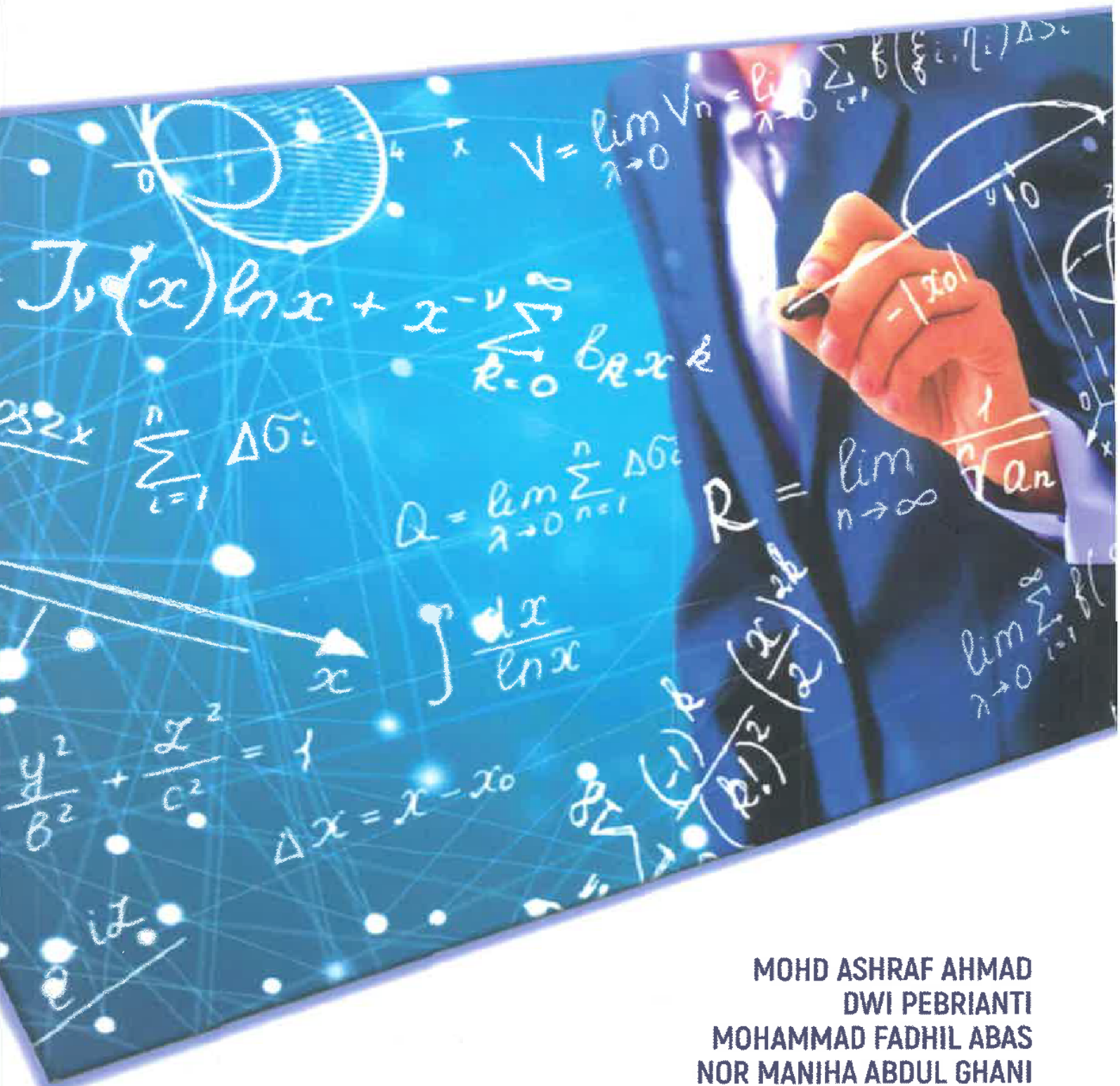
APPLICATIONS OF OPTIMISATION IN CONTROL ENGINEERING



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CHAPTER 2

PERFORMANCE EVALUATION OF PID CONTROLLER OPTIMISATION FOR WHEEL MOBILE ROBOT USING BAT BASED OPTIMISATION ALGORITHM

Dwi Pebrianti, Nurnajmin Qasrina Ann Ayop Azmi, Luhur Bayuaji, Nur Aisyah Syafinaz Suarin and Muhammad Syafrullah

ABSTRACT

By definition, a mobile robot is a type of robot that has the capability to move in a certain kind of environment and is generally used to accomplish certain tasks with some degrees of freedom (DoF). Applications of mobile robots cover both industrial and domestic areas. It may help to reduce risk to human beings and the environment. A mobile robot is expected to operate safely and it must stay away from hazards such as obstacles. Therefore, a controller needs to be designed to make the system robust and adaptive. In this study, the PID controller is chosen to control a wheel mobile robot. PID is considered as a simple yet powerful controller for many kinds of applications. In designing PID, user needs to set appropriate controller gain to achieve the desired performance of the control system, in terms of time response and its steady state error. In this study, three different optimisation algorithms that are based on bat swarm intelligence are examined. A new proposed algorithm called Extended Bat Algorithm (EBA) will be focused on and compared with three different optimisation algorithms which are Bat Algorithm (BA), Bat Algorithm with Mutation (BAM) and a well-known optimisation algorithm, Particle Swarm Optimisation (PSO) to optimise the value of PID controller gain for wheel mobile robot. The result shows that EBA and PSO have the lowest steady state error which is

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APPLICATIONS OF OPTIMISATION IN CONTROL ENGINEERING

This book chapter demonstrates an overview of the state-of-the-art of the most advanced (online and offline) Optimisation techniques and their applications in control engineering. The topics include in this chapter are safe experimentation dynamics algorithm for data-based PID controller of double pendulum overhead crane, performance evaluation of PID controller Optimisation for wheel mobile robot using Bat based Optimisation algorithm, optimize performance of a fully quaternion based quadrotor controller via genetic algorithm and particle swarm Optimisation , an interval type-2 fuzzy logic control with particle swarm Optimisation for two-wheeled robot and DC motor applications, and bio-inspired controller tuning using adaptive safe experimentation dynamics for container gantry crane and TRMS systems. The book would serve a broad audience including layman, researchers, academics, undergraduate and postgraduate students and working professionals in the field of applications of Optimisation in control engineering.

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