Engineering 12 (2022) 1–2

Contents lists available at ScienceDirect

Engineering

journal homepage: www.elsevier.com/locate/eng

Editorial

Editorial for the Special Issue on Unmanned Intelligent Cluster

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Recent advances in networked cooperative autonomous systems offer the potential to significantly improve system quality for a wide range of applications. Progress in embedded processor, sensor, communication, and networking technology in the last few decades has accelerated interest in networked cooperative autonomous systems, multirobot systems, and distributed sensor networks for applications such as manufacturing, logistics, process monitoring, enhanced situational awareness, plant safety, inspection, security, and rescue operations. The advances that have made individual autonomous systems more practical and have also enabled research on the development of cooperative systems, in which capabilities are expressed by the team rather than by a particularly capable individual. Such systems are especially relevant for complex tasks that require capabilities that vary in both quantity and difficulty, such as goods transportation, distributed assembly, vehicle coordination strategies, and infrastructure inspection. Moreover, one of the main advantages of having a cooperative system instead of a particularly capable individual lies in the former's increased reliability due to redundancy.

This Special Issue of *Engineering* contains original contributions and views on the most recent developments and research outcomes addressing relevant theoretical and practical aspects of unmanned swarm systems. In this issue, Zhang et al. propose a human-centric vision in an unmanned intelligent cluster (UnIC) design by incorporating cognitive features. Within this vision, distributed unmanned systems and humans are connected via knowledge to achieve cognition. These scholars' work introduces the overall concept of UnIC, along with its sources of intelligence, layered architecture, and social acceptance. Current state-of-the-art enabling technologies, future trends, and open questions that remain in achieving this vision are also reviewed to address challenging that remain this field.

Also in this issue, Meng et al. develop an explosive electric actuator and an associated control method for legged robots. Their work introduces a high-power-density variable transmission that enables continuous adjustment of the output speed to torque ratio. By leveraging a phase-change-material-based heat-dissipating structure and an integral torque control method, the developed actuators are demonstrated to provide high peak speed or high peak torque at specific moments during dynamic motion.

Finally, Chen et al. comment that the autonomous intelligent system (AIS) is an emerging interdisciplinary field that relies on big data and artificial intelligence (AI) to create unmanned systems with integrated task and motion planning, as well as decision-making and reasoning capabilities. In comparison with common unmanned platforms that may be rule-based or controlled remotely by humans or other machines, the AIS features several defining and unique characteristics: (increasing levels of) autonomy, intelligence, and cooperativity. Hence, the AIS is the ultimate goal of AI research, and AIS research provides a promising path toward artificial general intelligence (AGI).

As Chen notes in his article, research on autonomous unmanned systems is a never-ending endeavor. Given the development of powerful techniques in AI and deep learning for data processing,

https://doi.org/10.1016/j.eng.2022.04.001

intelligent autonomous unmanned systems will be one of the major technological and economic stories of the years to come, due to their wide range of applications and the added value they will provide. In particular, the detection and catching of intruding unmanned systems, as well as advanced sensing and perception techniques using bioinspired and event-based neuromorphic vision sensors, are crucial issues to be investigated in the near future.

It is our hope that the articles in this Special Issue will help to cultivate innovative thinking and broaden our collective vision in the development of unmanned intelligent systems. We thank all the authors for their submissions and outstanding contributions, as well as the many individuals who helped review the manuscripts and provided the editors and authors with excellent suggestions for improvement. In particular, we would like to thank the Editor-in-Chief, Ji Zhou, and *Engineering*'s Editorial Board for providing us with the unique opportunity to put together this Special Issue for their journal. Last but not least, we are grateful to the Editors Zhirui Han and Xue Wang, who provided invaluable assistance in ensuring prompt handling and publication of this Special Issue.