&(+/ . *)@[] , ({. * }.))
)

NB. 計算部分

mk_init=: ] , { . * }.
NB. Usage 'noaxes' plot {@|: 0.002 (10 8r3 28 lz) rk ^:(i.10000) 0.1 0.2 0.3

lorenz31=: 1 : 0
NB. Usage: 'noaxes' plot {@|: 0.02 (10 8r3 28 lorenz31) rk ^:(i.1000) 0.1 0.2 0.3
'S B R'=. m NB. s b r
M=: ((-S),S,0 0 0),(R,_1 0 0 _1),: 0 0 ,(-B),1 0 NB. make matrix
M&mp@mk_init NB. 計算部分
NB. same lorenz3
)

NB. lorenz32=: M@mp@mk_init

NB. Usage: lorenz31 10 8r3 28

NB. rossler
rossler=: 1 : 0
'a b c '=. m NB. s b r
M2=. (0 _1 _1 0 0),(1,a,0 0 0),: 0 0 ,(-c),1 ,b NB. make matrix
M2&mp@mk_init2 NB. 計算部分
)

mk_init2=: ] , { . * {:},1:

NB. *****
NB. some Muta's sample equation
Muta0=: 4 : 0
'a b'=: x NB. parameter
'xx yy'=: y

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X=. xx + dt* (xx* (>:a*b)) - b*xx *yy
Y=. yy+ dt* (yy*(<:b))+ b* ^&2 X
X,Y
)

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Mutal=: 4 : 0
'a b'=: x NB. parameter
'xx yy'=: y
X=. xx + dt*(yy + a*xx)
Y=. yy + dt* ( b+ ^&2 X)
X,Y
)

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init0=: 1.02 0.86
init1=: 0.57 1.55
init2=: 0.806 _0.85

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