



Foundations of Robotics & Automation (Theory & Practice)

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Salient Features of the Book : 1. Evolution of Robotics and Automation : Traces the fascinating of robotics from mechanical origins to cutting- edge automation. 2. Linear Algebra : Essential for solving complex robotics challenges using vectors, matrices , and transformations. 3. Calculus : A powerful tool for modeling and controlling robotic systems with precision and agility. 4. Differential Equations : Vital for understanding the dynamic behavior of robotic systems and automating processes. 5. Probability and statistics : Key for decision- making hypothesis testing, and driving machine learning in robotics. 6. Control Theory : Mastering the behavior of dynamic systems through feedback loops and stability analysis. 7. Kinematics and Dynamics : Analyses motion and force, essential for understanding robotic movement and interaction. 8. Machine Learning and AI : Explores intelligent systems that adapt, learn, and revolutionize automation. 9. Graph Theory : Solves real- world problems by analyzing networks and connections across domains. 10. Numerical Methods : Provides computational techniques for practical solutions to engineering challenges. 11. Signal processing : Interprets and analyses vast streams of data in the digital landscape for better decision -making. 12. Optimization : Focuses on finding the most efficient solutions for enhancing robotic performance. 13. Computer Vision : Enables robots to perceive and interpret their environment through AI- driven imaging. 14. Quantum Computing : Explores the future of robotics with quantum-level computation, unlocking unimaginable potential. This book offers a profound blend of theory and practice, charting the path toward the next generation of intelligent robotics & automation.

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Authors

Prof. A. B. Bhattacharya did his MSc and PhD degree from the University of Calcutta in Physics and Post-doc from the Massachusetts Institute of Technology (MIT), Cambridge, USA. He worked in close collaboration with the leading laboratories like Lincoln Laboratory; Milestone Hill Observatory; Earth, Atmospheric and Planetary Sciences division of MIT and many other well recognized laboratories in India and abroad. He served as Professor & Head of the Department of Physics, University of Kalyani; Dean of Research and Head of the ECE Department, Techno India University; Pro Vice Chancellor of JIS University and Director of Brainware University. He has published 32 text books for Science and Engineering students, two popular books for general readers and over 400 research articles in reputed International Journals. Under his supervision 24 scholars received their doctoral degree. He is a fellow of the Institute of Electronics and Telecommunication Engineers and member of many scientific organizations. India International Friendship Society awarded him the prestigious "Shiksha Ratna Award" and Certificate of Excellence for meritorious services, outstanding performance and significant contribution to education. The International Institute of Success Awareness honored him with their globally recognized "Glory of India Gold Medal" for his outstanding contribution to the national stature of India. A few words from the certificate issued by Prof. Williams of MIT may be quoted "Our collaborative effort was directed at the wavelength dependence of radar echoes observations with the Millstone Hill UHF radar in Westford. He made use of the Charles River Data System computer in the Weather Radar Laboratory for these calculations. His results help to make a convincing case that the volume reflectivity associated with lighting is a diminishing function of radar wavelength, contrary to contemporary thinking".

Dr. Debasish Roy is a highly accomplished and motivated professional with a robust academic background in Information Technology, including an MCA, MBA M. Tech, and PhD. He was currently the Director General(Railways) at a top-level position in the Indian Police Service (IPS). He received the Indian Police Medal and President's Police Medal in 2000 and 2010. He is well known for pioneering contributions in land mobile radio systems. He is highly recognized for spearheading strategic planning and execution of security measures for the railways network, implementing innovative technologies to enhance railway security and counteract emerging day-to-day operations efficiently. He has provided expert guidance on implementing land mobile radio system for public safety agencies and conducted groundbreaking research in cryptanalysis, leading to development of advanced techniques for enhancing cyber security. He successfully led a team in designing and implementing secure communication protocols for land mobile radio systems, ensuring robust and encrypted communication. He has published numerous research papers in reputed conferences. He mentored and guided students at the postgraduate and doctoral levels. He has a proven track record of effective leadership and team management, besides all his strategies planning and execution in high-stakes environments. He received many honors and awards for his outstanding contributions to the field and was recognized for exceptional leadership and innovation in technology-driven security initiatives. He completed an Executive Program in Quantum Company and Machine Learning from IIT Delhi in 2023. He participated in the



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