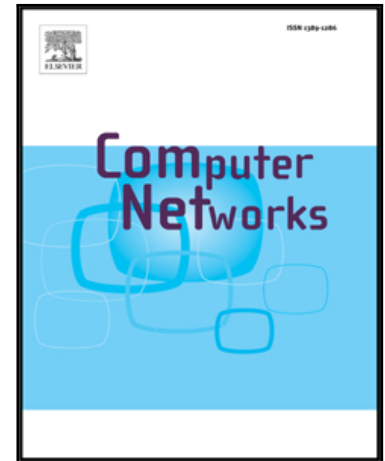


Accepted Manuscript

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PII: S1389-1286(18)30978-2
DOI: <https://doi.org/10.1016/j.comnet.2018.09.022>
Reference: COMPNW 6604



To appear in: *Computer Networks*

Received date: 23 October 2017
Revised date: 24 September 2018
Accepted date: 26 September 2018

Please cite this article as: Peng Sun, Azzedine Boukerche, Performance Modeling and Analysis of a UAV Path Planning and Target Detection in a UAV-based Wireless Sensor Network, *Computer Networks* (2018), doi: <https://doi.org/10.1016/j.comnet.2018.09.022>

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Performance Modeling and Analysis of a UAV Path Planning and Target Detection in a UAV-based Wireless Sensor Network

Peng Sun^{a,*}, Azzedine Boukerche^a

^a*Paradise Research Laboratory, School of Electrical Engineering and Computer Science,
University of Ottawa, 800 King Edward Ave., Ottawa, ON, Canada K1N 6N5*

Abstract

A wireless sensor network (WSN) is usually deployed in a field-of-interest (FoI) for detecting or monitoring special events. Traditionally, the WSN requires intensive deployment in which extra sensor nodes are deployed to achieve the required coverage level. In recent years, the UAV has been widely adopted in both military and civilian applications, depending on the development of unmanned aerial vehicle (UAV) techniques. Compared with traditional mobile sensor nodes, the UAV has much faster moving speed, longer deployment range and a relatively longer operating time. Consequently, the UAV can be considered as a perfect carrier for the existing sensing equipment, and can be used to form a UAV-based WSN (UWSN). Naturally, in order to determine the efficiency of a UWSN, we should investigate further the probability of detecting a target in the FoI if a UAV randomly scanned the FoI n times. Towards this end, we propose in this article to analyze theoretically the target detection problem in a UWSN by considering both static and mobile targets, respectively. We further analyzed the UAV Path Planning problem, and derived the optimal moving scenario for the UAV to detect a target. The experimental results further verified our theoretical results.

Keywords:

Wireless sensor networks, target detection, unmanned aerial vehicle.

*Corresponding author

Email addresses: psun044@uottawa.ca (Peng Sun), boukerch@site.uottawa.ca (Azzedine Boukerche)

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