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A Study of Mathematical Modeling in Mathematics

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Abstract- The Purpose of this paper is to describe real world phenomena, investigate important question about the observed world, explain real world phenomena, test ideas and makes predictions about the real world. On behalf of these point, in mathematics mathematical modeling took an important stir from a theoretical mathematical training to an application oriented mathematical expertise, and makes the student fit for mastering the challenges of our modern technology culture. In this paper we exposed the important tools of mathematical modeling how it could works with various features of mathematics.

Keywords: *Mathematical Model 74520, AMS Subject Classification: 46F12*

Introduction

Mathematical modeling is the art of translating problems from an application area into tractable mathematical formulation who's theoretical and numerical analysis provides insight answers and guidance useful for the originating mathematical modeling application. It's indispensable and successful in many further applications
It gives precision and direction for problem solution enables through understanding of the system modeled prepares the way for better design or control of a system, allows the efficient use of modern computing capabilities. Mathematical modeling essentially consists of translating real world problems into mathematical problems, solving the mathematical problems and interpreting these solutions in the language of the real world.

Modeling are depends on

(1) Accuracy
(2) Flexibility
(3) Cost

Mathematical Modeling is an experimental approach where a problem is solved and continually refined over time in order to be more efficient, faster, or more accurate it is the processes of scientific inquiry and formal part of the curriculum for mathematics.

In this the processes of constructing mathematical objects whose behaviors' or properties correspond in some way to a particular real world system. In this description a mathematical object could be a system of equation, a stochastic process, a geometric algebraic structure an algorithm, or even just a set of numbers.

The term real world system could refer to a physical system, a financial system, a social system or essentially any other system whose behaviors can be observed.

It is very important to understand that for any real system, there is no perfect model. One is always faced with tradeoffs between accuracy, flexibility and cost.

Increasing the accuracy of a model means generally increasing cost and decreasing flexibility. The object in creating a model is usually to obtain "sufficiently accurate" and flexible model at a lower cost.

Mathematical model is one of the main instruments of man's Knowledge of phenomena of surrounding world.
Under the mathematical model to understand the basic laws and communication is inherent phenomenon.

A list of application in various fields working a Mathematical modeling
(1) Anthropology
(2) Archeology
(3) Architecture
(4) Artificial Intelligence
(5) Arts
(6) Astronomy
(7) Biology
(8) Chemical Engineering
(9) Chemistry
(10) Computer Science
(11) Criminalistic Science
(12) Economics
(13) Electrical Engineering
(14) Finance
(15) Fluid Mechanics
(16) Geosciences

(17) Internet
(18) Linguistics
(19) Materials Science
(20) Mechanical Engineering
(21) Medicine
(22) Meteorology
(23) Music
(24) Neuroscience
(25) Pharmacology
(26) Physics
(27) Political Sciences
(28) Psychology
(29) Space Sciences
(30)Transport Science

The Modeling Diagram

The nodes of the following diagram represent information to be collected, sorted evaluated and organized.

