Preface

Artificial intelligence (AI) has progressed into a wide-ranging science, covering theories, technologies and applications that are designated to mimic, display and extend "human" intelligence like learning, deducting, thinking and planning. Since its germination 60 years ago, AI has experienced twists and turns in its development, and has markedly strengthened in recent years. The intelligence of "machines" has leapt into a leading force that drives a new momentum of technological revolution and industrial transformation around the world. AI is shaping the future of humanity across nearly every industry.

Aerospace science, another critical field of human progress, usually deploys macrosystems with high risks to face complicated and dynamic application environment. Thanks to AI, aerospace engineering has advanced remarkably and acquired the ability to achieve the goal of high-reliability and low cost. Studies that focus on this are fruitful and practical.

The special issue on "Aerospace Intelligence", launched by *Transactions of Nanjing University of Aeronautics and Astronautics*, is one of the demonstrations of these achievements. This issue is the third collection of AI progress in aerospace for three consecutive years. It presents AI applications in space vehicle control, intelligent management of airports, etc. The first paper investigates a multi-spacecraft intelligent orbit control problem, and proposes an intelligent low-thrust orbit phasing control method for multiple spacecraft by simultaneously considering fuel optimization and collision avoidance based on a minimum-fuel orbit phasing control database. The second paper focuses on an attitude control problem of a flexible solar power satellite, and establishes an orbit-attitude-structure coupled a dynamic model using the absolute nodal coordinate formulation. The third paper proposes a novel angles-only navigation architecture using non-linear dynamics method. Instead of utilizing orbital or attitude maneuvering, this approach captures the non-linearity of the system in the evolution of relative motions to improve the observability of angles-only navigation. The forth paper studies an inter-satellite links topology design and a relative navigation problem, and proposes a distributed relative navigation approach via inter-satellite sensing and communication for satellite clusters. The fifth paper stud-

ies a recognition problem of similar weather scenarios in terminal areas, and proposes a similar weather scenario classification method based on the contrastive learning. The sixth paper targets the thermal infrared salient human detection problem in airport terminals, and proposes a novel thermal infrared salient human detection model combined with thermal features called TF-SHD, which is based on U-Net. The seventh paper delves into a solving problem for two-dimensional laminar flows, and presents a graphics processing unit (GPU)-accelerated discontinuous Galerkin (DG) method, which is ported from central processing unit to GPU in a way of achieving GPU speedup through programming under the Compute Unified Device Architecture (CUDA) model.

AI has been evolving into a critical driver for the advancement of aerospace science by changing it from individual technique innovations to comprehensive systematic and industrial transformations. I believe the latest achievements this issue present will provide valuable references for scientists and researchers, and inspire more treasured studies. And I believe AI will augment aerospace science in significant ways.

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Reference

[1] WANG Bin, LI Haiyan. WANG Yulin. Prospect of artificial intelligence technology in the future aerospace field[J]. Journal of Command and Control, 2020, 6(4): 349-355. (in Chinese)

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