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CS 400: Thesis

Comparing Approximation Methods for Ordinary Differential Equations

Numerical Analysis is a branch of mathematics that deals with approximation of different types of function and equations. The goal is to get as close to the real solution as possible without actually getting there. Such methods are used in situations when, for example, getting the precise answer to a problem is not required or if we desire to get an idea of the projection the curve of a given function will take on a graph. With this in mind, some of the more challenging functions to approximate are those of differential equations. A differential equation is a mathematical equation that relates the variable or several variables of an unknown equation to its derivatives of various orders. In mathematical applications, the functions generally represent quantities of physical objects, the derivatives their rates of change and the differential equation defines the relationship between both. Such equations play a prominent role in engineering, economics, biology… where they are mainly used to model the behavior of complex systems. The three methods that I will be comparing in this paper are Euler, Higher Order Taylor Method and Runge-Kutta Method.