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Editorial

Unmanned Aircraft System and Its Applications in Transportation

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Within the past few years, civilian demand for unmanned aircraft system (UAS), commonly referred to as drones, has skyrocketed. Previously only used for military reconnaissance and later for strike programs, UAS has increasingly been considered for a variety of civilian tasks, including infrastructure monitoring, precision agriculture, package delivery services, search and rescue operations, photography, and more. Among many public and private sector agencies, transportation agencies are in a unique position to leverage the emerging technology, due to the nature of this profession, the vast demand, and the great benefit in terms of reducing accidents, mitigating congestion, and cost saving. According to a survey by the American Association of State Highway and Transportation Officials (AASHTO), 33 state departments of transportation (DOTs) have carried out or are exploring applications of UASs in various aspects of transportation, including inspecting bridges, collecting traffic data, and helping crash clear-up.

The purpose of this special issue is to publish high-quality research papers as well as review articles addressing recent advances on UAS and its applications in transportation. From those submitted manuscripts, we have chosen the following six papers to publish on this special issue:

C. Ziółkowski and J. M. Kelner proposed a solution to address UAS vertical take-off and landing. The authors showed the structure of an autonomous system and a Doppler-based navigation procedure that allows for automatic landing approaches. An accuracy evaluation of the developed solution for VTOL was made on the basis of simulation studies.

P. Chen et al. applied UAS to provide a bird's eye view at an urban intersection, based on which a surrogate safety analysis was conducted on pedestrian-vehicle conflicts. The findings demonstrated that UAS can support intersection safety analysis in an accurate and cost-effective way.

Y. Xu et al. employed UAS flying at low-altitude in combination with region-based convolutional neural network to detect vehicles at signalized intersections. Their test results demonstrated that this approach is robust to illumination changes and cars' in-plane rotation and thus can be applied for vehicle detection from both static and moving UAV platforms.

O. Alvear A. et al. proposed the use of UAVs equipped with off-the-shelf sensors to perform air pollution monitoring tasks. Experimental results showed that an implicit priority guides the construction of pollution maps by focusing on areas where the pollutants' concentration is higher. This way, accurate maps can be constructed in a faster manner when compared to other strategies.

U. Papa et al. reported the conceptual design of a low-cost, electrically powered hybrid unmanned aircraft system. Its capability of extended cruise endurance was investigated by analyzing the design drivers affecting the craft flight time. Experimental results in different testing scenarios and complex environments showed 50% improvement of the flight duration.

O. Doukhi et al. presented the mathematical model of a quadrotor UAV and the design of robust Self-Tuning PID controller. The proposed controller was applied in the inner and outer loop for heading and position trajectory tracking control to handle the external disturbances. The results of numerical simulation demonstrated the effectiveness of this intelligent control strategy.

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