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## 1.1

%

% gravity and velocity

% by CHT,

% based on 'Computational Physics' book by N Giordano and H Nakanishi

% Exercise 1.1 p15

% Solve the Equation dv/dt = -g

%

clear;clc;

g=9.8;

dt=0.5;

t=0:dt:10;

v=zeros(1,length(t));

v(1)=0;

for n=1:length(t)-1

v(n+1) = v(n) - g\*dt;

end

plot(t,v,'o');

xlabel('Time(s)')

ylabel('Velocity(m/s)')



## 1.2

%

% movements

% by CHT,

% based on 'Computational Physics' book by N Giordano and H Nakanishi

% Exercise 1.2 p16

% Solve the Equation dx/dt = v

%

clear;clc;

v=40;

dt=0.5;

t=0:dt:10;

x=zeros(1,length(t));

x(1)=0;

for n=1:length(t)-1

x(n+1) = x(n) + v\*dt;

end

plot(t,x,'o');

xlabel('Time(s)')

ylabel('Distance(m)')



## 1.3

%

% movements with friction

% by CHT,

% based on 'Computational Physics' book by N Giordano and H Nakanishi

% Exercise 1.3 p16

% By Solving the Equation dv/dt = a-b\*v, we would find a terminal velocity

%

clear;clc;

a=10;b=1;

dt=0.1;

t=0:dt:10;

v=zeros(1,length(t));

v(1)=0;

for n=1:length(t)-1

v(n+1) = v(n) + (a-b\*v(n))\*dt;

end

plot(t,v,'o');

xlabel('Time(s)')

ylabel('Velocity(m/s)')



## 1.4

%

% radioactive decay

% by CHT,

% based on 'Computational Physics' book by N Giordano and H Nakanishi

% Section 1.4 p2

% Solve the Equation dNA/dt = -NA/taoA;dNB/dt = NA/taoA - NB/taoB

%

k=3; %ratio of taoA/taoB;

taoB = 1;

taoA = k\*taoB;

NA=zeros(1,200);

NB=zeros(1,200);

NA(1) = 100; %ÓËÔ­×Ó³õÊ¼ÊýÁ¿

NB(1) = 0;

dt = 0.05;

t=0:dt:10-dt;

for n=1:200-1

NA(n+1) = NA(n) - (NA(n)/taoA)\*dt;

NB(n+1) = NB(n) + ((NA(n)/taoA)-(NB(n)/taoB))\*dt;

end

figure;

hold on;

plot(t,NA,'o-b');

plot(t,NB,'.-r');

xlabel('Time(s)')

ylabel('Number(%) of atoms,red dots represent B atoms')



## 1.5

%

% radioactive decay

% by CHT,

% based on 'Computational Physics' book by N Giordano and H Nakanishi

% Section 1.5 p2

% Solve the Equation dNA/dt = NB/tao - NA/tao;dNB/dt = NA/tao - NB/tao

%

clc;clear;

tao = 1;

NA=zeros(1,100);

NB=zeros(1,100);

NA(1) = 100; %ÓËÔ­×Ó³õÊ¼ÊýÁ¿

NB(1) = 0;

dt = 0.05;

t=0:dt:5-dt;

for n=1:100-1

NA(n+1) = NA(n) + (NB(n)/tao - NA(n)/tao)\*dt;

NB(n+1) = NB(n) + (NA(n)/tao - NB(n)/tao)\*dt;

end

figure;

hold on;

plot(t,NA,'o-b');

plot(t,NB,'.-r');

xlabel('Time(s)')

ylabel('Number(%) of atoms,red dots represent B atoms')



## 1.6

%

% Population growth

% by CHT,

% based on 'Computational Physics' book by N Giordano and H Nakanishi

% Section 1.6 p17

% Solve the Equation dN/dt = aN-bN^2

%

clc;clear;

cst=3;

dt = 0.03;

NA=zeros(1,cst/dt);

NB=zeros(1,cst/dt);

a=10;b=3;bb=0.013;

NA(1) = 1000;

NB(1) = 2;

t=0:dt:cst-dt;

for n=1:cst/dt-1

NA(n+1) = NA(n) + (a\*NA(n)-bb\*NA(n)^2)\*dt;

NB(n+1) = NB(n) + (a\*NB(n)-b\*NB(n)^2)\*dt;

end

figure;

subplot(211);

plot(t,NA,'o-b');

ylabel('Population')

subplot(212);

plot(t,NB,'.-r');

xlabel('Time(yr)')

ylabel('Population')

%显然，结果和实际情况不相符合，理想结果应该是在达到一范围后小幅震荡，而数值

%求解结果到达一稳定值后便不再改变。

