

INTELLIGENT ALGORITHM BASED ADAPTIVE CONTROL OF NONLINEAR SYSTEM

DISSERTATION

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CERTIFICATE

I, Sakshi Praliya, Roll No. 2k12/C&I/014 student of M. Tech. Control & Instrumentation (C&I), hereby declare that the dissertation titled “Intelligent Algorithm Based Adaptive Control Of Nonlinear System” under the supervision of Dr. Bharat Bhushan of Electrical Engineering Department Delhi Technological University in partial fulfillment of the requirement for the award of the degree of Master of Technology has not been submitted elsewhere for the award of any Degree.

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ABSTRACT

Evolutionary algorithms and Swarm Intelligent Algorithms, grouped together as nature-inspired algorithms. Evolutionary algorithms have inspired researchers all around the world for solving optimization problem. But now a day's besides evolutionary algorithms, swarm intelligent algorithm has also gained importance in solving complex and non-linear problems. Particle Swarm Optimization was the first one to be explored in this field and showed improved results. Other Swarm based algorithms such as the Artificial Bee Colony (ABC), the Bacterial Foraging Optimization Algorithm (BFOA), Firefly Algorithm (FFA) etc. have been proposed recently to deal with different types of optimization problems. Several advancements have also been made in these algorithms. This dissertation carves out a comparative analysis of Particle Swarm Optimization (PSO), Bacterial Foraging Algorithm (BFA) and Hybrid PSO-BFA in detail along with simulation results carried out on two different types of problems. In first problem a controller is designed for buck and boost converter, different controller parameters are found using all the three algorithms and comparative analysis is made on the basis of response given by them. Second problem is liquid level control of surge tank system. In this reference input and liquid level of surge tank is tried to made track using PSO, BFA and Hybrid PSO-BFA and analysis is drawn on the basis of simulation result. In the last brief conclusion is drawn regarding all the three algorithms.

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LIST OF ABBREVIATION

AI	Artificial Intelligence
PSO	Particle Swarm Optimization
GEP	Generation Expansion Problem
APSO	Adaptive Particle Swarm Optimization
SOSwarm	Self-Organizing Swarm
BFA	Bacterial Foraging Optimization Algorithm
BFOA	Bacterial Foraging Optimization Algorithm
GA	Genetic Algorithm
E. coli	Escherichia Coli

LIST OF SYMBOLS

S	Total Number Of Bacteria
θ	Position Of Bacteria
j	Total Chemotactic Loop
k	Total Reproduction Loop
l	Total Elimination And Dispersal Loop
P_{ed}	Elimination And Dispersal Probability
C	Chemotactic Step
Φ	Random Direction
p	Dimension
J	Fitness Function
x	Location Of Particle
g	Global Position Of Particle
$C1 \ \& \ C2$	Acceleration Constant
θ_{pbesti}	Global Best Position
θ_{pbest}	Best Position Of Each Particle
W	Weight
V	Velocity
e	Error
K_P	Proportional Constant
K_I	Integral Constant
K_D	Derivative Constant
V_g	Input Voltage
V_o	Output Voltage
r_L	Inductor Resistance

r_t	Switch Resistance
r_d	Diode Resistance
r_c	Capacitor Resistance
r_{Load}	Load Resistance
L	Inductor
C	Capacitor
d	Duty Cycle Ratio
T_{on}	On Time Period
T_{off}	Off Time Period
u	Inlet Volumetric Flow Rate
o	Outlet Volumetric Flow Rate
V	Volume Of Liquid In The Vessel
H	Height Of The Liquid In The Vessel
ρ	Liquid Density
A	Cross Sectional Area Of Vessel
\bar{c}	Clogging Factor
\bar{d}	Area Of Liquid Discharge
Q	Volumetric Flow Rate
g	Gravity Acceleration
m	Mass Of Liquid

