New Developments and Environmental Applications of Drones: Proceedings of FinDrones 2020, edited by Tarmo Lipping, Petri Linna, Nathaniel Narra. Cham: Springer International, 2022 vii+195, £129.99 (cloth), ISBN 978-3-030-77859-0

In 2021, the European Union introduced regulations concerning unmanned aircraft systems, based on common rules in civilian aviation and also creating a European Union Aviation Safety Agency. "Drones, or more officially, unmanned aircraft systems (UASs) have made their way into everyday life during the past decade both as handy appliances for private use [say, photography] and as professional equipment fitting into the workflows of a large variety of businesses (p.v)." This includes agriculture, environmental monitoring and logistics. There is also, but not covered in this volume, military surveillance, bombing and targeted killings by state forces (e.g., the U.S. and Israel) as well as potential use for non-state actor terrorist attacks. The editors note "the trends in drone usage, various aspects, operational issues (including training), data and computation, as well as more specific issues related to particular application areas." There are regulatory/legal and ethical issues, not least to do with airspace security and privacy. Research in the field is published now in even specialised [Open Access] journals, such as "*drones*" by MDPI [1].

There is 'drone discourse' [2] because of unmanned surveillance and also weapon-carrying military drones. Russia strikes Ukrainian civilian and energy targets amongst others with Iranian drones, and Ukraine counter-strikes Russian supply lines and military infrastructures. There is concern with terroristic / insurgency usage in the Middle East and elsewhere, mass surveillance and also (urban and other) airspace safety (e.g., when clashing with civilian helicopter and larger aircraft aviation). There is significant use of commercial drones for logistics/distribution.

The largest application has been in agriculture [3, 4] as well as environmental sciences / chemical monitoring / and greenhouse gas emissions with the right sensors and processing software [5, 6]. Infrastructures can be remotely inspected [7] and emergency / disaster management efforts can be improved by the use of drones [8]; especially when roads and landing fields are damaged. Wildlife monitoring and conservation applications are other areas of application [9].

This book focuses on the civilian, agricultural and environmental (change) monitoring fields. The first part surveys via Kramer et al. the technological and operational challenges facing civilian drone applications, especially when operated in difficult environments such as the Arctic. Those two challenges can overlap (e.g., weather-related ones), but can also be mitigated separately.

The second part contains deals with drone technology and navigation, and the usage of drones for agriculture. Suurnäki puts forward an experimental study of an icing wind tunnel to test the impact of those conditions on the dynamics of a drone propellor, finding this useful but needing refinement for work in Nordic conditions. Saffre et al. propose a methodological framework operating a swarm of drones for surveillance and situational awareness autonomously, employing a predefined mesh and evaluating this in terms of numerical and base deployment. Palovouri describes camouflaging a drone against the sky through automatic control of its LED tapestry. Nevalainen et al. suggest an algorithmic self-correcting simultaneous localisation and mapping framework for long-term use in forestry.

The third part covers drone-based imaging in smart farming. Kaivosoja examines improving target visibility, furthering sensor technology, data management, and the integration of robotics for actuation. Halla et al. propose a framework for estimating the availability of water in soil for plants using proxy data collection. Linna et al. discuss ground penetrating radars for data acquisition from crop fields, and mounting those radars onto drones to detect pipes and cables. Narra et al. proffer a cost-effective solution for sub-dividing crop fields by productivity and extrapolating this to predict yield for the whole field. Nevavuori et al. present a data fusion approach to improve the performance of a developed deep reinforcement learning framework for yield prediction and modelling, with remote sensing data obtained by drones integrated with soil properties, weather conditions, and low-resolution images from satellites. Overall, this is cutting-edge research.

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