

Preface

Servo system is a kind of widely used system, which is used to control a certain state of the controlled object, such as angle or displacement, so that it can automatically, continuously and accurately reproduce the law of the input signal. Servo system plays an important role in the field of industry and military. For example, in the industrial field, servo system is used to complete the high-precision positioning of numerical control equipment, and in the military field, servo system is used to accurately control military equipment. In recent years, with the continuous improvement of human science and technology, microelectronics technology, power electronics technology, computer technology and motor manufacturing technology have been rapidly developed. Therefore, the application fields of servo system have become more and more extensive, and its roles are also growing.

Due to the existence of friction, backlash and other nonlinearities in the mechanical transmission device, the dynamic performance and tracking accuracy of the system are reduced. At present, the power of the servo motor is limited by the technical conditions, and it is difficult to increase any more. Therefore, using a single motor for servo drive can not meet some applications with high precision,

high dynamic performance, large inertia and high power. Aiming at the problems of insufficient control accuracy, low dynamic performance and insufficient driving power, it is often necessary to use multi-motor for synchronous linkage. In practice, there have been successful examples of the application of dual-motor linkage. For example, in 2000, the British Navy successfully adopted the dual-motor linkage strategy to control the azimuth change of its MK8 114mm U-diameter naval gun. In addition, the multi-motor linkage control can also create conditions for eliminating the backlash non-linearity in gear transmission equipment, improve the control accuracy, make the system have redundant functions, and improve the reliability of operation. Multi-motor synchronous linkage system is the main research and development direction in the field of servo system, and the dual-motor driving servo system is the most common in practical engineering. Therefore, the research on adaptive control of dual-motor driving servo system in this book not only has good academic significance, but also has good engineering application value.

This book systematically introduces the theoretical basis, various design methods, computer simulation and verification technology of adaptive control for dual-motor driving servo system and its application in the actual system. The main contents include: improved backstepping control based on fuzzy parameter approximation, backstepping control based on projection algorithm, dynamic surface control based on projection algorithm, backstepping adap-

tive control based on radial basis function neural network, PID control with self-adjusting parameters, etc.

This book is a summary of the author's research achievements, which includes more than 20 academic papers published in domestic and foreign journals and academic conferences. The author hopes that the publication of this book can further meet the requirements of the majority of peers, promote academic and technical exchanges better, and provide reference for the further research of dual-motor driving servo system.

The publication of this book was supported by the National Natural Science Foundation of China (No. 61074023), Natural Science Research Major Project of Universities in Anhui Province of China (No.KJ2021ZD0124), Talent Foundation Project of Tongling University (No.2021tlxyrc22), and Engineering Technology Research Center of Optoelectronic Appliance in Anhui Province of China.

Due to the author's limited ability, shortcomings and mistakes in the book are inevitable, and readers are welcome to give criticism and correction.

Haibo Zhao

June 2021