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REVIEW OF MATHEMATICAL MODELLING

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ABSTRACT

This paper mainly consist classification of mathematical modelling ,significance of mathematical modelling , different method uses in mathematical modelling which use also engineering students to known how mathematics related to different subject such as computer science ,physics , political science like that.

Keywords:Classification, Significance, Different method, uses

I.INTRODUCTION

A mathematical model is a description of a system using mathematical concepts and language. Process of developing a mathematical model is termed mathematical modelling mathematical models are used in the natural sciences (such as Physics , Biology, Earth science, Meteorology) and engineering disciplines (such as Computer science ,Artificial intelligence), as well as in the social sciences (such as economics, psychology, sociology ,political science).Physicists ,engineers ,statisticians, operations research analysts and economists use mathematical models most extensively .A model may help to explain a system and to study the effects of different components ,and to make predictions about behaviour.

II.CLASSIFICATIONS

Mathematical models are usually composed of relationships and variables. Relationships can be described by operators, such as algebraic operators, functions, differential operators, etc. Variables are abstractions of system parameters of interest that can be quantified. Several classification criteria can be used for mathematical models according to their structure.

2.1 Linear vs. Nonlinear :

If all the operators in a mathematical model exhibit linearity, the resulting mathematical models is defined as linear .A model is considered to be nonlinear otherwise The definition of linearity and nonlinearity is dependent on context , and linear models may have nonlinear expressions in them .For example, in a statistical linear model , it is assumed that a relationship is linear in the parameters , but it may be nonlinear in the predictor variables, Similarly , a differential equation is said to be linear if it can be written with linear differential operators, but it can still have nonlinear expressions in it . Ina mathematical programming model, if the objective functions constraints are represented entirely by linear equations, then the models is as a linear model. If one or more of the objective functions or constraints are represented with a nonlinear equation, then the model is known as a nonlinear model.

Nonlinearity, even in fairly simple systems, is often associated with phenomena such as chaos and irreversibility. Although there are exceptions, nonlinear systems and models tend to be more difficult to study than linear ones. A common approach to nonlinear problems is linearization, but this can be problematic if one is trying to study aspects such A irreversibility, which are strongly tied to nonlinearity

2.2 Static vs. Dynamic:

A dynamic model accounts for time dependent changes in the state of the system, while a static (or steady state) model calculates the systems in equilibrium, and thus is time invariant. Dynamic models typically are represented by differential equations or difference equations.

2.3 Explicit vs. Implicit :

If all the input parameters of the overall model are know , and the output parameters can be calculated by a finite series of computations, the model is said to be explicit. But sometimes it is the out parameters which are known ,and the corresponding inputs must be solved for by an iterative procedure ,such as Newton's method (if the model is linear) or Boyden's method (if non-linear). In such a case the model is said to be implicit. For example, a jet engines physical properties such as turbine and nozzle throat areas can be explicitly calculated given a design thermodynamic cycle (air and fuel flow rates, pressures, and temperatures) at a specific flight condition and power setting, but the engines operating cycles at other flight conditions and power setting cannot be explicitly calculated from the constant physical properties

2.4 Discrete vs. Continuous:

A discrete model treats objects as discrete, such as the particles in a molecular model or the state in a statistical model , while a continuous model represents the objects in continuous manner , such as the velocity field of fluid in pipe flows, temperatures and stresses in a solid , and electric field that applies continuously over the entire model due to a point charge.

2.5 Deterministic vs. Probabilistic (**stochastic**) :

A deterministic model is one in which every set of variable states is uniquely determined by parameters in the model and by sets of previous states of these variables, therefore , a deterministic model always performs the same way for a given set of initial conditions. Conversely, in a stochastic model usually called a statistical model randomness is present, and variables states are not described by unique values, but rather by probability distributions.

2.6 Deductive, **Inductive**, **or Floating**:

A deductive model is a logical structure based on a theory. An inductive model arises from empirical findings and generalization from them .The floating model rests on neither theory nor observation, but is merely the invocation of expected structure. Application of mathematics in social sciences outside of economics has been criticized for unfounded models. Application of catastrophe theory in science has been characterized as a floating model.

III.DIFFERENT METHOD USE IN MATHEMATICAL MODELLING

1 Formulation of Models

1.1 Rate Equations

1.2 Transport Equations

1.3 Variational Principles

1.4 Dimensional Scaling Analysis

2 Solution Techniques

2.1 Self Similar Scaling Solution of Differential Equation

2.2 Perturbation Methods

2.3 Boundary Layer Theory

2.4 Long Wave Asymptotics for PDE problems

2.5 Weakly Nonlinear Oscillators

2.6 Fast/Slow Dynamical Systems

2.7 Reduced Models for PDE Problems

IV.SOME ARE IN WHICH WORK DONE

1 Mathematics modelling and simulation for dispersion of Air pollution from line source

2 Mathematical modelling on communicable disease

3 Mathematical modelling for biological data

4 Mathematical modelling and simulation of human cardiovascular system

5 Mathematical modelling of depleting dissolved oxygen on the aquatic species and planktonic population in the polluted water body by using lyapunovs function

6 Study of mathematical models for specialised data mining techniques

7 A study of mathematical model for corruption and its control

8 Mathematical modelling and availability analysis for complex system of a sugar plant using genetic algorithm

9 Mathematical models involving mutualism among species

10 Assembly line balancing and optimization through mathematical modelling

REFERENCE

[1.] Andreski stanislav (1972) *social science as sorcey st. martins press ISBN 0-14-021816-5*

[2.] Truesdell , Clifford (1984) . *An idiot's fugitive Essays on science springer pp 121-7 ISBN 3-540-90703-3*

[3.] Gallistel(1990) *The organization of Learning cambridge the MIT press ISBN 0-262-07113-4*

[4.] Edward A. Bender , *An introduction to mathematical modeling* ,courier corporation 2012 ISBN 0486137120

[5.] Rutherford Aris , *Mathematical modelling techniques* ,pitman 1978 , ISBN 0273084135,9780273084136

[6.] K.K .Tung , *Topics in mathematical modelling* ,princeton university press 2016 , ISBN 1400884055, 9781400884056

[7.] ShodhGangotri : Repository of Indian Research in Progress details (Synopses/Research Proposals for PhD programme)