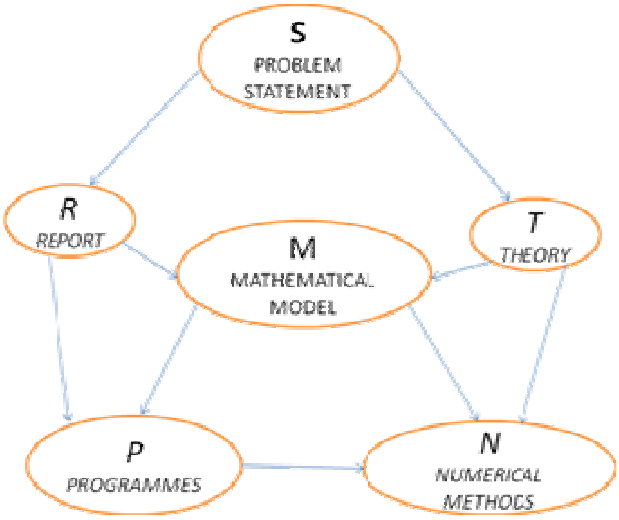

Figure:1

(1) Problem statement
  (a) Interests of Customer/Boss
  (b) Often Ambiguous/Incomplete
  (c) Wishes are Sometimes Incompatible
(2) Mathematical model
  (a) Concepts/Variables
  (b) Relations
  (c) Restrictions
(d) Goals
(e) Priorities/Quality Assignments
(3) Theory
  (a) Theory of Application
  (b) Theory of Mathematics
  (c) Theory of Literature Search
(4) Numerical Methods
  (a) Software Libraries
  (b) Free Software from W.W.W.
  (c) Background Information
(5) Programs
  (a) Flow Diagrams
  (b) Implementation
  (c) User Interface
  (d) Documentation
(6) Report
  (a) Descriptions
  (b) Analysis
  (c) Results
  (d) Model validation
  (e) Visualization
  (f) Limitations
  (g) Recommendations

The Modeling Process

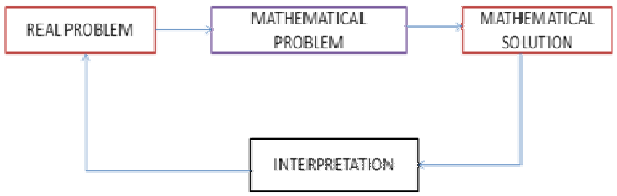

Figure: 2

In Mathematics field where we apply Mathematical Modeling related with
(1) Numerical Linear Algebra
(2) Numerical Analysis
(3) Numerical Data Analysis
(4) Numerical Functional Analysis
(5) Non-Numerical Algorithms

Needs of Mathematical Model

Mathematical model are an excellent method of conceptualizing knowledge about a process and to convey it to other people. Model are also useful for formulating hypotheses and for incorporating new ideas that can later be verified (or discarded) in reality. An accurate model of a process allows us to predict the process behavior for different conditions and thereby we can optimize and control process for a specific of our choice. Finally models serve as an excellent tool for any Purpose.

Modeling Objectives

Any given process may have different appropriate models. The chosen appropriate model depends on its objectives. So it is the first step about model and must be prepare before beginning of model construction. Some of the more relevant objectives concern model purpose, system boundaries, time constraints and accuracy.

Purpose of Model

A wide variety of models are possible, each of which may be suitable for a different applications. Example, A simple models suitable for model based control algorithms may be

totally inadequate for simulating and predating the entire process behavior for safety and operation analysis. A final statement of the model intension is needed as first step in setting the model objectives. This gives entire relevant process variables and the accuracy to which they must be modeled.

System Boundaries
It is define the scope of model in uncertainty exists about the correct choice of boundary a criterion for boundary selection is to check whether streams crossing the proposed boundary are easy to characterize (constant step impulses). If then streams are well characterized the correct boundary had been chosen.

Time Constrains
The constraints are important model restriction to be chosen before constructions of dynamic models frequently, the process under investigation contained a wide range of dynamic activity with widely varying speeds of response.

Accuracy
It is important that the desired accuracy of the model be specified before the model is constructed and that this accuracy reflects the purpose of the model.

Types of Model
1. Physical Models
2. Schematic Models
3. Verbal Models
4. Mathematical Models
Here we introduced only Mathematical Models

Types of Mathematical Models
1. Descriptive Models
2. Optimization Models
3. Reductionist Vs Holistic Models
4. Internal Vs External Models
5. Dynamics Vs Static Models
6. Deterministic Vs
Stochastic (Probabilistic) Model
7. Continuous Time Vs Discrete Time Model
8. Linear Vs Non- linear
9. Lumped Vs Distributed Parameters

Limitation
The accuracy of the model depends upon the knowledge of researcher and how much real and accurate data has been collected by the researcher.

Conclusion

Mathematical Modeling is an experimental approach where a problem is solved and continually refined over time in order to be more efficient, faster, or more accurate it is the processes of scientific inquiry and formal part of the curriculum for mathematics. Model are also useful for formulating hypotheses and for incorporating new ideas that can later be verified (or discarded) in reality. An accurate model of a process allows us to predict the process behavior for different conditions and thereby we can optimize and control process for a specific of our choice.

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