avoidance method. Flight underground-pilot control is also described. Chapter 14 outlines some of the safety issues in drone operation and outlines how to conduct mode state modelling. The final chapter 'Outlook' gives the author's view on some of the potential future developments for multicoptor development.

The book is something of a curate's egg. It contains a great deal of very useful information for multicoptor developers and experimentalists. The book is admirably ambitious in the range of topics covered. However, this invariably means some aspects are sketchily covered. Some of the design aspects are not much more than high school level, whereas the chapters on dynamics and control are of a fairly advanced level suitable for graduate courses or a primer for researchers. Each chapter is supported by a set of exercises; some of these are vague and not clearly posed.

Unfortunately, the book suffers enormously from very poor editing and proof-reading by the publishers. The English is substandard in much of the book and there are a number of errors, many of which result from what seems to be poor translation from Chinese to English. For such a shoddy product to have come from a publisher with the history of Springer is very worrying. It is also a real disservice to the author, who with a firmer hand and guidance could have produced a teaching text of lasting value. Alas the opportunity has been missed.

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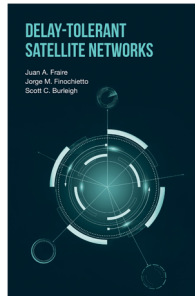
Delay-Tolerant Satellite Networks

J. A. Fraire *et al.*

Artech House, 16 Sussex Street, London, SW1V 4RW, UK. 2018, 249pp. Illustrated. £119 ISBN 978-1-63081-344-4.

*D*elay-Tolerant Satellite Networks addresses a significant and timely issue: will satellite systems allow us to move from a terrestrial world wide web with continuous connectivity to a space wide web with delay tolerant characteristics.

With the advent of mega-constellations, the potential exists for satellite networks that can transfer data in a far timelier fashion, as the book explains in the first few chapters. There is much information here on network theory, some of which seems a little pedantic, but the reader is left with a clear understanding of the challenges, from a communications perspective, of passing data through an intermittently connected network.

The predictability of satellite orbits means that it is possible to calculate a schedule of opportunities for data transfer and the text provides a comprehensive description of how

this would be achieved. A limitation of this volume is that the authors seem far more at home with the network-related aspects of their title than the satellite-related issues. As an example, one of the key aspects, from a satellite designer's point of view, is whether the on-board computer on the satellite will be required to perform these scheduling calculations. In a large, complex network, this could become a significant overhead. The alternative is to perform the scheduling calculations on the ground and then pass them through the network to instruct each satellite. More discussion on the pros and cons of this issue would have been an enhancement, as would a section on the satellite on-board computer and antenna hardware that would be required to implement these networks.

One of the most disappointing aspects of the book was the chapter dealing with example satellite constellations. Some of the information presented (a restatement of Kepler's Laws, for example) is redundant and too basic for a book of this sort. More worryingly, some of the terminology used to describe the example constellations is in error. In part, this appears to be an editing failure – the text contains frequent examples of linguistic infelicity that are a consequence of the fact that part of the manuscript has been translated. But there is also evidence that the authors are not really satellite orbit devotees. One example that is presented is a Walker constellation, a design method explicitly conceived to distribute the coverage and avoid overlaps between satellites. As an example, it serves to illustrate the tension between coverage designers, who want to minimise the time when the satellites are close together, and the network designers, who want frequent inter-visibility to increase the opportunities to route data. It would have been useful if the authors had spent more time addressing techniques to resolve these important, competing requirements.

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