Guest editorial

Autonomous control of Unmanned Aerial System (UAS) is that UASs can make decisions in the flight and carry out missions autonomously according to the scheduled tasks and rules through online sensing the surrounding situation. Through cooperation, UASs can share information among individual agents and work together to accomplish complicated mission which would not be possible for a single agent otherwise. With the development of UAS technology, autonomous control has become one of the hot topics and key technologies in UAS research field. The applications of UASs cover a broad spectrum of domains including scientific explorations in space and underwater far beyond human reach, life rescue in dangerous and hazardous environments, formation flight, cooperative foraging and coverage of a given area, multi-target observation, swarming and flocking. Due to the highly dynamic and uncertain environment in which mission is executed and the complexity of flight mission, improving the capability of autonomous control is one of the most important objectives for the development of UAS technologies.

This special focus is expected to present readers with some recent significant achievements on autonomous control of UAS. Ten excellent papers have been accepted in this special issue covering up-to-date advances in theoretical design and applications of this research topic.

The research paper "Agent model for multi-UAV control via protocol designs" by Sunan Huang *et al.* explores multi-UAV control in the framework of providing surveillance of areas of interest with automatic loss detection and replacement capabilities. The research is based on the concept of a multi-agent system in the decentralized form and presents the framework of the multi-agent system and protocol design for monitoring the network of a group of UAVs.

In the research paper "Formulating layered adjustable autonomy for unmanned aerial vehicles" by Mostafa Salama *et al.*, a layered adjustable autonomy (LAA) as a dynamically adjustable autonomy model for a multi-agent system is proposed to efficiently manage humans and agents share control of autonomous systems and maintain humans' global control over the agents. The UAV system implementation consists of two parts, software and hardware. The software part represents the controller and the cognitive, and the hardware represents the computing machinery and the actuator of the UAV system. The application of LAA model in a UAV manifests the significance of implementing dynamic adjustable autonomy.

The research paper "Fuzzy logic algorithm of hovering control for the quadrotor unmanned aerial system" by Lie Yu *et al.* presents a control strategy which uses two independent PID controllers to realize the hovering control for unmanned aerial systems. In which, one PID controller is used for position tracking control, while the other is selected for the vertical component of velocity tracking control. Meanwhile, fuzzy logic algorithm is presented to use the actual horizontal component of velocity to compute the desire position.

In the research paper "Station-keeping control for a stratosphere airship via wind speed prediction approach" by Jihui Qiu *et al.*, a feedforward-feedback PID controller is designed to improve the precision of the station-keeping control for a stratosphere airship by wind speed predication. First of all, the online prediction of wind speed is implemented by the I-ELM algorithm with rolling time. Second, the feedforward-feedback PID controller based on the location information of the airship and the predicted wind speed is designed. In the end,

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the one-dimensional dynamic model of the stratosphere airship is built and the controller is applied on it.

The research paper "Time-varying formation finite-time tracking control for multi-UAV systems under jointly connected topologies" by Tianyi Xiong *et al.* investigates time-varying finite-time formation tracking control problem for multiple unmanned aerial vehicle systems under switching topologies, where the states of the UAVs need to form a desired time-varying formations while tracking the trajectory of the virtual leader in finite time under jointly connected topologies. A consensus-based formation control protocol is constructed to achieve the desired formation. Based on graph theory, the finite-time stability of the close-loop system with the proposed control protocol under jointly connected topologies is proven by applying LaSalle's invariance principle and the theory of homogeneity with dilation.

The research paper "TML: A language to specify aerial robotic missions for the framework Aerostack" by Martin Molina *et al.* describes the specification language TML for adaptive mission plans, which is designed and implemented for the open source framework Aerostack for aerial robotics. The TML language combines a task-based hierarchical approach together with a more flexible representation, rule-based reactive planning, to facilitate adaptability. An interpreter integrated in the software framework Aerostack was built and it was validated with flight experiments for multi-robot missions in dynamic environments.

In the research paper "On anti-periodic oscillations of shunting inhibitory cellular neural networks with time-varying delays and continuously distributed delays" by Changjin Xu *et al.*, considering a class of shunting inhibitory cellular neural networks with time-varying delays and continuously distributed delays, sufficient conditions are obtained to ensure that all solutions of the networks converge exponentially to the anti-periodic solution by applying the inequality technique and Lyapunov functional method.

The research paper "Motion control design for unmanned ground vehicle in dynamic environment using intelligent controller" by Auday Al-Mayyahi *et al.* proposes a fuzzy inference system based on sensory information to navigate unmanned ground vehicles in cluttered and dynamic environments. The fuzzy inference system consists of two controllers. The first controller uses three sensors based on the obstacles distances from the front, right and left, while the second controller employs the angle difference between the heading of the vehicle and the targeted angle to obtain the optimal route based on the environment and reach the desired destination with minimal running power and delay.

We owe great thanks to all of the authors who have paid extreme efforts in preparing and submitting their creative manuscripts to this special focus. The same gratitude also comes to the anonymous reviewers that have presented their insightful comments and creative suggestions to improve the quality of the papers in this special focus. Finally, we sincerely appreciate all the valuable help and support from the editorial staffs of *International Journal of Intelligent Computing and Cybernetics.*

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