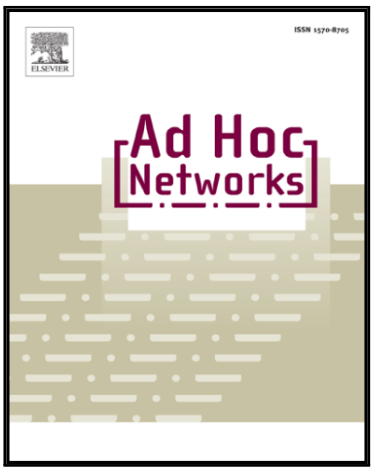

Drone Networks: Communications, Coordination, and Sensing

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Drone Networks: Communications, Coordination, and Sensing[☆]

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Abstract

Small drones are being utilized in monitoring, transport, safety and disaster management, and other domains. Envisioning that drones form autonomous networks incorporated into the air traffic, we describe a high-level architecture for the design of a collaborative aerial system consisting of drones with on-board sensors and embedded processing, sensing, coordination, and networking capabilities. We implement a multi-drone system consisting of quadcopters and demonstrate its potential in disaster assistance, search and rescue, and aerial monitoring. Furthermore, we illustrate design challenges and present potential solutions based on the lessons learned so far.

Keywords: drones, unmanned aerial vehicle networks, wireless sensor networks, vehicular communications, cooperative aerial imaging, search and rescue

1. Introduction

Autonomous unmanned aerial vehicles (UAVs), also called drones, have received increasing interest for environmental and natural disaster monitoring, border surveillance, emergency assistance, search and rescue missions, and relay communications [2, 3, 4, 5, 6, 7, 8]. Small multicopters are of particular interest in practice due to their ease of deployment and low acquisition and maintenance costs.

Research and development in small multicopters has started with addressing control issues, such as flight stability, maneuverability, and robustness, followed by designing autonomous vehicles capable of waypoint flights with minimal user intervention. With advances in technology and commercially available vehicles, the interest is shifting toward *collaborative* UAV systems. Consideration of small vehicles for the aforementioned

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