Notice and Invitation

Oral Defense of Doctoral Dissertation
The Volgenau School of Engineering, George Mason University

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IMPROVING BANDWIDTH EFFICIENCY AND PERFORMANCE FOR UNMANNED AERIAL SYSTEMS CONDUCTING TARGET DETECTION

Friday, April 20th, 2018, 10:00 a.m. – 12:00 p.m.
ENGR 2901
All are invited to attend.

Committee

Dr. Brian L. Mark, Chair
Dr. Bernd-Peter Paris, Member
Dr. Melvin Friedman, Member
Dr. Syed Abbas Zaidi, Member

Abstract

The demand for bandwidth resources is increasing for supporting Unmanned Aerial System (UAS) Intelligence, Surveillance, and Reconnaissance (ISR) missions and operations across the Department of Defense (DOD). The need for real-time target information is a major driver for UAS ISR, especially in prosecuting counter-insurgency operations against distributed, isolated enemy forces. To meet these increased demands for ISR information and bandwidth, the DOD needs to make better use of our available, but fixed, radio frequency spectrum resources.

In this thesis, we offer viable solutions to significantly improve bandwidth efficiency while maintaining, or even improving, target detection rates for tactical UASs conducting aerial reconnaissance missions. The thesis develops and evaluates the following three methods to accomplish this: 1) use of Serial Visual Presentation (SVP) and Aided SVP instead of Full Motion Video (FMV) to capture, process, and obtain target information from sequential fixed frame imagery (FFI) photographs, 2) use of additional independent observers to view SVP or Aided SVP images to improve the overall probability of target detection, and 3) compression of images by combining lossless target sub-images with a compressed background sub-images. In addition, we propose use of the class of phase-type distributions to extend the exponential form of the Networked Imager Sensor (NIS) Target Acquisition probability equation, which may provide a more accurate model for target detection rates in certain scenarios. The thesis also addresses bandwidth efficiency via aggregating multiple UAS Satellite Communication (SATCOM) or Tactical Common Data Link (TCDL) links into a single channel, using various Medium Access Control (MAC) techniques to transmit SVP or Aided SVP images.

A copy of this doctoral dissertation is on reserve at the Johnson Center Library.