Homework 1: Euler Method with Exponential Decay

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Introduction

This program describes the exponential decay of uranium atoms as a function of time using Euler's method.

Method

The program's output is a comparison between Euler's method and an analytical solution.

Verification of program

The plots in **Figure 1** and **Figure 2** show that Euler's method is approximately equal to the analytical solution at all times for both $\Delta T = 0.05$ and $\Delta T = 0.1$.

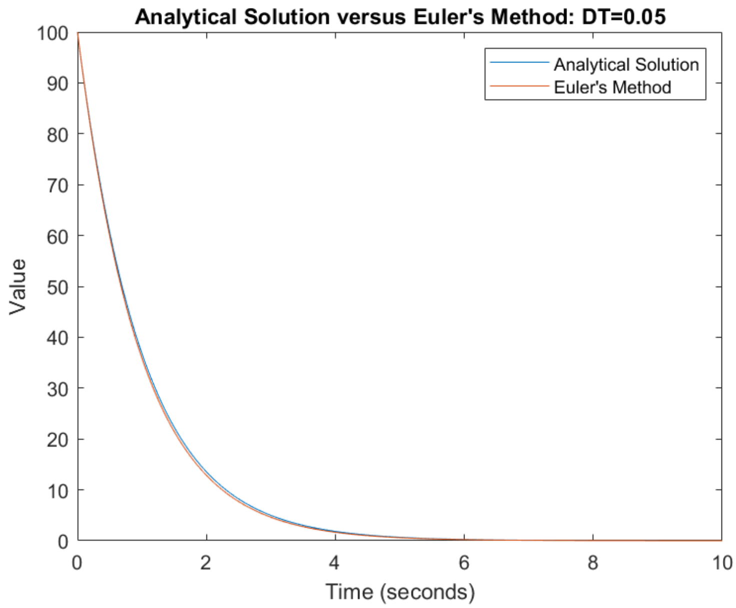

Figure 1: Euler's method is approximately equal to the analytical solution.

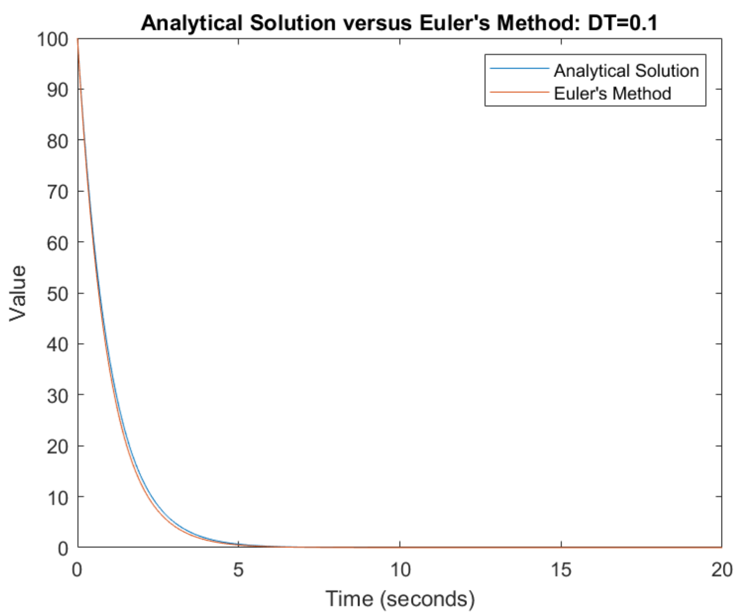

Figure 2: Euler's method is approximately equal to the analytical solution.

Data

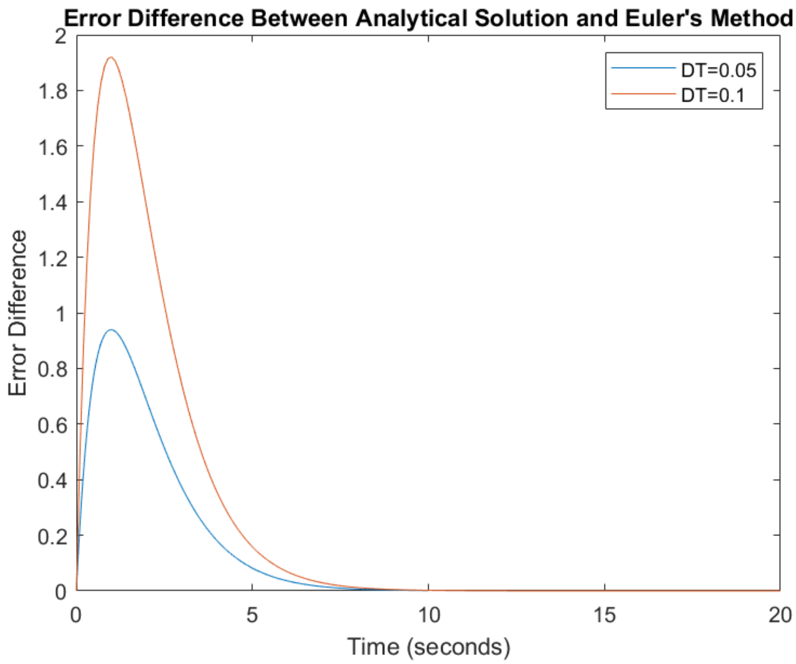

Figure 3: The error differences are plotted.

Analysis

We expect that the two graphs in **Figure 3** be similar in shape, yet different in value per unit time. As expected, the smaller time interval produces a smaller error at the sacrifice of needing more memory.

Critique

Euler's method is really just a first-order Taylor expansion. It is used for solving differential equations numerically.