**ISBN 978-93-84422-80-6**
**17th IIE International Conference on Computer, Electrical, Electronics and Communication Engineering (CEECE-2017)**
*Pattaya (Thailand) Dec. 28-29, 2017*

# An Offloading Decision Scheme for a Multi-Drone System

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***Abstract*:** *In the case of a single drone system, a drone should commit its task to the cloud to reduce task completion time and energy consumption. However, a multi-drone system, where several drones are connected to each other, can divide a task into small tasks and assign each small task to drones to improve responsibility. In this paper, we propose an offloading decision scheme that considers task completion time and energy consumption. The proposed scheme compares the cost of executing small tasks on the drones with the cost of committing a task to the cloud and decides offloading a task only if the cost of offloading is definitely smaller than the cost of using multiple drones. Our simulation results show that the proposed decision scheme is necessary because offloading spends more energy and time in some cases.*

***Keywords:*** *Computation offloading, multi-drone systems, cloud computing, task completion time, energy consumption.*

## 1. Introduction

The application of drones and related technologies have rapidly grown in the past few years. Application developers and researchers are realizing the potential of drones in applications such as the smart city, remote sensing, surveillance systems, disaster management, and border security [1]. A drone cannot execute a heavy task because it has limited resources including processing capability, storage, bandwidth and energy. Cloud computing can provide an energy and time saving technique called computation offloading to a drone [2]. A drone can save its energy through renting resources from the cloud.

However, a multi-drone system is different from a single drone system as summarized in Table 1 [3]. In a single drone system, an expensive large drone is used for a task and covers a large area. The drone communicates with a ground control center directly. In a multi-drone system, drones are smaller and less expensive and work in a coordinated manner. The drones communicate among other drones and some of the drones communicate with a ground control center directly. The cooperation of multiple drones in a network also improve the performance and the coverage area [4]. These connected drones integrate with cloud computing and are accessed as a cloud resource called a cloudlet [5]. In this system, drones register and provide their resources including computing power, storage, sensors, cameras, and actuators to achieve mission goals.

https://doi.org/10.17758/ERPUB.E1217114