This Week's Project Euler Method

Computational Physics Lab

Numerical Differentiation & Simple Differential Equations

03/17/2009

▲□▶▲□▶▲□▶▲□▶ □ のQ@

This Week's Project

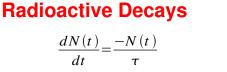








This Week's Project



Set
$$\frac{dN(t)}{dt} = D^+_{\Delta t}(N(t))$$

and solve for the incremental equation of state

$$N(t + \Delta) =$$

This Week's Project

Euler Method

Euler Method: Radioactive Decay

Differential equation describing radioactive decay

$$\frac{dN(t)}{dt} = -\frac{N(t)}{\tau}$$

Using the forward difference:

$$rac{N(t+\Delta t)-N(t)}{\Delta t}\,+\,O(\Delta t)\,=\,-rac{N(t)}{ au}$$

$$N(t + \Delta t) = N(t) - \Delta t \frac{N(t)}{\tau} + O(\Delta t)^2$$

Dropping the error term

$$N_{n+1} = N_n - \Delta t \frac{N_n}{\tau}$$

▲□▶ ▲□▶ ▲□▶ ▲□▶ ▲□ ● のへで

This Week's Project

Euler Method Procedure

Calculation of Decay (the incremental equation)

- **1** Specify the initial conditions: $N_1 \& \tau$.
- **2** Choose a time step Δt .
- **3** Use $N_{n+1} = N_n \Delta t \frac{N_n}{\tau}$ to compute new *N*.
- Go to step 3 until enough trajectory points have been computed.

Euler-Cromer Method

$$N_{n+1} = N_n - \Delta t \, rac{N_n}{ au}$$