Using Decoys as a Resiliency Mechanism in Spectrally Harsh DSA Environments

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Thesis submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Master of Science
in
Electrical Engineering

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February 20, 2014
Blacksburg, Virginia

Keywords: Cognitive Radio, Dynamic Spectrum Access, Decoy-Based Approach

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(ABSTRACT)

As wireless communication mediums develop and Dynamic Spectrum Access (DSA) is implemented as a means to increase capacity on a limited spectrum, the threat of reactive interference becomes real. The motivation for this thesis is to address this problem by suggesting a mechanism which could be used in these spectrally harsh DSA environments.

Overcoming certain types of interference in DSA environments requires unique approaches to transmitting and receiving data. This thesis discusses a decoy-based approach to mitigate conditions in which interference reacts to the spectral movement of the transmitting DSA radio as it hops around the frequency spectrum. Specifically using a polyphase channelizer, multiple replicas of the information signal are simultaneously transmitted at separate frequencies to lure reactive interference away from the main source of transmission. Using either serial or parallel transmission (splitting the signal in time or splitting the signal's energy) with the decoy signals and the original signal can either maximize data throughput in a minimal-interference environment or can add necessary robustness in the presence of multiple sources of reactive interference.

This decoy-based approach is verified with network simulation. An event-based simulator written in C++ was used to define the capacity or maximum throughput. Configuration files loaded with the necessary presets are used to run three network simulation scenarios: First Responder, Military Patrol, and Airborne Network.