



Introduction to Numerical Computing

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Abstract

The main aim of this paper is to understand the information to numerical computing. In this paper we solve some examples of numerical computing. The numerical computational techniques are the technique by which mathematical problems are formulated and they can be solved with arithmetic operations. Those techniques are basically numerical methods. Numerical method supports the solution of almost every type of problems. The numerical methods are classified depending upon the type of the problem.

Keywords: Numerical computing; Roots of equation

Introduction to Numerical Computing

Numerical computing is an approach for solving complex mathematical problems using only simple arithmetic operations [1]. The approach involves formulation of mathematical models physical situations that can be solved with arithmetic operations [2]. It requires development, analysis and use of algorithms. Numerical computations invariably involve a large number of arithmetic calculations and, therefore, require fast and efficient computing devices [3]. The microelectronic revolution and the subsequent development of high, low cost personal computers have had a profound impact on the application of numerical computing methods to solve scientific problems [4].

Numerical Methods are Classified Basically Depending upon the Type of Problem

Numerical methods to find roots of equations

In many Engineering and Science application we come across some algebraic and transcendental equation [5].

Ex. Consider the equation:

$$F(x) = x^2 - 3x + 2$$

Such equation is satisfied at some specific value of x. These values are called roots of the equation. The solution of this equation can be obtained with the help of numerical methods [6].

System of Linear Algebraic Equation

Consider,

$$2x + 3y = 7$$

$$5x + 8y = 18.$$

The values of x and y in these equation can be obtained with help of numerical method [7].

Direct method become complex for no. of variables.

Numerical method are the best solution for large system. Such equation are generated in analysis of electronic ckt. Large structures etc. [8].

Floating Point Numbers

The term floating point is derived from fact that there is fixed no of digit before and after the decimal point i.e., the decimal point can float [9].

There are also representation in which number of digit before and after the decimal no is set called as fixed point representation [10].

In general, floating point representations are slower and less accurate. Than fixed point representation, but they can handled a large range of numbers [11].

Distinguish Between Analog Computing and Digital Computing

Analog computing

Analog refers to the principle of solving a problem by using a tool which operates in way analogues to the problem [12,13]. Many real life measurable quantities are analog in nature: time, temperature, pressure, and speed, for instance. The basic requirement in the application of analog computers is the writing down of differential equations describing the physical systems of interest [14,15].

Digital Computing

A digital computer is a computing device that operates on inputs which are discrete in nature [16,17]. The input data are numbers that may represents numeral, letters, or other special symbols. Digital computers are more accurate than analog computers. Digital computers are widely used for many different applications and are often called general purpose computer [18-20].

Characteristics of Numerical Computing

1. **Accuracy:** Every method of numerical computing introduces errors. They may be either due to using an appropriate in pace of an exact mathematical procedure or due to inexact representation and manipulation of numbers in the computer. These errors affect the accuracy of the results.
2. **Efficiency:** One more consideration in choosing a numerical method for solution of a mathematical model is efficiency.

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Numerical Computing An Introduction

Nabil Nassif, Dolly Khuwayri Fayyad



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